UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration

OFFICIAL DOCKET FILE

Terminated (or cancelled) without certification. DMEA No. 1248

This is the official contract file containing all official records of the project. Duplicate material has been removed. The records contained in the files are checked and are arranged in this manner:

Left Side

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.

Schedule of Collections.

✓ Operator's monthly reports and all attachments (latest on top).

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.

Interim Reports.

✓ On-site Exam Report(s). (Tab)

Settlement Sheets.

If additional folders are required because of volume of records, show folder numbers and contents below:

Maps in folder number _____

Operator's Monthly Reports in folder number _____

A. J. M.
Reviewer's Initials

7973

DEFENSE MINERALS EXPLORATION ADMINISTRATION
CONTRACT ADMINISTRATION AND AUDIT DIVISION

REPORT OF REVIEW

I have reviewed the Monthly Reports of:

Arkansas Manganese Company
100 Professional Building
Fort Smith, Arkansas

Pertaining to Exploration Project Contract No. Idm-# 82, Docket No. DMA-1248A, for the months of September and October, 1951.

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, consultation with the Executive Officer of the Field Team, and a determination of the reasonableness and propriety of the costs.

This review was made in lieu of an audit of the Operator's accounts and records for the following reasons:

(a) the administrative cost to the Government of an audit would be excessive in relation to the estimated amount of possible disallowances thereunder;
(b) the files of the DMEA Finance Officer contain documentary proof of the costs incurred under the contract; and
(c) a major portion ($8,027.50) of the accepted costs covered drilling and drifting at footage rates and an additional portion ($2,000.00) of the costs covered engineering and geological services on a job basis, both under sub-contracts.

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

Total cost as billed by Contractor		$ 11,277.50
Exceptions:		
By DMEA Finance Officer	$ -0-	
Herewith	-0-	-0-
Total Accepted Cost		$ 11,277.50

The contract calls for a 75 per cent participation of exploration expenses by the United States Government. Therefore, payment to the contractor by the Government in the amount of Eight thousand four hundred fifty-eight and 12/100 dollars

-$8,458.12-

is considered valid and proper.

Date: AUG 19 1952

E R Talbert
Auditor

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
DEC 10 1951

SETTLEMENT AGREEMENT COVERING
EXPLORATION PROJECT CONTRACT Idm-E82
(Docket No. DMA-1248X)

This agreement entered into this 19th day of November, 1951, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government", and Arkansas Manganese Company, hereinafter called the "Operator",

WITNESSETH THAT:

WHEREAS, these parties are parties to an Exploration Project Contract dated July 27, 1951, Idm-E82 (Docket No. DMA-1248X); and

WHEREAS, all work provided for in said contract was to be and has been performed under contracts with third-party independent contractors, which contracts are described as follows:

(a) Contract dated July 13, 1951 between the Operator and Tom Musgrove and Son for the performance of drilling, assigned by Tom Musgrove and Son under date of August 20 to Parkwood Homes, Inc.; and

(b) Contract dated July 13, 1951 between the Operator and Parkwood Homes, Incorporated, for driving tunnels;

NOW THEREFORE, it is agreed as follows:

1. Said Exploration Project Contract is hereby terminated as of the date of this agreement.

2. The said contracts for the performance of work under the Exploration Project Contract are hereby approved as of the date of the Exploration Project Contract.

3. The Government will participate in no costs incurred or accrued under the Exploration Project Contract after the date of this termination agreement.

4. As of the date of this termination agreement the aggregate total of costs incurred or accrued under the Exploration Project Contract is the sum of $ 11,277.50, and the amount of the Government's participation in said costs is 75 percent thereof or the sum of $ 8,458.12.

5. After the execution of this settlement agreement the Government shall pay its said agreed contribution to said costs under the Exploration Project Contract, as above specified, and thereupon the said Exploration Project Contract shall be fully performed, settled and satisfied as to both parties thereto, and both parties shall be forever released from any and all claims, one against the other, arising out of said Exploration Project Contract.

IN WITNESS WHEREOF, these parties have entered into this settlement agreement as of the date and year first above written.

THE UNITED STATES OF AMERICA

By C O Mitchendorf
Acting Administrator
Defense Minerals Administration

ARKANSAS MANGANESE COMPANY

By [illegible]

Victor Howard, Secy.

DEFENSE MINERALS
ADMINISTRATION
WASHINGTON, D. C.

OCT 29 1 55 PM '51

ASSIGNMENT OF CONTRACT

We hereby assign all our rights and interests in Contract for Churn Drilling and Core Drilling dated July 13th, 1951, between the Arkansas Manganese Company, Inc. and Tom Musgrove and Son to Parkwood Homes, Inc., Said Parkwood Homes, Inc. are to assume full responsibility for performing the Contract, and Tom Musgrove and Son are hereby released from the performance of said contract.

Work performed by Tom Musgrove and Son will be paid by Parkwood Homes, Inc. at the rate of $2.00 per foot for work now completed, upon presentation of Bill by Tom Musgrove and Son to Parkwood Homes, Inc.

IN WITNESS WHEREOF, the parties hereto have executed this Contract as of the 20th day of August, 1951.

TOM MUSGROVE AND SON

WITNESSED:

By Tom Musgrove

ACCEPTED BY:

PARKWOOD HOMES, INC.

Eva Butler

By Walker M. Watson
Walker M. Watson

APPROVED BY:

ARKANSAS MANGANESE COMPANY, INC.

Thomas Kalafat

By Victor Howard
Victor Howard, Secretary

MF-200
(April 1951)

Docket No. DMA-1248X
Commodity Manganese
Idm-E82

Item
Card
Card
Reviewed
8/14/51

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT[1]

AUG 8 1951

It is agreed this 27th day of July, 1951, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and[2] ARKANSAS MANGANESE COMPANY, 100 Professional Building, Fort Smith, Arkansas

hereinafter called the "Operator," as follows:

1. *Authority for contract.* This agreement is entered into under the authority of the Defense Production Act of 1950, pursuant to Mineral Order 5, entitled "Regulations Governing Government Aid in Defense Exploration Projects."

2. *Operator's property rights.* The exploration project shall be conducted on that certain property situated in the State of Arkansas, County of Polk, described as follows:[3] Mining claims located in sections 27 and 28, Township 3 South, Range 30 West as shown on attached plat.

with respect to which the Operator represents and undertakes:[4]

(*a*) That he is the sole owner, in possession and entitled to possession, and that the property is subject only to the following claims, liens, or encumbrances as to each of which the subordination agreement of the holder is attached: No encumbrances

~~(*b*) That he is a lessee in possession and entitled to possession, and the subordination agreement of the lessor is attached.~~

3. *Exploration project.* The Operator, within fifteen days from the date of this contract shall commence work on a project of exploration for[5] manganese; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of[6] ninety days from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

4. *Performance of the work.* The work shall be performed by the Operator, under his sole direction and control: *Provided,* That with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors. The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

5. *Fixtures and improvements.* The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof. Attached hereto, marked "Exhibit 'B'," is a detailed list of additional facilities, buildings, and fixtures, to be purchased, installed, or erected by the Operator, with the estimated cost of each, to which the Government will contribute its agreed pro-rata share of the cost. The difference between the cost of such additional facilities, buildings, or fixtures, and the salvage value thereof at the conclusion of the work, shall be charged as a cost of the project to which the Government has contributed its pro-rata share. NONE

6. *Operating equipment.* Attached hereto, marked "Exhibit 'C'," is a detailed list of operating equipment divided into categories of items to be rented, purchased, or furnished by the Operator, with the allowable rental, purchase price, or rental value, as the case may be, annexed to each. As to equipment purchased for the project, the Government will contribute its agreed pro-rata share of the cost thereof, and the difference between the cost and the salvage value at the conclusion of the work shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property.
[4] Strike out the provision not applicable.
[5] Name of mineral.
[6] Not in excess of 2 years.

7. *Title to and disposition of property.* All facilities, buildings, fixtures, equipment and other items costing more than $50 each, paid for or purchased with funds contributed jointly by the Operator and the Government, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the termination of the contract, if they have any salvage value, shall be disposed of for their joint account unless the Government, in writing, waives its interest in any such items. The Government may require the dismantling, severance from land, and removal of any such items in order to realize its interest in the salvage value thereof, and the cost of any such removal and of the disposal of the items shall be for the joint account of the parties in proportion to their respective interests.

8. *Labor and supervision.* Attached hereto, marked "Exhibit 'D'," is an itemized schedule of labor, by numbers and classes (miners, muckers, millmen, etc.), and of supervisors, by numbers and positions, with the maximum wages or salaries that may be paid to each as an allowable cost of the project.

9. *Rehabilitation and repairs.* Attached hereto, marked "Exhibit 'E'," is a detailed schedule of existing facilities, buildings, installations, and fixtures, with a statement of the cost of any necessary rehabilitation or repairs to put into useful and operable condition, which cost shall be allowed as a cost of the project. NONE

10. *Allowable costs of the project.* The allowable costs of the project in which the Government will participate are limited to the necessary, reasonable, direct costs of performing the exploration work, including the costs of materials, supplies, engineering, power, water, and utilities, including items of equipment costing less than $50 each; and the costs referred to in Articles 5, 6, 8, and 9, and the exhibits annexed to and referred to in the contract. Although the Government may pay part of the cost of new or additional facilities, structures, buildings, and equipment, only the depreciation on such items, computed as indicated in Articles 5 and 6, will be charged as a cost of the project. No items of general overhead, corporate management, interest, or any other indirect costs not expressly allowed by these regulations, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

11. *Participation by the Government.* At the end of the first full calendar month after the Operator has commenced work under the project, and at the end of each succeeding calendar month, the Operator shall submit to the Government a voucher for payment with a detailed statement of work done and allowable costs (as defined in Article 10 of this agreement) incurred, in a form and with supporting data acceptable to the Government. After approving the voucher, the Government shall pay to the Operator 75 percent of the sum of such costs incurred; *Provided,* That the aggregate total of all sums paid by the Government under this agreement shall not exceed $15,000.00, which is 75 percent of the agreed estimated total cost of this project, $20,000.00.

12. *Accounts and audits.* The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract.

13. *Progress reports.* The Operator shall provide the Government with monthly reports of progress in form and content satisfactory to the Government, and upon the completion of the project or termination of the contract shall provide the Government with a comprehensive geologic and engineering report, including an estimate of ore reserves, to the best of his ability. Four copies of all reports shall be furnished to the Government.

14. *Repayment by Operator.* If, upon the completion of the exploration project or termination of the contract, the Government considers that a discovery or development has resulted from the work from which commercial production of ore may be made, the Government, within 6 months thereafter shall so certify to the Operator, particularly describing and delimiting its estimate of the discovery or the development. Thereafter, if and as ore is produced as a result of such discovery or development, the Operator and his successor in interest shall be and become obligated to pay to the Government a percentage royalty on the net smelter returns or other net proceeds realized from such ore, concentrates, or metal produced within ten (10) years from the date of this contract, until the total amount contributed by the Government, without interest, is fully repaid or said 10 years have elapsed, whichever occurs first, as follows:

Of net smelter returns or other net proceeds not in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent.

Of net smelter returns or other net proceeds in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent, plus one-half (½) percent additional for each full fifty cents ($0.50) in excess of eight dollars ($8.00) per ton of ore, but not in excess of a maximum of five (5) percent.

This obligation to repay from net returns or proceeds shall be and remain a claim and lien upon the property which is the subject of the exploration project and upon any production resulting from such discovery or development, in favor of the Government, until fully paid, or until said 10-year period has elapsed; and this claim and lien and the Government's right to repayment shall survive any termination of the contract, whether by completion of the exploration project or otherwise. This article is not to be construed as imposing any obligation on the Operator or his successor in interest to produce ore from any such discovery or development.

15. *No assignment of contract.* Without the written consent of the Government, the Operator shall not assign or otherwise transfer or hypothecate this contract or any rights thereunder.

16. *Termination and completion.* The Government may, at any time, by written notice to the Operator, terminate this contract: (*a*) If the Operator fails to provide his share of the money necessary to prosecute operations pursuant to the terms of the contract; (*b*) if the Operator, in the opinion of the Government, fails to prosecute operations pursuant to the terms of the contract; or (*c*) if in the opinion of the Government, operations up to the time of the notice have not indicated the probability of making any worthwhile discovery and in the opinion of the Government further operations are not justified. Upon the completion of the project or any termination of the contract the Operator shall render to the Government a full and final accounting of his operations under the contract and his expenditures of money; shall dispose of any unused materials, supplies, and equipment for the joint account of the Operator and the Government in the proportion of their respective interests; and shall pay to the Government its pro-rata share of any money remaining.

Executed in triplicate the day and year first above written.

ARKANSAS MANGANESE COMPANY, INC.
(Operator)

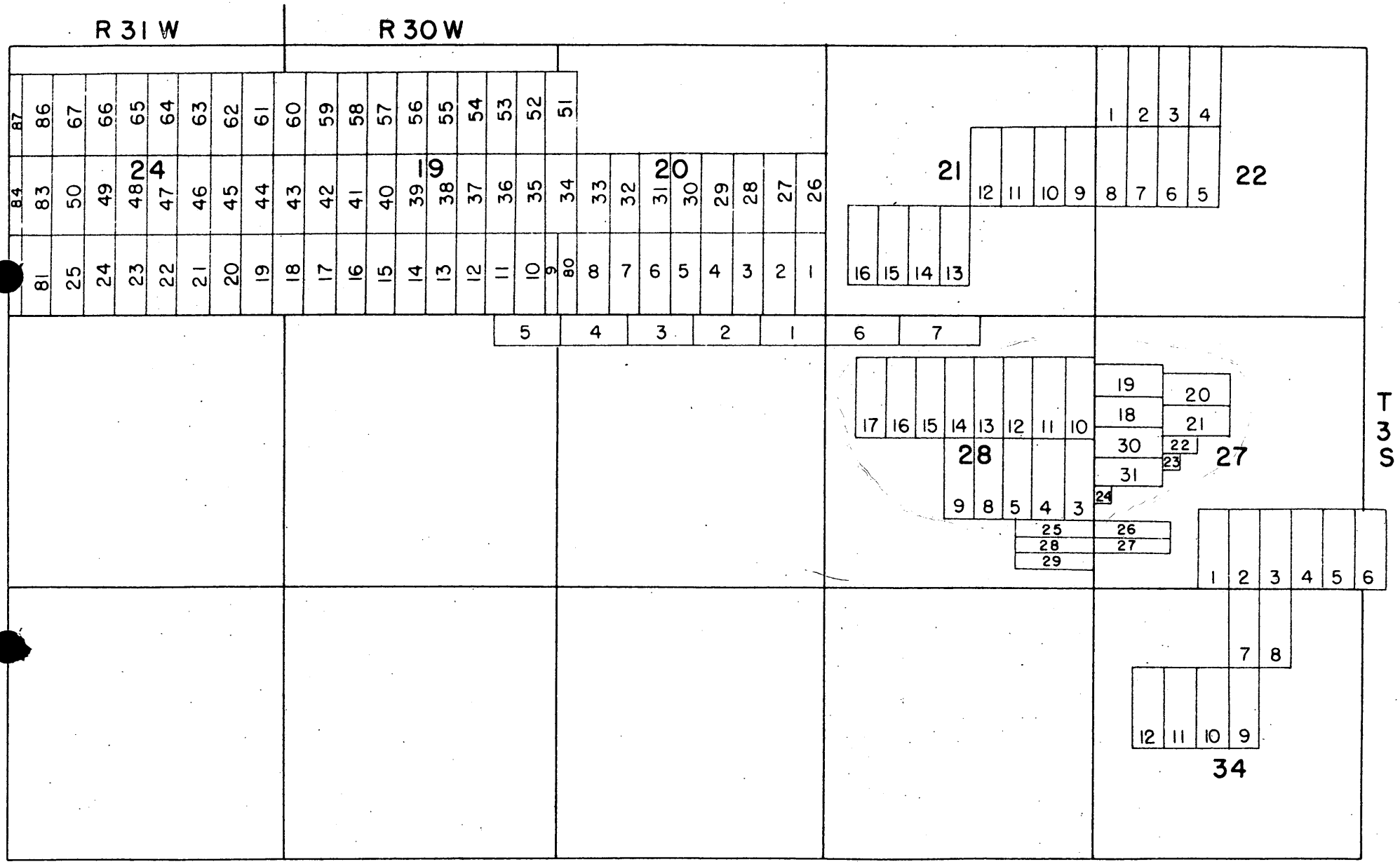
By Victor Hubbard Sec'y

THE UNITED STATES OF AMERICA

By C O Mittendorf

Director, Production Expansion Division
Defense Minerals Administration

U. S. GOVERNMENT PRINTING OFFICE 16—64066-1



PLAT OF UNPATENTED MINING CLAIMS HELD BY ARKANSAS MANGANESE CORPORATION

POLK COUNTY, ARKANSAS

PLATE I

EXHIBIT A - Exploration Project

The project can be divided into two parts. A drilling operation and a tunneling or drifting operation.

The drilling operation will be in two parts, i.e., churn drilling and diamond drilling. This is done to reduce the cost, by taking advantage of the less costly churn drilling, in that part of the drill hole that passes through the overburden and using the costly diamond drilling operation, only when the ore horizon is encountered and a core is desired.

The tunneling is to be done in two places and will be 5 feet wide by 7 feet high. One will be approximately 80 feet long and the other approximately 120 feet long.

Two maps will accompany this contract and will be attached thereto. One of these maps will show the position of the mining claims to be considered in this project and the other the approximate location of the drill holes and the two tunnels.

The actual drilling and tunneling will be done by contract as shown below.

3000 feet churn drilling @ $3.25 per foot	$ 9750.00
200 feet NX diamond coring @ $15.00 per foot	3000.00
200 feet tunneling @ $20.00 per foot	4000.00
	$16,750.00

EXHIBIT B - Additional facilities

Does not apply.

EXHIBIT C - Operating Equipment and Supplies

Analytical work and sample containers	$ 250.00

EXHIBIT D - Labor and Supervision

Engineering and Geological Services (Duration of Contract)	$2000.00
Supervision on the Job (Duration of Contract)	$1000.00

EXHIBIT E - Rehabilitation

Does not apply.

Recapitulation

3000 feet churn drilling @ $3.25 per foot	$ 9750.00
200 feet NX diamond coring @ $15.00 per foot	3000.00
200 feet Tunneling @ $20.00 per foot	4000.00
Chemical analysis and sample containers	250.00
Engineering and Geological Services for duration of contract	2000.00
On the job Supervision for duration of contract	1000.00
Total	$20,000.00

For Government Use Only

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

Minutes
OPERATING COMMITTEE
February 27, 1956

Field Referrals - Applications

DMEA-4138
Tungsten, Lead, an[illegible]pper
Region III

JESSE A. BINGEL, SILVERTON, COLORADO. Dora Mi
Juan County, Colora[illegible].
Letter to the [illegible]ld requesting a field ex
and report. Copies of memoranda dated January
by [illegible] E. Nelson, USGS, and [illegible], [illegible]
sent to the Field.
Letter to the Applicant.

DME[illegible]169
(626 and 2279)
Tungsten
Region II

MOE MINING AND DEV[illegible]MENT COMPANY, INC., RENO,
North-half Now Nosco and Nosco No. 1 Claims, Ny
Nevada.
Letter to the Field requesting review of t
cation, possibly a field examination, and repor
of memoranda dated February 14 and 16, 1956, by
[illegible]
were sent to the Field.
Letter to the Applicant.

DMEA-4172
Uranium
Region II

HOLIDAY MINES, INC., BREMERTON, WASHINGTON. Hol
Falcon Claims, Mineral County, Nevada.
Letter to the Field requesting either a fie
lination and report on the proposed project or th
Team's recommendations based on information avai
Copies of memoranda dated February 16 and 23, 19
N. E. Nelson, USGS, and John E. Crawford, USBM,
tively, were sent to the Field.
Letter to the Applicant advising the applic
been referred to the Field for consideration. T
Applicant was asked to furnish additional inform

CONTRACT

DEPARTMENT OF THE ...
Defense Minerals Administration
RECEIVED
JUL 19 1954
LAMBOR P. SIEGEL
Executive Secretary

This contract entered into this thirteenth (13th) day of July, 1951, by ARKANSAS MANGANESE COMPANY, INC. (hereinafter called the party of the first part) and TOM MUSGROVE AND SON (hereinafter called the Contractor) witnesseth that the parties hereto do mutually agree as follows:

The Contractor shall furnish the labor, equipment, material and supplies and perform the following described work on the property of the party of the first part located in Sections 27 and 28, Township 3 South, Range 30 West, Polk County, Arkansas: The work shall consist of drilling churn drill holes to the ore horizon as designated by the project engineer representing the party of the first part. The churn drill holes will range in depth from 100 feet to approximately 300 feet and the total footage to be churn drilled shall not exceed 3,000 feet. Upon completion of each churn drill hole the contractor shall set NX size casing to the bottom of the hole so as to make a tight seal at the bottom of the casing and then proceed to core drill through the ore horizon as designated by the project engineer. The core shall be of NX size and every reasonable precaution shall be taken to secure as complete core recovery as possible including pulling of the core barrel as often as requested by the project engineer. The contractor shall provide core boxes and place the core in same under the project engineer's supervision. Sludge tubs and provisions for recovering, drying, and sacking of sludge samples shall be provided for by the contractor. The total amount of core drilling will not exceed approximately 200 feet.

The work shall be commenced within (10) calendar days after date of receipt of notice to proceed is given to the contractor by the party of the first part.

The work shall be completed within 75 calendar days after date of receipt of notice to proceed as provided above.

Upon completion of each hole the contractor shall present in triplicate separate invoices for the churn drilling and the core drilling. The party of the first part will then pay to the contractor within ten days the amount of Three and 25/100 - ($3.25) Dollars per foot for the churn drilling and the amount of Fifteen and No/100 ($15.00) Dollars per foot for the core drilling.

The contractor shall be responsible for all damages to persons or property that occur as a result of his fault or negligence in connection with the prosecution of the work, and shall show to the party of the first part proof of Workmen's Compensation, Public Liability, and Property Damage insurance as carried by him.

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

ARKANSAS MANGANESE COMPANY, INC.

By: R. W. Newton
R. W. Newton, President

Witnessed:

Frances Kalapat

Fort Smith, Ark.
Address

J. E. Chastain
Mansfield Ark.

TOM MUSGROVE AND SON

By: Tom Musgrove

C O N T R A C T

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 13 1951
LAMBOH F. STROBEL
Executive Secretary

This contract entered into this thirteenth (13th) day of July, 1951, by the ARKANSAS MANGANESE COMPANY, INC. (hereinafter called the party of the first part) and PARKWOOD HOMES, INCORPORATED (hereinafter called the Contractor) witnesseth that the parties hereto do mutually agree as follows:

The Contractor shall furnish the labor, equipment, material and supplies and perform the following described work on the property of the party of the first part located in Sections 27 and 28, Township 3 South, Range 30 West, Polk County, Arkansas: The work shall consist of driving two tunnels a distance of 80 feet and 120 feet respectively. The dimension of the tunnels shall be approximately five feet wide by seven feet high. The locations of the respective tunnels have been established and the contractor is familiar with said locations. The work shall be done in a workmanlike manner and the tunnels and entrance thereof shall be left in good useable condition with any necessary timbering being done by the contractor. All phases of this work shall be subject to the supervision and approval of the project engineer representing the party of the first part.

The work shall be commenced within fifteen (15) calendar days after days of receipt of notice to proceed is given to the Contractor by the party of the first part.

The work shall be completed within sixty (60) calendar days after date of receipt of notice to proceed as provided above.

Upon completion of each tunnel the Contractor shall present an invoice in triplicate. The party of the first part (subject to inspection and approval of the work by their project engineer) will then pay to the contractor within ten days the amount of twenty dollars ($20.00) per foot for each foot of tunnel driven up to a combined total of 200 feet.

The Contractor shall be responsible for all damages to persons or property that occur as a result of his fault or negligence in connection with the prosecution of the work, and shall show to the party of the first part proof of Workmen's Compensation, Public Liability, and Property Damage insurance as carried by him.

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

ARKANSAS MANGANESE COMPANY, INC.

Witnessed:

Dromus Kalright

Pauline Childress

By: R W Newton
R. W. Newton, President

PARKWOOD HOMES, INCORPORATED
Fort Smith, Arkansas

By: Walker M. Watson
Walker M. Watson, Vice-President

Form MF-103
(April 1951)

U. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. Dma - 1248 X

Date received 5/25/51

Participation

The Defense Minerals Administration
Regional No. 6 Defense Office
221 West 3rd Street
Joplin, Missouri

Arkansas Manganese Company, Inc.
100 Professional Building
Fort Smith, Arkansas

Name and address of applicant

Date May 16, 1951

FILL IN THIS BLOCK

Date of application May 16, 1951

Estimated cost $20,000.00

Mineral or metal Manganese Concentrate

Percentage of Government participation 75%

Location of mine Township 3, South, Section 27 & 28, Range 30 West, Polk County, Arkansas

Date of filing MF-100 May 16, 1951

DMA Docket Number, if available Dma - 1248 X Not available

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property. None
7. If lessee, attach a copy of the lease and state if it is in good standing. NONE

NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract. Not Applicable

8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement. See Exhibit B attache
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)? $6,000.00 or $7,000.00, yes

*If you have already answered these questions on MF-100, you are not required to answer the questions for this application.

16—64067-1

THE PROPERTY

10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property. See accompaning report from R. B. McElwaine, Consulting Mining Geoligist

(*b*) Give the legal description of the exact parcel, plot, or area upon which the exploration is to be conducted.

NOTE.—If both areas are the same, so state. The only obligation to repay the Government is from the net earnings from any commercial discovery made in the area specified in (*b*) above in which the exploration is to be conducted, and the expenditure of funds which may be charged as costs of the project must be limited to that area or to work necessary to perform the exploration in that area. See Report R. B. McElwaine, Consulting Mining Geoligist

*11. State the present and former names of the property, if any.

*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.

*13. State source and quantity of water available for operations and its sufficiency at all seasons. State amount of power to be used, rate per hour or other cost, and source.

*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.

15. State in detail how the ore could be shipped and how and where milled. Plans are to be milled on site if exploratory work proves satisfactory.

*16. History:

(*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.

(*b*) State briefly the known history and production of adjoining and neighboring properties.

(*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

*17. Production:

(*a*) If mine is in production, furnish the following information:

	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
(1) Mining				
(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)

(*a*) Describe the ore or mineral deposits briefly.

(*b*) Submit available maps and assay data.

(*c*) Give estimated tonnage and grade of each class of ore reserves.

19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions. NONE

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted? Manganese bearing ore.

21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it. See report of R.B. McElwaine Consulting Mining Geoligist

NOTE.—The Government will not participate in a project that will require more than 2 years to complete.

22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data. See Report of R. B. McElwaine Consulting Mining Geoligist.

THE REQUIREMENTS AND COSTS

23. Tabulate in the form of an itemized statement with a sum for each item the estimated requirements and costs of the project so that the total will give the estimated cost of the project in which the Government will participate, as follows: See Report of R. B. McElwaine, Consulting Mining Geoligist.

(*a*) Labor, by numbers and classes (miners, muckers, millmen, etc.), with wages of each.

(*b*) Supervisors, by numbers and positions, with salaries of each.

(*c*) Cost of necessary repairs to existing facilities, structures, and buildings.

(*d*) Cost of necessary installation or construction of additional facilities, structures, and buildings.

(*e*) Cost of items of equipment, not now owned by the applicant which must be purchased for operations at a cost of $50 or more each.

(*f*) Cost of rental for equipment which the operator proposes to rent.

(*g*) Rental value of items of equipment which the operator now owns and which will be devoted to the work.

(*h*) Cost of materials and supplies, including items of equipment costing less than $50 each.

(*i*) Cost of power, water, utilities, and any other items not provided for above.

24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent. Approximately 90 days.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

ARKANSAS MANGANESE COMPANY, INC.
(Name of company)

By Victor Howard
(Signature of authorized official)

May 16, 1951
(Date)

Secretary
(Title)

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.

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

ARKANSAS MANGANESE CO., INC.

OFFICES: 100 PROFESSIONAL BUILDING
TELEPHONE 8995
Fort Smith, Arkansas

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TREASURER

VICTOR HOWARD
SECRETARY

JAMES M. TAYLOR, JR.
ASST. SECRETARY

ARKANSAS MANGANESE COMPANY, INC.

BALANCE SHEET

MAY 16, 1951

ASSETS:	
CASH	$ 11,229.81
MACHINERY & EQUIPMENT	66,864.00
LODE MINING CLAIMS	48,791.71
	$126,885.52
LIABILITIES & CAPITAL	
ACCOUNT PAYABLE	74.00
NOTES PAYABLE	15,000.00
MORTGAGE PAYABLE	6,790.00
PAYROLL TAXES PAYABLE	21.52
COMMON STOCK	48,000.00
PREFERRED STOCK	57,000.00
	$126,885.52

Certified True and Correct.
Victor Howard
Secy.

2

MAY 12 1952

1

ARKANSAS MANGANESE COMPANY, INCORPORATED
Defense Minerals Administration
Exploration Project No. 1248X

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAY 14 1952

by

Robert B. McElwaine

Consulting Mining Geologist

Little Rock, Arkansas

May 10, 1952

TABLE OF CONTENTS

	Page
Summary	
Introduction	1
Location	2
Physical Features and Climate	3
Labor and Living Conditions	3
History and Production	4
Beneficiation	5
General Geology	6
Structure	7
Novaculite	7
Ore Deposits	9
Occurrence of Deposits	9
Exploration	13
Drilling	13
Tunneling	16
Previous Exploration	17
Ore Reserves	18
Conclusion	21
Drill Hole Logs (at back of report)	

ILLUSTRATIONS

Plate No.		Follows Page
1.	Plate of unpatented mining claims held by Arkansas Manganese Company, Polk County, Arkansas	2
2.	Plan and cross section views of tunnel No. 1	16
3.	Plan view of tunnel No. 2	16
4.	Geologic map of portion of property of Arkansas Manganese Company (In pocket at back)	
5.	Ideal cross section through drill hole No. 7 showing structural conditions	17

SUMMARY

This report covers the work done on manganese properties held by the Arkansas Manganese Company, Incorporated in Polk County, Arkansas. The original work was done during the spring of 1951 and is fully discussed in a report prepared by the writer in May of that year. Subsequent work was done under a Defense Minerals Administration exploration project (No. 1248X). All of the work proposed under the DMA project was not completed because it was ascertained that a geological theory postulating a large bedded deposit extending all of the way across a synclinal structure was not going to prove out.

Geological conditions are thoroughly discussed in this report and it is pointed out that one particular horizon at the top of the lower division of the Arkansas novaculite formation is the most favorable zone in which to find substantial quantities of manganese. It is believed possible to find substantial quantities of material containing 5 to 6 percent manganese in deposits ranging in size from a few thousand to two or three hundred thousand tons.

Ore reserves totaling 69,000 tons of indicated ore with a manganese content of 6.00 percent or more are outlined. An additional quantity of 19,000 tons of inferred ore with an average grade of 6.00 percent is postulated.

Beneficiation is a paramount problem that has not been adequately solved. This is true at least as far as any published information or general public knowledge is concerned.

In summation it can be said that large but not unlimited quantities of low grade ore may be present in the western Arkansas manganese area. The economics of the mining and beneficiation of such ores are yet to be determined. It is a financially hazardous business that requires large sums of money and should be left to those who "hath and to spare".

INTRODUCTION

During the month of March and the early part of April 1951 the Arkansas Manganese Company of Fort Smith, Arkansas conducted some surface exploration work for manganese within a small local area on some of its properties in Polk County, Arkansas. This work was directed by the writer who subsequently prepared a report dealing with the manganese possibilities of the area. Some of the geological phenomena developed during the period of this initial exploratory work indicated some possible new geological interpretations of the manganese deposits of the region. The report noted the possibility of an entirely new geologic interpretation of the manganese deposition to account for its secondary deposition in selective stratigraphic horizons. An initial exploratory program calling for the expenditure of twenty thousand dollars was recommended providing the investors fully understood that it was a most hazardous financial venture.

The Company subsequently applied for and obtained Governmental aid in the form of a Defense Minerals Administration exploration loan to assist in carrying out the proposed exploratory work. The work was begun in August 1951. Before the project was completed it was amply demonstrated that the postulated theory upon which the project was proposed was not

correct. The writer recommended that the project be terminated and this was done before half of the proposed drilling had been completed. Tunnel work proposed for the project was completed.

A discussion of the results of the exploration work done and the geological information obtained is presented in this report.

LOCATION

The property on which the exploration work was done is located in the southeast 1/4 of section 28 and the south west 1/4 of section 27 all in township 3 south, range 30 west, Polk County, Arkansas. The property is in the Ouachita National Forest and is served by good gravel roads maintained by the federal Forestry Service. The nearest town of any consequence is Mena, Arkansas which is 17 miles to the northwest. Mena is near the Oklahoma border and is about 140 miles west and slightly south of Little Rock, Arkansas. It has a population of approximately 5,000 and has telephone and telegraph facilities, hotels, rail and truck freight service. The nearest rail point to the property of the Arkansas Manganese Company is Hatfield, Arkansas on the mainline of the Kansas City Southern Railroad. This point is about 12½ miles southwest of the property and is accessible by moderately good gravel roads.

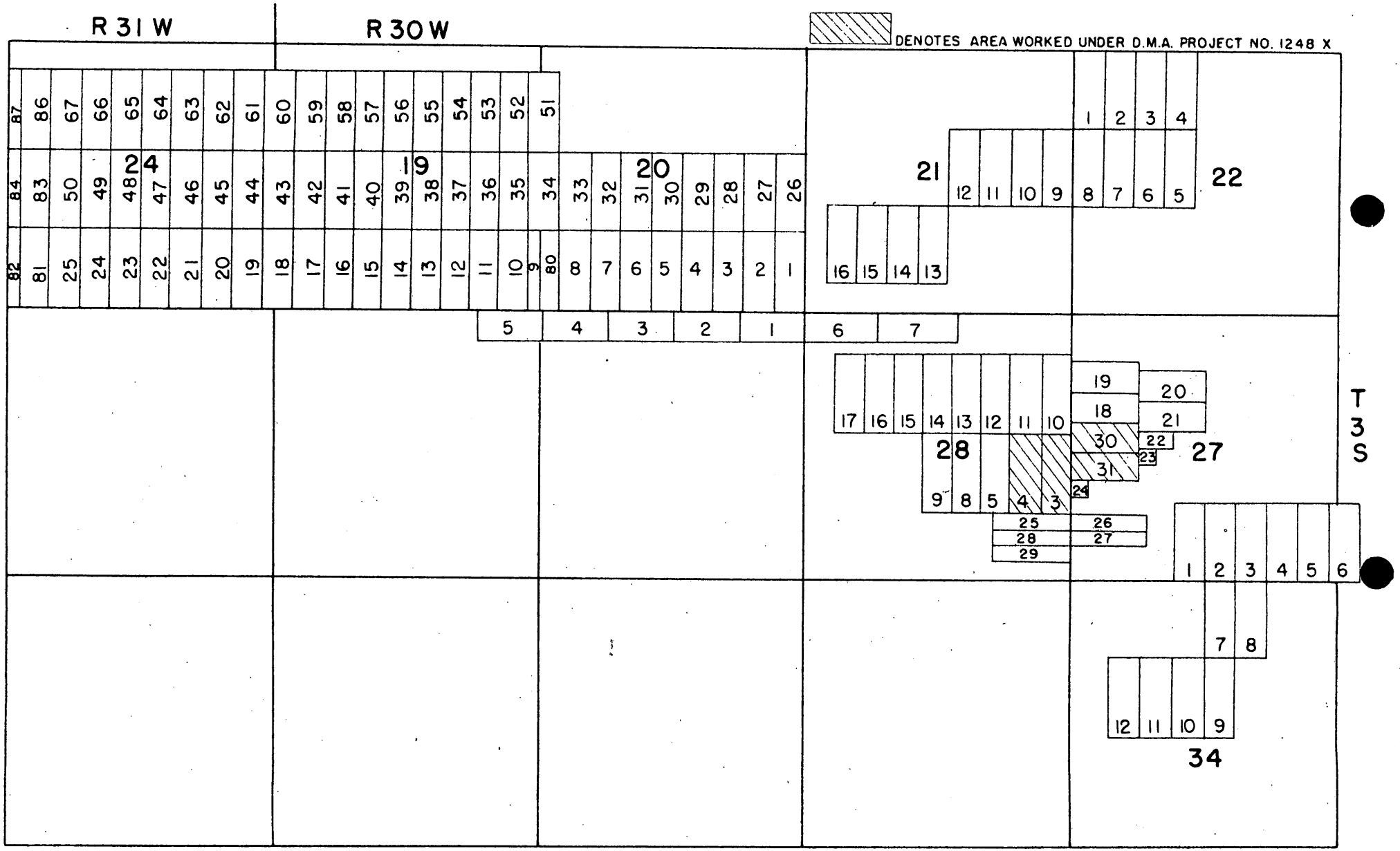
PHYSICAL FEATURES AND CLIMATE

The property is located in the Ouachita Mountain subdivision of the Interior Highlands physiographic province. The topography consists of moderately rugged east-west trending parallel ridges and valleys. The average relief ranges from 400 to 600 feet and the general stream elevation is 1100 to 1200 feet above sea level.

The climate is mild and favorable to year around mining. Vegetation is heavy, and dense undergrowth makes prospecting during the growing season difficult. Adequate oak and pine timber for mining and building purposes occurs throughout the area. The average annual rainfall is in excess of fifty inches and the larger streams of the area are of a perennial character. The property of the Arkansas Manganese Company is adjacent to Brushy Creek which would furnish adequate water for milling purposes throughout the year.

LABOR AND LIVING CONDITIONS

There is a good supply of unskilled labor consisting mostly of loggers and farmers. As a whole they are willing workers and learn quickly. Many of the natives have had some experience in the limited type of surface mining operations that have been carried on intermittently throughout the area for the past fifty years. The prevailing rate



PLAT OF UNPATENTED MINING CLAIMS HELD BY ARKANSAS MANGANESE CORPORATION
POLK COUNTY, ARKANSAS

PLATE 1

for unskilled labor is seventy-five cents per hour, but the better class of labor cannot long be retained at this rate of pay. The normal rate of pay for skilled labor such as machine operators, etc., would have to be met.

Housing facilities are not available near the Company's property. Local labor could probably group together and handle their own transportation problems. Unless housing facilities were constructed on the property, imported labor would have to be housed at Mena and transported to and from any mining operations on the property. A limited amount of housing facilities are probably available in Mena. Living costs are relatively low when compared to other parts of the country.

HISTORY AND PRODUCTION

The manganese bearing area as a whole is large and extends from southeastern Oklahoma eastward to the vicinities of Glenwood and Hot Springs, Arkansas. This gives it a longitudinal length of a hundred miles or more and it has a north-south extent of six to twelve miles. Most of the manganese mining activity has been in the area between Mena and Glenwood. It has been mined and promoted sporadically for the past 75 years. The mining has consisted primarily of the surface or near surface extraction of the "free" ore by hand cobbing methods. A number of operators have unsuccessfully attempted in a crude way to do some milling by gravity methods.

The operations have all been on a small tonnage basis and the vast majority of them of a crude type. Apparently little or no technical skill has been applied to the geological, engineering, or metallurgical problems involved.

No accurate figures as to the past production of manganese are available. The writer believes that 2,500 long tons of manganese would be a high estimate of the total production of the entire area. Very little ore is being produced in the district at the present time. One small car of high grade ore was recently shipped from Mena. This ore came from a property located in the extreme southeastern part of township 3 south, range 29 west and was mined by a Dr. Scott from Abilene, Texas.

The world situation in regard to manganese and its resultant effect on the price in recent years has created considerable interest in the western Arkansas manganese district. Numerous parties have been actively investigating the area and some have tried to produce manganese. Most of these have repeated the errors of earlier operations, especially in regard to milling operations, and thus were doomed to failure from the start.

BENEFICIATION

The bulk of the ore of the area is not amenable to treatment by gravity methods. This is principally due to the fact

that the manganese is finely interlocked with silica. Numerous attempts have been made to recover the manganese by means of jigs and tables. These methods cannot make a merchantable concentrate nor effect an efficient recovery of the milling grade ore which constitutes the bulk of the reserves. Some of the ore is not economically recoverable by any known means of mechanical concentration. The type of ore which makes up the bulk of the reserves is recoverable by means of flotation processes, but it has not been proven practical to produce a marketable concentrate in this manner. It is reported to be practical to produce a low grade concentrate by means of heavy media separation processes. Recent investigations indicate that it is feasible to convert this low grade concentrate into ferro-manganese by means of pyrometallurgy.

GENERAL GEOLOGY

With some very minor exceptions such as volcanic tuff the rocks of the area are all of water laid sedimentary origin. They are of Paleozoic age ranging from Cambrian to Carboniferous. Since the manganese is contained in the Arkansas novaculite and it is the most conspicuous formation of the area it is the only one that need be described in much detail in this report.

The areal extent of the Ouachita Mountains, in which the manganese deposits occur, is some 200 miles in length extending from Little Rock, Arkansas slightly south-westward into southeast Oklahoma. The north-south extent of this physiographic and geologic province is approximately 50 miles.

Structure

Structurally the Ouachita Mountains consist of highly folded weak and strong strata that form parallel east to west trending anticlines and synclines resulting in topographic ridges and valleys. However, the topographic features do not always correspond to the geologic structures, and anticlinal structures often occur topographically as valleys. A great deal of thrusting and cross faulting and cross folding has resulted from the forces which developed the extreme folding of some 25,000 to 30,000 feet of sediments. The attitude of the formations are normally observed to be steeply dipping beds due to the close folding and often the folds are overturned so that both limbs dip to the south. Locally there are areas where the folding has not been so intensive and the anticlines and synclines are of a broader form with more gentle dips to their limbs.

Novaculite

The Arkansas novaculite is fully described by Miser and Purdue (U.S.G.S. Bulletin 808) and a detailed description will not be given in this report. It is essentially a pure silica chert, usually white or very light grey in color but commonly found in various shades of red, green, yellow, brown and mottled hues as well as black. The formation is predominantly chert with subordinate although substantial amounts of shale in the middle division thereof. The chert has a con-

choidal fracture and breaks with sharp edges. It is brittle and highly fractured and jointed and it is a fine grained homogenous rock composed almost entirely of silica. It has three stratigraphic divisions with a combined thickness of about 900 feet. Its maximum thickness is in the southern portion of the Ouachita Mountain region and it thins toward the north and at places has a thickness of only 250 to 300 feet. The lower division is made up principally of massive white novaculite ranging in thickness from 150 to 300 feet. This division makes up the most conspicuous part of the formation and is normally the part that is exposed on the crest of the ridges.

The middle part of the formation varies greatly in thickness from less than 100 feet to over 500 feet and is predominantly thin beds of interbedded chert and shale. The chert in this division is mostly black or dark grey in color, but otherwise is similar to that of the lower division. The shale occurs in uniform beds of various thicknesses and is normally of fissile argillaceous type, but is at places highly siliceous. Miser and Purdue (op. Prev., cited) state that, "In some places the novaculite layers are partly and in others wholly replaced by beds of conglomerate from 1 inch to 2 feet thick. The matrix of this conglomerate is very compact novaculite; its pebbles are composed of novaculite, though some are of sandstone or other hard rock." This is interesting because of its similarity to some of the conglomerate beds occuring at the unconformity at the top of the lower division and its relationship to the manganese deposits.

The upper division of the novaculite normally occurs only along the southern border of the Ouachita Mountains and ranges in thickness from a few to over 100 feet. It is found chiefly in massive beds and ranges in color from white or light grey to some bluish black occurrences. It resembles the lower division in general appearance in its unweathered form. However, it is highly calcareous and upon weathering, it loses its calcium carbonate content and becomes porous and soft and contains a great many small cavities.

ORE DEPOSITS

Occurrence of Deposits

Manganese oxides in minor amounts can be found throughout the novaculite area of the Ouachita Mountain province. Their most obvious occurrence is as fracture and joint fillings in the massive white novaculite and on rock surfaces as purely residual deposition. More infrequently, where rock deformation has been sufficient to create larger fractures and openings, the manganese is found as nodules and lumps ranging from a few inches to a foot or more in diameter; it also occurs as a cement or matrix of rock breccia, and as stalactitic and botryoidal deposits in the larger rock openings.

Manganese can be found, in minor quantities, throughout the stratigraphic range of the novaculite formation. However, the most important deposition occurs at the top of the lower division. A detailed study of the manganese deposits of the

area makes it quite obvious that the far greatest amount of the manganese to be found is in this horizon. Several different conditions no doubt contribute to this phenomena. The better manganese deposits occur in the areas of greatest rock deformation where the fractures and openings are most numerous and of a larger character. The structures making up these more deformed areas are principally the noses or axis of plunging anticlines and synclines; and the axis of cross folds, drag folds, and cross faults. At such places concentration of manganese in suffieient quantities so as to form possible orebodies can frequently be found. However, structure alone is not sufficient to cause a concentration of manganese. The ore is not always present even when extensive fracturing of the manganese bearing horizon is present. No accounting has been made to date as to why the manganese occurs only locally in this horizon. Extensive stretches of this favorable horizon, with adequate structural conditions, can be found where there is not the slightest indication of any manganese deposition. The writer thinks it is possible that the original concentration of the manganese in local areas of this horizon may have occurred in low lying regions of an old land surface when the area was only partially covered with water and the deposition of the middle division of the novaculite was in its early stages. In all instances observed to date, the better or more extensive deposits of manganese found in this horizon are in areas where conglomerate, locally associated with the unconformity occurring at the top of this horizon, is present. Another factor that may have some

bearing on the deposition of the manganese in this horizon is a lithologic difference in the beds from those stratigraphically below them. This is indicated by the confining of the principal manganese deposition to this series of beds with a total thickness of about twenty feet. The lithologic difference is further denoted by the fact that where the beds are sufficiently elevated for erosional processes to easily attack them, the twenty foot series of beds frequently have their upturned edges considerable more eroded than do the beds stratigraphically below them. This condition often forms an appreciable bluff between the two rock types. The manganese deposition in this horizon can frequently be found to occur for several hundred feet along the strike of the beds. Where the truncated edges of the beds occur somewhere down the slope of a hill side rather than high on the slope, the manganese is usually more concentrated. This indicates that erosion of the manganese bearing horizon released the manganese content and that part of it was redeposited and thus tended to increase the concentration in the near surface, but unremoved portion of the beds of this horizon. The massive strata, where deformed so as to have fracturing and openings, permitted relatively free circulation of meteoric waters and epigenetic deposition of manganese oxides. It is interesting to note that no manganese deposition of any appreciable consequence whatever has been observed in the massive novaculite beds immediately below this horizon. This may further denote a difference in lithologic character and indicate that

the ore horizon was a much better host rock than the adjoining beds.

Two other principal zones of deposition occur, one at the top of the upper division of the novaculite and one at the base of the lower division. Good ore is frequently found in the horizon near the top of the upper division near its contact with the Stanley shale, the overlying formation. The ore in this horizon is usually relatively small in areal extent and assumes a more or less chimney or pipe like form in the steeply dipping beds. The main ore bed is eight to twelve feet in thickness and the strike length of the deposits is usually limited to tens of feet. It is interesting to note that this ore horizon is also adjacent to an overlying conformity. The ore at the base of the lower division of the novaculite is adjacent to the underlying, impermeable Missouri Mountain slate formation. It would seem that this would be a favorable condition for concentration of the manganese, but normally there is not sufficient distortion of the beds to allow for any appreciable amount of fracturing and openings in the rock to provide space in which the manganese may form. Manganese found in this horizon is usually confined to fine fractures and like that at the top of the upper horizon it does not usually persist for any appreciable distance along the strike of the beds.

There is one other horizon in which appreciable quantities of manganese mineralization have been observed. It occurs from one to two hundred feet below the top of the lower division. Apparently it is, like the horizon at the top of this division, of a different lithologic character and is receptive to deposition of manganese carried through it by meteoric waters. The ore is of a comparable quality to any of the other zones, but the indications are that no large quantities are likely to be found in this horizon.

It is the writer's opinion that the principal source of any adequate tonnage of manganese bearing material will be the horizon near the top of the lower division of the novaculite. In this zone and the one at the top of the upper division there is usually a small percentage of so called "free" ore that can be mined and shipped as a marketable product without further processing. The principal quantities of ore present in the area is of a type which will have to be beneficiated to produce a marketable product.

EXPLORATION

Drilling

The project as originally set up called for a total of 3,200 feet of exploratory drilling. This was to be principally churn drilling with a small amount of diamond core drilling in the ore horizon at the bottom of each hole. The formation proved to be very difficult and extremely costly to core drill

and only 32.66 feet was actually core drilled. By the time the drilling was one third completed it became well apparent that the postulated theory outlining the possibilities of a large bedded deposit of manganese extending across the syncline, and upon which the project was based, was not going to be substantiated. Therefore the project was terminated with a total amount of drilling of only 1,123.36 feet of which 1,090.5 feet was churn drilling and the balance core drilling.

Seven holes were drilled and the only core drilling was in the bottom of holes 3 and 4. Graphic cross sections, logs, and sample analyses of six of these holes were included in the September monthly project report under date of October 10, 1952. An ideal cross section of hole No. 7 is shown on plate 5. Logs and analyses of all holes are presented at the back of this report. Location of the drill holes are shown on plate 4.

Drill hole No. 1 beyond the extreme east end of the ore outcrop penetrated the ore horizon at a point about 145 feet down the dip of the beds. Badly broken ground resulted in the obtaining of unreliable samples due to caving for a considerable distance away from the hole and consequent falling in of material from above. Twelve feet in this hole had an average Mn content of 1.89 percent according to the samples recovered.

Drill hole No. 2 which was located slightly east of tunnel No. 1 penetrated the ore horizon at a point approximately 200

feet down the dip from the outcrop and showed a manganese bearing thickness of seven feet with an average manganese content of 3.33 percent. The samples obtained from this hole were also badly mixed and unreliable as to accuracy.

Drill hole No. 3 was located slightly west of tunnel No. 1 and penetrated the ore horizon at a point approximately 180 feet down the dip from the outcrop. The ore horizon was core drilled in this hole. The core recovery from the upper four feet of the ore horizon was 39.32 percent with an average Mn content of 7.34 percent. This was all in the beds overlying the massive novaculite of the lower division. No sample was recovered below this point except a very small amount of sludge which showed less than one percent manganese.

Drill hole No. 4 penetrated the ore horizon at a point approximately 275 feet down the dip of the beds from the outcrop. This hole was discontinued due to the impossibility of penetrating any deeper with the diamond drill. The bottom 1.16 feet from which 100 percent core recovery was obtained revealed a manganese content of 9.14 percent. This hole could have been drilled deeper by putting the churn drill back over the hole, but in view of the results obtained from the surrounding holes it was not considered worthwhile.

Hole No. 5 penetrated the ore horizon 140 feet down the dip from the outcrop. An eight foot zone in this hole revealed a manganese content of 1.50 percent. Hole No. 6 penetrated the ore horizon 315 feet down the dip from the outcrop. One two foot interval had a manganese content of

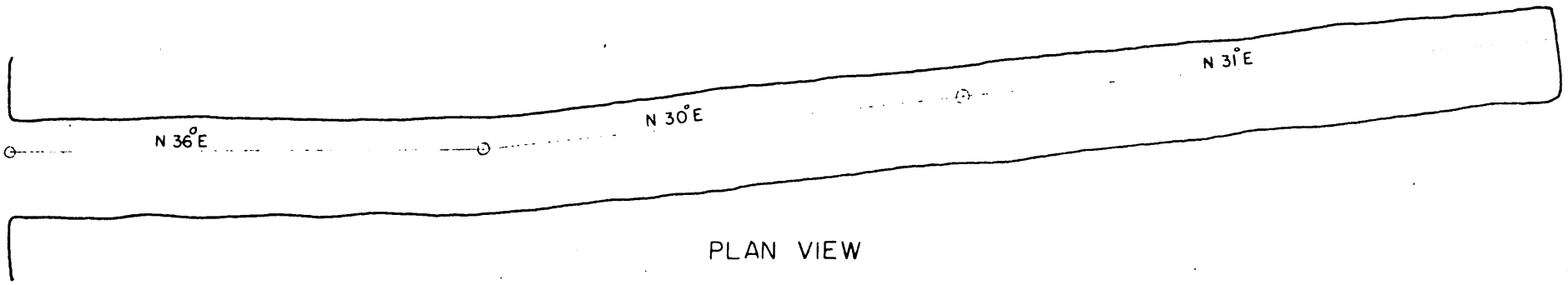
4.90 percent and the balance of the samples contained less than one percent Mn.

Drill hole No. 7 was located on the axis of the synclinal structure approximately 570 feet away from the outcrop. It penetrated the ore horizon at a depth of 392 feet to 406 feet. In this zone heavily iron stained material was encountered after passing through 300 feet of unaltered material. The influence of ground waters traveling along the zone of the unconformity was plainly visible. The maximum Mn content of any sample interval was 0.54 percent. Manganese oxide was distinguishable in the drill cuttings from the ore horizon.

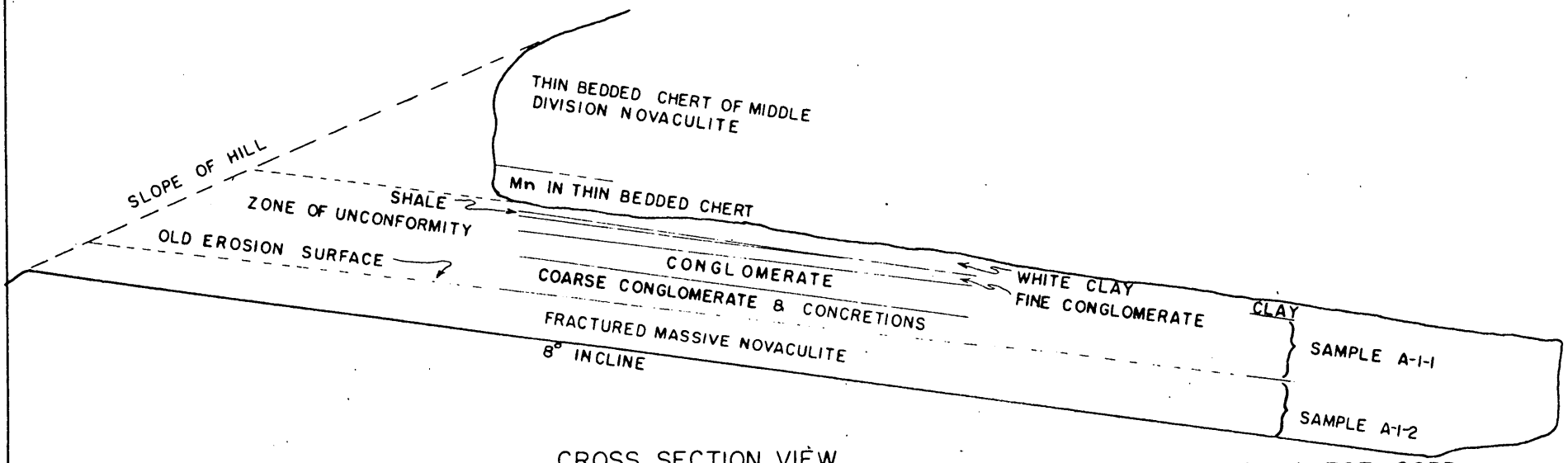
Tunneling

The project called for drifting and cross-cutting in two locations for a total of 200 feet. This work was done and maps of the two tunnels are shown on plates 2 and 3 respectively. Their location is shown on plate 4.

Tunnel No. 1 was actually an incline down the dip of the ore horizon. A cross section of this work is shown on plate 2. Not much apparent change in the grade of the ore was noted in this tunnel between the surface outcrop and the heading. However, two respective samples gave the folbwing results.



PLAN VIEW



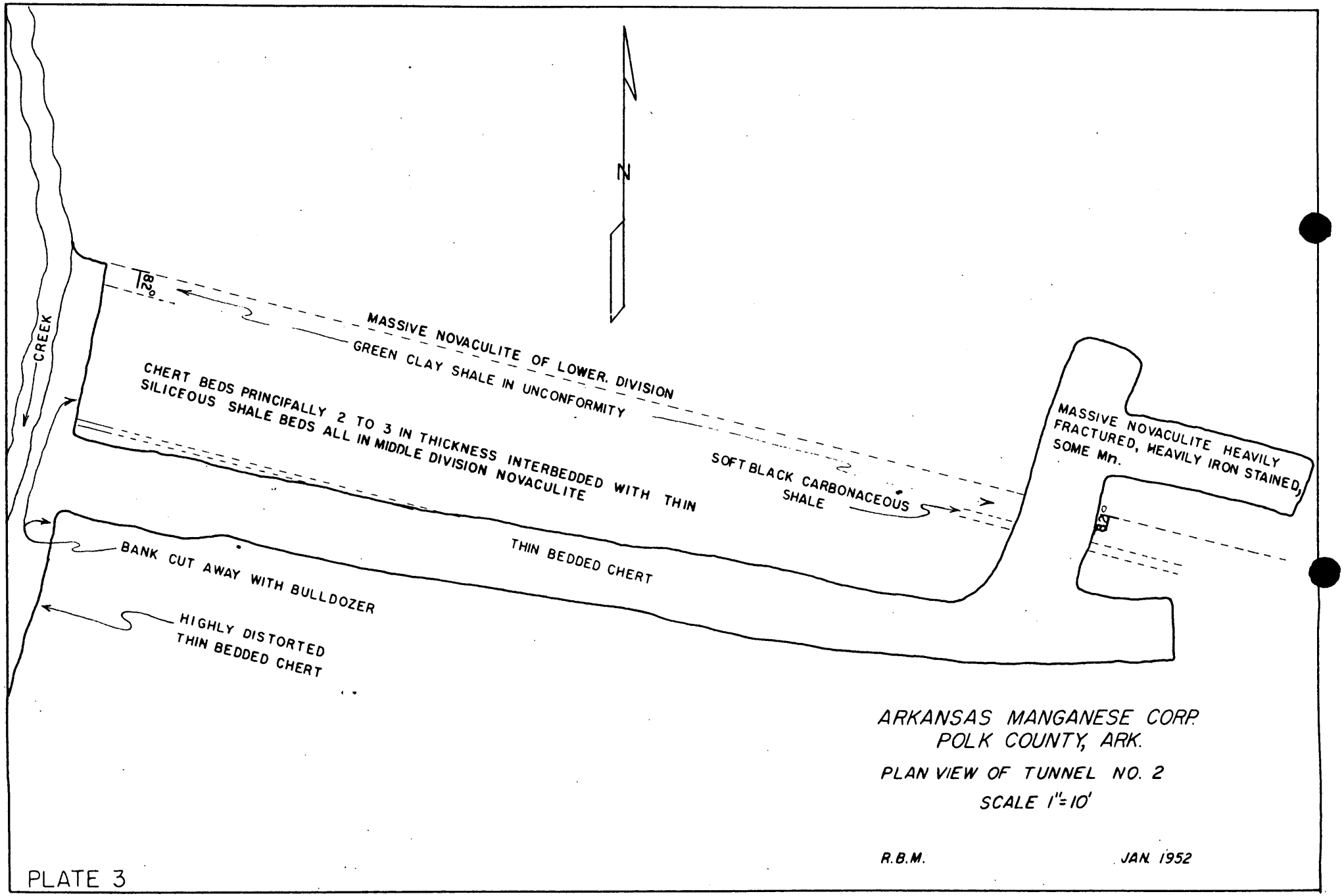
CROSS SECTION VIEW

ARKANSAS MANGANESE CORP.
POLK COUNTY, ARK.
PLAN AND CROSS SECTION VIEWS OF TUNNEL NO. 1

SCALE 1" = 10'

R.B.M. *JAN. 1952*

PLATE 2



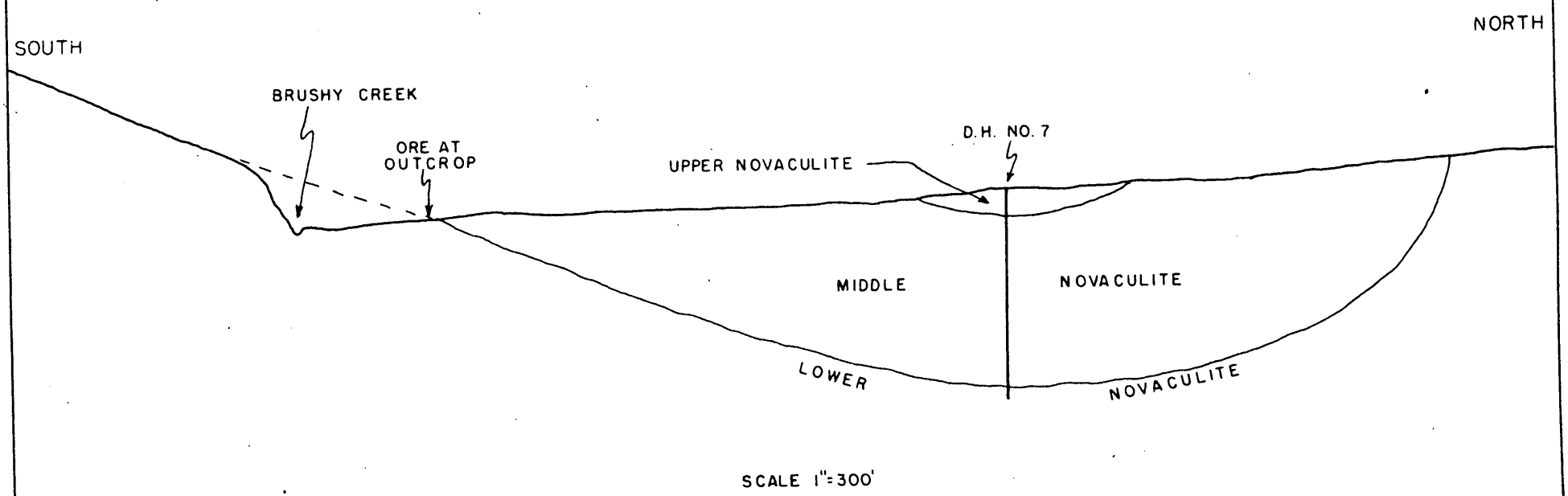
ARKANSAS MANGANESE CORP.
POLK COUNTY, ARK.

PLAN VIEW OF TUNNEL NO. 2

SCALE 1"=10'

R.B.M. JAN. 1952

PLATE 3



IDEAL CROSS SECTION THROUGH DRILL HOLE NO. 7 SHOWING STRUCTURAL CONDITIONS. VIEW IS ALONG EROSIONAL RAVINE DRAINING INTO BRUSHY CREEK.

R.B.M JAN, 1952

PLATE 5

	Sample at outcrop	Sample 75' down incline from outcrop.
Thickness of beds sampled	97inches	92 inches
Percent Mn	6.69	5.32
Percent Fe	5.40	3.94
Percent P	0.20	0.18

This one comparison showed a drop in manganese content of 1.37 percent in progressing down the dip away from the outcrop for a distance of 75 feet.

Tunnel No. 2 was a drift along the beds as shown in plan on plate 3. The ore horizon was cross cut near the end of the drift. At this point it was at an elevation of approximately 100 feet below the surface outcrop on the overlying hillside. Very little manganese was encountered. The ore horizon in the drift heading is highly fractured and altered by meteoric waters. Considerable iron oxide is present but only small isolated kidneys of Mn were encountered. The conglomerate bed frequently associated with the manganese deposition was not present in the drift.

Previous Exploration

The exploration work done on this property by the Arkansas Manganese Company during the spring of 1951 consisted principally of trenching across the outcrop of the ore horizon and the taking of 39 channel samples. This work revealed the presence of some 2,000 tons of material with an average tenor of 7.30 percent. Based on an apparent improvement of the grade of the ore down the dip of the beds as revealed in a short adit

and upon the presence of some high grade pockets at other points on the property; the writer had given the indicated ore a tenor of 12.0 percent. It is now apparent that this was an error and that the average tenor will be much lower.

ORE RESERVES

By correlating the results of the previous exploration work with the information obtained from the work done under the recent DMA project it is possible to make a fairly reliable estimate of the indicated ore available in the area explored. In the true technical sense of the word it may be questionable whether any ore exists on the property. The term "ore" generally indicates that the material is susceptible to beneficiation and that it exists under conditions and in such quantities so as to make feasible a profitable mining operation. The writer does not propose to bring forth a discussion on those questions in this report. There are many factors to be weighed pro and con in attempting to arrive at an answer to the objective question as to whether the material is ore. Furthermore, many of the factors are undeterminable at this time. For the purposes of simplicity and brevity the term "ore" will be used in the following discussion of ore reserves.

In the area along the outcrop from tunnel No. 1 westward to where the contact crosses Smoke Rock Creek there is a zone of ore that has excellent continuity. Projecting this

zone 100 feet down the dip of the beds into the hill and using a thickness of $7\frac{1}{2}$ feet, gives an ore block that is relatively well assured. On the basis of the above described block it is estimated that there is an indicated tonnage of 50,000 tons of ore. The calculated average grade of the outcrop is 7.30 percent Mn. The only sample in the ore horizon at a point approximately 100 feet down the dip of the beds is the one taken near the heading in tunnel No. 1. This sample showed a manganese content of 5.32 percent. Based upon the writer's experience of the manganese deposition under similar conditions, throughout the area; it is believed that this is a reliable figure upon which to calculate the average grade along the lower extremity of the ore block under discussion. Using this figure versus the 7.3 percent content at the outcrop would give the block an average grade of 6.31 percent Mn.

Across Smoke Rock Creek to the west where the contact turns back south there is a smaller block of ore. This is shown on the map on plate 4. In this area the mineralization carries down into the 20 foot zone of the massive novaculite underlying the unconformity at the top of the lower division novaculite. It is exposed in a high bluff which swings around the hill to the west. The ore in the conglomerate section is comparable to that on the outcrop of the ore block across the creek although somewhat thinner. The twenty foot zone of

massive novaculite was sampled at only one point. This was sample No. 7 (see map) in a short tunnel at the base of the 20 foot zone. An eight foot channel sample from the roof of the tunnel revealed a manganese content of 4.15 percent. This old tunnel contained many large vugs and fracture openings from which high grade free ore had been gouged. None of this material was included in the sample and it is believed that a truly representative sample would show a higher manganese content. The upper ten feet of this 20 foot zone contains ore of a much higher grade. It was not sampled but it is estimated that it would show a manganese content of 8 to 10 percent. It is believed that a fair estimate of the grade of this entire block would be 6 percent Mn. The mineralization appears to be quite uniformily distributed with a gradual dimunition in tenor downward through the block. The block used for estimating indicated ore in this area is 250 feet long by 20 feet in thickness. Projecting it up the dip a distance of 50 feet gives a block containing over 19,000 tons of indicated ore with an average grade of 6 percent. The tonnage factor used is 13 cubic feet. In this same area, projecting the ore to the north along the strike of the beds, it is possible to infer a similar block of material of comparable size and grade. Thus, an inferred tonnage of 19,000 tons of ore containing 6 percent manganese is arrived at.

On the north limb of the syncline in the vicinity of tunnel No. 2 no ore of interest was revealed by the exploratory work.

No exploratory work was done on any of the balance of the Company's holdings (see plate 1), and no estimate of ore reserves can be made. However, numerous outcrops containing manganese are known to be present.

CONCLUSION

The writer believes it is feasible, by extensive exploratory work, to develop sizeable tonnages of material containing 5 to 6 percent manganese. The probable size of the individual deposits is from a few thousand tons to two or three hundred thousand tons. Any mining operation would necessarily have to be on a fairly large scale in order to be profitable. Exploratory work should be confined principally to areas where it would be possible to mine the ore by open pit methods.

Where the ore beds are in a vertical or steeply dipping attitude the mineralization is normally confined to a relatively thin zone along the stratigraphic top of the beds. Where the beds are lying at a low angle dip ranging from 45 degrees down to relatively flat the probability of the ore having a thickness across the beds of 5 to 20 feet is much better than it is in the steeply dipping beds. An ideal condition is where the ore horizon is lying at a dip slope attitude and most of the overlying beds have been removed by erosion.

It must be realized that anyone contemplating a venture in manganese in this area should have very considerable financial resources at their command. The financial hazard is very great. The beneficiation of the ores is a paramount problem and no one should enter into an extensive exploratory program without first ascertaining all of the facts in this phase of the business. Work is being done on the beneficiation problem and it appears probable that it will be satisfactorily solved in due course of time. The best answer apparently lies in the field of pyrometallurgy.

Any geological or prospecting work should be done between October 15 and April 15. During the balance of the year the dense undergrowth makes such work much slower and much more inefficient. The actual exploratory work can be done most anytime of the year.

Robert B. McElwaine
May 10, 1952

2

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 1
Elevation at collar: 1,026
Depth: 57'

Location: No. 3 claim
SE¼ Sec. 28, T.3S., R.30W.
Drilled August 1951

DRILL HOLE LOG

0' - 36'	Middle division novaculite made up of thin bedded, dark colored chert and siliceous shale.
36' - 42'	Light grey and iron stained chert.
42' - 48'	Grey chert, iron stone, manganese and pyrite.
48' - 51'	Sandstone, conglomerate, little manganese.
51' - 53'	Conglomerate, little manganese.
53' - 57'	Conglomerate and highly fractured, massive (lower division) novaculite.

Remarks: Conglomerate marks unconformity between middle and lower divisions of novaculite formation.

ASSAYS

Interval	Manganese	Iron	Phos.
36' - 42'	1.48	3.60	0.19
42' - 48'	2.31	3.00	0.17
48' - 51'	0.74	1.70	0.10
51' - 53'	0.36	1.10	0.06
53' - 57'	0.41	1.15	0.04

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 2
Elevation at collar: 1,043'
Depth: 117'

Location: Claim No. 3
SE¼ Sec. 28, T.3S., R.30W
Drilled August 1951

DRILL HOLE LOG

0' - 95'	Middle division novaculite made up of thin bedded, dark colored chert and siliceous shale.
95' - 103'	Medium to light grey chert. Little white quartz.
103' - 106'	Coarse cuttings with many large pieces 1/4" to 1/2" or larger. Large pieces of fine grained sandstone character--light to yellow brown (iron) and medium grey in color. Little light greyish-green chert. Some manganese and pyrite.
106' - 108'	Medium grey chert, arenaceous light to yellow brown rock. Fine conglomerate material with Mn matrix. Quartz. Greyish green to green chert. Little manganese and some pyrite.
108' - 110'	White and iron stained novaculite (lower division) with manganese. Pyrite. Some grey chert (caved from above).
110' - 112'	White to pinkish tan novaculite. Little manganese and pyrite.
112' - 114'	White to yellowish novaculite.
114' - 117'	" " " "

ASSAYS

Interval	Manganese	Iron	Phos.
103 - 106	3.50	10.10	0.57
106 - 108	1.55	5.40	0.21
108 - 110	4.85	5.50	0.21
110 - 112	0.90	2.00	0.04
112 - 114	0.50	1.50	0.04

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 3
Elevation at collar: 1,080'
Depth: 137'6"

Location: Claim No. 3
SE¼ Sec. 28, T.3S R30W.
Drilled September 1951

DRILL HOLE LOG

0' - 125.5'	Middle division novaculite made up of thin bedded, dark colored chert and siliceous shale.
125.5' - 127'	Dark grey chert interbedded with brown iron bearing light grey chert.
127' - 129.5'	Thin bedded, highly fractured grey chert carrying Mn and Fe in fractures, bedding planes and some possible replacement of thin laminae in rock (lies parallel to bedding). Little light grey chert at top. Apparent dip 22½ degrees.
129.5' - 130'8"	Thin bedded, highly fractured grey chert highly mineralized with Mn and Fe as fracture filling and possibly some replacement. Much of rock is of an arenaceous nature.
130'8" - 130'10"	Unaltered (iron free) fractured grey chert with considerable Mn as fracture filling. Very fine to thick (3/8") fractures.
130'10"- 131'	Same as above. Setting on top of sand bed. Contact shows dip of 22°.
131' - 135'4"	White sand. No core. Sludge sample.
135'4" - 136'6"	Conglomerate. No core. " "
136'6" - 137'6"	Fractured novaculite. Sludge sample. No core.

Remarks: This hole was churn drilled to 110.5' and diamond core drilled from that point to a depth of 137.5'.

ASSAYS

Interval	% of Core Recovered	Manganese	Copper	Phos.	Iron
127' -129.5'	37	5.69	None	0.77	17.50
129.5'-130'8"	21	9.00	None	0.79	19.70
130'8"-130'10"	100	13.07	None	0.13	3.30
130'10"-131'	100	14.15	None	0.18	3.80
131' -135'4"	Sludge	0.57	0.02	0.03	1.70
135'4"-136'6"	Sludge	0.25	0.02	0.02	2.20
136'6"-137'6"	Sludge	0.19	0.04	0.03	2.70

127-131 = 4' @ 7.4%

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 4
Elevation at collar: 1,093'
Depth: 169'8"

Location: Claim No. 3
SE¼ Sec. 28, T.3S., R30W.
Drilled September 1951

DRILL HOLE LOG

0'	- 164'	Middle division novaculite made up of thin bedded, dark colored chert and siliceous shale.
164'	-168'3"	Light grey chert, thin bedded. 4" iron bearing sandstone at bottom marks top of unconformity.
168'3"	-168'6"	Same as above with Mn adhering to bottom.
168'6"	-169'	Fractured massive white novaculite with all openings filled with Mn.
169'	-169'8"	Same as above.

Remarks: This hole was churn drilled to 164' and diamond core drilled from that point to a depth of 169'8". All of the beds normally occuring in the unconformity were missing at this location. It was not feasible to penetrate any deeper with the core drill. A new diamond bit made only three inches before it stopped cutting.

ASSAYS

Interval	% of Core Recovered	Manganese	Copper	Phos.	Iron
168'3"-168'6"	33	1.85	None	0.83	23.40
168'6"-169'	100	9.23	"	0.24	6.10
169' -169'8"	100	9.07	"	0.11	2.50

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 5
Elevation at collar: 1,058'
Depth: 89'

Location: Claim No. 3
SE¼ Sec. 28, T. 3S., R.30W
Drilled September 1951

DRILL HOLE LOG

0' - 76'	Middle division novaculite made up of thin bedded, dark colored chert and siliceous shale.
76' - 80'	Medium to light grey chert. Considerable pyrite and little quartz. Little light grey, porous chert and some iron stained dark chert. Broken ground.
80' - 84'	Entered ore zone. Chert, shale, sand, conglomerate.
84' - 86'	Sand, conglomerate, grey chert caved from above.
86' - 88'	Fractured massive white novaculite with Mn.
88' - 89'	Fractured massive white and pink chert. Open ground. Iron stain.

ASSAYS

Interval	Manganese	Copper	Phos.	Iron
80-84	1.14	0.03	0.22	5.80
84-86	0.90	0.02	0.13	3.30
86-88	2.99	0.05	0.02	4.20
88-89	0.85	0.02	0.03	2.40

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 6
Elevation at collar: 1,060'
Depth: 147'

Location: Claim No. 3
SE¼ Sec. 28, T.3S., R.30W
Drilled September 1951

DRILL HOLE LOG

0'-135.5'	Middle division novaculite made up of thin bedded, dark colored chert and siliceous shale.
135.5' -140.5'	Mostly chert with some dark grey arenaceous material that probably makes up iron stained bed at outcrop and in other drill holes.
140.5' -142.5'	Chert (cave material), iron stone, black shale, Mn., pyrite, quartz, white sand. Black shale is marker bed that shows consistently in outcrop but was undetected in most drill holes.
142.5' -144.5'	White (lower division) novaculite, part of which is possibly conglomerate bed. Black chert, (cave from above), novaculite fragments with Mn stain on sides.
144.5' -147'	Massive fractured white novaculite with grey and black chert out of walls above.

ASSAYS

Interval	Manganese	Copper	Phos.	Iron
135.5-140.5	0.25	0.03	0.02	2.10
140.5-142.5	4.90	0.02	0.29	7.70
142.5-144.5	0.90	0.04	0.03	2.10
144.5-147.0	0.38	0.02	0.01	1.70

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 7
Elevation at collar: 1,040'
Depth: 406'

Location: No. 31 Claim
SW¼ Sec. 27, T.3S., R.30W
Drilled October 1951

DRILL HOLE LOG

0' - 55'	White porous novaculite from upper division of formation.
55' -392'	Thin bedded, dark colored chert of middle division of novaculite formation.
392' -393'	Dark grey shale (contact of unconformity). Iron stained grey chert. The sample is principally altered (iron) material from conglomerate beds of unconformity. Heavily iron stained and impregnated.
393' -394'	Material from conglomerate beds in unconformity. Highly discolored with iron oxides.
394' -400'	White massive novaculite from lower division. Carrying manganese oxide as fracture filling.
400' -406'	White novaculite. Iron oxides.

ASSAYS

Interval	Manganese	Copper	Phos.	Iron
392'-393'	0.54	0.026	0.05	3.75
393'-394'	0.40	0.016	0.03	4.75
394'-400'	0.46	0.012	0.04	2.25
400'-406'	0.34	0.008	0.02	0.90

REPORT ON MANGANESE POSSIBILITIES OF WESTERN ARKANSAS WITH PARTICULAR REFERENCE TO HOLDINGS OF THE ARKANSAS MANGANESE CORPORATION

Prepared For

ARKANSAS MANGANESE CORPORATION

by

Robert B. McIlwaine

Consulting Mining Geologist

Little Rock, Arkansas

May 11, 1951

TABLE OF CONTENTS

Page

Summary

Introduction ---------- 1

Location ---------- 1

Physical Features and Climate ---------- 2

Labor and Living Conditions ---------- 2

History and Production ---------- 3

Property and Ownership ---------- 3

General Geology ---------- 4
- Structure ---------- 4
- Nevasulite formation ---------- 5

Ore Deposits ---------- 6
- Occurrence of deposits ---------- 6
- Conglomerate series (M-horizon) ---------- 7
- Character of ore ---------- 9
- Origin of manganese ---------- 11

Surface Exploration and Examination ---------- 15
- Sample descriptions and analyses ---------- 15-A
- Discussion of sampling results ---------- 16

Ore Reserves ---------- 18
- Measured ore ---------- 18
- Indicated ore ---------- 18
- Inferred ore ---------- 19

Conclusions ---------- 20

Recommendations ---------- 22
- Exploration ---------- 23
  - Drilling ---------- 23
  - Drifting ---------- 24
- Summary of cost of exploration ---------- 26

ILLUSTRATIONS

Plate No.		Follows Page
1.	Plat of unpatented mining claims held by Arkansas Manganese Corporation. Polk County, Arkansas ----------	3
2.	Ideal cross section showing M-horizon in detail as revealed on south limb of syncline in area of trenching ----------	8
3.	Ideal cross section looking northwest, of geological conditions and ore deposition across syncline ----------	13
4.	Geologic map of portion of property of Arkansas Manganese Corporation (In pocket at back) ----------	26
5.	Cross section A-A' showing relationship of old adit to outcrop and topography --	15

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11. Same as number 2. Plate I

SUMMARY

This report deals with the possibilities of developing manganese ore in commercial quantities in the western Arkansas manganese district as a whole as well as on the holdings of the Arkansas Manganese Corporation.

The history of the district is that of small, inefficient, sporadic and unsuccessful attempts to mine manganese profitably for the past 75 years. The district has been more or less condemned as to economic possibilities by most of the competent geologists that have examined it. The author has always concurred in this view until recently. The discovery of new ore possibilities in the course of examination work leading up to the preparation of this report has led the writer to believe that the area may have unforeseen possibilities. There are some new developments that could quite possibly change the picture completely. First and foremost of these is the possibility of an entirely new geologic interpretation of the origin of the manganese which accounts for its secondary deposition in selective stratigraphic horizons. This theory concurrently points out the possibilities of developing some very large reserves of low grade manganese ore that could be relatively easily proven and mined. There is strong evidence to support the suggested theory of a different type of deposition than has been considered in the past. The possible ore reserves that may be developed, if this postulated geological interpretation is correct, is in the class of hundreds of millions of tons with a manganese content of 12 to 20 percent.

An initial exploration program calling for the expenditure of twenty thousand dollars has been recommended. However, it has also been pointed out that it is a most hazardous financial venture. The possible rewards are likewise great.

The postulated ore reserves are of a type of ore that present difficult metallurgical problems, but with large reserves to work on it is feasible to solve these problems. The profitable production of manganese from this district will involve fairly large scale operations and a minimum capital investment probably exceeding one million dollars.

With the critical position of manganese in the national economy and defense program, the possibility of developing some very large reserves of manganese ore, the availability of large tracts of potential ore bearing

lands, and the probability of obtaining substantial governmental assistance; it is recommended that the initial exploration work be carried out. However, it should be fully realized that the financial investment may be a total loss.

If the exploration work reveals that the postulated theory outlining the possible existence of a heretofore unrecognized type of manganese ore bodies is wrong, then any further work in the area should not be contemplated.

INTRODUCTION

An examination of the holdings of the Arkansas Manganese Corporation, which this report covers, was made upon the request of the president of the Corporation, Mr. H. W. Newton. Initial field work was begun on March 1, 1951, and nineteen days were spent in the field between that date and April 9th when the work was completed. The writer was accompanied by Mr. Newton during the course of most of the field work.

The primary purpose of the examination was to obtain data upon which to base a formal report as to the economic possibilities of the property. Early in the course of the examination, the writer became aware of the possibilities of some new geological interpretations of the manganese deposits of the area. This led to the recommendation and subsequent execution of some surface exploration work and detailed study in one local area on the Corporation's holdings.

A general reconnaissance of most of the property was made. Some of the surrounding properties were visited briefly as an aid to an understanding of a particularly interesting type of manganese deposition that occurs in the area where the more detailed work was done. Subsequent investigation indicated that this type of deposition may occur locally throughout much of the novaculite area.

LOCATION

The general location of the property is in sections 27 and 28, township 3 south, range 30 west, Polk County, Arkansas. It is within the Ouachita National Forest and is thus served by good gravel roads maintained by the Forestry Service. The nearest town of any consequence is Mena, Arkansas, which is about 17 miles to the northwest. Mena is near the Oklahoma border and is about 140 miles west and slightly south of Little Rock, Arkansas. It has a population of approximately 5,000 and has facilities such as telephone, telegraph, hotels, railroad and truck freight service. The nearest rail point to the mining property is Hatfield, Arkansas on the mainline of the Kansas City Southern Railroad. It is 12.5 miles distant from the property and accessible by moderately good gravel roads. There are a few shallow fords that would necessitate bridging in order to make the road usable at all times.

PHYSICAL FEATURES AND CLIMATE

The property is located in the Ouachita Mountain subdivision of the Interior Highlands physiographic province. The topography consists of moderately rugged east-west trending parallel ridges and valleys. The average relief ranges from 400 to 600 feet and the general stream elevation is 1100 to 1200 feet above sea level.

The climate is mild and favorable to year around mining. Vegetation is heavy and dense undergrowth makes prospecting during the growing season difficult. Adequate oak and pine timber for mining and building purposes occurs throughout the area. The average annual rainfall is in excess of fifty inches. The larger streams of the area are of a perennial character. The main stream in the locality of the Corporation's property is Brushy Creek and this stream would provide adequate water for milling purposes throughout the year.

LABOR AND LIVING CONDITIONS

There is a large supply of unskilled labor throughout the area consisting mostly of loggers and farmers. As a whole, they are willing workers and learn rapidly. Many of the natives have had some experience in the limited type of surface mining operations that have been carried on intermittently throughout the area for the past fifty years. They do not have any comprehension of modern mining methods. The prevailing rate for unskilled labor is seventy-five cents per hour, but the better class of labor cannot long be retained at this rate of pay.

A modern mining operation would require the importation of a limited number of skilled miners to assist in the training of the native labor. This would of course necessitate the payment of normal rates of pay for those men and the establishment of a pay scale for the local labor ranging from seventy-five cents to a dollar and a half per hour.

Housing facilities are not available near the proposed mining operation. Local labor would probably be able to group together and handle their own transportation problems. Unless housing facilities were constructed at the mine, imported labor would have to be housed at

Mena and transported to and from the mining operation. A limited amount of adequate housing facilities are probably available in Mena. Living costs are relatively low when compared to other parts of the country.

HISTORY AND PRODUCTION

The manganese bearing area as a whole is large and extends from southeastern Oklahoma eastward to the vicinities of Glenwood and Hot Springs, Arkansas. This gives it a longitudinal length of a hundred miles or more and it has a north-south extent of six to twelve miles. Most of the manganese mining activity has been in the area between Mena and Glenwood. It has been mined and prospected sporadically for the past 75 years. The mining has consisted primarily of the surface or near surface extraction of the "free" ore by hand cobbing methods. A number of operators have unsuccessfully attempted in a crude way to do some milling by gravity (jigs and tables) methods. The writer knows of two World War II installations of rather well constructed gravity type mills, but these operations were unsuccessful and the mills dismantled and shipped out of the area. They were a monument to the folly of constructing mills before proving up adequate ore reserves and satisfactory metallurgical methods to justify the investment. The operations have all been on a small tonnage basis and the vast majority of them of a crude type. Apparently little or no technical skill has been applied to the geological or engineering problems involved.

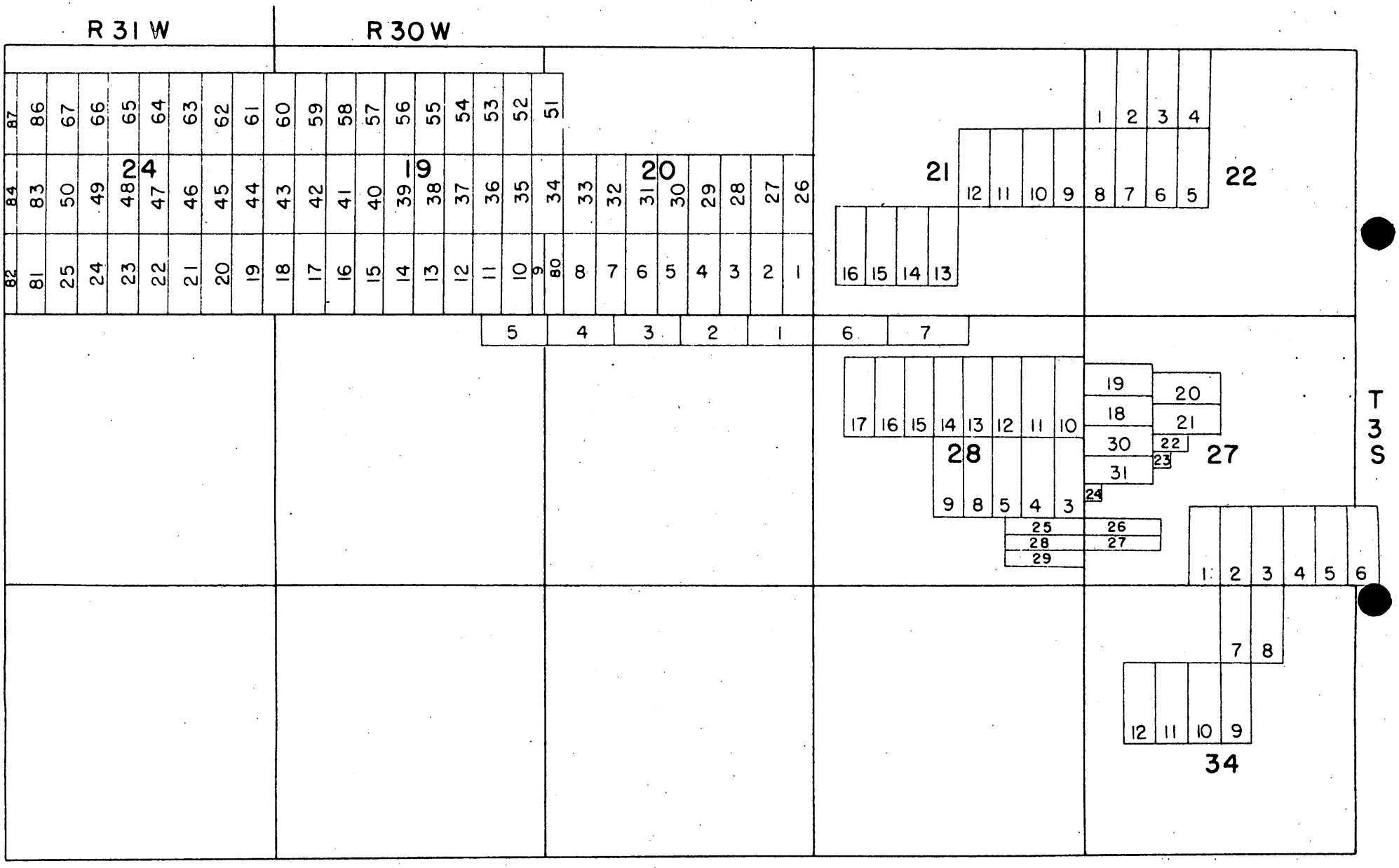
No accurate figures as to the past production of manganese ore available. The writer believes that 2,500 long tons of manganese would be a high estimate of the total production of the entire area.

No ore is being produced in the district at the present time but the world situation in the manganese market and its resultant effect on the price in recent years has created a new interest in the western Arkansas manganese district. Rumors of numerous prospect operations are reported.

PROPERTY OWNERSHIP

Since this report is being prepared for the directors of the Arkansas Manganese Corporation, a discussion of the ownership is not considered pertinent. A plat

Mr. Tibbetts –
from Oklahoma
on Manganese



PLAT OF UNPATENTED MINING CLAIMS HELD BY ARKANSAS MANGANESE CORPORATION

POLK COUNTY, ARKANSAS

PLATE 1

(Plate I) of the holdings of the corporation is made a part of this report. The property is held by means of unpatented mining claims on public domain. The holdings consist of approximately 3,000 acres.

GENERAL GEOLOGY

With some very minor exceptions such as volcanic tuff the rocks of the area are all of water laid sedimentary origin. They are of paleozoic age ranging from Cambrian to Carboniferous. A table summarizing the succession of formations, together with the principal features of their lithology is given by Miser[1]. A revised version of this table with considerable delineation of the description of the character of the formations is given on the next page of this report.

Since the manganese is contained in the Arkansas novaculite and it is the most conspicuous formation of the area it is the only one that need be described in much detail in this report.

The areal extent of the Ouachita Mountains, in which the manganese deposits occur, is some 200 miles in length extending from Little Rock, Arkansas slightly south-westward into southeast Oklahoma. The north-south extent of this physiographic and geologic province is approximately 50 miles.

Structure

Structurally the Ouachita Mountains consist of highly folded weak and strong rocks that form parallel east to west trending anticlines and synclines resulting in topographic ridges and valleys. However, the topographic features do not always correspond to the geologic structures, and anticlinal structures often occur topographically as valleys. A great deal of thrusting and cross faulting and cross folding has resulted from the forces which developed the extreme folding of some 25,000 to 30,000 feet of sediments. The attitude of the formations are normally observed to be steeply dipping due to the close folding and often the folds are overturned so that both limbs dip to the south. Locally there are areas where the folding has not been so intensive and the anticlines and synclines are of a broader form with more gentle dips to their limbs.

1/ All references are listed immediately following table of contents.

GENERALIZED SECTION OF THE PALEOZOIC ROCKS OF THE CADDO GAP AND DeQUEEN QUADRANGLES, ARK., AND OKLA.
(Modified after Miser)*

SYSTEM	FORMATION	THICKNESS (feet)	CHARACTER
	Atoka	6,000+	Hard micaceous ripple-marked light-grey to greenish-grey sandstone interbedded with equal amount of sandy micaceous black clay shale.
Pennsylvanian.	Jackfork sandstone	5,000-6,600	Fine to coarse grained, massive light grey sandstone, with some millstone grit at base. Green fissile clay shale.
	Stanley shale	6,000	Black, fissile clay shale with some fine-grained compact blue-grey sandstone. Hatton tuff lentil at base in some areas.
	Unconformity		
Devonian	Arkansas novaculite	250-950	Consists of three lithologic divisions— a lower one, made up almost entirely of massive white novaculite, at whose top is one of the two manganese horizons; a middle one, consisting mainly of thin layers of dense dark-colored novaculite interbedded with shale and having a conglomerate of local distribution at the base; and an upper one, consisting chiefly of massive, highly calcareous novaculite, which also yields manganese.
	Unconformity?		
	Missouri Mountain slate	50-300	Red and green clay slate.
Silurian	Unconformity?		
	Blaylock sandstone	0-1,800	Fine grained light to dark grey or green compact sandstone and dark fissile shale.
	Unconformity		

* Op. cit., ref. 1. Slightly revised and description of character modified and condensed. Ordovician and Cambrian sections omitted.

Novaculite

The Arkansas novaculite is fully described by Miser and Purdue and a detailed description will not be given in this report. It is essentially a pure silica chert, usually white or very light grey in color but commonly found in various shades of red, green, yellow, brown and mottled hues as well as black. The formation is predominantly chert with subordinate although substantial amounts of shale. The chert has a conchoidal fracture and breaks with sharp edges. It is brittle and highly fractured and jointed and is a fine grained homogenous rock composed almost entirely of silica. It is composed of three stratigraphic divisions with a combined maximum thickness of about 900 feet. Its maximum thickness is in the southern portion of the Ouachita Mountain region and it thins toward the north and at places has a thickness of only 250 to 300 feet. The lower division is made up principally of massive white novaculite ranging in thickness from 150 to 300 feet. This division makes up the most conspicuous part of the formation and is normally the part that is exposed on the crest of the ridges.

The middle part of the formation varies greatly in thickness from less than 100 feet to over 500 feet and is predominantly thin beds of interbedded chert and shale. The chert in this division is mostly black or dark grey in color, but otherwise is similar to that of the lower division. The shale occurs in uniform beds of various thicknesses and is normally of a fissile argillaceous type, but is at places highly siliceous. Miser and Purdue state that, "In some places the novaculite layers are partly and in others wholly replaced by beds of conglomerate from 1 inch to 2 feet thick. The matrix of this conglomerate is very compact novaculite; its pebbles are small and well rounded to subangular, and their larger percentage are composed of novaculite, though some are of sandstone or other hard rock." This is interesting because of its similarity to some of the conglomerate beds occurring at the unconformity at the top of the lower division and its relationship to the manganese deposits. This phenomena will be discussed more in detail later on in this report.

The upper division of the novaculite occurs only along the southern border of the Ouachita Mountains and ranges in thickness from a few to over 100 feet. It is found chiefly in massive beds and ranges in color from white or light grey to some bluish black occurrences. It resembles the lower division in general appearance

in its unweathered form. However, it is highly calcareous and upon weathering, it loses its calcium carbonate content and becomes porous and soft and contains a great many small cavities.

ORE DEPOSITS

Occurrence of Deposits

Manganese oxides in minor amounts can be found at random throughout the Ouachita Mountain area wherever the novaculite is exposed on the surface. Its most obvious occurrence is as fracture and joint fillings in the massive white novaculite. Very little of the novaculite can be walked over without finding float ore lying on the surface and not much ground can be covered without finding manganese in place in the novaculite as fracture fillings and on rock surfaces as purely residual or secondary deposition. More infrequently, where rock deformation has been sufficient to create larger fractures and openings, the manganese is found as nodules and lumps ranging from a few inches in diameter to a foot or more; it also occurs as a cement or matrix of rock breccia, and as stalactitic and botryoidal deposits in the larger rock openings.

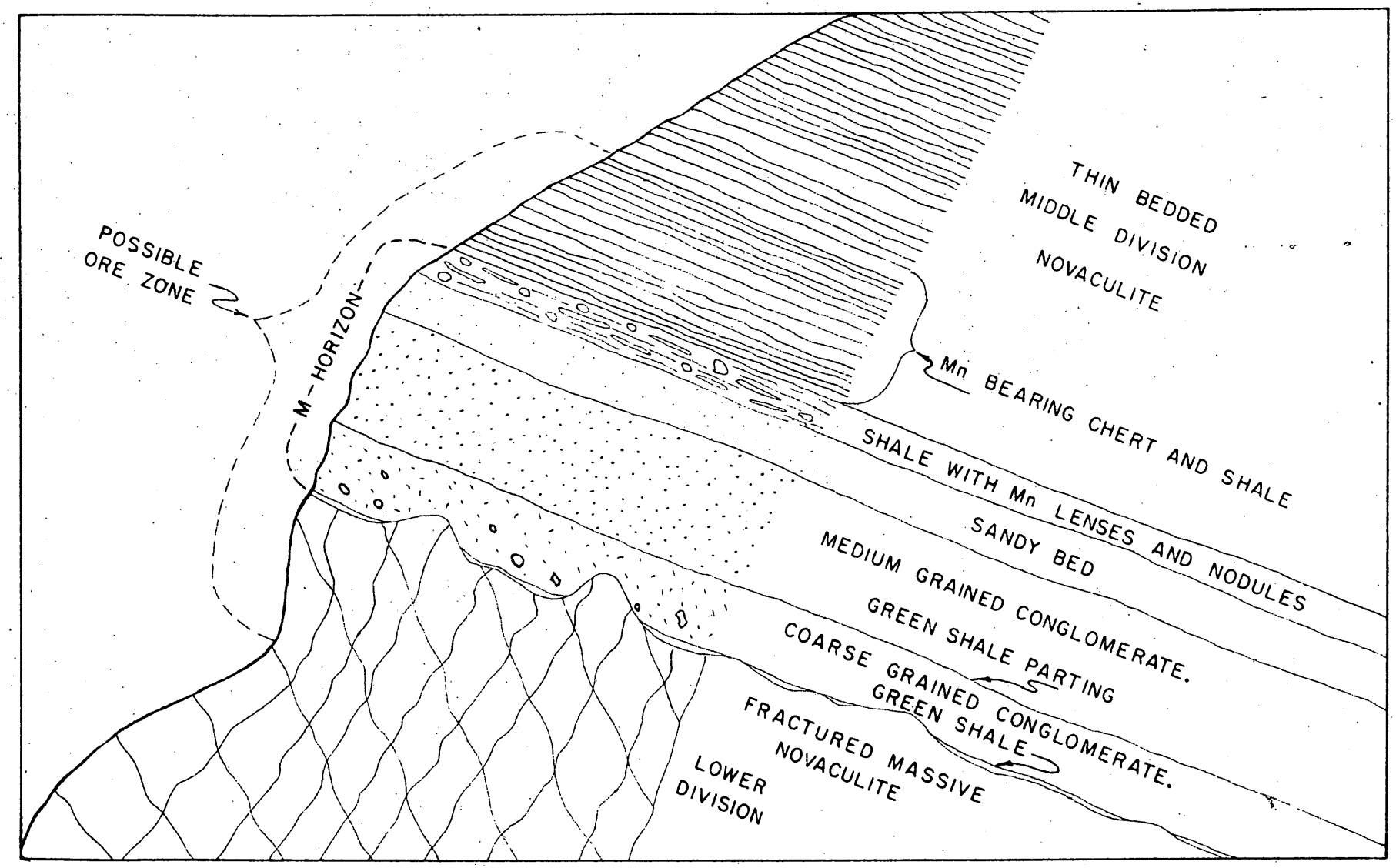
Manganese can be found, in minor quantities, throughout the stratigraphic range of the novaculite formation. However, the main deposition occurs at two horizons which are the top of the lower division and near the top of the upper division. The main horizon with which this report will deal is that at the top of the lower division of the novaculite. The most obvious deposits, and the ones on which the most prospecting has been done, are those occurring at zones of greater rock deformation where the fractures and openings are larger than in the less deformed areas. The structures making up these more deformed areas are principally the noses or axis of plunging anticlines, the axis of cross folds, and cross faults. At these points, sufficient concentration of manganese to make up into material that can be classified as ore can frequently be found. However, generally speaking the extent of the concentration is not sufficient to make up into ore bodies of adequate size to permit their economic extraction. There is usually a small percentage of so called "free" ore in these deposits that can be shipped as a marketable product as it comes from the ground. There are larger amounts of

mill ore from which a marketable product could be produced by proper milling methods. The upper part of the lower division of the novaculite consists of massive strata and their deformation resulted in considerable fracturing and shattering. This in turn permitted relatively free circulation of meteoric waters and epigenetic deposition of manganese oxides. The upturned edge of the manganese bearing strata can be followed across country and manganese deposition within it observed quite frequently and at times more or less continuously along the strike for several hundred feet. Only at local points along the strike could the deposition be classified as ore, however. This horizon occurs immediately adjacent to a well developed regional parallel unconformity. Wherever this unconformity is exposed, it is readily discernible. At places the irregular surface of the erosional unconformity is filled in with green to dark grey or black shale which is immediately overlain with the interbedded thin beds of chert and shale of the middle division novaculite. In other areas, of a local nature but often widespread in areal extent, the eroded surface making up the unconformity is overlain with a bed of conglomerate varying in thickness from a few inches to several feet. Observations to date indicate that this conglomerate occurs as lenticular deposits which may vary in extent from a few hundred feet to a few miles. Like true lenses they are thicker at the middle and thin out at their borders. There are three or four types of material in this horizon and in general they seem to be of a similar character throughout the novaculite area. This horizon is known to carry substantial amounts of manganese in at least some localities, and it is possible that a through study of the manganese deposition in these beds may lead to an entirely new interpretation of the origin of the manganese.

Conglomerate Series (M-horizon)

It is not proposed to discuss the conglomerate occurring at the unconformity in relation to the overall area of the novaculite region to any extent in this report. A study of the publications of various authors dealing with the novaculite indicates that the conglomerate is more or less of an inconspicuous nature as far as surface outcrops are concerned. Nevertheless, the references to it by various authors or the indication of its presence as revealed by their reference to concealed strata, as well as the writer's own field ex-

perience in the novaculite area, lead to the conclusion that it is far more widespread and of much greater significance in relation to manganese occurrences than it has ever been given credit for. The formation is apparently of a similar character, with only minor variations, wherever it occurs throughout the novaculite area. It does vary in thickness from an inch or two to eight or ten feet. A detailed description of the conglomeratic series in the local area of the Arkansas Manganese Corporation's holding will suffice to reveal its general character throughout the area. Plate II gives a pictorial view of the formation in cross section. For the purpose of simplyfying the discussion of this series of sediments it will be referred to henceforth as the M-horizon. On the irregular, hummocky erosional surface of the massive white novaculite at the top of the lower division there is usually found a thin layer of one to three inches of green, clayey shale. Where remnants of the massive novaculite as much as 8 to 12 inches in height protruded above the floor of the erosional surface they do not have the green shale covering. Immediately overlying this is a conglomerate series composed of novaculite fragments with a siliceous matrix. The character of this conglomerate is such that observation of it in restricted local areas would indicate that it is a breccia caused by fracturing and shattering of the novaculite in place. Normally it is observed as two distinct beds, the lower one always being coarser than the upper. This is in addition to occassional bedding occurring within the lower bed itself. The average thickness of the lower series as measured at 12 different openings is 13 inches. At two of those openings it was entirely missing and the greatest thickness observed was 24 inches. This course grained bed is the most variable and irregular of any of the beds making up the M-horizon. The average size of the conglomerate fragments varies from ½ inch in the lower part of the bed to ¼ inch in the upper part, but frequently much larger pieces can be observed in the lower part. Sometimes the upper and lower part are separated by a definite bedding plane and at other times they grade into one another with no apparent bedding. Immediately overlying this bed, and sometimes separated from it by a thin layer (one inch or less) of the green, clayey shale, is found the most uniform bed of the M-horizon. It is composed of fragments averaging approximately 1/8 inch in diameter. The fragments are mostly angular but occassionally have rounded corners and in rare instances a rounded pebble can be observed. This bed has the first hand appearance of being a breccia rather than a conglomerate. The fragments



SCALE 1"=2'

IDEAL CROSS SECTION SHOWING M-HORIZON IN DETAIL
AS REVEALED ON SOUTH LIMB OF SYNCLINE IN AREA OF TRENCHING

PLATE 2

R.B. McELWAINE APRIL 1951

appear to be principally novaculite, but other minerals are present, and the matrix of the unweathered rock as observed on the property examined, is a black manganese compound which is quite hard. Where weathered, the rock is of a cellular or porous character with numerous voids and quite light in weight. It is a shell of the novaculite fragments making up the original conglomerate. The manganese is usually entirely leached out in the more weathered exposures, but casts of it or other minerals can be observed at random through the rock. Occasional fragments of a greenish chloritic appearing mineral are also present. This bed is the most uniform and consistent of any in the M-horizon and the average thickness at twelve observed openings was twenty inches. Overlying this medium grained conglomerate bed is a thin bed of sandy material separated from the conglomerate by a layer of shale a fraction of an inch in thickness. The sandy bed is quite friable in many of its weathered exposures, but it is hard and compact where fresh exposures are made. The sand grains are clear rounded quartz with an estimated average size that would pass a 40 mesh screen. The unweathered exposures in the local area studied have a matrix of manganese oxide. Where weathered or leached, the bed frequently has a matrix of red iron oxide with concentrations of manganese along bedding planes or vertical fracture or joint planes. Where the iron or manganese are not present the sandy bed has no apparent matrix and can be readily disintegrated in the hand. The average thickness as observed in 12 openings is 8 inches. The uppermost bed of the M-horizon is a bed of shale averaging about 5 inches in thickness. It is dark grey to black in color except where it has a high iron content giving it a red color. It contains varying amounts of hard manganese oxide in the form of lenses and nodules. It has a high iron content in most of its weathered exposures and is quite siliceous in places. In its harder occurrences it often contains veinlets of manganese crossing the bedding at right angles as secondary manganese deposition in joint planes or fracture cracks. At places, this bed grades out into a soft, light grey shale of a homogenous character.

Character of Ore

"The manganese ores of the Caddo Gap and De Queen quadrangles consist of oxides, four of which, psilomelane, pyrolusite, manganite and wad, have been identified; if others are present, they probably occur in minute quantities. Although these minerals may be found separately, as a rule two or more are intimately mixed in the same deposit, and in some places they are associated with iron ores and manganiferous iron ores. Psilomelane, pyrolusite,

and manganite form the larger part of the manganese ore in this region. A material consisting of rock fragments and clay cemented together by soft manganese oxide is present at a number of places; locally it is known as "hog ore".

As previously stated the ore in the massive novaculite occurs as fracture and breccia fillings and as lumps or nodules and in stalactitic and botryoidal forms in the larger openings in the novaculite. Many of the fracture fillings are mere paint surfaces and the natives of the area refer to it as "smoke" ore. This is a very apt description as it has the appearance of rock which has been covered with smoke from a wood fire and the manganese film is of about the same thickness as smoke. It has such good hiding powers that one is apt to think that it is much thicker unless he breaks it. Where zones of sufficient rock deformation to form larger openings are accompanied by other conditions conducive to mineral concentration, the amount of "free" ore or ore which can be hand selected so as to make a high grade shipping ore is frequently quite high in ratio to the rock that must be removed in order to recover it. However, the orebodies are relatively small in areal extent and working space limited so as to make mining of the "free" ore by itself expensive. Most of the manganese is quite hard and not subject to excessive reduction to fines in the handling process. This free ore is always accompanied by larger amounts of mill ore occurring as fracture and breccia fillings.

The manganese in the conglomerate beds occurs as a filling of principally manganese oxides in what would otherwise be voids and as a matrix or associated mineral with the minerals other than novaculite fragments making up the conglomerate. Possibly it is a partial replacement of the novaculite as well as the other minerals. The manganese making up the void fillings is hard, steel blue, smooth, extremely fine grained material and is probably psilomelane. The manganese occurring in association with other minerals is of a dull black color and of a granular nature impregnated with impurities. Under a hand lens small particles of light colored foreign material are readily discernible. These particles are apparently silica. In its weathered form the conglomerate is void of manganese and cellular and porous in character. The same type of rock can be obtained in the laboratory by removing the manganese by submersing it for a few minutes in hot hydrochloric acid. However, there is one important detail that is different, nec-

casionally in the hydrochloric treated rock small patches of manganese remain intact. This is apparently due to the enclosure of the manganese within the rock so that it is not accessible to the acid. This is an important point in connection with the origin of the manganese which will be brought out later in this discussion. The manganese in the sandy phase of the conglomerate occurs as the matrix of the sandstone. When treated with acid it completely disintegrates and leaves rounded sand grains as the only solid matter. These sand grains are estimated to be of minus 40 mesh in size. The shale phase at the top of M-horizon contains manganese as lenses and nodules of apparently pure manganese oxide and as siliceous manganese.

The above description of the ore is in its more unweathered state. When partially weathered the manganese occurs in the medium grained conglomerate and in the sandstone as concentration zones along the bedding planes, joint planes and fracture systems. The zone of concentration usually varies from one to three inches in thickness as if they had developed along the lines of water circulation and built out from them. The balance of the outcrop often being void of manganese and carrying considerable iron oxide. Small open fractures in these two beds usually cross the bedding and are often filled with manganese so as to form seams of solid manganese which is obviously of secondary origin. The shale bed where hard and silicified often has tiny fractures which are now veinlets of secondary manganese. In the coarse grained conglomerate the secondary manganese does not reconcentrate in a pattern similar to that described above, but often does occur as pockets of soft manganese oxide.

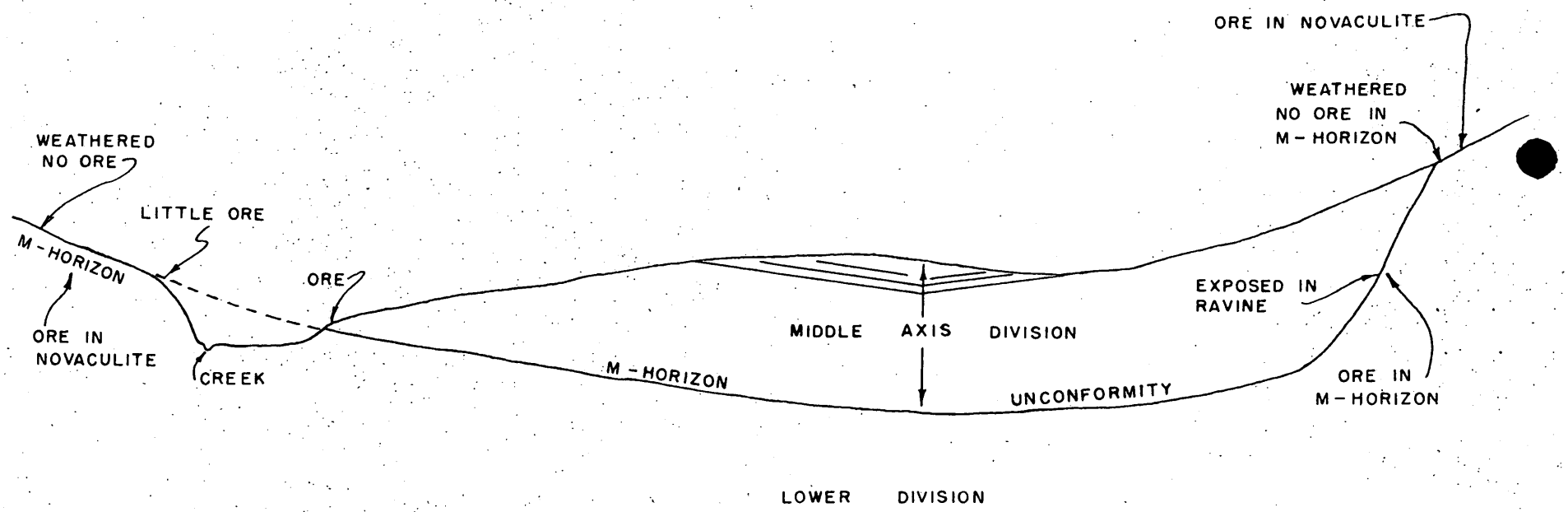
When exposed high on the ridges and fully weathered the manganese is almost completely removed from all phases of the M-horizon except the shale bed. In these exposures, the adjacent massive novaculite will often be very highly mineralized with manganese and considerable quantities of free nodules or lumps of manganese will be present on the surrounding surface.

Origin of Manganese

This is a controversial point that has never been fully answered. It has been pointed out by Penrose[2], Wiser[4] and others that the novaculite as originally laid down contained minute quantities of manganese that

may have been removed by solution, segregated and redeposited during the long erosional history of the Ouachita Mountains. It is further postulated that the two main horizons of present manganese concentration are due to either the fact that these horizons as originally deposited contained more abundant quantities of manganese or that they offered the most favorable place for the deposition of manganese. The writer believes that a more detailed study of the unconformity and overlying shale and cherts and the M-horizon occurring between the lower and middle division of the novaculite as well as the relationship of the manganese horizon in the upper division to the overlying shales and cherts making up the top of the division as well as the unconformity between it and the Stanley shale formation and the thin interbedded shales and cherts often found in the base of the Stanley may all shed considerable light on the source of the manganese making up the deposits. The higher concentration of manganese in the two particular horizons in the formation may be due to the fact that they are immediately adjacent to the source from which the greater part of the secondary deposition is obtained. Present information available points to the syngenetic deposition of manganese in the conglomerate, sandstone and shale of the M-horizon and in the thin bedded cherts and shales of the overlying middle division and possibly a similar condition in the thin beds at the top of the upper division and base of the Stanley shale. Observed conditions indicate that the beds related to the main manganese horizon of the lower division contained larger amounts of manganese than did other parts of the novaculite and this would account for greater concentrations of secondary manganese in the fractured novaculite adjacent to these beds than in other sections of the formation. The thin shale beds adjacent to the unconformity contain nodules and lenses of manganese that appear to be primary in origin. The thin chert beds occurring intermixed with them contain apparent quantities of manganese oxides and possibly silicates and carbonates. Whether it is partially of primary origin is not known, but it is known that manganese frequently occurs in beds of jasper or radiolarian chert[2]. The physical appearance of the manganese in the M-horizon and its variation in mode of occurrence and manganese content from the extremely weathered zone through the moderately weathered to unweathered zones indicate the probability of manganese having been deposited simultaneously with the beds themselves. It may have been originally deposited as a carbonate or as oxide or even as a silicate. Honess[4] mentions the presence of considerable

rhodocrosite in the upper division of the novaculite and Miser and Purdue[2] state that, "The manganese was probably deposited as a manganese bearing calcite at the two main ore horizons, but some of it was doubtless deposited as a carbonate in other parts of the novaculite and in the underlying shales". The writer suggests the theory that the conglomerate beds could have been a source of considerable more manganese than the shales and cherts. The greater concentration of secondary manganese in the bed next to the M-horizon in the lower division than in the main manganese bed in the upper division tends to support this reasoning. The analysis of a composite of 28 samples taken by the writer from the M-horizon as exposed on the property of the Arkansas Manganese Corporation shows a content of manganese, present as carbonate, in the amount of 0.61 percent. This may be a remnant of the original deposition that has not been completely oxidized. Initial observations of the writer have given him the impression that where secondary manganese occurs in the top of the lower division that it is of a higher tenor where the M-horizon is present than it is in areas where the M-horizon is missing. On high outcrops the M-horizon, except for the shale bed at the top, is entirely void of any apparent manganese content while the adjacent massive novaculite may contain an abundance of manganese oxide and the surrounding surface rubble have considerable quantities of "free" ore. Where it is possible to trace these exposures down to water level the conglomerate will gradually begin to show up a little manganese and near the bottom of the valleys it develops the character previously described wherein the manganese is concentrated along the bedding planes and fracture and joint systems. Then where the conglomerate has been observed farther down the dip away from the zone of weathering the manganese appears distributed throughout the rock in a rather uniform character. This uniform character of the manganese distribution in the fresh unweathered conglomerate, the failure to leach parts of it out with acid as previously described, and the general physical characteristics indicate the possibility that it is of syngenetic origin. Admittedly it may have been enriched by the decomposition which changed much of it into an oxide. However, on freshly broken faces of the strictly unweathered rock, it appears that the manganese may be a dark siliceous manganese carbonate or other manganese compound rather than an oxide. Some petrographic work would be of considerable benefit in this regard. The condition described above is illustrated on plate No. III which is an ideal composite cross section of the manganese deposit on the Arkansas Manganese Corporation's property upon which detailed surface work was done. The M-horizon as it occurs



SCALE 1" = 300'

IDEAL COMPOSITE CROSS SECTION LOOKING NORTHWEST OF GEOLOGICAL CONDITIONS AND ORE DEPOSITION ACROSS SYNCLINE

R.B. McELWAINE — APRIL 1951

PLATE 3

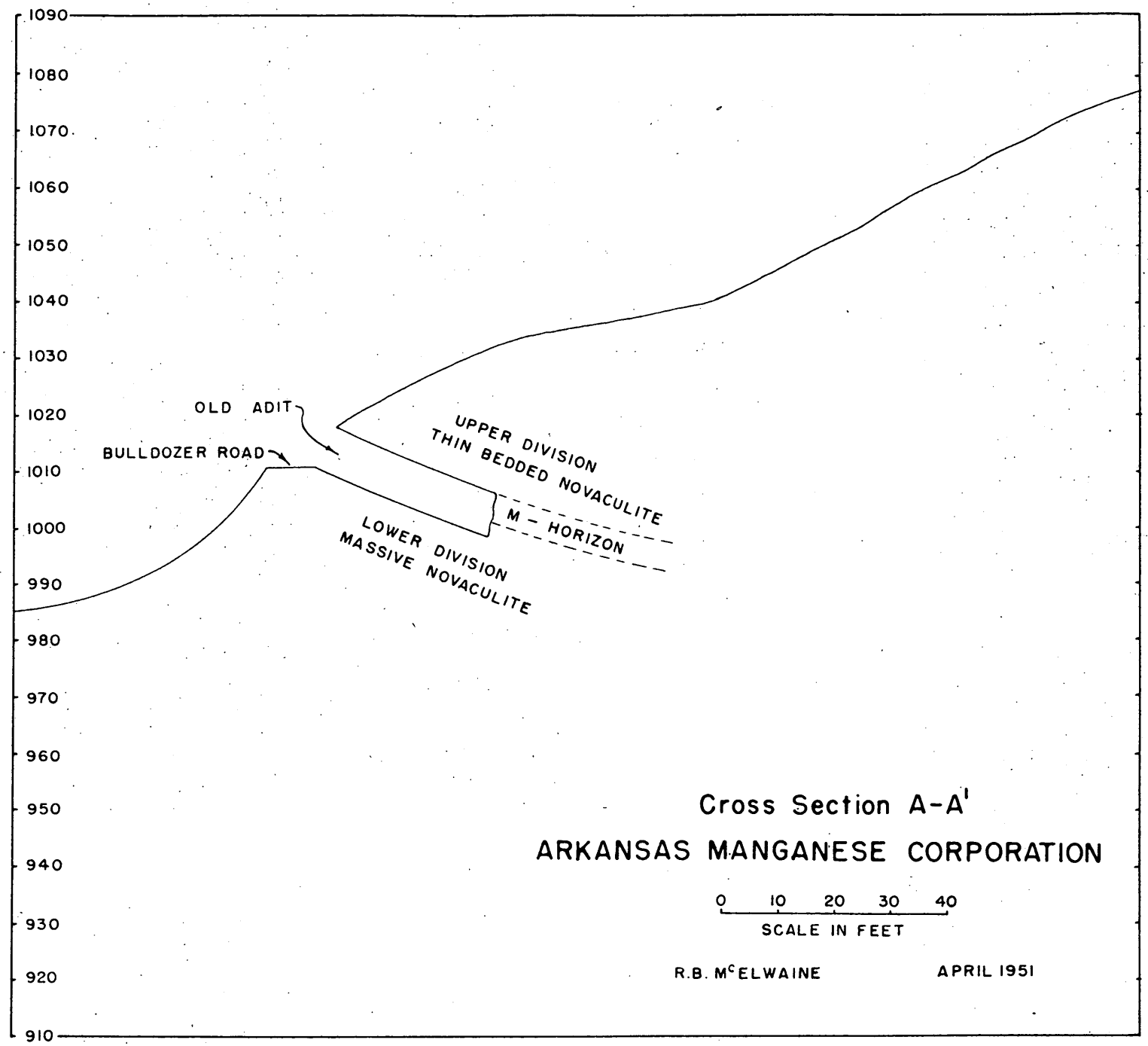
in this deposit contains manganese on both limbs of the syncline. Whether the character of the deposition will be the same on down the dip and below the water table is a question that needs to be answered. The M-horizon at the lowest points that it could be examined in relation to the surface weathering, revealed a better grade of ore than at any point back up the dip. It is possible that the grade could continue to improve for some distance and it is equally possible that it could rapidly diminish in grade. If the deposition is all secondary it might be of a better or at least comparable grade until the water table is reached and then either gradually or quickly die out. On the other hand if the ore in the M-horizon is an altered variety of primary ore then progressing on down the dip may show a transition from oxides to carbonates or silicates or both. What the grade of such an ore would be is problematical but if most of the voids in the weathered phase of the conglomerate were originally filled with manganese compounds, then it is possible that the grade of the postulated primary ore may be in the range of 15 to 20 percent manganese. It may be argued that the manganese retained in the fresh conglomerate when it is treated with acid should also show up in the leached surface exposures of the conglomerate if it is original with the rock and so protected from leaching when enclosed within it. However, this rock is readily susceptible to physical breakdown as well as chemical and the surface exposures subjected to weathering have both processes at work on them.

As to whether the M-horizon itself will continue across the syncline, it is the writers opinion that it will. Along the strike to the southeast on either limb the M-horizon does lense out. But its strike length on both limbs is greater than the distance across the syncline and at the west end of the deposit the axis of the pitching syncline is exposed and reveals the presence of the M-horizon with its normal amount of manganese in relation to height of the outcrop above the water level. West of this point the M-horizon was traced for some distance on the limbs of the anticline which makes up the westward extension of the syncline. The M-horizon continued to be of the same character but all exposures are on high ground and extremely weathered and show decreasing amounts of manganese as the elevation increases. The adjoining massive novaculite shows substantial amounts of manganese and at local points makes up into high grade ore. The thickness of the M-horizon is comparable on each limb of the syncline studied. On the south limb where it is possible, due to the erosional valley cut by Brushy Creek,

to trace the W-horizon several hundred feet up the dip it tends to thin as it does along the strike to the east away from the point of greatest thickness. This would indicate that it is quite possible for the W-horizon to thicken slightly down the dip as the surface indications are that the center of the lenticular deposit is somewhere within the syncline.

SURFACE EXPLORATION AND EXAMINATION

The local area of detailed surface exploration on the Arkansas Manganese Corporation's property is shown on the map (plate IV) included as a part of this report. Most of the work was done on claims 3 and 4 in section 28. Some bulldozer work to uncover and make more accessible the W-horizon was done. Fifteen trenches were opened up by hand and deepened by means of drilling and blasting. Twelve of these were sampled in detail. One inclined adit down the dip of W-horizon was started and driven about 20 feet from the point of original exposure as revealed by the bulldozer. An old adit previously driven about 25 feet down the dip of W-horizon was examined, mapped and sampled. The general relationship of this adit to the outcrop and topography is shown on plate V which is a cross section along line A-A' on the geological map. The old adit revealed the most unweathered ore available and about 1100 pounds of material for mill tests were taken from the east wall of this adit as well as a channel sample of some 125 pounds for analysis. Two other short adits into the massive novaculite underlying the W-horizon were already present on the property and a channel sample (No. 7) from the roof of one of these was taken. Twelve of the trenches were sampled and mapped. Their location is indicated by sample numbers on the map with accompanying symbols to show the dip and strike of the W-horizon at each trench. A total of 39 samples were analyzed by the Bruce Williams Laboratories of Joplin, Missouri. A description of these samples with analytical results are shown on the next page as exhibit "A". During the course of the sampling it was soon decided that more accurate results as to manganese content and more information regarding the deposition could be obtained by taking separate samples of each bed at the various sample locations. In most cases the sample contained 15 to 30 pounds of material taken by chip channel methods from each individual bed of the W-horizon. The sample number represents the trench and the letter represents the bed from which it was taken.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920
910
OLD ADIT
BULLDOZER ROAD
UPPER DIVISION
THIN BEDDED NOVACULITE
M - HORIZON
LOWER DIVISION
MASSIVE NOVACULITE
Cross Section A-A'
ARKANSAS MANGANESE CORPORATION
0 10 20 30 40
SCALE IN FEET
R.B. McELWAINE
APRIL 1951

PLATE 5

Discussion of sampling results.

The results of the sampling and analyses indicate that the best ore lies down the dip from the weathered or leached outcrops. This is corroborated by observation of surface outcrops as previously discussed. However, since there is only one exposure of relatively unweathered ore that was available for examination and sampling, it is not permissible to assume that all of the exposures sampled would be of a comparable grade down the dip to that of unweathered sample No. 12. Nevertheless, that is the indication and the writer believes it is justifiable to use the average of samples 4 and 12 or a manganese content of 12 percent for the purpose of computing ore reserves. It is his opinion, based upon overall observation of the character of the surface outcrops, that the entire strike length of the deposit will show a grade of ore down the dip comparable to that of sample No. 12. The surface outcrops when opened up invariably showed a better grade below the surface. Down the dip trench No. 4 showed a rapid transition from the leached outcrop with the manganese secondarily concentrated along the planes of bedding, fracturing and jointing to a more uniformly distributed type of ore approaching comparison with the unweathered exposure in the wall of the adit where sample No. 12 was obtained. However, it still showed substantial leaching and this apparently accounts for its failure to have as high a manganese content as sample No. 12. Trench No. 4 was opened right on the creek bank and was fully exposed without any protection by overburden. However, it was so close to the water level that down the dip it rapidly approached a condition of considerable less leaching than its surface exposure. The new adit at sample location No. 9 was not sampled at the face but it still showed considerable leaching. This is probably due to the fact that it does not have as much cover as does the old adit from which sample No. 12 was taken.

The overlying thin-bedded cherts may not have been given as much consideration in the course of the examination as they should have received. This was first brought to notice by the persistent occurrence of Mn in obvious quantities in approximately a two foot thickness of the overlying chert and shale beds in driving the new adit. Subsequent re-examination of the old adit revealed the same condition. The Mn content of 15.90 percent in sample 10-A which contained 2" of chert and a notation in

SAMPLE DESCRIPTIONS AND ANALYSES--EXHIBIT "A"

Sample No.	Description	True Thickness	Percent Mn	Percent SiO_2	Percent Fe	Percent Phos.
1	Composite of M-horizon of 8" shale ore, 8" sandy ore, 24" medium grained conglomerate, 8" coarse grained conglomerate.	48"	6.73	71.30	7.00	0.31
2	Approximately same as No. 1. Sample channel not uniform.	48"	4.28	71.30	8.00	0.37
3-A	Sandy bed.	12"	8.58	62.81	10.70	0.52
3-B	Medium grained conglomerate. (Coarse grained bed missing).	22"	7.19	80.89	2.10	0.08
4-A	Shale and sandy ore. (Most of shale weathered away).	8"	9.80	48.39	16.80	0.94
4-B	Medium grained conglomerate	16"	10.40	61.10	11.00	0.65
4-C	Coarse grained conglomerate	22"	9.80	66.90	7.80	0.32
5-A	Shale 4" and 14" of fine conglomerate. (This sample well up on hill but protected with several feet of overburden.)	18"	9.80	40.19	20.70	0.92
5-B	Medium grained conglomerate	24"	4.45	70.84	10.30	0.51
5-C	Coarse conglomerate and fractured novaculite remnants on erosion surface	12"	5.35	65.90	11.00	0.57
5-X	Specimen sample of shale ore only		6.75	33.73	27.00	1.31
6	Medium conglomerate. Outcrop very badly weathered.	24"	1.05	66.44	15.80	0.61
7	Eight foot cut in roof of tunnel in fractured massive novaculite		4.15	89.91	1.80	0.04
8-A	Shale and chert with Mn inclusions	6"	4.60	56.66	18.10	0.92
8-B	Sandy bed (surface exposure)	12"	6.60	73.06	6.30	0.24
8-C	Medium grained conglomerate.	18"	7.20	68.63	8.70	0.37
8-D	Medium grained conglomerate 4" and coarse conglomerate 6"(surface ex.)	10"	8.55	55.50	15.10	0.75
9-A	Siliceous shale, brown with nodules, lenses and vertical veinlets of manganese	6"	12.25	51.93	12.80	0.66
9-B	Medium conglomerate interbedded with siliceous iron oxide with manganese lenses	23"	4.30	67.60	9.80	0.37
9-C	Coarse conglomerate grading into fractured novaculite	36"	7.35	75.80	4.50	0.13
9-D	Highly fractured massive novaculite	32"	6.60	84.79	1.90	0.06
10-A	Two inches Mn bearing chert and 9" siliceous shale with nodules and lenses of Mn with siliceous hematite as enclosing rock. Thin chert beds overlying this sample carrying considerable Mn.	11"	15.90	40.01	13.20	0.70
10-B	Eight inches fine grained and 14" coarse conglomerate	22"	9.15	73.64	3.90	0.17
10-C	Medium grained weathered conglomerate, 1" green clay shale at bottom	15"	1.40	88.70	1.90	0.04
10-D	Coarse conglomerate and erosional remnants of massive novaculite. Green shale parting at bottom.	10"	4.80	81.64	2.50	0.08
10-E	Fractured massive novaculite	40"	6.10	84.74	1.60	0.08
11-B	Sandy zone 4" and medium conglomerate 19". Shale missing. Mn bearing thin chert beds well exposed above this sample.	23"	7.05	68.64	8.70	0.38

SAMPLE DESCRIPTIONS AND ANALYSES—EXHIBIT "A"
(continued)

Sample No.	Description	True Thickness	Percent Mn	SiO_2	Fe	Phos.	$CaCO_3$*
11-C	Coarse grained conglomerate (True character of conglomerate revealed)	23"	1.20	89.14	2.80	0.05	
11-D	Massive novaculite	12"	3.05	79.84	4.60	0.10	
14-A	Sandy bed 15" and 11" medium conglomerate with less Mn than sandy bed	26"	6.40	57.05	15.30	0.77	
14-B	Two beds of coarse conglomerate the lower one being coarser than the upper one.	16"	4.00	80.90	4.00	0.19	
14-C	Fractured massive novaculite	24"	4.30	88.28	2.10	0.04	
N.B.	Composite of above samples 4-A through 14-C contained 0.61 percent of manganese in the form of carbonate.						
12-A	Shale ore (30 pound sample)	12"	16.80	35.46	14.60	0.86	0.22
12-B	Sandy bed 5" and 23" medium conglomerate (40 pound sample)	28"	12.55	62.96	7.50	0.36	0.18
12-C	Coarse conglomerate (60 pound sample)	22"	14.05	65.56	4.50	0.29	0.09
13-A	Four inches shale ore and 4" sandy bed	8"	4.90	52.13	17.25	0.57	0.13
13-C	Coarse conglomerate. 1/4" to 1/2" fragments with inclusions of much larger pieces of novaculite remnants.	24"	7.20	74.44	6.15	0.27	0.10
13-B	Medium conglomerate. Ore in concentration zones only.	22"	2.45	86.61	4.80	0.17	0.10
13-D	Fractured massive novaculite. Best ore in top half.	18"	7.80	81.61	2.05	0.11	0.14

CALCULATED AVERAGES OF TRENCHES INDICATED

3-A-B	High and considerable weathered	34"	7.67			0.23	
4-A-B-C	Low but considerably weathered and secondarily enriched	46"	9.81			0.37	
5-A-B-C	High and considerably weathered	54"	6.43			0.64	
8-A-B-C-D	High and considerably weathered	46"	6.99			0.49	
9-A-B-C-D	High and considerably weathered	97"	6.69			0.19	
10-A-B-C-D-E	High and considerably weathered	98"	7.03			0.16	
11-B-C-D	Higher and extremely weathered	58"	3.90			0.20	
14-A-B-C	Low but extremely weathered and leached	66"	5.10			0.36	
12-A-B-C	Unweathered exposure in old adit	62"	13.84			0.43	
13-A-B-C-D	Low but extremely weathered	72"	5.58			0.23	
	Average of calculated trench samples	53.3"	7.30			0.33	

* $CaCO_3$ not checked in samples other than those indicated.

the field notes referring to considerable amounts of Mn in the overlying cherts further emphasized the necessity for considering the possibilities of this part of the formation.

The massive novaculite below the M-horizon where sampled showed a Mn content averaging 5.50 percent. It is believed that in nearly all instances in this deposit that the top one to two feet of the massive novaculite adjacent to M-horizon will contain sufficient Mn to justify its mining if the overlying material is being mined. At places where it has suffered more deformation it will no doubt contain good ore to a depth of several feet below the M-horizon. How far down the dip this secondary mineralization will continue after the permanent water table is reached is a questionable matter.

The average thickness of the beds sampled as shown in the table above is 63.3 inches. The average thickness of M-horizon at 12 places if 50.24 inches. It is possible that the Mn in the overlying thin beds may add one or two feet to the potential ore zone.

The average phosphorous content of the samples is revealed to be 0.33 percent. It is not known what the phosphorous content of the Mn concentrate will be but in view of the fact that the shale and sandy horizons showed a much higher phosphorous content than the other beds it is quite possible that all the phosphorous content is not contained in the Mn itself. The analyses of the samples from the massive novaculite all show a relatively low phosphorous content ranging from 0.04 to 0.11 percent. The market specifications call for a maximum phosphorous content of 0.10 percent without penalty. It is quite possible that the phosphorous content of the manganese concentrate will be within this range. Wiser[10] describes analyses of psilomelane and pyrolusite from the area which show a phosphorous content of only a trace.

The iron content is much higher in the more weathered exposures and in the shaly and sandy beds than in the more unweathered and coarser grained beds. It is believed that the iron is mostly of secondary origin and that any material quantities of it will be limited to the surface or near surface zone. It appears to be segregated from the manganese and is not believed to be much of a hazard in meeting market specifications of a maximum of 7 percent iron content for high grade ores.

The market specifications call for a maximum combined SiO_2 and Al_2O_3 content of 11 percent. In the ores from the

M-horizon this presents the most difficult problem as far as beneficiation is concerned. The ores from the medium grained conglomerate and sand and shale beds contain considerable silica interlocked with the manganese in fairly fine grained sizes. This would necessitate moderately fine grinding in order to liberate the Mn from the gangue. This would result in the necessity of sintering the Mn in order to make a marketable product if high grade ore is the immediate goal. However, if a lower grade ore is to be utilized either as an intermediate product in the making of ferro-manganese or as a direct product to a lower priced market, then the silica content would not present such a serious problem.

Considerable work will have to be done on the economics of the beneficiating and marketing problems in order to arrive at the best solution for this problem. The Denver Equipment Company of Denver, Colorado is currently performing detailed test work on a representative sample of ore from the M-horizon from the Arkansas Manganese Corporation property and the results of this test work should contribute some substantial data upon which to base some calculations as to the best market, from an all around viewpoint, to aim for.

ORE RESERVES

Measured Ore

The amount of true measured ore available is so small in comparison with the cost of recovering and milling it that it is of little importance at this time. Consequently it was not considered worth the cost of the time involved to accurately determine the measured ore. A reliable estimate would be approximately 2,500 tons with a tenor of 7.30 percent manganese.

Indicated Ore

The indicated ore now available on the property is estimated to be 17,500 tons with an average tenor of not less than 12 percent contained manganese. This is based upon a strike length of 900 feet of M-horizon that was trenched and sampled, projected to a distance of 40 feet down the dip from the outcrop, and with an average thickness of six feet (this thickness includes a portion of the massive fractured novaculite). The ore was observed

in place in the two adits in the M-horizon at distances of 20 and 25 feet from the outcrop and the writer believes from all observations and indication that there is little question but what it will be equally as good for at least another 20 feet down the dip. It is given an average thickness of six feet instead of the five foot average of the samples because there is no doubt but what at various locations the ore will penetrate downward into the massive novaculite for several feet. Also it is strongly indicated that from one to two feet of the overlying thin beds will carry ore of a tenor at least comparable if not superior to that of the beds sampled. The above described dimensions, with a tonnage factor of 13 cubic feet per short ton, gives a calculated tonnage of 15,230 tons. The 2,270 tons required to make up the balance of the 17,500 tons of indicated ore is unquestionably present in the other outcrops of good manganese ore, mostly of the "free" ore and high grade ore types in the highly fractured novaculite, that were observed at various places on the Corporation's holdings. Three particularly promising vicinities for the production of a few to several hundred tons of ore of this type are on claims 30 in section 27, claims 15, 16 and 17 in section 28, and claims 40, 41, 42 and 43 in section 19. (See ownership plat Plate I). Many others were observed and a great many locations with considerable geological promise can be pointed out on the geological map of Wiser and Purdue[11]. The grade of 12 percent is used because while some of the outcrop of the M-horizon will not be of this tenor, most of the 2,270 tons to be derived from local concentrations in the fractured massive novaculite will be of a considerably higher grade than 12 percent.

Inferred Ore

Based on the theory of mineralization of the M-horizon all of the way across the syncline from the outcrop as sampled to the outcrop as observed on the north limb, a distance of about 2,000 feet or about 2,400 feet along the bed (see plate III), and an average strike length of 2,200 feet and an average thickness of 5 feet an inferred reserve in excess of 2,000,000 tons is indicated in this one deposit. The outcrops indicate a fairly uniform grade of ore. The tenor of 12 percent can easily be low dependent upon whether or not all of the interstitial spaces in the conglomerate contain manganese minerals or if they were only partially filled. Based upon the known repetition of geological conditions upon the holdings of the Corporation

there may be three similar deposits to the one studied. Two somewhat smaller and one considerably larger. The latter lying mostly in section 19, T. 3 S, R. 30 W., lies in a syncline closed at both ends and nearly two miles in length. Only one limb of the syncline for a distance of about ½ mile along the strike was visited and is but briefly, but the mineralized M-horizon was present and further investigation may reveal it to be of equal if not greater promise than the deposit upon which most of the work was done. It is quite possible that a field study of the entire holdings of the Corporation would lead to a tentative estimate of inferred reserves in the neighborhood of 8 to 10 million tons.

CONCLUSIONS

A thorough study of the manganese deposition in the M-horizon as well as the overlying thin beds of shales and cherts and similarly the thin beds adjacent to the manganese horizon in the upper division of the novaculite may lead to an entirely new interpretation of the origin of the manganese. Similarly it may aid in laying out an effective manner in which to prospect for additional reserves, and change the picture as to the possibility of blocking out and proving substantial reserves of manganese bearing rock that occurs in a definite stratigraphic relationship and manner. Thus a re-orientation of thinking as to the economic possibilities, particularly as related to changed economic conditions, of the western Arkansas manganese deposits may be required. If the postulated theory of the writer in regard to syngenetic manganese deposition in the conglomeratic series can be substantiated, then the possible amount of reserves of this type of material could prove to be in the range of hundreds of millions of tons in the novaculite area as a whole. Mining of this material would be highly feasible. If it can be proven to be of sufficient grade, and the metallurgical problems are not too difficult, then it may be possible to develop large reserves of manganese in the area. The M-horizon, in which the ore occurs, is believed to be of considerable total areal extent although not present throughout the novaculite area.

The metallurgical problems involved are admittedly serious, but if large reserves of ore are available it may be feasible to solve these problems. This may be done by turning to the production of a lower grade product than

high grade ore. Methods of using the product other than meeting fixed market specifications should be considered. If large reserves are available, it may justify an entire new industry that would combine the mineral with complementary industrial raw materials so as to create a market for the grade of manganese that could be most economically produced in the area.

The mining problems involved in the contemplated M-horizon deposits are very ordinary in nature and on a large scale operation the per ton cost of mining could be reduced to a minimum for hard rock underground mining. On the steeply dipping structures the deposits could be readily mined by shrinkage stoping methods. On the flatter deposits long wall or room and pillar mining methods could be employed. They could be highly mechanized and the aid of gravity utilized in getting the ore to haulage drifts. The cost of development per ton of ore developed would be small and the amount of dead rock to be moved in either the development or mining operations would be relatively low. Some water would be encountered but not in quantities great enough to create a hazard or to greatly increase mining costs.

As to the manganese found in the massive novaculite as local concentrations of free ore and associated mill ore, the writer does not believe that sufficient reserves of this type of ore exist to justify an attempt to set up a modern mining and milling operation with these deposits as a basis. If the M-horizon can be proven to contain local deposits of large reserves of mill ore, then with these deposits as the basis of an operation it would be highly feasible to mine some of the better deposits in the locally shattered novaculite that exist throughout the area. Alone they do not constitute sufficient reserves upon which to set up an operation which calls for even a moderate amount of ore to be fed to a mill daily. It is true that manganese exists in a widespread area of the novaculite and at some places it occurs continuously over a relatively long surface extent. But these deposits are of too low a grade to consider the possibility of utilizing them for the basis of a successful mining operation. Unquestionably the local concentrations of better ore will continue to be "gouged" and the area prospected, especially during times of high prices, but the writer does not believe they have much possibility of supporting profitable mining operations in the foreseeable future.

Wherever manganese is found concentrated in the massive novaculite, the adjacent area should be investigated

for the presence of the M-horizon and its manganese content. The extent of the mineralization in the M-horizon may be just as a secondary deposition in the zone at the top of the water table or it may exist as original with the sediments wherever they have not been subjected to the leaching action of meteoric waters. In either case the mineralization will probably be of a comparable grade, wherever it exists, throughout the area.

RECOMMENDATIONS

In view of the strategic position of manganese, its probable good economic future, and the possibilities the western Arkansas area has for containing large reserves of low grade ore, the writer is recommending that an investigation to further determine these possibilities be made. However, it would be most imprudent to follow these recommendations without fully realizing that it is a most hazardous financial venture. If the initial work being recommended is done and proves out, there will still be many hurdles to overcome and the expenditure of considerable time and money will be required before it can be determined if the basis of a successful mining venture is present.

Before investing money in the acquisition and surface exploration of additional property it is recommended that the deposit upon which the recent work has been done be thoroughly investigated. It should be used as more or less of a "test case" to determine the possibilities of the M-horizon. If the results of the proposed exploration are all negative, especially as to the presence of a commercial grade of manganese existing well below the water table, then any further attempt to explore the manganese possibilities of the area should be abandoned. If the exploration work gives favorable results, then the Corporation should have a geological reconnaissance made of their present holdings and dispose of those that do not have favorable geological indications and thus eliminate the cost of carrying them. Furthermore, the claims should be reoriented to conform with the trend of the mineral deposition and thus make them more valid.

Some discussion of the construction of a mill for processing manganese ore has been held with the writer. It is more and now positively recommended that no additional milling equipment be acquired or negotiated for until such time as substantial ore reserves have been

proven, an efficient beneficiating process has been worked out, and a satisfactory market for the grade of material that can be most economically produced has been determined.

Exploration

Recommended work for initial exploration is outlined below. It may be that before this initial work is completed that it can be determined that completion of the work would be futile and it can be discontinued and money saved. On the other hand if the results of this initial work are favorable, additional drilling will be required to fully develop the amount of reserves available in the deposit.

Drilling:

This should consist of churn drill holes to the top of the ore zone, casing of the holes with NX casing and diamond coring with NX size bits through the ore zone. The possible ore zone should include two to four feet of the thin beds overlying the M-horizon until it is proven otherwise and a comparable amount of the massive novaculite underlying the conglomerate. The estimated cost of the churn drilling is $3.00 per foot and the diamond drilling is estimated to cost $15.00 per foot including setting of the casing. The churn drilling can be done under contract on a per foot basis. Due to the difficulty and hazard involved in diamond drilling the novaculite, this work will probably have to be done on a cost plus basis. However, it will not very likely exceed the cost cited above.

The location and spacing of the drill holes can be determined to the best advantage as the drilling progresses and it may prove expedient to vary from the tentative layout of the holes described as follows: Initially a row of about ten holes approximately 100 feet northeast of the outcrop along which the trenching was done. These holes can be placed so as to take advantage of the topography in keeping the depth of the holes at a minimum. Some of the holes should be placed northwestward along the strike to test the ground beyond the area of trenching and east of Smoke Rock Creek. This will be up the dip of the pitching syncline and will result in somewhat more shallow holes than those farther south. The average depth of these holes is estimated to be 100 feet. A second row of about

five holes, more widely spaced, should tentatively be placed parallel to the first row of holes and about 100 feet northeast of it so as to intercept the M-horizon about 100 feet farther down the dip than will the first row of holes. These holes can be so placed in relation to the topography that it is estimated that the average depth of the five holes will be about 200 feet. Tentative plans should also call for about three holes along the branch that traverses across the syncline from the outcrop of the north limb to that of the south limb. One should be placed at about or slightly north of the axis of the syncline and the other two spaced between this location and the trace of M-horizon outcrop to the southwest. It is estimated that these three holes will require about 1,000 feet of drilling.

The area should be thoroughly checked and the first two or three holes watched carefully in an attempt to find a reliable marker horizon to use in determining the depth of the churn drill holes below this horizon before casing and starting core drilling. It can be fairly well established by calculations from the dip of the beds and relative elevations of the outcrop and drill hole location. However, it could not be as closely estimated in that manner as it could by a good marker horizon. The more closely the necessary depth of the churn drill holes can be estimated, the less amount of coring that will be required and thus less cost will be incurred.

Drifting:

This should consist of two tunnels totaling about 200 feet of drifting. One is the extension of the new adit down the dip of M-horizon an additional 80 feet. This will reveal the character and continuity of the ore down the dip below the water table and reveal the character of the ground from a mining viewpoint. The other tunnel proposed is at the outcrop of M-horizon on the north limb of the anticline where it is crossed by the deep ravine that forms the branch revealed on the map (Plate IV). It should be driven in M-horizon, which has a dip of 62 degrees at this location, along its strike to the southeast a distance of 100 feet. This will place the end of the tunnel a hundred feet or more below the surface outcrop of M-horizon at that point and probably well below the zone of weathering and leaching. This will reveal the character of the ground and mineralization at this point and give a comparison of the north limb with the south limb of the syncline. On top of the hill above

the heading of the proposed tunnel the M-horizon is completely leached of its manganese content and the adjacent massive novaculite contains some excellent ore. This tunnel will afford a comparison of these conditions underground. At the tunnel heading short cross cuts about ten feet in length should be driven both to the right and left to penetrate both the massive novaculite of the lower division and the thin bedded novaculite and shale of the middle division.

It is estimated that this work can be done for a cost of $15.00 per foot including labor, supplies, and equipment rental. It is suggested that equipment be rented to do this work and not try to utilize the obsolete equipment now on the property. The main equipment needed is a portable air compressor with a minimum capacity of 200 cubic feet of air per minute, a 3½ inch drifter, and adequate supply of drill steel and air and water hose. Adequate pipe and hand tools are available on the property. The air driven hoist on the property will be suitable for hauling the broken rock out of the inclined adit but it is advisable to obtain a different mine car than the one used previously. A car that can be dumped by hand and used to build a dumphead of itself is recommended. It is essential that an expert machine operator be employed to do the drilling and supervise the drifting. The balance of the labor can be obtained locally. Local men could do the job alone but at a considerable sacrifice in time and a resultant higher cost despite the saving in labor cost to be obtained by using cheaper labor for the drilling operation. A compressor can probably be obtained in Fort Smith, Arkansas and the balance of the equipment can be rented from any one of several firms in Joplin, Missouri. A competent machine operator can probably be obtained in the Joplin area. In connection with the drilling it should be pointed out that it is imperative that this drilling be done with a wet machine. The novaculite is practically pure silica and the silicosis hazard is very serious when drilling this formation with dry drills.

Metallurgical tests in addition to that work now being done by Denver Equipment Company will no doubt be necessary. Funds should be set aside to do some of this work privately as well as the assistance than can probably be obtained from the U. S. Bureau of Mines and possible petrographic work by the U. S. Geological Survey.

Summary of Cost of Exploration

3,000' of churn drilling @ $3.00		$ 9,000.00
200' of NX diamond coring (16 holes)	@15.00	3,000.00
200' of drifting @ $15.00		3,000.00
Engineering		2,000.00
Miscellaneous and contingent expense		2,000.00
Metallurgical expense		700.00
Sample containers, freight and analyses		300.00
		$20,000.00

R. B. McElwaine

R. B. McElwaine
Consulting Mining Geologist
Little Rock, Arkansas
May 11, 1951

Form MF-100
(March 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Form approved.
Budget Bureau No. 42-R1026.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950

NOT TO BE FILLED IN BY APPLICANT

Docket No. dma-1248X

Date received 5/25/51

The Defense Minerals Administration
Regional No. 6 Defense Office
221 West 3rd Street
Joplin, Missouri

Arkansas Manganese Company, Inc.
100 Professional Building
Fort Smith, Arkansas

Name and address of applicant

Date May 16, 1951

INSTRUCTIONS

This form is to be filed with Defense Minerals Administration, Department of the Interior, Washington 25, D. C. It should be accompanied by appropriate application form when a specific type of Government assistance is requested, in the form of (1) loan, (2) purchase contract, (3) Government guarantee of a private loan, (4) Necessity Certificate pursuant to the provisions of Sec. 124-A (Amortization Deduction) of Internal Revenue Code, 1950, (5) priorities or allocation of mining equipment, and maintenance, repair and operating supplies, and (6) other forms of Government assistance that might arise under the Act. Submit four (4) signed copies of the form and accompanying papers. Name and address should be stamped or typed on each sheet of this form and all accompanying papers. *When a question is inapplicable it should be so stated on the form.* Additional sheets may be attached in answering any questions or in supplying additional information. (IF YOU CANNOT ANSWER A QUESTION, SO STATE.) If a question is answered elsewhere indicate where answered. It is not necessary to answer it again.

GENERAL TECHNICAL DATA

Supply the following information on separate sheets, arranged, numbered, and lettered as indicated:

1. Materials produced:
   (*a*) What are the chief mine, mill, or smelter products?
   (*b*) What are the byproducts, if any?
2. Name(s) and type(s) of mine(s), mill(s), smelter(s), refinery(ies), pit(s), quarry (ies), drilling operation(s). Include old names of property, if any. Show extent of workings, including the following:
   (*a*) Linear feet of shafts.
   (*b*) Linear feet of drifts and crosscuts.
   (*c*) Linear feet of tunnels or adits.
   (*d*) Linear feet of other mine openings (explain briefly).

   Indicate whether mine is flooded or not. Describe any pumping problems. Give size or productive capacity.
3. For each operation listed above supply the following:
   (*a*) Distance and direction from nearest town and shipping point.
   (*b*) Mining district.
   (*c*) Township, Section, Range.
   (*d*) County, State.
4. (*a*) State whether or not property is now in operation, and if in operation, by whom operated.
   (*b*) Are you operating this property as:
   - ☐ Owner.
   - ☐ Lessee.
   - ☐ Contractor.
5. Number of years in production _____

   If not in production or operation, estimated date when production will begin _____
6. Experience of operators:

   Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who manage the project.
7. History:
   (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for suspension of operation.
   (*b*) State briefly the known history and production of adjoining and neighboring properties.
   (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

8. Names and addresses of Officers, Directors, or Partners, and in addition thereto, the five largest stockholders if applicant is a corporation.

Name and Address (a)	Official Title (If officer is also director indicate by "D") (b)	Total of Annual Salary, Commissions, Bonuses, Etc., Received From Applicant and Affiliates During Last Fiscal Year (c)	Estimated Net Worth Outside of Interest in Applicant (d)	Number of Shares Held in Applicant Corporation: Common (e)	Number of Shares Held in Applicant Corporation: Preferred (f)	Life Insurance Carried for Benefit of Applicant: Amount (g)	Life Insurance Carried for Benefit of Applicant: Net Cash Surrender Value After Loans (h)
R. W. Newton	President	none	15,000.	12,000.	230	none	none
Glenn C. Click	Vice-President	none	30,000.	12,000	140	none	none
Wesley Adams	Treasurer	none	100,000.	6,000	none	none	none
Victor Howard	Secretary	none	100,000.	6,000	none	none	none
James M. Taylor, Jr.	Asst. Secretary	none	50,000.	12,000	200	none	none
	Total		x x x x x	48,000	570	x x x x x	x x x x x

If more lines are needed continue on separate sheet.

9. Capital Stock Issues:

For Corporate Applicants

Item	Authorized (a)	Outstanding (b)	Par Value (c)	Number of Shares Outstanding (d)	Dividend Rate Last Paid* (e)
Common stock	$ 100,000	$ 48,000	$ 1.00 per share	48,000	none
Preferred stock	$ 100,000	$ 57,000	$ 100.00	570	none

*Indicate period covered.

10. Production: Not in production

Item	Kind of Product (a)	1948 Total (b)	1949 Total (c)	1950 Total (d)	Present Average Monthly (e)
1. Quantity of product mined or quarried (Short, long, metric tons; barrels; pounds; etc.)					
2. Quantity of product processed (specify unit of measure and type of process)					
3. Quantity and grade of product sold or shipped (specify units of measure)					

11. Do you contemplate a change in the present average monthly rate of production? If so, state estimated maximum monthly production and basis of change. Not applicable

12. Ore or Mineral Reserves: See Report of R. B. McElwaine consulting mining geoligist.

(a) Describe the ore or mineral deposit briefly. Accompany the application by any available report on the geology and ore reserves.

(*b*) If deposit is other than placer: See Report of R. B. McElwaine, Consulting Mining Geoligist.

(1) Submit assay plans and/or sections showing location and size of proved (measured) and probable (indicated) ore or mineral reserve.

(2) State the tonnage (indicate type of ton) and grade of each class of ore reserve, as above, and show how computed. Tabulated total ore reserve as follows:

TOTAL ORE OR MINERAL RESERVES

Ore or Mineral Reserve	Estimated Tons (a)	Metal or Mineral Content Per Ton (Grade) (b)	Gross Value Per Ton (c)	Recoverable Unit Value Per Ton (d)	Estimated Cost of Production Per Ton (e)
Measured (proved)					
Indicated (probable)					

(*c*) If placer:

(1) Give estimated total yardage and average marketable mineral content of each deposit.

(2) Submit map showing location of placer deposit and surrounding area, with all test holes or pits. Submit logs of each hole and test pit with depth and average value of each.

(3) Describe gravel, stating whether fine, medium or coarse; loose, tight, cemented, or frozen, and whether it contains stumps or boulders more than 1 foot in diameter; if so, how large, and in what proportion.

(4) Describe bedrock, giving type (granite, sandstone, shale, etc.) and state whether it is hard or soft, smooth, uneven or rough.

(5) Describe overburden, stating whether loose, tight, or cemented; fine or coarse textured; furnish estimate of average thickness and total amount.

(6) Tabulate the reserves using the form outlined above for ore or mineral reserves.

13. Access Roads:

Give road distances to shipping, supply and residence points, stating kind and condition of roads.

14. Water Supply:

State source and quantity of water available for operations and whether sufficient for all seasons of year.

15. Power:

State amount of power used, rate per hour, and source thereof.

16. Labor:

State number and classes (miners, muckers, millmen, etc.) of men employed during a recent representative payroll period.

17. Equipment and Facilities:

Describe present equipment on the property, including buildings. (State condition.) List major pieces of equipment now owned or controlled and in serviceable condition available for this operation.

18. Are there any particular conditions or circumstances affecting your operations that are not described above? If so, explain.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

ARKANSAS MANGANESE COMPANY, INC.
(Name of company)

By Walter Howard
(Signature of authorized official)

May 16, 1951
(Date)

Secretary
(Title)

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—63792-1

ARKANSAS MANGANESE CO., INC.

OFFICES: 100 PROFESSIONAL BUILDING
TELEPHONE 8995
Fort Smith, Arkansas

OFFICERS & DIRECTORS
R. W. NEWTON
PRESIDENT
GLENN C. CLICK
VICE PRESIDENT
WESLEY ADAMS
TREASURER
VICTOR HOWARD
SECRETARY
JAMES M. TAYLOR, JR.
ASST. SECRETARY

Supplement of Form MF-100

No. 1 Materials produced:
(a) Manganese concentrate.
(b) To be determined.

No. 2 See report of Robert B. McElwaine, Consulting Mining Geologist.

No. 3 (a) Twelve and one-half miles due East, Hatfield, Arkansas, K.C.S. Railway
(b) Mena Mining District
(c) Township 3 South, Section 27 and 28, Range 30 West.
(d) Polk County, Arkansas

No. 4 (a) Not in operation
(b) Owner, yes, Under unpatented mining claim.

No. 5 Not in production, To be determined from exploratory work.

No. 6 Experience of operators: Arkansas Manganese Company, Inc. is a new corporation organized to explore and to mine manganese ore in the Mena Mining District.

(b) R. W. Newton, President and General Manager of the Company, seven years coal experience with Pocahontas Fuel Company, Inc. Pocahontas, Virginia. Eleven Years actual experience in the field, doing prospect work in the field this Company proposes to open. Is experience in construction, using all classes of materials both heavy and light on various projects, also is an accountant.

Glenn C. Click, Vice President of Corporation, is experience in distribution of national products, has been employed with the Texas Company. At present is traffic manager for England Truck Lines, Fort Smith, Arkansas.

J. Wesley Adams, President of Adams and Howard Company, Inc., Mortgage Banker, Appraiser, and General Insurance.

Victor Howard, Secretary, Adams and Howard Company, Inc. Fort Smith, Arkansas, Mortgage Banker, General Insurance and Real Estate.

No. 6 (b) continued

James M. Taylor, Jr., Asst. Secretary of Corporation, owns and operates plumbing contracting firm in Fort Smith, also is experienced in as dirt moving contractor. Mr. Taylor has been employed by The Salway Chemical Company, prior to World War II in Construction of their plant. Also worked for E. D. Badger and Company in construction synthetic rubber plant, at Baton Rouge, Louisiana. Mr. Taylor served in the Armed Forces with the U. S. Army Engineers doing heavy pipe work and construction of large storage tanks.

The Company proposes to hire experienced men in operating the mining operation.

No. 7 See Report of R. B. McElwaine, consulting mining geoligist for corporation.

No. 8, No. 9, No. 10, No. 11, No. 12 is completed on the Original Form MF-100.

No. 13 Access Roads:
Twelve and one-half miles to nearest shipping point over gravel roads. Roads are in good condition. Nearest shipping point Hatfield, Arkansas.

No. 14 Water Supply:
Water can be supplied from brushy creek, which runs across property. Is sufficient for all seasons of the year.

No. 15 Power:
Individual power units, Diesel Powered.

No. 16 Labor:
Not. Applicable

No. 17 Equipment and Facilities:
Wood need new machinery and building throughout.

No. 18 None

Bu. Con. No. OMA-6.-11

MF-104
(April 1951)

1st Copy

Budget Bureau No. 42-R1036.
Approval expires 6-30-51.

DEFENSE MINERALS ADMINISTRATION
UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
JAN 14 8 47 AM '52

POSTED
Oct.
DEC 12 1951
By

1248
OCT

STRATEGIC AND CRITICAL MINERAL EXPLORATION PROGRAM
OPERATOR'S MONTHLY PROGRESS REPORT

Operators are to submit monthly reports to the designated field representative of the Defense Minerals Administration. Reports are to be submitted in quadruplicate prior to the 15th day of the month following the reporting period.

Narrative.—A concise narrative description of progress made, results accomplished, and any unusual difficulties encountered is to be furnished.

Maps.—Wherever possible, the narrative is to be illustrated with maps or sketches showing formations penetrated and location and assays of samples taken as well as advances in workings. In the case of diamond drilling or churn drilling, the location and inclination of holes is to be shown on a map; logs and assays also are to be submitted.

Cost Accounts.—All applicable parts of this form are to be filled in. This report will form the basis for payments of the Government's participating share of expenses. Audits of accounts will be made from time to time.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this report is correct and complete to the best of their knowledge and belief.

Arkansas Manganese Company, Inc.
(Name of Company)

By Victor Howard
(Signature of Authorized Official)

November 12, 1951
(Date)

Secretary
(Title)

NOTE.—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.

16—64068-1

MONTHLY SUMMARY COST STATEMENT

Name of operator Arkansas Manganese Company, Inc.
Project No. DMA 1248-X
Total contract amount $20,000.00
Government participation percent 75%

Distribution of Expenditures for Month of October 1951

Exploration Contract No. Idm - E82

Item	Monthly Total	Totals Previously Reported	Totals to Date	For Government Use Only: Approved Monthly Total	Approved Totals Previously Reported	Approved Totals to Date
Wages and salaries	1425.00	1575.00	3000.00			
Equipment purchase [1]						
Equipment rental [2]						
Buildings						
Explosives						
Repair parts						
Other supplies						
Power						
Transportation						
Withholding taxes						
Compensation insurance						
Other insurance						
Contract work	3919.50	4108.00	8027.50			
Other (specify) Chemical Analysis	250.00	None	250.00			
Total	5594.50	5683.00	11,277.50			
Totals previously reported	5683.00					
Totals to date	11277.50		11,277.50			

FOR GOVERNMENT USE ONLY

Checked by Clinton C. Knox
Entered by
Approved by David Gallagher
Amount approved for payment $ 4,195.87
Remarks

[1] Enter total purchase price in month purchase is made.
[2] Payments for rental of equipment or prorated depreciation on equipment owned by contractor.

16—64068-1

MONTHLY PROGRESS REPORT
For Month Ending October 31, 1951

Arkansas Manganese Company, Inc.
100 Professional Building
Fort Smith, Arkansas

To: Defense Minerals Administration
Regional Office
Joplin, Missouri

Docket No. DMA-1248X

Discussion

Churn drill hole No. 7 was finally completed after numerous and extended delays on account of drilling and equipment difficulties and heavy rains. The hole was located at the axis of the syncline at an approximate elevation of 1,050 feet. This is about 50 feet above the elevation of Brushy Creek. A generalized log of the hole is shown below.

Interval In Feet	Description
0 - 55	White porous novaculite from upper division of formation.
55 -392	Thin bedded, dark colored chert of middle division of novaculite formation.
392 -393	Dark grey shale (contact of unconformity). Iron stained grey chert. The sample is principally altered (iron) material from conglomerate beds of unconformity. Heavily iron stained and impregnated.
393-394	Material from conglomerate beds in unconformity. Highly discolored with iron oxides.
394-400	White massive novaculite from lower division. Carrying manganese oxide as fracture filling.
400-406	White novaculite. Iron oxides.

The water level in this hole stands within 15 feet of the surface. A detailed log of the hole has been prepared and samples of all cuttings saved. Samples from the last four intervals are being forwarded to Bruce Williams Laboratories for analysis.

Excessive water was encountered in the No. 1 tunnel (slope) after driving it a total distance of 90 feet which was its depth at the end of September. Seventy feet of this was under the DMA exploration program. The work was discontinued at this point and work started on No. 2 tunnel which was driven a total of 130 feet during the month of October. This made a total of 200 feet of drifting as provided for under the DMA exploration contract.

No. 1 tunnel, as previously reported, was driven down the dip along the unconformity between the middle and lower divisions of the Arkansas novaculite formation. It showed some manganese all the way. No. 2 tunnel, on the north limb of the syncline where the beds are at a near vertical attitude, was driven about 90 feet in the lower part of the middle division of the novaculite and then a cross cut was made into the lower division. At theheading of the tunnel the massive novaculite of the lower division is highly fractured, and altered by meteoric waters. Considerable iron oxide is present and each of the last three shots in the tunnel revealed increasing amounts of manganese oxide. This is apparently the downward extension of a manganese deposit which outcrops on the surface of the hill above the tunnel heading.

Work on the project has been terminated except for the mapping and sampling of the two tunnels and writing of the final report.

R. B. McElwaine, Geologist.

DISTRIBUTION OF WAGES AND SALARIES FOR MONTH OF October 1951

Name of operator Arkansas Manganese Company, Inc.
Project No. DMA 1248-X
Total contract amount $20,000.00
Government participation percent 75%

Exploration Loan No. Idm-E82

Type	Number	Man-Shifts	Rate	Total
Miners			$	$
Muckers				
Trammers				
Timbermen				
Pumpmen				
Hoistmen				
Surface				
Samplers				
Assayers				
Shift bosses				
Mechanics				
Electricians				
Blacksmiths				
Carpenters				
Drill runners				
Drill helpers				
Teamsters				
Manager				
Superintendent	1	4 - Weeks	75.00	300.00
Engineers	1	3 - Weeks	175.00	525.00
Geologists	1	4 - Weeks	150.00	600.00
Bookkeeper				
Foreman				
Clerks				
Stenographers				
Other				
Total				1425.00

Note.—Show only that portion of supervisory, office, and engineering salaries that is chargeable to this project.

FOR GOVERNMENT USE ONLY

Checked by Clinton C. Kinnor
Entered by
Approved by David Gallagher
Remarks

16—64068-1

EXPLORATION UNIT COST AND PROGRESS REPORT FOR MONTH OF .....

Name of operator ....Arkansas Manganese Company, Inc.....
Project No. DMA ....1248-X.....
Total contract amount ....$20,000.00.....
Government participation, percent ....75%.....
Exploration Contract No. Idm - E82

Item	Costs					Progress				
	Wages [1] and salaries	Equipment [2]	Supplies	Other [3]	Total	Unit	Units this month	Units previously reported	Units to date	Units authorized by contract
				Contract						
Drifting				2600.00	2600.00	FT	130	70	200	200
Crosscutting										
Raising										
Shafts										
Winzes										
Drill holes Charm Drilling				1319.50	1319.50	FT	406	684	1090	3000
Overburden										
Rehabilitation and preparation										
Geology and geophysics	950.00				950.00	$	950.00	1050.00	2000	2000
Trenching										
Sampling and assaying			250.00		250.00	$	250.00	None	250	250
Roads and trails										
Dia. Core Drilling				None	None	FT.	None	32 1/3	32 1/3	200
Other (specify) Supervision	475.00				475.00	$	475.	525	1000	1000
Totals	1425.00		250.00	3919.50	5594.50					

[1] Prorate supervisory, engineering, and office salaries in proportion to man-shifts of direct labor.
[2] Prorate charges for equipment that is not exclusively for one type of job (such as compressors) against authorized units of work in each category.
[3] Where entries in the "Other" column (above) are more than 25 percent of the total expenditures, a breakdown of this item should be made.

16—64068-1 U. S. GOVERNMENT PRINTING OFFICE

FOR GOVERNMENT USE ONLY

Checked by Clinton C. Knox
Entered by
Approved by David Gallagher
Remarks

MF-104
(April 1951)

Budget Bureau No. 42-R1036.
Approval expires 6-30-51.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

POSTED
DEC 12 1951

STRATEGIC AND CRITICAL MINERAL EXPLORATION PROGRAM
OPERATOR'S MONTHLY PROGRESS REPORT

Operators are to submit monthly reports to the designated field representative of the Defense Minerals Administration. Reports are to be submitted in quadruplicate prior to the 15th day of the month following the reporting period.

Narrative.—A concise narrative description of progress made, results accomplished, and any unusual difficulties encountered is to be furnished.

Maps.—Wherever possible, the narrative is to be illustrated with maps or sketches showing formations penetrated and location and assays of samples taken as well as advances in workings. In the case of diamond drilling or churn drilling, the location and inclination of holes is to be shown on a map; logs and assays also are to be submitted.

Cost Accounts.—All applicable parts of this form are to be filled in. This report will form the basis for payments of the Government's participating share of expenses. Audits of accounts will be made from time to time.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this report is correct and complete to the best of their knowledge and belief.

Arkansas Manganese Company, Inc.
(Name of Company)

By Victor Howard
(Signature of Authorized Official)

October 12, 1951
(Date)

Secretary
(Title)

NOTE.—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.

16—64068-1

MONTHLY SUMMARY COST STATEMENT

Name of operator Arkansas Manganese Co., Inc.
Project No. DMA 1248x
Total contract amount $20,000
Government participation percent 75%

Distribution of Expenditures for Month of September, 1951

Exploration Contract IDM-E82

Item	Monthly Total	Totals Previously Reported	Totals to Date	For Government Use Only: Approved Monthly Total	Approved Totals Previously Reported	Approved Totals to Date
Wages and salaries	1,575.00	None	1,575.00			
Equipment purchase [1]	None	"				
Equipment rental [2]	None	"				
Buildings	None	"				
Explosives	None	"				
Repair parts	None	"				
Other supplies	None	"				
Power	None	"				
Transportation	None	"				
Withholding taxes	None	"				
Compensation insurance	None	"				
Other insurance	None	"				
Contract work ?	4,108.00	"	4,108.00			
Other (specify)	None	"				
Total	5,683.00	None	5,683.00			
Totals previously reported	None	None	None			
Totals to date	5,683.00	None	5,683.00			

FOR GOVERNMENT USE ONLY

Checked by Clinton C. Knox
Entered by
Approved by David Gallagher
Amount approved for payment $4,262.25
Remarks

[1] Enter total purchase price in month purchase is made.
[2] Payments for rental of equipment or prorated depreciation on equipment owned by contractor.

16—64068-1

DISTRIBUTION OF WAGES AND SALARIES FOR MONTH OF September

Name of operator Arkansas Manganese Company, Inc.
Project No. DMA 1248X
Total contract amount $20,000
Government participation percent 75%

Exploration Contract No. IDM-E82

Type	Number	Man-Shifts	Rate	Total
Miners			$	$
Muckers				
Trammers				
Timbermen				
Pumpmen				
Hoistmen				
Surface				
Samplers				
Assayers				
Shift bosses				
Mechanics				
Electricians				
Blacksmiths				
Carpenters				
Drill runners				
Drill helpers				
Teamsters				
Manager				
Superintendent	1	7 weeks	$75.00 Weekly	$525.00
Engineers } Geologists }	1	7 weeks	150.00 Weekly	1050.00
Bookkeeper				
Foreman				
Clerks				
Stenographers				
Other				
Total	2			$1575.00

Note.—Show only that portion of supervisory, office, and engineering salaries that is chargeable to this project.

FOR GOVERNMENT USE ONLY

Checked by Clinton C. Knox
Entered by
Approved by David Gallagher
Remarks

16—64068-1

EXPLORATION UNIT COST AND PROGRESS REPORT FOR MONTH OF September, 1951

Name of operator: Arkansas Manganese Company, Inc.
Project No. DMA: 1248X
Total contract amount: $20,000
Government participation, percent: 75%
Exploration Contract No. IDM-E82

Item	Costs					Progress				
	Wages [1] and salaries	Equipment [2]	Supplies	Other [3] Contract	Total	Unit	Units this month	Units previously reported	Units to date	Units authorized by contract
Drifting				$1400.00	$1400.00	Ft.	70	None	70	200
Crosscutting										
Raising										
Shafts										
Winzes										
Drill holes Churn drilling				$2223.00	$2223.00	Ft.	684	None	684	3000
Overburden										
Rehabilitation and preparation										
Geology and geophysics	$1050.00				$1050.00	$	1050	None	1050	2000
Trenching										
Sampling and assaying										
Roads and trails										
Test pits Diamond Core drilling				$485.00	$485.00	Ft.	32 1/3	None	32 1/3	200
Other (specify) Supervisor	$525.00				$525.00	$	525	None	525	1000
Totals	$1575.00	None	None	$4108.00	$5683.00					

[1] Prorate supervisory, engineering, and office salaries in proportion to man-shifts of direct labor.
[2] Prorate charges for equipment that is not exclusively for one type of job (such as compressors) against authorized units of work in each category.
[3] Where entries in the "Other" column (above) are more than 25 percent of the total expenditures, a breakdown of this item should be made.

16—64068-1 U. S. GOVERNMENT PRINTING OFFICE

FOR GOVERNMENT USE ONLY

Checked by: Clifton C. Knox
Entered by:
Approved by: David J. Gallagher
Remarks:

Monthly Progress Report
For Month Ending September 30, 1951.

Arkansas Manganese Co., Inc.
100 Professional Building
Fort Smith, Arkansas
To: Defense Minerals Administration
Regional Office
Joplin, Missouri
Docket No. DMA-1248X. Contract No. Idm-E82

A. DATA SECTION

Location:
Polk County, Arkansas

1.) Total footage drilled and other pertinent data is shown in the table below. Drill hole logs, cross sections and assays are attached to this report.

TABULATION OF DRILLING DATA

Hole No.	Feet Churn Drilled	Feet Core Drilled	Sludge Samples	Core Samples
1	57		5	
2	117		5	
3	110.5	27	4	4
4	164	5'8"	0	3
5	89		4	
6	147		4	
Total for project--	684.5	32'8"	22	7

2.) Total footage penetrated in drift No. 1 is seventy feet. No samples have been taken for analyses.

B. INFORMAL DISCUSSION

Original drilling started on this project on August 10, 1951. Several difficulties were encountered and only two holes had been completed at the end of the month. The Executive Officer of D.M.A. Field Team, Region VI advised that it would not be necessary to submit a monthly progress report until the end of September.

The hard and highly fractured novaculite formation being penetrated and the rough terrain plus numerous mechanical difficulties have all contributed to very slow progress with the drilling.

Two churn drill holes were cased and diamond core drilled through the ore horizon. The novaculite formation is so hard and abrasive that $630.00 worth of diamonds were used, and two weeks actual working time consumed in drilling 33 feet. The cost was so excessive that the contractor could not perform under his contract. It was decided that churn drilling and sampling was the only practical procedure to use.

Hole No. 1 was so badly broken and fractured that it was useless to try and core drill it. Churn drill samples were taken but the ground caved so badly around the bit that badly mixed and resultant poor samples as far as accuracy is concerned were obtained from this hole. The ground for a considerable distance back from the outcrop is badly leached and altered with surface water circulation so as to make it much more subject to caving than ground farther removed from the outcrop.

Hole No. 2 penetrated the ore zone before it was recognized and it was decided to complete this hole by churn drilling methods rather than put the core drill over the hole after the best part of the ore zone had already been penetrated. A flat bottom bailer was not available and the sampling was done with a dart valve bailer. It was not possible to get the hole absolutely clean and thus each sample was slightly affected by the material left from the sample above.

Hole No. 3 was churn drilled to 110.5 feet. No definite marker horizon had been established and churn drilling was halted for fear of penetrating the ore horizon. Sixteen and one half feet of core drilling was required before the ore horizon was reached. After passing a depth of 131 feet no core was recovered. Excessive quantities of sludge were recovered and these samples are not considered to be accurate records of the grade of ore penetrated. Part of this lower drill-

ing was in the fractured massive novaculite where the manganese occurs as fracture filling. This heavier material was probably not carried out by the return water in the same ratio as the lighter gangue material.

Hole No. 4 was churn drilled to 164 feet and the core drill encountered the ore horizon at a depth of 168 feet. About six feet of the ore horizon was missing in this hole and the only ore was encountered in the fractured massive novaculite. A point was reached where the diamond drill would penetrate no deeper and the hole was abandoned. A new bit drilled a total of three inches and was so polished at that time that it would not cut any farther.

Hole No. 5 was churn drilled to a depth of 89 feet. A sand pump was obtained to take the samples and the hole successfully cleaned at the bottom of each sample interval. The exact point of entry into the ore zone is not known but was somewhere in the 80-84 foot interval. Examination of the cuttings revealed approximately 50 percent of the overlying material and 50 percent of the ore bearing material. On that basis it is estimated that the ore horizon was entered at approximately 82 feet in depth.

Hole No. 6 was churn drilled to a depth of 147 feet. Highly fractured ground was encountered for the entire depth of the hole and material off of the walls contaminated the samples. The ore zone was quite thin in this hole.

At the end of the month the drill was moving to location No. 7 (See map attached) in the center of the syncline. It is anticipated that this hole will be 300 to 350 feet in depth. Unless a couple of holes in the syncline develop different conditions to those revealed by the drilling to date, it is recommended that the drilling be discontinued at that time.

Drifting

At the end of the month drift No. 1 had been driven an additional 70 feet to place it at a point 90 feet from the outcrop down the dip of the ore horizon. (See map). No samples have been taken for analyses but visual observation indicated that much better results, as far as thickness and grade of ore, have been obtained by the drifting program than by the drilling. However, all of this ore is apparently of a supergene character. Working down the dip and encountering of the water table has presented difficulties that have materially slowed down the progress of this work. Ten more feet will complete the proposed work on this drift.

Drift No. 2 will progress much more rapidly than Drift No. 1. This drift will not only test out the ore horizon in the unconformity but will also drive under a highly mineralized surface area in the massive novaculite that is carrying excellent ore on the surface over quite an area. The penetration of this area by the drift will reveal what changes occur below the surface of these types of deposits. If this particular one persists in size and grade to the depth of the tunnel level it will develop a sizeable tonnage of good ore.

Conclusion

As pointed out by the writer's original report under date of May 11, 1951 this project is a "most hazardous financial venture". It now appears very doubtful that the postulated theory outlining the possibilities of a large bedded deposit of manganese will prove out. Substantial reserves apparently do exist along the outcrop of the unconformity and down the dip for a distance of a hundred feet or more. However, with the extremely difficult metallurgical problems connected with this ore, it does not appear that the huge reserves necessary to encourage diligent work on the metallurgical problems are available in this area.

Limited quantities of ore susceptible to conversion into marketable concentrates by known metallurgical methods do exist in the massive novaculite. The economics of this situation require considerable investigation before the feasibility of an operation on this type of ore can be decided upon.

R. B. McElwaine
Consulting Mining Geologist
Little Rock, Arkansas
October 10, 1951

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 1
Elevation at collar: 1,026
Depth: 57'

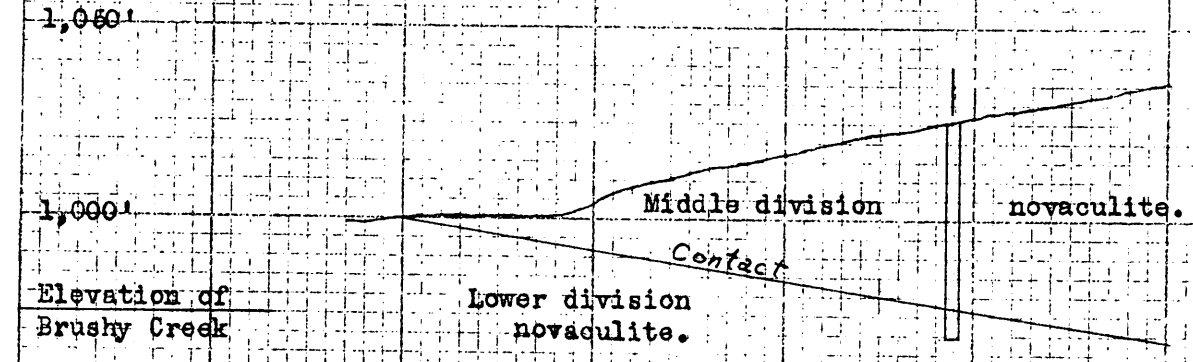
Location: No 3 claim.
SE ¼ Sec. 28, T.3S., R.30W.
Drilled August 1951
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

36' - 42' Light grey and iron stained chert.
42' - 48' Grey chert, iron stone, manganese and pyrite.
48' - 51' Sandstone, conglomerate, little manganese.
51' - 53' Conglomerate with little manganese.
53' - 57' Conglomerate and highly fractured massive (lower division) novaculite.

Contact is top of zone of unconformity between middle and lower division of Arkansas novaculite formation. There are three to five beds ranging in thickness from a few inches to a foot or two each which make up this unconformable zone. Each of these beds reveal an erosional surface before deposition of the succeeding bed.

The middle division novaculite is made up of thin bedded medium and dark grey chert with about twenty feet of light grey chert immediately above its contact with the lower division of the novaculite. The lower division is principally fractured, massive white to very light grey chert.



ASSAYS

Interval	Manganese	Iron	Phos.
36' - 42'	1.48	3.60	0.19
42' - 48'	2.31	3.00	0.17
48' - 51'	0.74	1.70	0.10
51' - 53'	0.36	1.10	0.06
53' - 57'	0.41	1.15	0.04

DATA SHEETS
NO. 700-10
CHARLES GRUNING COMPANY, INC.
10 x 10 to the inch.

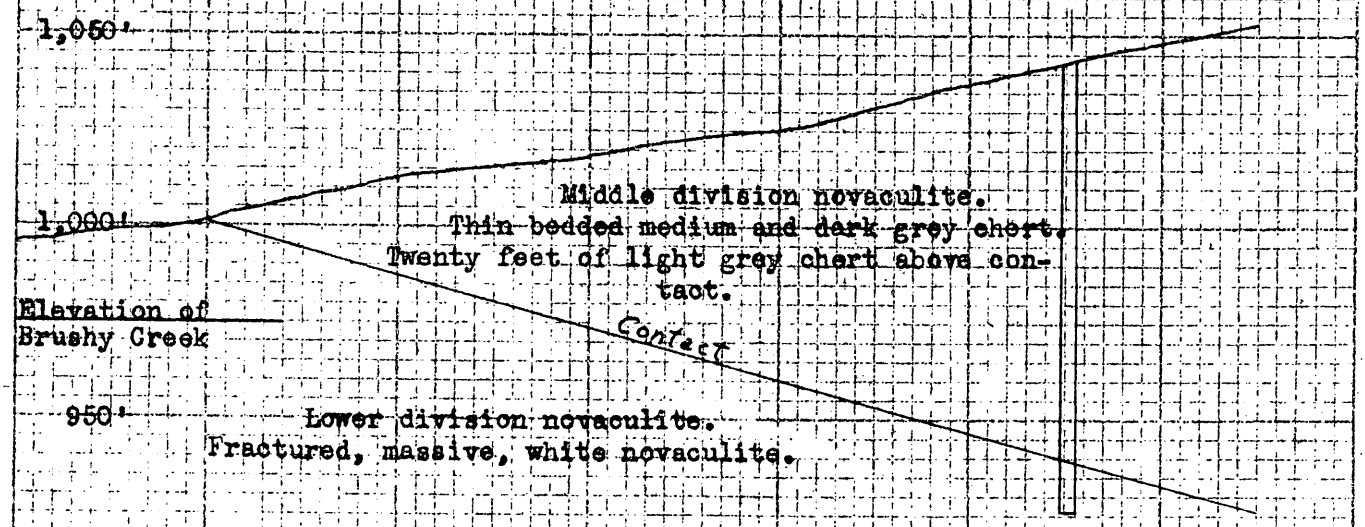
ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 2
Elevation at collar: 1,043'
Depth: 117'

Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled August 1961
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

65' - 103'	Medium to light grey chert. Little white quartz.
103' - 106'	Coarse cuttings with many large pieces 1/4" to 1/2" or larger. Large pieces of fine grained sandstone character--light to yellow brown (iron) and medium grey in color. Little light greyish-green chert. Some manganese and pyrite.
106' - 108'	Medium grey chert, arenaceous light to yellow brown rock. Fine conglomerate material with Mn matrix. Quartz. Greyish green to green chert. Little manganese and some pyrite.
108' - 110'	White and iron stained novaculite (lower division) with manganese. Pyrite. Some grey chert (caved from above).
110' - 112'	White to pinkish tan novaculite. Little manganese and pyrite.
112' - 114'	White to yellowish novaculite.
114 - 117'	" " " "



ASSAYS

Interval	Manganese	Iron	Phos.
103 - 106	3.50	10.10	0.57
106 - 108	1.55	5.40	0.21
108 - 110	4.85	5.50	0.21
110 - 112	0.90	2.00	0.04
112 - 114	0.50	1.50	0.04
114 - 117	Not assayed.		

DATA SHEETS
NO. 720-10
CHARLES BRUNING COMPANY, INC. 10 x 10 to the inch.

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

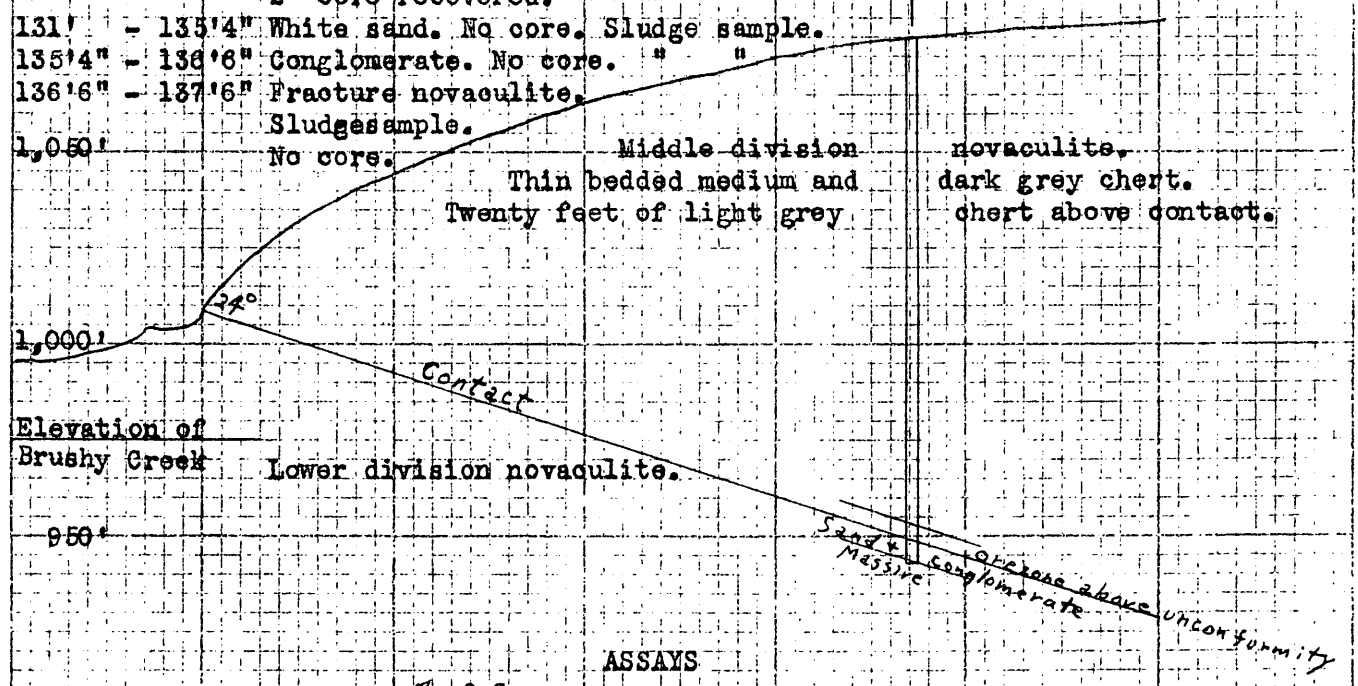
Project: DMA-1248X
Hole No. 8
Elev. at collar: 1,080'
Depth: 137'6"

Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

This hole was churn drilled to 110.5' and diamond core drilled from that point to a depth of 137.5'

125.5' - 127' Dark grey chert interbedded with brown iron bearing light grey chert.
127' - 129.5' Thin bedded, highly fractured grey chert carrying Mn and Fe in fractures, bedding planes and some possible replacement of thin laminae in rock (lies parallel to bedding). Little light grey chert at top. Apparent dip 22½ degrees. 11" of core recovered.
129.5' - 130'8" Thin bedded, highly fractured grey chert highly mineralized with Mn and Fe as fracture filling and possibly some replacement. Much of rock is of an aremaceous nature. 3" core recovered.
130'8" - 130'10" Unaltered (iron free) fractured grey chert with considerable Mn as fracture filling. Very fine to thick (3/8") fractures. 2" core.
130'10" - 131' Same as above. Setting on top of sand bed. Contact shows dip of 22°. 2" core recovered.
131' - 135'4" White sand. No core. Sludge sample.
135'4" - 136'6" Conglomerate. No core. " "
136'6" - 137'6" Fracture novaculite. Sludge sample.



ASSAYS

Interval	% of Core Recovered	Manganese	Copper	Phos.	Iron
127' -129.5'	37	5.69	None	0.77	17.50
129.5'-130'8"	21	9.08	None	0.79	19.70
130'8"-130'10"	100	13.07	None	0.13	3.30
130'10"-131'	100	14.15	None	0.18	3.80
131' -135'4"	Sludge	0.57	0.02	0.03	1.70
135'4"-136'6"	Sludge	0.25	0.02	0.02	2.20
136'6"-137'6"	Sludge	0.19	0.04	0.03	2.70

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 4
Elev. at collar: 1,093'
Depth: 169'8"

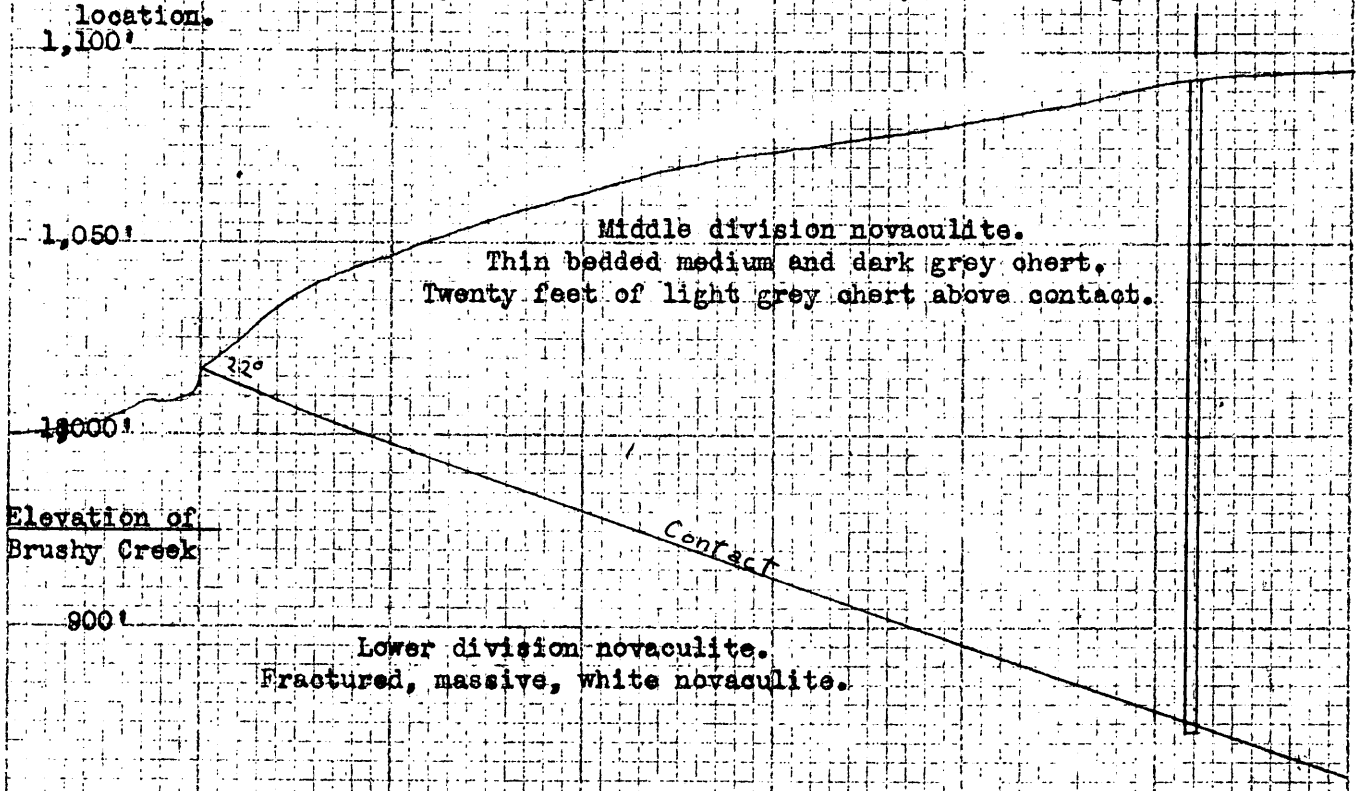
Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

This hole was churn drilled to 164' and diamond core drilled from that point to a depth of 169'8".

164' - 168'3" Light grey chert, thin bedded. 4" iron-bearing sandstone at bottom marks top of unconformity.
168'3"- 168'6" Same as above with Mn adhering to bottom. 1" of core recovered.
168'6"- 169' Fractured massive white novaculite with all openings filled with Mn. 6" of core recovered.
169' - 169'8" Same as above. 8" of core recovered.

All of the beds normally occuring in the unconformity were missing at this location.



ASSAYS

Interval	% of Core Recovered	Manganese	Copper	Phos.	Iron
168'3"-168'6"	33	1.86	None	0.83	23.40
168'6"-169'	100	9.23	"	0.24	6.10
169' -169'8"	100	9.07	"	0.11	2.50

Remarks: Could not penetrate any deeper with core drill. Put on new diamond bit and made three inches and it stopped cutting.

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 5
Elev. at collar: 1,058'
Depth: 89'

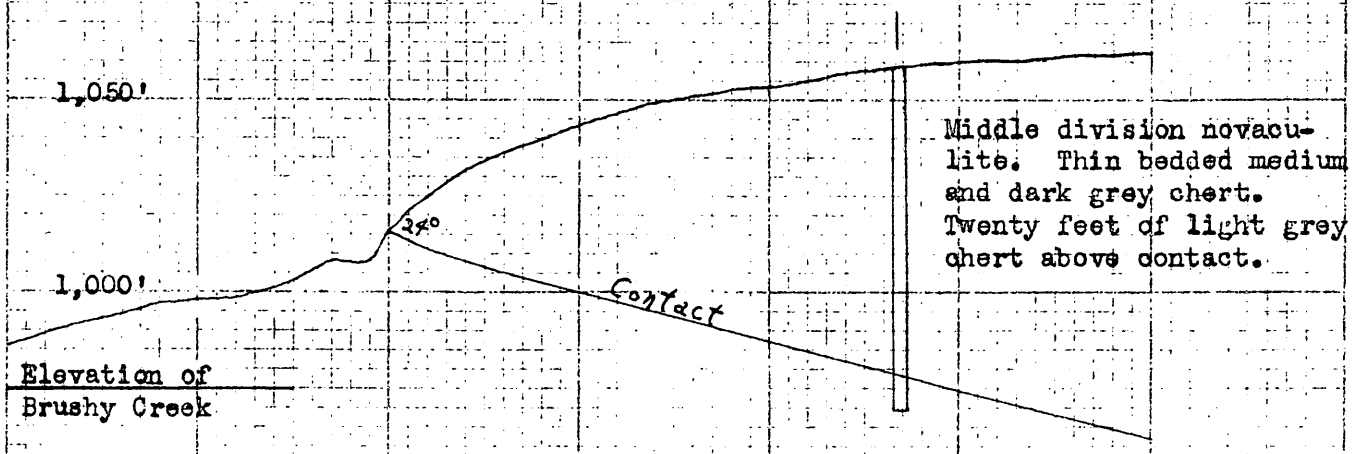
Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

76'-80' Medium to light grey chert. Considerable pyrite and little quartz. Little light grey, porous chert and some iron stained dark chert. Broken ground.
80'-84' Entered ore zone. Chert, shale, sand, conglomerate.
84'-86' Sand, conglomerate, grey chert caved from above.
86'-88' Fractured massive white novaculite with Mn.
88'-89' Fractured massive white and pink chert. Open ground. Iron stain.

ASSAYS

Interval	Manganese	Copper	Phos.	Iron
80 - 84	1.14	0.03	0.22	5.80
84 - 86	0.90	0.02	0.13	3.30
86 - 88	2.99	0.05	0.02	4.20
88 - 89	0.86	0.02	0.03	2.40



Contact is top of zone of unconformity.

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

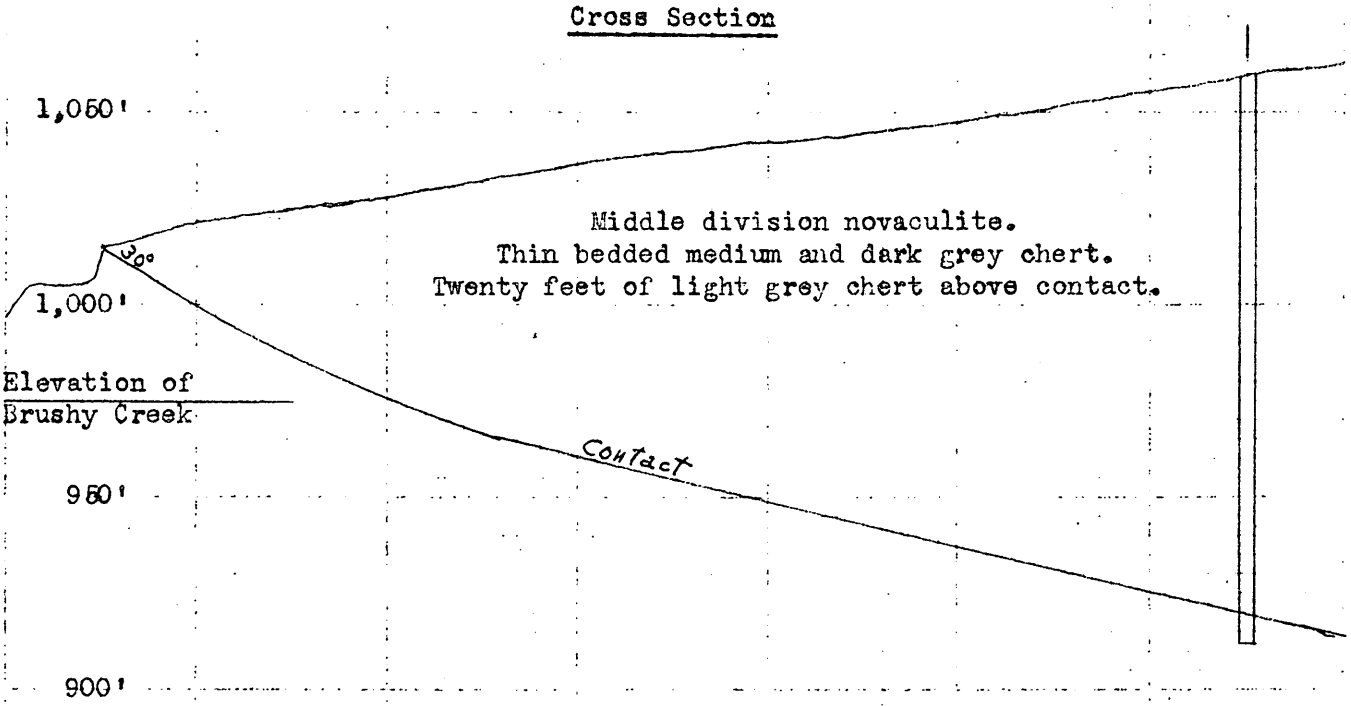
Project: DMA-1248X
Hole No. 6
Elev. at collar: 1,060'
Depth: 147'

Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale: 1" = 50'

LOG

135.5'-140.5'	Mostly chert with some dark grey arenaceous material that probably makes up iron stained bed at outcrop and in other drill holes.
140.5'-142.5'	Chert(cave material), iron stone, black shale, Mn., pyrite, quartz, white sand. Black shale is marker bed that shows consistently in outcrop but has been undetected in most drill holes.
142.5'-144.5'	White (lower division) novaculite, part of which is possibly conglomerate bed. Black chert,(cave from above), novaculite fragments with Mn stain on sides.
144.5'-147'	Massive, fractured white novaculite with grey and black chert out of walls above.
	Contact is top of zone of unconformity.

Cross Section



ASSAYS

Interval	Manganese	Copper	Phos.	Iron
135.5-140.5	0.25	0.03	0.02	2.10
140.5-142.5	4.90	0.02	0.29	7.70
142.5-144.5	0.90	0.04	0.03	2.10
144.5-147.0	0.38	0.02	0.01	1.70

MF-164
(April 1951)

Budget Bureau No. 42-R1036.
Approval expires 6-30-51.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

STRATEGIC AND CRITICAL MINERAL EXPLORATION PROGRAM
OPERATOR'S MONTHLY PROGRESS REPORT

Operators are to submit monthly reports to the designated field representative of the Defense Minerals Administration. Reports are to be submitted in quadruplicate prior to the 15th day of the month following the reporting period.

Narrative.—A concise narrative description of progress made, results accomplished, and any unusual difficulties encountered is to be furnished.

Maps.—Wherever possible, the narrative is to be illustrated with maps or sketches showing formations penetrated and location and assays of samples taken as well as advances in workings. In the case of diamond drilling or churn drilling, the location and inclination of holes is to be shown on a map; logs and assays also are to be submitted.

Cost Accounts.—All applicable parts of this form are to be filled in. This report will form the basis for payments of the Government's participating share of expenses. Audits of accounts will be made from time to time.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this report is correct and complete to the best of their knowledge and belief.

Arkansas Manganese Company, Inc.
(Name of Company)

By Victor Howard
(Signature of Authorized Official)

October 12, 1951
(Date)

Secretary
(Title)

NOTE.—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.

16—64068-1

MONTHLY SUMMARY COST STATEMENT

Name of operator Arkansas Manganese Co., Inc.
Project No. DMA 1248X
Total contract amount $20,000
Government participation percent 75%

Distribution of Expenditures for Month of September, 1951

Exploration Contract IDM-E82

Item	Monthly Total	Totals Previously Reported	Totals to Date	For Government Use Only: Approved Monthly Total	Approved Totals Previously Reported	Approved Totals to Date
Wages and salaries	1,575.00	None	1,575.00			
Equipment purchase [1]	None	"				
Equipment rental [2]	None	"				
Buildings	None	"				
Explosives	None	"				
Repair parts	None	"				
Other supplies	None	"				
Power	None	"				
Transportation	None	"				
Withholding taxes	None	"				
Compensation insurance	None	"				
Other insurance	None	"				
Contract work 7	4,108.00	"	4,108.00			
Other (specify)	None	"				
Total	5,683.00	None	5,683.00			
Totals previously reported	None	None	None			
Totals to date	5,683.00	None	5,683.00			

FOR GOVERNMENT USE ONLY

Checked by Clinton C. Knox
Entered by
Approved by David Gallagher
Amount approved for payment
Remarks

[1] Enter total purchase price in month purchase is made.
[2] Payments for rental of equipment or prorated depreciation on equipment owned by contractor.

16—64068-1

DISTRIBUTION OF WAGES AND SALARIES FOR MONTH OF September

Name of operator: Arkansas Manganese Company, Inc.
Project No. DMA: 1248X
Total contract amount: $20,000
Government participation percent: 75%

Exploration Contract No. IDM-E82

Type	Number	Man-Shifts	Rate	Total
Miners			$	$
Muckers				
Trammers				
Timbermen				
Pumpmen				
Hoistmen				
Surface				
Samplers				
Assayers				
Shift bosses				
Mechanics				
Electricians				
Blacksmiths				
Carpenters				
Drill runners				
Drill helpers				
Teamsters				
Manager				
Superintendent	1	7 weeks	$75.00 Weekly	$525.00
Engineers	1	7 weeks	150.00 Weekly	1050.00
Geologists				
Bookkeeper				
Foreman				
Clerks				
Stenographers				
Other				
Total	2			$1575.00

Note.—Show only that portion of supervisory, office, and engineering salaries that is chargeable to this project.

FOR GOVERNMENT USE ONLY

Checked by Clinton E. Knox
Entered by
Approved by David Gallagher
Remarks

16—64068-1

EXPLORATION UNIT COST AND PROGRESS REPORT FOR MONTH OF September, 1951

Name of operator: Arkansas Manganese Company, Inc.
Project No. DMA: 1248X
Total contract amount: $20,000
Government participation, percent: 75%
Exploration Contract No. IDM-182

Item	Costs: Wages [1] and salaries	Equipment [2]	Supplies	Other [3] Contract	Total	Progress: Unit	Units this month	Units previously reported	Units to date	Units authorized by contract
Drifting				$1400.00	$1400.00	Ft.	70	None	70	200
Crosscutting										
Raising										
Shafts										
Winzes										
Drill holes: Churn drilling				$2223.00	$2223.00	Ft.	684	None	684	3000
Overburden										
Rehabilitation and preparation										
Geology and geophysics	$1050.00				$1050.00	$	1050	None	1050	2000
Trenching										
Sampling and assaying										
Roads and trails										
Test pits: Diamond Core drilling				$485.00	$485.00	Ft.	32 1/3	None	32 1/3	200
Other (specify): Supervisor	$525.00				$525.00	$	525	None	525	1000
Totals	$1575.00	None	None	$4108.00	$5683.00					

[1] Prorate supervisory, engineering, and office salaries in proportion to man-shifts of direct labor.
[2] Prorate charges for equipment that is not exclusively for one type of job (such as compressors) against authorized units of work in each category.
[3] Where entries in the "Other" column (above) are more than 25 percent of the total expenditures, a breakdown of this item should be made.

16—64068-1 U. S. GOVERNMENT PRINTING OFFICE

FOR GOVERNMENT USE ONLY

Checked by: Clinton C. Knox
Entered by:
Approved by: Vernon Pallagher
Remarks:

Monthly Progress Report
For Month Ending September 30, 1951.

Arkansas Manganese Co., Inc.
100 Professional Building
Fort Smith, Arkansas
To: Defense Minerals Administration
Regional Office
Joplin, Missouri
Docket No. DMA-1243K. Contract No. Idm-202

A. DATA SECTION

Location:
Polk County, Arkansas

1.) Total footage drilled and other pertinent data is shown in the table below. Drill hole logs, cross sections and assays are attached to this report.

TABULATION OF DRILLING DATA

Hole No.	Feet Churn Drilled	Feet Core Drilled	Sludge Samples	Core Samples
1	57		5	
2	117		5	
3	110.5	27	4	4
4	164	5'8"	0	3
5	89		4	
6	147		4	
Total for project--	684.5	32'8"	22	7

2.) Total footage penetrated in drift No. 1 is seventy feet. No samples have been taken for analyses.

B. INFORMAL DISCUSSION

Original drilling started on this project on August 10, 1951. Several difficulties were encountered and only two holes had been completed at the end of the month. The Executive Officer of D.M.A. Field Team, Region VI advised that it would not be necessary to submit a monthly progress report until the end of September.

The hard and highly fractured novaculite formation being penetrated and the rough terrain plus numerous mechanical difficulties have all contributed to very slow progress with the drilling.

Two churn drill holes were cased and diamond core drilled through the ore horizon. The novaculite formation is so hard and abrasive that $630.00 worth of diamonds were used, and two weeks actual working time consumed in drilling 33 feet. The cost was so excessive that the contractor could not perform under his contract. It was decided that churn drilling and sampling was the only practical procedure to use.

Hole No. 1 was so badly broken and fractured that it was useless to try and core drill it. Churn drill samples were taken but the ground caved so badly around the bit that badly mixed and resultant poor samples as far as accuracy is concerned were obtained from this hole. The ground for a considerable distance back from the outcrop is badly leached and altered with surface water circulation so as to make it much more subject to caving than ground farther removed from the outcrop.

Hole No. 2 penetrated the ore zone before it was recognized and it was decided to complete this hole by churn drilling methods rather than put the core drill over the hole after the best part of the ore zone had already been penetrated. A flat bottom bailer was not available and the sampling was done with a dart valve bailer. It was not possible to get the hole absolutely clean and thus each sample was slightly affected by the material left from the sample above.

Hole No. 3 was churn drilled to 110.5 feet. No definite marker horizon had been established and churn drilling was halted for fear of penetrating the ore horizon. Sixteen and one half feet of core drilling was required before the ore horizon was reached. After passing a depth of 131 feet no core was recovered. Excessive quantities of sludge were recovered and these samples are not considered to be accurate records of the grade of ore penetrated. Part of this lower drill-

ing was in the fractured massive novaculite where the manganese occurs as fracture filling. This heavier material was probably not carried out by the return water in the same ratio as the lighter gangue material.

Hole No. 4 was churn drilled to 164 feet and the core drill encountered the ore horizon at a depth of 168 feet. About six feet of the ore horizon was missing in this hole and the only ore was encountered in the fractured massive novaculite. A point was reached where the diamond drill would penetrate no deeper and the hole was abandoned. A new bit drilled a total of three inches and was so polished at that time that it would not cut any farther.

Hole No. 5 was churn drilled to a depth of 89 feet. A sand pump was obtained so take the samples and the hole successfully cleaned at the bottom of each sample interval. The exact point of entry into the ore zone is not known but was somewhere in the 80-84 foot interval. Examination of the cuttings revealed approximately 50 percent of the overlying material and 50 percent of the ore bearing material. On that basis it is estimated that the ore horizon was entered at approximately 82 feet in depth.

Hole No. 6 was churn drilled to a depth of 147 feet. Highly fractured ground was encountered for the entire depth of the hole and material off of the walls contaminated the samples. The ore zone was quite thin in this hole.

At the end of the month the drill was moving to location No. 7 (See map attached) in the center of the syncline. It is anticipated that this hole will be 300 to 350 feet in depth. Unless a couple of holes in the syncline develop different conditions to those revealed by the drilling to date, it is recommended that the drilling be discontinued at that time.

Drifting

At the end of the month drift No. 1 had been driven an additional 70 feet to place it at a point 90 feet from the outcrop down the dip of the ore horizon. (See map). No samples have been taken for analyses but visual observation indicated that much better results, as far as thickness and grade of ore, have been obtained by the drifting program than by the drilling. However, all of this ore is apparently of a supergene character. Working down the dip and encountering of the water table has presented difficulties that have materially slowed down the progress of this work. Ten more feet will complete the proposed work on this drift.

Drift No. 2 will progress much more rapidly than Drift No. 1. This drift will not only test out the ore horizon in the unconformity but will also drive under a highly mineralized surface area in the massive novaculite that is carrying excellent ore on the surface over quite an area. The penetration of this area by the drift will reveal what changes occur below the surface of these types of deposits. If this particular one persists in size and grade to the depth of the tunnel level it will develop a sizeable tonnage of good ore.

Conclusion

As pointed out by the writer's original report under date of May 11, 1951 this project is a "most hazardous financial venture". It now appears very doubtful that the postulated theory outlining the possibilities of a large bedded deposit of manganese will prove out. Substantial reserves apparently do exist along the outcrop of the unconformity and down the dip for a distance of a hundred feet or more. However, with the extremely difficult metallurgical problems connected with this ore, it does not appear that the huge reserves necessary to encourage diligent work on the metallurgical problems are available in this area.

Limited quantities of ore susceptible to conversion into marketable concentrates by known metallurgical methods do exist in the massive novaculite. The economics of this situation require considerable investigation before the feasibility of an operation on this type of ore can be decided upon.

R. B. McElwaine

R. B. McElwaine
Consulting Mining Geologist
Little Rock, Arkansas
October 16, 1951

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 1
Elevation at collar: 1,026
Depth: 57'

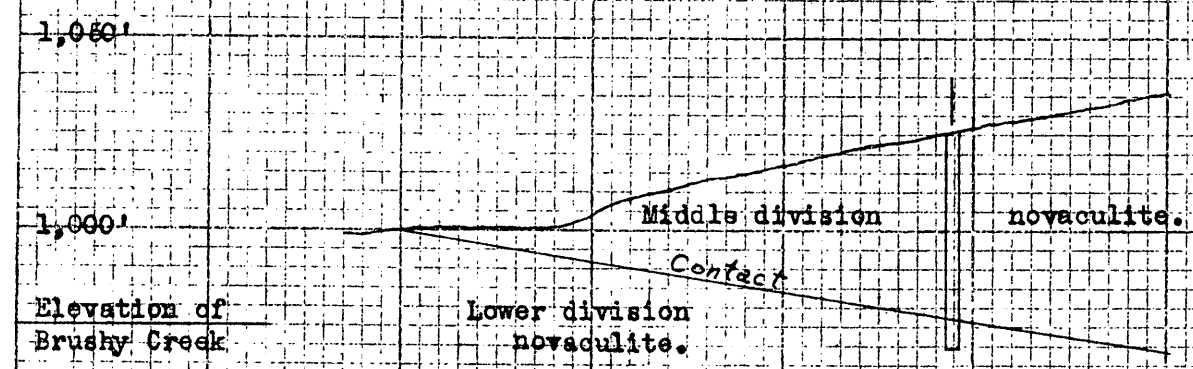
Location: No 3 claim.
SE ¼ Sec. 28, T.3S., R.30W.
Drilled August 1951
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

36' - 42' Light grey and iron stained chert.
42' - 48' Grey chert, iron stone, manganese and pyrite.
48' - 51' Sandstone, conglomerate, little manganese.
51' - 53' Conglomerate with little manganese.
53' - 57' Conglomerate and highly fractured massive (lower division) novaculite.

Contact is top of zone of unconformity between middle and lower division of Arkansas novaculite formation. There are three to five beds ranging in thickness from a few inches to a foot or two each which make up this unconformable zone. Each of these beds reveal an erosional surface before deposition of the succeeding bed.

The middle division novaculite is made up of thin bedded medium and dark grey chert with about twenty feet of light grey chert immediately above its contact with the lower division of the novaculite. The lower division is principally fractured, massive white to very light grey chert.



ASSAYS

Interval	Manganese	Iron	Phos.
36' - 42'	1.48	3.60	0.19
42' - 48'	2.31	3.00	0.17
48' - 51'	0.74	1.70	0.10
51' - 53'	0.36	1.10	0.06
53' - 57'	0.41	1.15	0.04

DATA SHEETS
NO. 700-10
CHARLES BRUNING COMPANY INC.
10 x 10 to the inch.

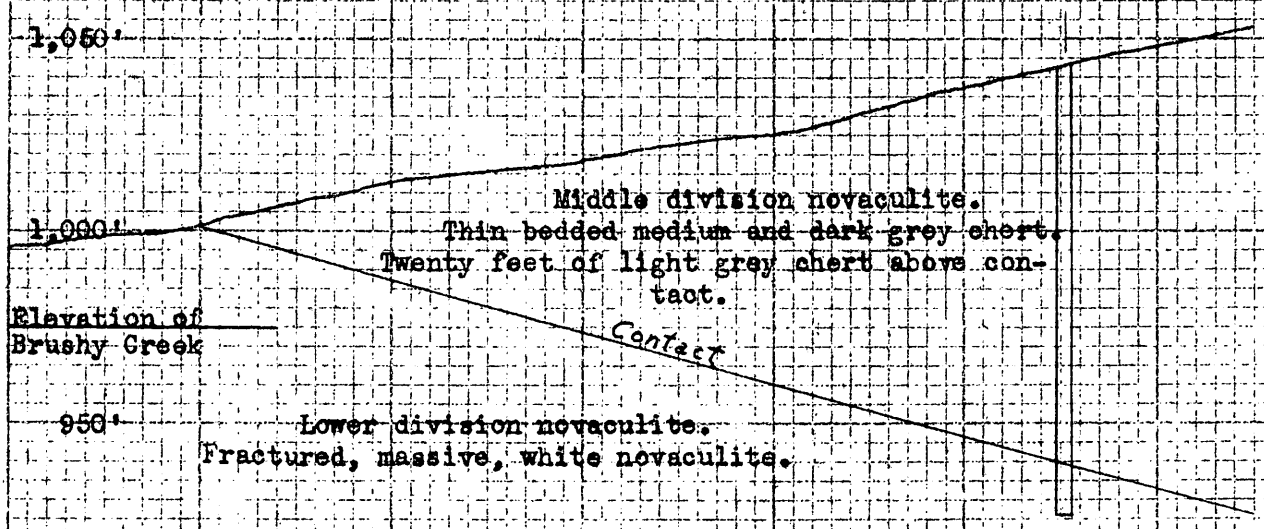
ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 2
Elevation at collar: 1,043'
Depth: 117'

Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled August 1961
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

95' - 103' Medium to light grey chert. Little white quartz.
103' - 106' Coarse cuttings with many large pieces 1/4" to 1/2" or larger. Large pieces of fine grained sandstone character--light to yellow brown (iron) and medium grey in color. Little light greyish-green chert. Some manganese and pyrite.
106' - 108' Medium grey chert, arenaceous light to yellow brown rock. Fine conglomerate material with Mn matrix. Quartz. Greyish green to green chert. Little manganese and some pyrite.
108' - 110' White and iron stained novaculite (lower division) with manganese. Pyrite. Some grey chert (caved from above).
110' - 112' White to pinkish tan novaculite. Little manganese and pyrite.
112' - 114' White to yellowish novaculite.
114 - 117' " " " "



ASSAYS

Interval	Manganese	Iron	Phos.
103 - 106	3.50	10.10	0.57
106 - 108	1.55	5.40	0.21
108 - 110	4.85	5.50	0.21
110 - 112	0.90	2.00	0.04
112 - 114	0.50	1.50	0.04
114 - 117	Not assayed.		

DATA SHEETS
CHARLES BRUNING COMPANY, INC. 10 x 10 to the inch. NO. 700-10

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

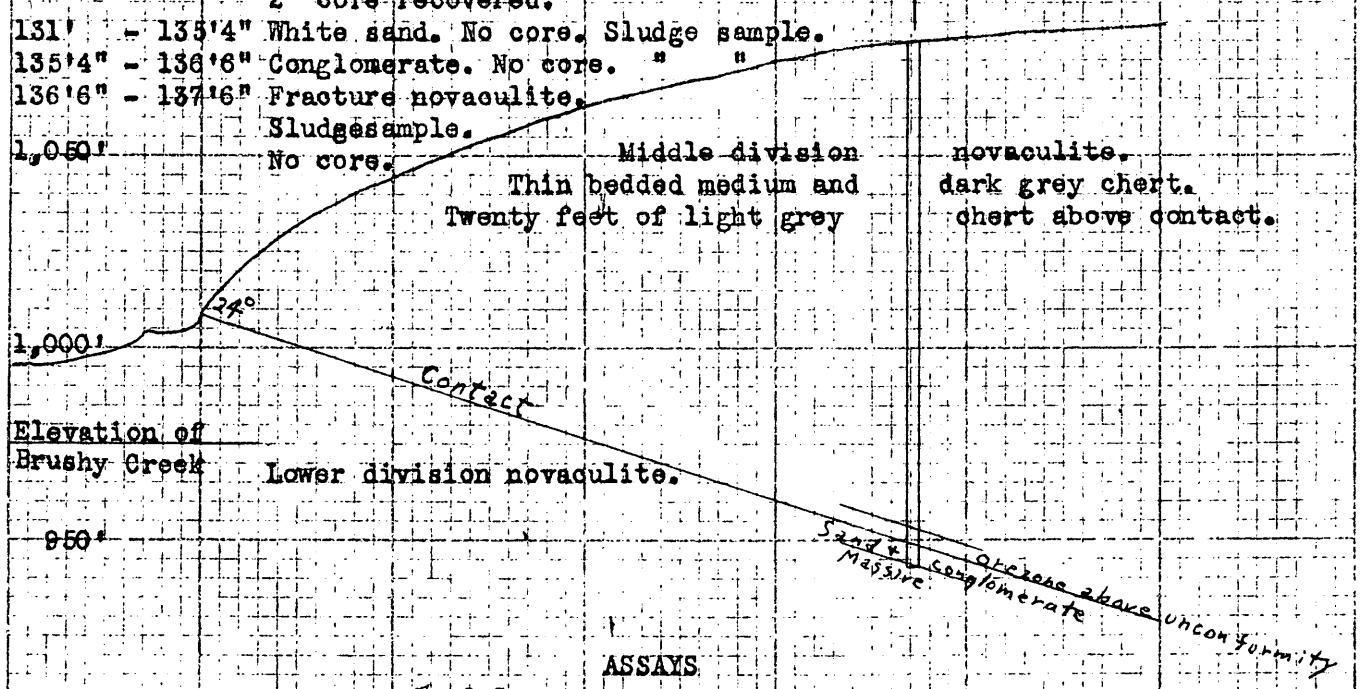
Project: DMA-1248X
Hole No. 3
Elev. at collar: 1,080'
Depth: 137'6"

Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

This hole was churn drilled to 110.5' and diamond core drilled from that point to a depth of 137.5'

125.5' - 127' Dark grey chert interbedded with brown iron bearing light grey chert.
127' - 129.5' Thin bedded, highly fractured grey chert carrying Mn and Fe in fractures, bedding planes and some possible replacement of thin laminae in rock (lies parallel to bedding). Little light grey chert at top. Apparent dip 22½ degrees. 11" of core recovered.
129.5' - 130'8" Thin bedded, highly fractured grey chert highly mineralized with Mn and Fe as fracture filling and possibly some replacement. Much of rock is of an arenaceous nature. 3" core recovered.
130'8" - 130'10" Unaltered (iron free) fractured grey chert with considerable Mn as fracture filling. Very fine to thick (3/8") fractures. 2" core.
130'10" - 131' Same as above. Setting on top of sand bed. Contact shows dip of 22°. 2" core recovered.
131' - 135'4" White sand. No core. Sludge sample.
135'4" - 136'6" Conglomerate. No core. " "
136'6" - 137'6" Fracture novaculite. Sludgesample.
1,050' No core.



ASSAYS

Interval	% of Core Recovered	Manganese	Copper	Phos.	Iron
127' -129.5'	37	5.69	None	0.77	17.50
129.5'-130'8"	21	9.08	None	0.79	19.70
13088"-130'10"	100	13.07	None	0.13	3.30
130'10"-131'	100	14.15	None	0.18	3.80
131' -135'4"	Sludge	0.57	0.02	0.03	1.70
135'4"-136'6"	Sludge	0.25	0.02	0.02	2.20
136'6"-137'6"	Sludge	0.19	0.04	0.03	2.70

DATA SHEETS
CHARLES BRUNING COMPANY, INC. No. 700-19

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 4
Elev. at collar: 1,093'
Depth: 169'8"

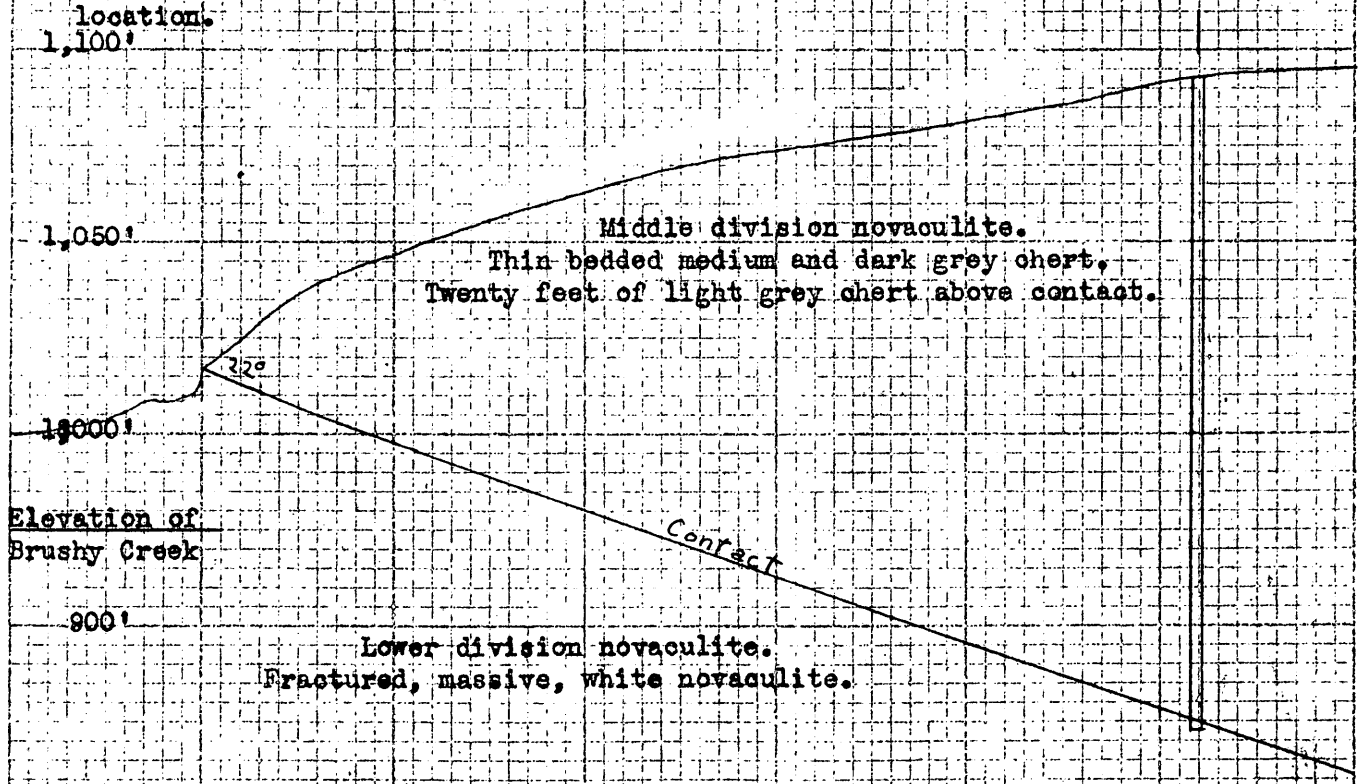
Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale 1" = 60'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

This hole was churn drilled to 164' and diamond core drilled from that point to a depth of 169'8".

164' - 168'3" Light grey chert, thin bedded. 4" iron bearing sandstone at bottom marks top of unconformity.
168'3"- 168'6" Same as above with Mn adhering to bottom. 1" of core recovered.
168'6"- 169' Fractured massive white novaculite with all openings filled with Mn. 6" of core recovered.
169' - 169'8" Same as above. 8" of core recovered.

All of the beds normally occuring in the unconformity were missing at this location.



ASSAYS

Interval	% of Core Recovered	Manganese	Copper	Phos.	Iron
168'3"-168'6"	33	1.85	None	0.83	23.40
168'6"-169'	100	9.23	"	0.24	6.10
169' -169'8"	100	9.07	"	0.11	2.50

Remarks: Could not penetrate any deeper with core drill. Put on new diamond bit and made three inches and it stopped cutting.

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 6
Elev. at collar: 1,058'
Depth: 89'

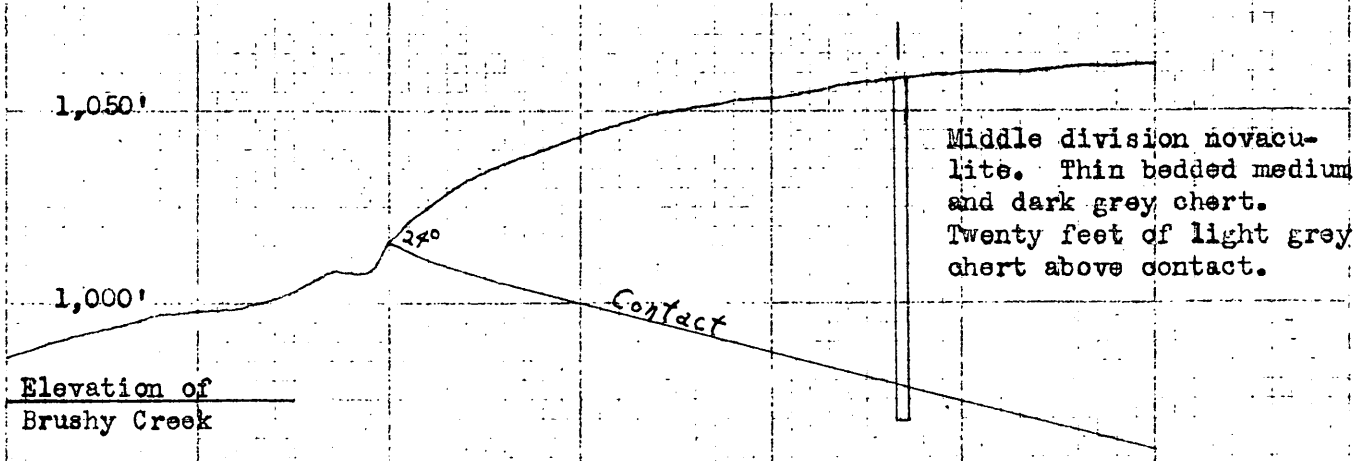
Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale 1" = 50'

DRILL HOLE LOG, CROSS SECTION AND ASSAYS

76'-80' Medium to light grey chert. Considerable pyrite and little quartz. Little light grey, porous chert and some iron stained dark chert. Broken ground.
80'-84' Entered ore zone. Chert, shale, sand, conglomerate.
84'-86' Sand, conglomerate, grey chert caved from above.
86'-88' Fractured massive white novaculite with Mn.
88'-89' Fractured massive white and pink chert. Open ground. Iron stain.

ASSAYS

Interval	Manganese	Copper	Phos.	Iron
80 - 84	1.14	0.03	0.22	5.80
84 - 86	0.90	0.02	0.13	3.30
86 - 88	~~2.99~~	0.05	0.02	4.20
88 - 89	0.85	0.02	0.03	2.40



Elevation of Brushy Creek

950'

Contact is top of zone of unconformity.

ARKANSAS MANGANESE COMPANY, INC.
Polk County, Arkansas

Project: DMA-1248X
Hole No. 6
Elev. at collar: 1,060'
Depth: 147'

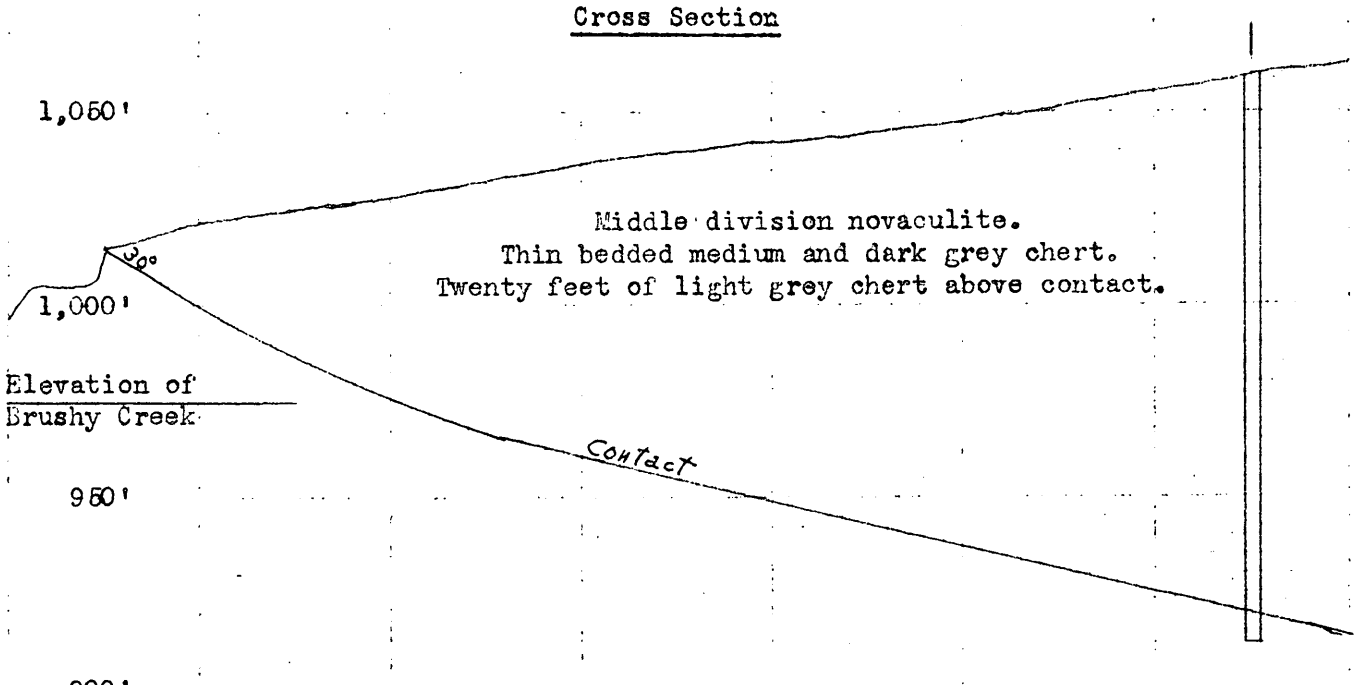
Location: Claim No. 3
SE ¼ Sec. 28, T.3S., R.30W.
Drilled September 1951
Scale: 1" = 50'

LOG

135.5'-140.5'	Mostly chert with some dark grey arenaceous material that probably makes up iron stained bed at outcrop and in other drill holes.
140.5'-142.5'	Chert(cave material), iron stone, black shale, Mn., pyrite, quartz, white sand. Black shale is marker bed that shows consistently in outcrop but has been undetected in most drill holes.
142.5'-144.5'	White (lower division) novaculite, part of which is possibly conglomerate bed. Black chert,(cave from above), novaculite fragments with Mn stain on sides.
144.5'-147'	Massive, fractured white novaculite with grey and black chert out of walls above.

Contact is top of zone of unconformity.

Cross Section



ASSAYS

Interval	Manganese	Copper	Phos.	Iron
135.5-140.5	0.25	0.03	0.02	2.10
140.5-142.5	4.90	0.02	0.29	7.70
142.5-144.5	0.90	0.04	0.03	2.10
144.5-147.0	0.38	0.02	0.01	1.70

Manufacturing Manganese Concentrates, all grades
Building Blocks - All Grades Road Base Materials
Mines in Caddo-Gap-DeQueen Quardrangle, Ark.

R. W. NEWTON
President
1306 Lexington Ave. Ft. Smith, Ark.
Te. Su 3-4471

Manganese Corp. of Delaware, Inc.
P. O. Box 527, Mena, Ark.
Arkansas Manganese Co. Inc.
P. O. Box 527, Mena, Ark.

Manganese Mine Owners
Assn. of W. Central
Ark.,
700½ Mena St., Mena,
Arkansas

Left here by Mr. Tippett 5/8/57

[ ] Audited Reviewed [redacted] ANALYSIS SHEET - DMEA PROJECT [redacted] [X] Actual Cost

[ ] Certified Analysis as of 12/3/1954 [ ] Agreed Unit Costs

No Incl. Voucher for

Name Arkansas Manganese Company Docket No. DM - 1248X

State Arkansas Commodity Manganese Idm-E No. 82

OPERATION		AUTHORIZED Units	AUTHORIZED Cost	COMPLETED Units	COMPLETED Cost	NET COST
Drifting & Crosscutting		200'	4,716.40	200'	5,494.90	27.47 ft.
Raising						
Shafts						
Winzes						
Drilling (Specify)	Diamond	200'	3,537.30	32.33'	666.20	20.60 ft.
	Churn	3,000	11,496.30	1,090	4,866.40	4.46 ft.
Surface Excavation						
Underground Excavation						
Roads and Trails						
Operating Equipment Purchased			250.00			
Surface Rehabilitation & Repairs						
Underground Rehabilitation						
New Building, Improvements, etc.						
Other (Specify)	Assaying				250.00	
	Totals		20,000		11,277.50	

Contract terminated by mutual agreement

Prepared by TLC

G. O. Kittendorf, Acting Administrator, DMEA — August 27, 1952

Iron and Ferro-Alloy Division, DMEA

1248

Reports by Audit Division

Reports of review by the Audit Division have been examined and noted for the following completed contracts:

Adm-782 - Docket No. DMA 1248X - Arkansas Manganese Company
Adm-93 - Docket No. DMA 197X - Westmoreland Manganese Corporation
Adm-2130 - Docket No. DMA 2002X - Westmoreland Manganese Corporation

An audit certificate and report was also received pertaining to Exploration Contract No. Adm-879, Docket No. DMA 1107X, Tom C. Stanford.

The above reports are attached for your information. It would be appreciated if in the future copies of all such audit reports were prepared for the Division files. This would enable us to keep a more accurate check on the expenditures and costs for each project.

W. S. Martin, Acting Chief
Iron and Ferro-Alloy Division

Attachments

FARutledge:lm
8/27/52

cc: Admn. Reading File
Docket
J. L. Chambers
O. C. Selfridge
F. A. Rutledge
DMA 1248, 197, 2002, 1107

FILE COPY
SURNAME:
800

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

AUG 11 1952

Mr. E. D. Talbert
c/o Mr. Ray C. Jones
Bureau of Mines
214 Barfield Building
Amarillo, Texas

Dear Dal:

You left a note on project Idm-E82, Docket DmA-1248X, Arkansas Manganese Company, in which you state that engineers' and technical salaries were paid in the amount of $2,175, but that the contract limited such salaries to $2,000. A settlement agreement, however, signed by the Administrator under date of November 19, 1951, releases both parties from any and all claims. The question arises will the settlement agreement signed by the Administrator authorize the payment of the $175 over the contract amount. The opinion of the Chief Counsel is that since the Administrator has final authority in approving contracts, that his approval of an overpayment where the payment has actually been earned is tantamount to an amendment.

In writing the Report of Review it might be well to refer to the settlement agreement signed by the Administrator.

Sincerely yours,

(Signed) J. L. Chambers

J.N. 8-11-52

Jay L. Chambers, Chief
Contract Administration and
Audit Division

JLChambers/wb
August 8, 1952

Copy to: Mails & Files
Admr. Reading File
Mr. Chambers

400

FILE COPY
SURNAME:

Rutledge
Selfridge
Johnson

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

MAY 2 9 1952

Mr. David Gallagher
Executive Officer, Region VI
221 West Third Street
Joplin, Missouri

Re: Docket No. DMA 1248X - Manganese
Arkansas Manganese Company, Inc.
Polk County, Arkansas
Exploration Project Contract Idm-282

Dear Mr. Gallagher:

This is to inform you that this Administration has determined that no significant discovery or development has resulted from the subject exploration work.

The above referenced contract was terminated by agreement on November 19, 1951, after spending $11,277.50 of the contract sum of $20,000.00. The Government's share was $8,458.125, as you advised.

Sincerely yours,

C. O. Mittendorf (for) cc 5/26

Acting Administrator
Defense Minerals Exploration
Administration

FARutledge:lm
5/21/52

cc: Admn. Reading File
Docket
N. B. Melcher, USBM
M. D. Crittenden, USGS
Field Team Reg. VI
J. L. Chambers
G. C. Selfridge
F. A. Rutledge
Operating Committee

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

May 20, 1952

Memorandum

To: Acting Administrator, DMEA

From: Iron and Ferro-Alloy Division, DMEA

Subject: Recommendation of non-certification of discovery or development
Exploration Project Contract No. Idm-E82
Docket No. DMA 1248X - Manganese
Arkansas Manganese Company
Polk County, Arkansas

This Division hereby concludes that the work done upon the subject property, as proposed in the subject contract, and described in the final reports of the Operator and the field team, has resulted in no significant discovery or development from which commercial production of ore may be made.

A description of the property, the work done, and the results obtained are as follows:

1. The property included unpatented lode mining claims located in Sections 27 and 28, T. 3 S., R. 30 W., Polk County, Arkansas, as shown on Plate 1 attached to the contract.

2. The mineral sought was manganese, which occurs as fracture and joint fillings throughout the stratigraphic range of the novaculite formation. However, the most important deposition occurs at the top of the lower division of the novaculite in the so-called "M" horizon. Manganese mineralization has formed nodules and lumps ranging from a few inches to a foot or more in diameter where rock deformation has been sufficient to create larger fractures and openings. The manganese also occurs as a cement or matrix of breccia and as stalactitic and botryoidal deposits in the larger rock openings.

   The exploration program was based on a geological theory postulated by the applicant's geologist that the manganese deposition was controlled in part by synclinal structures.

3. Prior to the work performed under this contract, the Arkansas Manganese Company had developed by surface trenching and short adits the following reserves:

Measured	2,000 tons @ 7.30 per cent Mn.
Indicated	17,000 tons @ 12.0 per cent Mn.
Inferred	2,000,000 tons @ +12.0 per cent Mn.

4. The exploration work done under this contract consisted of driving two adits and churn and core drilling seven holes. The main deposit explored is on the south limb of a syncline and crops out along Bushy Creek. Tunnel No. 1, near the eastern limit of the main deposit, followed down the bedding at the contact between the lower and middle division of the novaculite for 75 feet. This tunnel followed the ore horizon, which at this point consisted of fractured novaculite, coarse conglomerate with concretions, and conglomerate, all containing manganese and marking an old erosion surface. Samples taken near the outcrop and the end of the tunnel indicated a drop of 1.37 per cent manganese in the distance of 75 feet: 6.69 per cent manganese to 5.32 per cent manganese.

Six holes were drilled to explore the extension of this "bedded" deposit down the dip 150 to 300 feet from the outcrop. Manganese mineralization of mineable width and grade was not encountered in any of these holes.

Diamond Drill Results

Drill Hole No.	Sample Thickness Feet	Analyses Per cent Mn.
1	12.0	1.90
2	7.0	3.33
3	4.0	7.34
4	1.5	7.92
5	9.0	1.47
6	4.0	1.45
Avg.	6.2	2.84

The applicant has indicated a total of 50,000 tons of 6.31 per cent manganese in the area along Bushy Creek westward to Smoke Rock Creek.

The final report of the DMEA Field Team concurs with this estimation of tonnage and grade. This reserve is based mainly on surface samples taken by the applicant prior to the exploration program under this contract and presupposes a block of ground 7-1/2 feet thick extending for 100 feet down the dip. A review of the results of the surface sampling, however, gives a thickness and grade of 58 inches and 7.0 per cent manganese instead of the 90 inches and 7.3 per cent manganese used by the applicant. Since the only analysis at depth was near the end of the adit, 92 inches at 5.32 per cent manganese,

the above figure should be reduced to 6-1/4 feet and 6.0 per cent manganese. This would give a total indicated reserve of 40,000 tons of 6.0 per cent manganese.

However, manganese of this grade and composition cannot at present be classified as "ore". See the following excerpts from reports by the Bureau of Mines and Denver Equipment on metallurgical testing of manganese-bearing material from this deposit.

<u>From memorandum from R. G. Knickerbocker to L. T. McElvenny - September 17, 1951</u>

"Bureau of Mines tests by M. M. Fine and R. B. Fisher on sample submitted by M. Howard Berliner of Mena, Arkansas, manganese ores.

"Results of gravity concentration, flotation, roasting and magnetic separation showed 27.3% recovery of the manganese at a grade of 46.1% Mn, 3.1% Fe, 25.8% SiO_2, 3.0% Al_2O_3, and 0.16% P. This very low recovery of a sub-grade product is due to the very intimate association of the manganese oxides and novaculite which precluded the ready production of ferrograde material by mineral dressing methods".

<u>Denver Equipment Company -- Report to -- Robert B. McElwaine Ore Test No. CC-18297</u>

"The results of the tests . . . described show that the submitted sample does not respond to flotation or gravity treatment to produce a high grade manganese product. Test No. 3 produced a reasonably good recovery of the manganese (Flotation - 81.0 per cent recovery with the concentrate containing 26.6 per cent Mn), but the grade is regarded as too low for marketing. The occurrence of manganese in close association with the siliceous gangue is responsible for the low grade concentrates produced. It will be noted that the concentrate of Test Number 3 was 81.9% minus 200-mesh, but that the concentrate contained excessive silica (33.1% Insol.) as the chief impurity.

"No recommendations for treatment of this ore can be made due to the negative results obtained by conventional ore dressing means."

The second tunnel was driven along the beds on the north limb of the syncline easterly from Branch Creek near the "M" horizon outcrop in that area. This tunnel was driven for 90 feet in the lower part of the middle division of the novaculite

and then a crosscut made into the lower division. No manganese of mention was encountered in this tunnel.

Drill hole No. 7 on the axis of the syncline was located along Branch Creek approximately midway between the two tunnels. This hole penetrated the mineralized horizon at a depth of 392 feet to 406 feet. In this zone heavily iron-stained material was encountered after passing through unaltered material. Evidence of the ground water traveling along the zone of unconformity was plainly visible. The average of the analyses for the 14 feet was 0.41 per cent manganese.

5. There was no equipment purchased; hence, none is to be disposed of by the Operator.

6. The project was started on August 10, 1951, and completed on November 19, 1951. The amount expended was $11,277.50, of which the Government's share would be $8,458.125.

The following contract costs were incurred during this project:

	Feet	Unit Cost	Total Cost
Drifting	200	$20.00	$4,000.00
Churn drilling	1,090	3.25	3,542.50
Diamond core drilling	32-1/3	15.00	485.00
			$8,027.50

G. C. Selfridge

G. C. Selfridge, Chief
Iron and Ferro-Alloy Division

IN REPLY REFER TO:

G-MD-MDC

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

May 19, 1952

Memorandum

To: George C. Selfridge, DMEA

From: M. D. Crittenden, USGS

Subject: Final report
Arkansas Manganese Corporation DMA 1248-X Manganese

At your request I have reviewed the final report on the above project prepared by Robert B. MacElwaine. An independent estimate of reserves based on the sampling originally done by the Arkansas Manganese Corporation, and on the results of diamond drilling and sampling done during the course of this project follows.

	Reserves		
	Indicated	Inferred	Grade % Mn
Main ore block	10,000	15,000	6%
West ore block	10,000	10,000	5%
	20,000	25,000	
Total	50,000		5%

It must be pointed out that these estimates of "reserves" do not imply that the material so designated can be mined or treated at a profit.

The main ore block extends along the outcrop from locality No. 8 to the location of the added locality No. 9. (Plate 4) Original surface samples at about 100' intervals throughout this distance indicate an average thickness of 5' and an average grade of 7.3 percent Mn. The results of drill holes 1, 2, 4, 5 and 6 indicate that material of this grade does not extend down dip to the point where those holes penetrated the ore horizon. The presence of 7½' of ore averaging 5 percent Mn near the face of adit No. 1 suggests that the reserve block may extend approximately 100' north of this outcrop. Such a block is estimated to average 5 to 6' in thickness, and to contain about 25,000 tons of material averaging about 6 percent Mn. 10,000 tons of this is regarded as indicated.

Manganese-bearing material at and just below the same horizon as that present in the main ore block is exposed west of Smoke Rock Creek. Although this outcrop was incompletely sampled, MacElwaine's estimates of thickness and grade appear reasonable. On this basis, there may be 20,000 tons of indicated and inferred reserves in this area in a block 250' x 50' x 20'. Half of this tonnage is regarded as indicated.

The metallurgical work which has been done on material from this property by the Bureau of Mines indicates that it is not possible either to make a satisfactory product from this material or to recover a satisfactory percentage of the manganese content. Moreover, much of the reserve inferred here requires underground mining methods or very extensive stripping and it seems most unlikely that they could be mined profitably at present subsidy prices even if the metallurgical problems were solved.

For these reasons I do not recommend that the above reserve should be regarded as constituting a discovery from which production is likely to result. //

Max D. Allenden Jr

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

~~WASHINGTON 25, D.C.~~
Joplin, Missouri
May 12, 1952

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAY 14 1952
Reviewed by
DMEA OPERATING COMMITTEE
6-9-52
(date)

Mr. C. O. Mittendorf
Acting Administrator
Defense Minerals Exploration
Administration
U. S. Department of Interior
Washington 25, D. C.

Re: Docket No. DMA 1248X - Manganese
Arkansas Manganese Company, Inc.
Polk County, Arkansas
Exploration Project Contract Idm-E82

Dear Mr. Mittendorf:

I have your letter of May 9, 1952 saying that you wrote me on April 3, 1952 inquiring about the status of this project and have not received an answer. Your letter was instamped in this office on April 7, and on April 9, I wrote to the operator, Victor Howard, referring to your letter of April 3 and asking him for information regarding the long-delayed final report from R. B. McElwaine. Carbon copies of my letter were sent to R. B. McElwaine, to Ray C. Jonas, and to you.

I received a letter on April 11, dated April 10, from Victor Howard saying that he was writing to McElwaine and hoped that the report would reach us at an early date.

In the same mail with your letter this morning, I have received four copies of McElwaine's report dated May 10, 1952. The original and two copies are being forwarded to you today under separate cover, and the fourth copy is being retained in our Joplin file.

I concur with, and accept, Mr. McElwaine's tonnage and grade figures and his estimate of reserves. I particularly agree with his statement on p. 18 that, "In the true technical sense of the word (ore) it may be questionable whether any ore exists on the property".

This exploration program was predicated on a geological hypothesis regarding extension and enhancement of the manganiferous material in depth. Prosecution of a small part of the exploration program showed that this geological hypothesis was wrong and the project was abandoned.

The MF-104 reports of the operator, approved by this office for payment, show total expenditure of $11,277.50 of which the Government's 75% would be $8,458.12½ -- your letter of April 3, 1952 states this as $8,458.62.

Copy retained 400

You may wish to certify a discovery in order to safeguard the Government's interest in the event that ore is mined from this deposit within the next 10 years. Such a certification, of course, imposes a continuing expense upon the Government for periodic inspections.

On the other hand, you may not wish to certify a discovery because of (1) the submarginal tenor of the manganiferous material found, (2) the speculative aspects of the likelihood of a successful beneficiation process being devised within 10 years for treating this material that up to now has not been beneficiated successfully by any known technique, and (3) the chance that anyone within 10 years will dare to hazard the large amount of money on it that would be necessary to get this typical "Mena manganese" property into production bearing in mind the 75-year record of many consistent failures without a single success in this district.

Certification would obligate the Government in the amount of about $100 every 6 months for 10 years or a total of about $2,000 -- nearly a 25% insurance rate against the seemly remote chance of recovering $8,458.12.

Sincerely yours,

David Gallagher

David Gallagher
Executive Officer
DMEA Field Team, Region VI

/jd

UNITED STATES
DEPARTMENT OF THE INTERIOR

DEFENSE MINERALS ADMINISTRATION

~~WASHINGTON 25, D.C.~~
Joplin, Missouri
May 12, 1952

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAY 14 1952

Docket No. DMA 1248X - Manganese
Arkansas Manganese Company, Inc.
Polk County, Arkansas
Exploration Project Contract Idm-E82

FIELD TEAM FINAL REPORT

This manganese exploration project in Polk County, Arkansas, was predicated on a geologic hypothesis advanced by R. B. McElwaine regarding extension and enhancement of these deposits in depth. Contract Idm-E82 was approved by Washington on July 27, 1951, without consultation with this office, providing for a $20,000 program of drilling and adit work.

Work began on August 10, 1951. Seven holes were drilled, totaling 1,122.83 feet (1,090.5 churn and 32.33 diamond core), two adits were driven approximately 80 and 120 feet long, 32 drill hole samples and 2 adit samples were taken and assayed, the work was surveyed.

This part of the initially planned program sufficed to show that the geological hypothesis was wrong and that the "ore" was poorer at depth than at the outcrops. Accordingly, the contract was terminated by mutual agreement on November 19, 1951, after a total expenditure of $11,277.50 of which the Government's 75% is $8,458.12½ as reported on the MF-104's approved by the Field Team for payment.

The Field Team concurs with, and accepts, the "ore" reserve estimates in R. B. McElwaine's final report dated May 10, 1952, totaling 69,000 tons of indicated "ore" with a manganese content of 6.00 percent and an additional 19,000 tons of inferred "ore" at 6.00 percent. However, it is to be re-emphasized that none of this material has yet been proved to be ore.

David Gallagher
Executive Chairman
DMEA Field Team, Region VI

Clinton C. Knox
For L. T. McElvenny

Reviewed by
DMEA OPERATING COMMITTEE
6-9-52
(date)

/jd

FILE COPY
SURNAME:

Selfridge.

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

MAY 9 1952

Mr. David Gallagher
Executive Officer, Region VI
221 West Third Street
Joplin, Missouri

Re: Docket No. DMA 1248X - Manganese
Arkansas Manganese Company, Inc.
Polk County, Arkansas
Exploration Project Contract Idm-882

Dear Mr. Gallagher:

The subject contract was terminated on November 19, 1951. Only a short time remains before the 6-month period closes in which we may certify a discovery or development. On April 3, 1952, we wrote you requesting information concerning the status of the final reports on the property. To date we have not received an answer.

In going over the file it is noted that there is not sufficient data to say whether or not a discovery or development might have been made. If the final reports are not available, will you please advise us to the best of your knowledge whether or not it is likely that there will be a certification of discovery or development.

Sincerely yours,

C. O. Mittendorf (for)

Acting Administrator
Defense Minerals Exploration
Administration

P.N. 5.9.52

GCSelfridge:ls
5/8/52

cc: Admn. Reading File
Docket
G. C. Selfridge
Field Team, Region 6
J. L. Chambers - Code 800
N. B. Melcher, USBM
M. D. Crittenden, USGS

FILE COPY
SURNAME:

Brewer
Selfridge

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

Mr. David Gallagher
Executive Officer, Region VI
221 West 3rd Street
Joplin, Missouri

Re: Docket No. DMA 1248X - Manganese
Contract No. Idm-E82
Arkansas Manganese Company
Polk County, Arkansas

Dear Mr. Gallagher:

The above referenced contract was terminated by agreement on November 19, 1951, after spending $11,277.50 of the contract sum of $20,000.00. The Government's share was $8,458.62.

In your letter to the Operator, transmitting the agreement for signature, it is observed that the Government allowed the full geological and engineering cost figure of $2,000.00 which included the cost of preparing the Operator's final report.

The Government wishes to close its records in this case but we have not yet received the Operator's final report nor the field team's final report.

The allowance of the full amount of $2,000.00 for engineering before the work had actually been completed does not appear to be in keeping with our usual practice.

As more than 4 months have elapsed since the contract was terminated, and we have had no information as to the results of the work, we request your immediate attention in this respect.

Sincerely yours,

Acting Administrator
Defense Minerals Exploration
Administration

QLBrewer'lm
4/1/52

cc: Admn. Reading File
Docket
N. B. Melcher, USBM
M. D. Crittenden, USGS
Field Team Reg. VI
G. C. Selfridge
Q. L. Brewer
Operating Committee

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
~~WASHINGTON 25, D.C.~~
Joplin, Missouri

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
APR 9 1952

April 8, 1952

Re: Docket No. DMA 1248X - Manganese
Contract No. Ida-382
Arkansas Manganese Company
Polk County, Arkansas

Mr. Victor Howard
Arkansas Manganese Company, Inc.
100 Professional Building
Ft. Smith, Arkansas

Dear Mr. Howard:

I have received a letter from C. O. Mittendorf, Acting Administrator, Defense Minerals Exploration Administration, indicating that they would like to close the records on the above-subject docket, and asking that I advise them of the present status.

The contract was terminated by agreement on November 19, 1951. In a letter dated November 29, 1951 you were reminded that under the terms of the contract a final report was required. My latest advice in this regard is a carbon copy of a letter from R. B. McElwaine to Victor Adams dated March 10, 1952 in which Mr. McElwaine states, "Have not completed my report on the exploration project, but expect to do so within the next couple of weeks".

Receipt of Mr. McElwaine's final report, and approval of it by this office, appears to be the only thing that now stands in the way of closing the records on this docket. Anything you can do to expedite this matter will be appreciated.

I am writing today to Ray C. Jonas, Finance Officer at Amarillo, to inquire if all the aspects of the docket with which he is concerned have been satisfactorily concluded.

Sincerely yours,

David Gallagher
Executive
DMEA Field Team, Region VI

cc: C. O. Mittendorf
R. B. McElwaine
Ray C. Jonas

DG/lh

FILE COPY
SURNAME:

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

APR 3 1952

Mr. David Gallagher
Executive Officer, Region VI
221 West 3rd Street
Joplin, Missouri

Re: Docket No. DMA 1248X- Manganese
Contract N o. Idm-282
Arkansas Manganese Company
Polk County, Arkansas

Dear Mr. Gallagher:

The above referenced contract was terminated by agreement on November 19, 1951, after spending $11,277.50 of the contract sum of $20,000.00. The Government's share was $8,458.62.

In your letter to the Operator, transmitting the agreement for signature, it is observed that the Government allowed the full geological and engineering cost figure of $2,000.00 which included the cost of preparing the Operator's final report.

The Washington office wishes to close its records in this case as soon as possible but cannot do so until we receive both the Operator's final report and the Field Team's final report. Would you kindly advise the present status of these reports and approximately when they might be forwarded?

QLBrewer'lm
4/1/52

Sincerely yours,

C. O. Mittendorf (for)

Acting Administrator
Defense Minerals Exploration
Administration

F.N. 4-3-52

cc: Admn. Reading File
Docket
N. B. Melcher, USBM
M. D. Crittendon, USGS
Field Team Reg. VI
G. C. Selfridge
Q. L. Brewer
Operating Committee

FILE COPY
SURNAME:

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

Acting Administrator, DMEA

April 1, 1952

Brewer
Selfridge

Iron and Ferro-Alloy Division, DMEA

Final reports by the field team and by the Operator in re:
Docket No. DMA 1248X - Manganese
Contract No. Idm-182
Arkansas Manganese Company
Polk County, Arkansas

1. This contract was terminated on November 19, 1951, after $11,277.50 of the contract sum of $20,000.00 had been spent. The Government's share, or 75 per cent, was $8,458.62. The terminating agreement was received in Washington on December 10, 1951.

2. In the letter to the Operator transmitting the termination agreement for signature, Mr. Gallagher states that the Government is approving the amount of $2,000.00 for geological and engineering costs, which by virtue of an arrangement between the Operator and his geologist, includes the Operator's final report. Attention is also called to the requirements of Article 16 of the contract in this respect.

3. On December 27, 1951, this Division requested 3 copies of the Operator's final report. It has not yet been received.

4. We have not yet received the field team's final report.

5. There is not sufficient data at hand to indicate whether or not a discovery has been made.

George C. Selfridge

G. C. Selfridge, Chief
Iron and Ferro-Alloy Division

QLBrewer'lm
4/1/52

cc: Admn. Reading File
Docket
G. C. Selfridge
Q. L. Brewer

ORE RESERVE ESTIMATE

WESTMORELAND MANGANESE CORPORATION PROPERTY

INDEPENDENCE COUNTY, ARKANSAS

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 20 1952

Prepared by

Robert H. Dodlwaine
Consulting Mining Geologist

Little Rock, Arkansas

January 31, 1952

INTRODUCTION

The Westmoreland Manganese Corporation of Batesville, Arkansas has recently completed an exploration program on certain properties owned or controlled by them a short distance north and east of Cushman, Independence County, Arkansas. The writer has been requested to prepare an estimate of ore reserves on these properties as revealed by information available on December 11, 1951.

DISCUSSION

Maps, logs of drill holes, analyses of samples from said drill holes, measurements of old open pit workings and ore exposures therein, and geological information available have all been factors used in computing the ore estimates presented herein. All of this information should be considered as an integral part of the report. For the sake of brevity and because the above described information is already available to those parties concerned, it is not attached to this report.

The tonnage factors used in compiling this report were arrived at in the following manner. Cubic foot samples in place were cut from five different points on the property. The samples were carefully cut, measured, weighed, assayed, moisture content determined and calculations made from that data. Average figures derived from the five samples were as follows:

Pounds Weight	Percent H_2O	Percent Mn	Percent Fe	Percent SiO_2	Percent Al_2O_3	Percent Phos.
123	14.16	2.63	6.04	59.94	12.95	0.63

The samples were not taken with a view towards manganese content, but strictly with regard to determination of weight of gangue. Taking the average weight of 123 pounds and deducting 18 pounds for the 14.66 percent of moisture, a dry weight of 105 pounds per solid cubic foot for material containing 2.63 percent manganese was obtained. Adding 4.5 pounds for each additional one percent of metallic manganese content the following table was established.

Percent of Manganese	Weight Per Dry Cu. Ft. In Place	Tonnage Factor
3	106.67 lbs.	21
4	111.17	21
5	115.67	20
6	120.17	19
7	124.67	18
8	129.17	18
9	133.67	17
10	138.17	17

* Cubic feet in place per long dry ton with safety factor included.

The tonnage factor used in computing the quantities of each segment of each ore reserve block was based upon the average manganese content as revealed by analysis of drill hole samples included in any particular segment.

ORE CLASSIFICATIONS

Measured, indicated, and inferred ore reserves are based on these classifications as defined by the U. S. Geological Survey and the U. S. Bureau of Mines. The estimated reserves conform closely with the requirements of these classifications. The old and new workings in both the Polk-Southard and Turner open pits have been mapped by Brunton traverse. This data, plus the information obtained from examination of the pits, is of major importance in placing much of the Polk-Southard and Turner estimated ore tonnages in the measured ore classification.

More complete drilling information and more rigid conformance with government specifications as to ore classification have both served to somewhat reduce the estimates of measured and indicated ore tonnages given in a previous report under date of October 29, 1951.

ORE RESERVES ESTIMATE

The ore reserves were calculated by the weighted volume estimate method. A tabulation of ore reserve calculations is given below.

TABLE OF ORE RESERVES

Block No.	Description	Long Dry Tons Measured	Indicated	Inferred	Percent* Mn
1	Southern Hill, Grubb Area	776,956			7.36
2	South Southern Hill Area		99,457		
3	Southern Blue Block	357,143			4.00
4	Polk-Southard, Turner, Blue Ridge Area	3,248,335	527,027	796,924	5.31
5	Page Property (Hole 23 area)	2,112,974	581,035	523,035	6.45
6	New Southern Hill (Hole 21 area)	120,769	124,849	43,302	4.22
7	Holes 24, 25, and 90 area		115,000	120,000	
8	Area between So. Hill & Polk-Southard			1,600,000	
	Totals	6,610,183	1,447,368	3,083,324	

*This reflects the manganese content of the measured ore only.

The sum total of all blocks and classifications is over 11 million long dry tons. The calculated average grade of the measured ore is 5.82 percent manganese.

In conclusion it should be pointed out that the reserve figures given in this report apply only to that part of the property actually explored by drilling or immediately adjacent thereto. These areas are described in the ore blocks listed in the table above. No consideration has been given to the following described areas: 1. The eastern one half of Blue Ridge, which constitutes an area approximately ½ mile long and ¼ mile wide. 2. The Rowe Field Mine area lying south of the above described portion of Blue Ridge. 3. An eighty acre tract lying immediately north of the Turner and Polk-Southard Mines. 4. About sixty acres lying south of the west one half of Blue Ridge. Ore has been mined in these areas and is known to be present on them. No doubt a study of them would justify an estimate of a very substantial amount of inferred ore and probably some indicated ore. However, the writer has not examined these tracts and therefore cannot make any reliable estimates of the possible ore reserves thereon.

R. B. McElwaine

R. B. McElwaine
Consulting Mining Geologist
Little Rock, Arkansas
January 31, 1952.

REPORT ON DRILLING DISCREPANCIES IN DRILL HOLE
SITE OF LEACH WESTMORELAND MANGANESE CORPORATION
EXPLORAT BY CONTRACT NO. Idm-2-139

INTRODUCTION

The Westmoreland Manganese Corporation of Batesville, Arkansas, in cooperation with the Defense Minerals Administration of the U. S. Department of the Interior has recently completed an exploratory drilling project for manganese in the vicinity of Cushman, Independence County, Arkansas. The project carried docket No. DMA-2002. Attached to the original contract between the two parties was a map upon which 35 drill hole locations were specified at which prospect holes were to be drilled. Twenty-seven of the actual designated holes were drilled and twenty-five additional holes were drilled as provided for by an amendment to the original contract. Due to discrepancies in the map, physical conditions encountered during the progress of the work, and drilling of some of the specified holes under a previous exploratory project, all of the specified holes were not drilled. In order for the contract to be legally consummated, it is necessary that the discrepancy in the drilling of the specified holes be explained. When the discrepancies are satisfactorily explained and agreed upon between the operator and the government, then an

amendment to the original contract can be prepared which will permit legal consummation of the contract. The purpose of this report is to formally explain the above-mentioned discrepancies.

DISCUSSION

In order to simplify the explanation of the discrepancy between the drill holes originally specified and those actually drilled, a map has been attached to this report. The map is a photostatic copy of the map which was attached to the contract between the government and the operator and carrying contract No. Idm-s-139. Certain additions were made to the map as follows: (1) Designated hole sites were numbered as per the actual number of the hole as drilled during the course of the project; (2) Holes specified but not drilled were given letters to identify them; (3) Two drill holes, No. 55 and No. 60, were added to the original map.

Prior to the beginning of the recently completed project, a similar project was carried out. This previous project had DMA docket No. 197-X. The map accompanying the present contract under DMA docket No. 2958 was prepared while the previous exploratory project was still in progress. As a result, holes were

specified on the latter contract that had already been drilled under the previous contract.

A discussion of the respective areas in which drill holes were specified and explanation of the discrepancies is given below.

Polk Southard Mine and Turner Mine Areas

Twenty holes were specified for these areas and are shown on the attached map and indicated by numbers and letters. Five of the designated holes were plotted at the site of holes drilled under the previous contract. Therefore these holes were eliminated from the recent project. They are represented on the map by holes 25, 27, 29, 40 and 41 respectively. Nine of the designated holes were drilled and are indicated on the map by the following numbers: 58, 61, 62, 64, 65, 66, 67, 75 and 91.

The location and outline of the old mine workings are very inaccurately shown on the map and this affected the selection of actual drill hole sites. Hole "G" fell within the old pit and thus was not drilled. Hole No. 63, not shown on the map but located about 250 feet south of hole No. 62, was drilled in lieu of hole "G".

The map is also very inaccurate with regard to contours. Hole sites "A" and "B" are both at a lower elevation than indicated on the map and lie on the outside

of the outcrop of the ore horizon. It is quite evident on the ground that no ore would be encountered by the drilling of these two holes. Hole No. 60 was drilled at a point approximately 500 feet northeast of hole No. 29 in lieu of hole "A". Hole "B" was not drilled.

The remaining specified holes unaccounted for in this area are those designated by the letters "C", "D" and "E". Hole No. 67 revealed only 7½ feet of the ore horizon with an average Mn content of only 1.84 percent. Hole No. 91 showed no ore and encountered 55 feet of creek gravel and sand. In view of the results of these two holes, it was agreed by the operator and the government representative that it would not be prudent to drill holes "C", "D" and "E".

North Southern Hill Area

The holes specified to be drilled in this area were so drilled and are indicated on the attached map by the numbers 78, 79, 80, 81, 82, 83, 84, 85, 89 and 90. Four additional holes were drilled in this area.

Pare Property

Four of the holes specified to be drilled in this area are accounted for by holes 45, 46, 47 and 50. The hole site designated by the letter "H" was not on the operator's property and hole No. 55 was drilled in lieu

of it. Considerable good ore was present in this tract and 16 additional holes were drilled in the process of blocking it out.

Conclusion

It is the writer's opinion that the holes drilled during this project were located as nearly as possible as specified by the contract between the government and the operator. The only exception being the practicality of the specified sites as far as the possibility of finding ore was concerned.

Respectfully submitted,

R. B. McElwaine

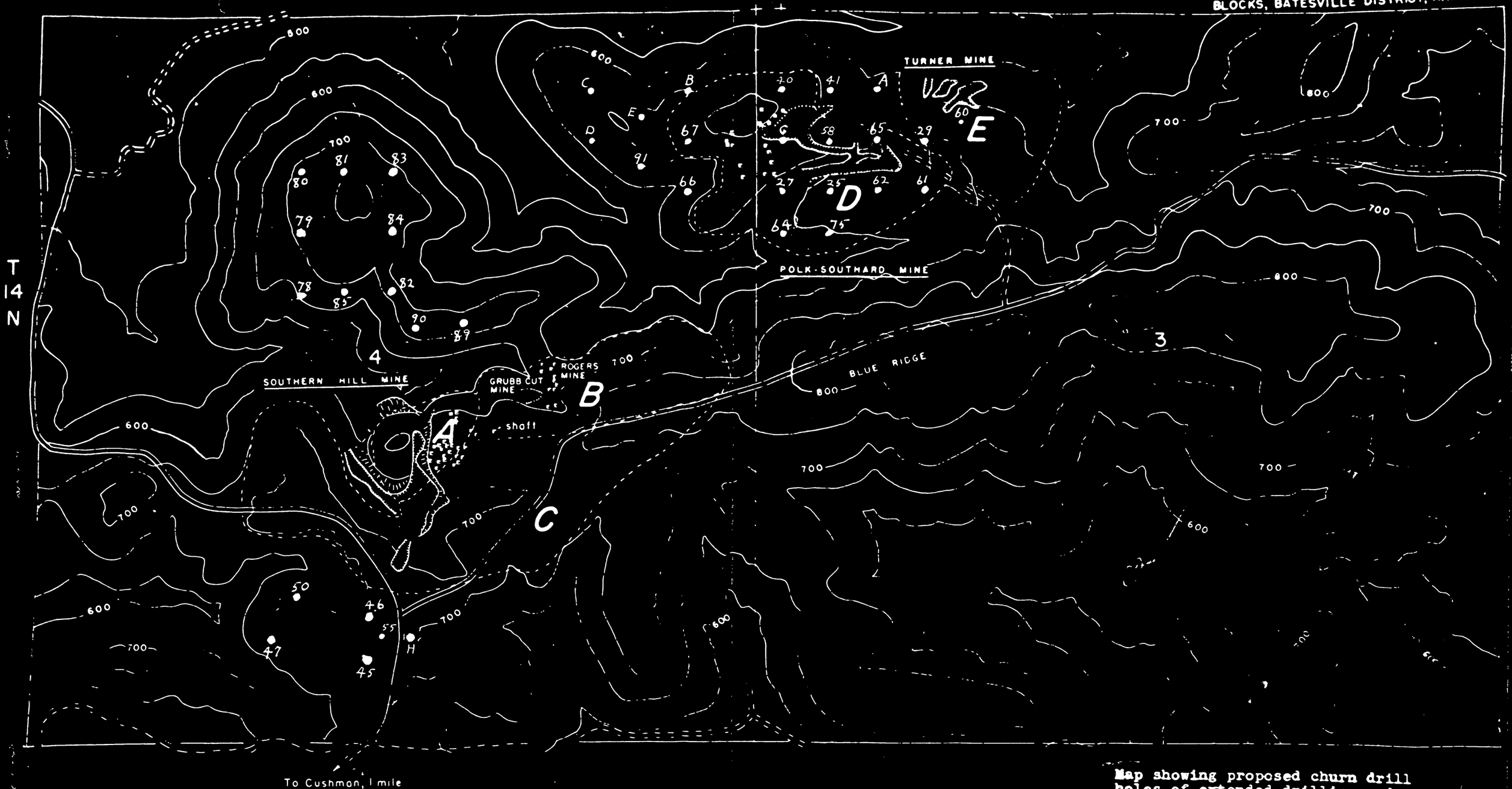
R. B. McElwaine
Consulting Mining Geologist
Little Rock, Arkansas
January 21, 1952

Batesville, Arkansas
January 22, 1952.

This is to certify that I collaborated in the preparation of and have carefully read and checked the foregoing report relative to the drill hole discrepancies in the Westmoreland Manganese Corporation exploratory project (DMA docket No. 2002). I herewith agree with the essential details of the report as to the explanation of the discrepancies.

J. P. Ryan
Mining Engineer
U. S. Bureau of Mines

MAP OF THE SOUTHERN HILL, POLK SOUTHARD, TURNER MINES, SHOWING ORE RESERVE BLOCKS, BATESVILLE DISTRICT, ARKANSAS



Map showing proposed churn drill holes of extended drilling under Exploration Contract - Westmoreland Manganese Corporation, Batesville, Arkansas

Figure

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
~~WASHINGTON 25, D. C.~~
Joplin, Missouri
January 9, 1952

DEFENSE MINERALS ADMINISTRATION WASHINGTON, D.C.
JAN 14 0 46 AM '52

Operating Committee
Defense Minerals Exploration
Administration
U. S. Department of Interior
Washington 25, D. C.

Re: Docket DMA-1248X
Contract No. Idm-E82
Arkansas Manganese Co., Inc.

Dear Sirs:

Forwarded herewith are one copy each of monthly reports for September and October (Form MF-104) for above subject project.

These copies were requested by Frank E. Johnson in letter to me dated December 11, 1951, received in Joplin December 13, 1951. On December 13, 1951 they were requested from Ray C. Jonas by letter from Harvey L. Sobel of this office, and were received in Joplin on January 7, 1952 from Mr. Jonas.

Sincerely yours,

David Gallagher

David Gallagher

DG/jd
Encs.

400

FILE COPY
SURNAME:

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

Selfridge

DEC 27 1951

Mr. David Gallagher
Executive Officer, Region VI
DMEA Field Team
221 West 3rd Street
Joplin, Missouri

Re: DMA Docket 1248X - Manganese
Arkansas Manganese Co., Inc. Property
Polk County, Arkansas
Exploration Contract - Idm-E 82

Dear Mr. Gallagher:

Please refer to your letter of December 7, 1951, transmitting the "Settlement Agreement" to terminate the subject Exploration Contract and the September and October Monthly Progress Reports.

In our letter of December 11, we advised you that the Progress Reports should be submitted in duplicate. In the text of the October report it is stated that work on the project has been terminated except for the mapping and sampling of the two tunnels and writing of the final report. When the final geologic and engineering report, with maps and assays, is submitted as required under section 14 of the Exploration Contract, please forward three of the copies to Washington and retain one for your file. The letter of transmittal should include any supplemental data or comments the Regional Office has, and should state whether or not the report is satisfactory as submitted.

Sincerely yours,

C. O. Mittendorf (for) S.N. 12-27

Acting Administrator,
Defense Minerals Exploration
Administration.

GCSelfridge/hmj
cc to: Adm. Reading File
Mails and Files
Mr. Mittendorf
Mr. Melcher
Mr. Thayer
Mr. Selfridge
Region IV
Docket

BS

FILE COPY
SUBJECT: 100

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

P.G.

Selfridge
Jr. Johnson

DEC 11 1951

Mr. David Gallagher
Executive Officer, Region VI
221 West 3rd Street
Joplin, Missouri

Re: Docket No. DMA-1248X-Manganese
Arkansas Manganese Co., Inc. Property
Polk County, Arkansas
Exploration Contract I&m - 582

Dear Mr. Gallagher:

Receipt of your letter of December 7, 1951, transmitting the "Settlement Agreement" to terminate the above subject contract and copies of the September and October Monthly Progress Reports is acknowledged.

Please furnish us with an additional copy of each of the September and October Monthly Progress Reports. Reports of this type should be submitted to us in duplicate.

It is necessary to submit only the original copy of the reports to the Field Finance Officer, U. S. Bureau of Mines, Amarillo, Texas.

Sincerely yours,

(signed) FRANK E. JOHNSON (for)
Acting Administrator,
Defense Minerals Exploration
Administration.

GCSelfridge/hmj
12-10-51
cc to: Adm. Reading File
Mails and Files
Mr. Mittendorf
Thayer
Melcher
Region VI
Docket

P.W.
12-11

Mr. Rodenson

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
DEC 10 1951

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
~~WASHINGTON 25, D.C.~~
Joplin, Missouri

December 7, 1951

Mr. C. O. Mittendorf
Defense Minerals Exploration Administration
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMA-1248X
Contract No. Idm-E82
Arkansas Manganese Co., Inc.

Dear Sir:

Referring to your letter of November 23, 1951, the signed original and two copies of the "Settlement Agreement" to terminate the above subject contract are enclosed processed in accordance with your instructions. One of the copies was inadvertently lost, so we have replaced it by a certified copy, which is the fourth herewith enclosed, in the belief that it is adequate for the files of the Operating Committee.

Also transmitted herewith are one copy each of the September and October Monthly Progress Reports on Form MF-104 for the above subject project as required by your office.

The original and one copy of the reports have been forwarded on this date to the Field Finance Officer, U. S. Bureau of Mines, Amarillo, Texas, and a copy of each is retained in this Joplin office file.

Sincerely yours,

David Gallagher

David Gallagher

Enclosures

CCK/lh

Forms MF 104 transmitted to Frank Johnson - 12/10/51

DEFENSE MINERALS
ADMINISTRATION
WASHINGTON, D. C.

DEC 3 8 36 AM '51

XXXXXXXXXXXXXXX
Joplin, Missouri
November 29, 1951

Reviewed by Omer Operating Committee 12/2/51 DB

Mr. Victor Howard
Arkansas Manganese Company
100 Professional Building
Fort Smith, Arkansas

Re: Docket No. DMA-1248X
Contract No. Idm-E82
Arkansas Manganese Company

Dear Mr. Howard:

Enclosed are six copies of a Settlement Agreement as prepared in Washington covering termination of your above-captioned project contract. Your signature of approval on all copies of this agreement will expedite our transmittal of your first (September) and last (October) Monthly Progress Reports, which we have been holding on orders from Washington pending arrival of this Settlement Agreement.

You will note that this Settlement Agreement both approves your drilling and tunneling sub-contracts, and terminates the obligations of both parties to Contract Idm-E82. Please retain one signed copy of the Settlement Agreement for your file, and return the signed original and four signed copies to this office for proper distribution. We have entered the total project costs in the space provided in Article 4 of the Settlement Agreement in the amount certified by your company on the above mentioned Monthly Progress Reports.

The Monthly Progress Reports indicate that 1,123.3 feet, or 37.4%, of the authorized 3,000 feet of hole was drilled at a cost of $4,027.50, or 41.3% of the $9,750.00 allotted for drilling. These same reports also indicate that the entire amount of 200 feet of tunneling was accomplished under Contract at $20.00 per foot, or a total cost of $4,000, the full footage and cost authorized and allotted in Exhibit "A" attached to and a part of Contract Idm-E82. We understand that the work commenced on August 10 and was terminated on October 27, except for the final report, a total elapsed time of 79 days, or 87.8% of the total allotted time of 90 days.

We realize that many difficulties were encountered in the course of the work, and feel that because nearly all the allotted time of the project was used our approval of your statement for $1,000.00 for supervision is justified to the full amount of money authorized for supervision under the terms of Exhibit "A" of Contract Idm-E82.

[illegible]

[illegible]

[illegible]

Mr Kallagher — 11 Apr 51

E82

It is understood that the total amount of Govt participation in the event amount spent, but the exact amount cannot be determined until final payrolls expires and received [illegible]

You are committed by Article 16 of Contract Idm-E82 to furnish the Government with a final "comprehensive geologic and engineering report". According to the terms of the enclosed Settlement Agreement, the Government will not participate in the costs of obligations incurred after November 19, 1951. However, we understand that you arranged at the beginning of the work for your consulting geologist to render full services for a total agreed fee of $2,000.00, including preparation of the required Final Report. We assume that this required Final Report is being prepared for submission in compliance with the terms of Contract Idm-E82, and therefore we approve your statement of $2,000.00 for geological and engineering costs the full amount authorized in Exhibit "A" of the contract.

We further realize that expenses of sampling and assaying are a necessary cost in the preparation of this required Final Report that is in itself an obligation under the contract, and therefore an obligation entered into prior to November 19, and therefore we approve your statement of $250.00 for these costs which are the full amount authorized in Exhibit "A" of the contract.

In short, the facts as known to us justify our approval of the entire list of expenses submitted by you in your Monthly Report Forms MF-104. You will note that Article 16 of Contract Idm-E82 requires that you "render to the Government a full and final accounting of operations under the contract and expenditures of money". We will expect to receive documentary evidence of said final cost accounting with your Final Report. Also, under Article 12, you "shall keep and preserve said records and accounts for at least three years....(such records) the Government may inspect and audit at any time".

Your previously mentioned last (October) Monthly Progress Report did not include the "maps showing formations penetrated and locations and assays of samples taken as well as advances in workings....and the locations, collar elevations and other drill hole data to be shown on a map, with logs and assays also to be submitted" as directed on the front sheet of the Monthly Report Form MF-104, but we assume that this information also will be included in the required Final Report.

As soon as you have signed and returned the original and four copies of the enclosed "Settlement Agreement we believe we can approve your September and October Monthly Progress Reports for payment, assuming that you will submit as soon as possible the final report fully incorporating all the above-suggested substantiating data.

Sincerely yours,

David Gallagher
Chairman
Field Team, Region VI

/jd
Enclosures
cc - Operating Committee (3)
Finance Office - Amarillo

400
FILE COPY
SURNAME:

Blakemore
Mittendorf (for)

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

NOV 23 1951

Mr. David Gallagher
Executive Officer, DMA
Field Team, Region VI
Joplin, Missouri

Re: Docket DMA-1248X
Contract No. Idm-182
Arkansas Manganese Co., Inc.
Mena, Arkansas

Dear Mr. Gallagher:

In reply to your letter of October 24, 1951, regarding the termination of the subject contract, there are enclosed the original and five copies of a Settlement Agreement for that purpose, which was prepared by the General Counsel of DMA.

I have signed these agreements and in order to complete them it will be necessary for you to fill in the amount of money due the Operator and obtain his signature on each of them. One copy should be retained by the Operator, one for your files, and the original and three copies forwarded to this office for distribution.

It is understood that the vouchers for payment are in order and that you are prepared to process them for payment immediately after the enclosed agreements are signed by the Operator.

Sincerely yours,

C. O. Mittendorf (for) 11/23

C. O. Mittendorf, Director
Production Expansion Division

Enclosures
APPROVED:
C. O. Mittendorf

Chairman, Coordinating Committee

Member, Bureau of Mines

Member, Geological Survey

PDBlakemore/jem
11-19-51
cc to: Adm. Reading File
Reports & Records
Messrs. Mittendorf, Olund
Moon
Melcher
Thayer
Blakemore
Field Team, Reg. VI
Docket

FILE COPY
SURNAME: Koontz

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

Not stripped in R+R.

November 15, 1951

Memorandum

To: Director, Production Expansion Division

From: General Counsel

Subject: Arkansas Manganese Company exploration contract — Idm-782 (Docket No. DMA-1248X)

This is in response to your memorandum of October 30.

The file in this case is attached together with a form of agreement terminating and settling the Exploration Project Contract. As you know, the work to be performed under the exploration contract has only been partially completed. It is the desire of the Operator and the Government that no further work under the contract be performed. I am informed by Mr. Gallagher, the Executive Officer, that the Operator has received no payments under the contract. He advises that the Operator performed his work satisfactorily and that the Operator's vouchers are in the Joplin office and will be processed as soon as the Government gives its written approval to the subcontracts covering drilling and tunneling. Mr. Gallagher states that the work performed under the subcontracts has been satisfactory.

You will note that the attached form of agreement provides for termination of the exploration contract, the written approval of the Government of the subcontracts entered into by the Operator for drilling and tunneling and for settlement of all money due the Operator by the Government. The agreement also calls for a full release to both parties upon payment of the Operator's vouchers.

If the form of agreement is found to be satisfactory to you, it is suggested that you execute it and transmit the same to Mr. Gallagher who should be instructed to fill in the amount of money due the Operator in the spaces provided for that purpose in the form of agreement. The contract should then be forwarded to the Operator for execution and returned to the Washington office for proper distribution. Upon execution by the Operator, Mr. Gallagher should then process for payment the Operator's vouchers now in his possession and which, according to Mr. Gallagher, are in satisfactory form for processing.

J. L. Hofflund

J. L. Hofflund
General Counsel

Copy to: Repts. & Records
C. J. Koontz
J. L. Hofflund
Chron.

Attachments

CJKoontz/bjl

FILE COPY
SURNAME: 400

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

October 30, 1951

Memorandum

To: General Counsel

From: Acting Director, Production Expansion Division

Subject: Docket DMA 1248X, Idm-E82
Arkansas Manganese Co.

Termination of subject Exploration Contract is desirable within a few days.

Attached hereto is the subcontract for churn and core drilling on which you will please give your opinion as to Governmental liability if terminated.

Also, please prepare an appropriate certification for use by Field Team in terminating this contract and declaring no discovery has been made.

Attached:

Letter -	October	24,	1951	- Gallagher to Director, PED
"	"	18,	"	- Johnson to Knox
"	"	19,	"	- Arkansas Manganese Co. to Gallagher
"	"	20,	"	- " " " " "
"	(Copy)July	30,	"	- Director to Arkansas Manganese Co.

(signed) FRANK E. JOHNSON (for)

Frank E. Johnson
Acting Director

Attachments

PBBlakemore/meh
cc to: Reports and Records
PED
Mr. Blakemore
Docket

n.s
R&R

G.E.

Mr. Beckmann

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
~~WASHINGTON 25, D.C.~~
Joplin, Missouri

DEPARTMENT OF THE INTERIOR
RECEIVED
OCT 30 1951
Defense Minerals Administration,
Production Expansion Division.

DEFENSE MINERALS ADMINISTRATION
WASHINGTON, D.C.
OCT 29 1 55 PM

October 24, 1951

Mr. C. O. Mittendorf, Director
Production Expansion Division
Defense Minerals Administration
Washington 25, D. C.

Subject: Docket No. DMA-1248X
Contract No. Idm-E82
Arkansas Manganese Co., Inc.
Mena, Arkansas

Dear Mr. Mittendorf:

In compliance with your request in a letter dated October 18, 1951 by Frank E. Johnson to Clinton C. Knox of this office, copies of the Operator's subcontracts for drilling and tunneling on the above subject project are enclosed.

The results of the exploration are disappointing and the question of terminating it is under consideration. However, Mr. Hofflund has pointed out that the subcontracts for drilling and tunneling contain no termination clauses. It is my understanding that he has asked for copies of these subcontracts in order to resolve the question of Government liability in the event that the exploration project is terminated.

Work started on this project on August 10, 1951 and, in accordance with the regulations, this office received the first Monthly Progress Report on October 15, 1951. According to the Operator, Mr. Victor Howard, Washington had requested him, at the time he signed the exploration contract, to submit the subcontracts for drilling and tunneling to Washington for approval. He says that he received telephonic advice from Washington that the subcontracts were being approved, and that work could commence.

In endeavoring to process the first monthly report for reimbursement, this office raised the query with Mr. Howard about approval of the subcontracts. Mr. Howard informed us that no written approval has, as yet, been received from Washington; only the telephonic approval. Mr. Howard says he sent two copies of each of the contracts to Washington. I phoned Mr. Johnson; he had the files searched; and he phoned me back that the contracts could not be found.

The enclosed copies of the drilling and tunneling subcontracts furnished to us by Mr. Howard, and forwarded herewith, may suffice for the issuance of back dated approval. I hope that this approval can be made by your office in accordance with Mr. Howard's and our original understanding.

Although manganese has been encountered, nothing resembling ore, in either grade or amount, has been found. Mr. Howard tells me that his group has already spent about twice as much money as they intended. They have been rather favorably disposed toward terminating the project for some time. However, on the recommendation of our geologists and their engineer we all agreed to put down one more hole. This hole was to test the bottom of the syncline. It is our feeling that, unless this hole shows extremely encouraging results, the project should be terminated.

Because of the character of the rocks and their fracturing, drilling has been extremely difficult. In coring only 33 feet they lost $603 worth of diamonds. The first drilling contractor withdrew, and, as shown by the accompanying documents, the drilling contract was reassigned. The second contractor is having an equally difficult time. For this reason, Mr. Howard feels that there will be no difficulty in terminating these subcontracts, even though they fail to contain specific termination clauses.

We would appreciate your providing us with written approval of the subcontracts so that we can process the monthly report to the Field Finance Officer for reimbursement. We would also appreciate specific instructions about termination of the project as soon as possible, since prompt termination may be necessary in order to save money for all parties concerned.

Sincerely yours,

David Gallagher

David Gallagher

Enclosures

DG/lh

OCT 22 1951

ARKANSAS MANGANESE CO., INC.

OFFICES: 100 PROFESSIONAL BUILDING
TELEPHONE 8995
Fort Smith, Arkansas

OFFICERS & DIRECTORS
R. W. NEWTON
PRESIDENT
GLENN C. CLICK
VICE PRESIDENT
WESLEY ADAMS
TREASURER
VICTOR HOWARD
SECRETARY
JAMES M. TAYLOR, JR.
ASST. SECRETARY

October 20, 1951

David Gallagher, Chairman
DMA Field Team, Region VI
Defense Minerals Administration
Joplin, Missouri

Re: Docket No. DMA-1248X
Contract No. Idm-E82
Arkansas Manganese Company

Dear Mr. Gallagher:

We received your letter of October 19, 1951 in regard to submitting photostatic copies of the subcontracts between Arkansas Manganese Company and the contractors who would perform certain work. After a recheck of our files, we find we have copies of these contracts properly signed and witnessed which we are sending to you at this time. You will note that the contract with Tom Musgrove and Son for churn drilling and core drilling has been assigned to Parkwood Homes, Inc. who assumed the responsibility for performing this contract by paying Mr. Musgrove a certain sum for the work he did. Mr. Musgrove dug approximately 57 feet of churn drilling holes. This assignment of contract, you will note, was approved by Arkansas Manganese Company, and we trust that this will also meet with your approval. We are certainly sorry that this mix-up occurred, and if there is anything further we can do to expedite matters, we will appreciate hearing from you.

Thanking you very much for the interest you have shown in this project, we are

Yours very truly,

ARKANSAS MANGANESE COMPANY, INC.

Victor Howard

Victor Howard
Secretary

VH:sb
Enc. (2)

OCT 22 1951

ARKANSAS MANGANESE CO., INC.

DEFENSE MINERALS ADMINISTRATION WASHINGTON, D. C.

OFFICES: 100 PROFESSIONAL BUILDING

TELEPHONE 8995

OCT 29 1 55 PM '51

Fort Smith, Arkansas

OFFICERS & DIRECTORS

R. W. NEWTON
PRESIDENT

GLENN C. CLICK
VICE PRESIDENT

WESLEY ADAMS
TREASURER

VICTOR HOWARD
SECRETARY

JAMES M. TAYLOR, JR.
ASST. SECRETARY

October 19, 1951

David Gallagher
Defense Minerals Administration
221 West 3rd Street
Joplin, Missouri

Re: Docket No. DMA-1248X
Exploration Contract No. Idm-E82
Arkansas Manganese Company

Dear Mr. Gallagher:

Enclosed you will find certified copy of letter we received from C. O. Mittendorf. We have form MF-200 in our files, but we do not have written approval on the sub-contracts covered under MF-200. These contracts were approved verbally in a telephone conversation between me and some member of the Defense Minerals Administration in Washington, D.C. We trust that you will be able to get copies from the Washington office since we are in need of the moneys authorized in this contract.

Mr. Adams and I are going to Mena today and make a thorough check of the possibilities of closing down the project. We will keep you advised.

Yours very truly,

ARKANSAS MANGANESE COMPANY, INC.

Victor Howard

Victor Howard
Secretary

VH:sb

xxxxxxxxxxxxxxx
Joplin, Missouri

October 19, 1951

Mr. Victor Howard
Arkansas Manganese Company
100 Professional Building
Fort Smith, Arkansas

Subject: Docket No. DMA-1248X
Contract No. DMA-282
Arkansas Manganese Co.

Dear Mr. Howard:

Confirming our phone conversation of 10:00 A.M. this morning: You acknowledged receipt of my letter of October 18, 1951. I pointed out to you that under Clause 4 of the contract Form MP-200 it was necessary to have subcontracts approved in writing by the Government. You advised me that, in accordance with a telephonic request from Washington, you had sent two copies of each of the subcontracts to Washington for approval. You also said that you were advised by telephone from Washington that the contracts were being approved, and that it was all right to commence work. You further informed me that the copies of the subcontracts you sent to Washington have not been returned to you, nor have you received written approval from Washington of the subcontracts.

Immediately after talking with you, I telephoned to Washington and talked with Mr. Johnson, acting for Mr. Mittendorf, and pointed out the situation to him. He advised me that he will try to have the copies of the subcontracts found in the Washington files and air-mailed to me as soon as possible.

Sincerely yours,

David Gallagher
Chairman,
DMA Field Team, Region VI

DG/jd

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
WASHINGTON 25, D. C.
~~XXXXXXXXXXXXX~~
Joplin, Missouri
October 18, 1951

OCT 22 9 01 AM '51
DEFENSE MINERALS ADMINISTRATION WASHINGTON, D.C.

1248

Mr. Victor Howard
Arkansas Manganese Company
100 Professional Building
Fort Smith, Arkansas

Dear Mr. Howard:

We have received the first monthly progress report for the period ending September 30, 1951 of the exploration contract Docket No. DMA-1249X, Contract No. Idm-782.

You doubtless realize that this office is authorized to approve only those expenditures that are proper under the terms of the Exploration Project Contract (Form MF-200). You will note that clause 4 of this contract states "... with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors."

I understand that this office has been advised verbally by R. R. McIlwaine, your consulting mining geologist, that the subcontracts for drilling and drifting were approved in writing by the Washington office of DMA. However, no copies of this written approval have been furnished to the Joplin office of DMA either by Washington or by your office.

We have examined the report and statement of expenditures you have submitted and find them in order. However, we cannot approve them until we are able to confirm the existence of written approval of the subcontracts by actually seeing the documents. Clinton G. Knox of this office wrote to G. O. Mittendorf in Washington on October 3, 1951 requesting copies of the written approval of the subcontracts. No answer has as yet been received. If you can assist us by showing us bonafide copies of this written approval, we would then be in a position to approve the expenditures and recommend appropriate reimbursement under the terms of the contract.

The narrative account of the accomplishments so far indicate that both parties to the contract should give serious consideration to the advisability of continuing the work; because from reading the report, I gather that nothing has been encountered by the first six holes that even approaches manganese ore in either grade or thickness. Furthermore, we are all aware of

the serious metallurgical problem. I am therefore strongly inclined to agree with the statement on page 3 of McElwaine's report "Unless a couple of holes in the syncline develop different conditions to those revealed by the drilling to date, it is recommended that the drilling be discontinued at that time."

Inasmuch as your money is also being expended on this exploration project, you may wish to give serious consideration to terminating it.

Sincerely yours,

David Gallagher
Chairman
DMA Field Team, Region VI

DG/jd

Copies - C. O. Wittendorf
O. W. Reve

400

FILE COPY
SURNAME:

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

A.E.C.

OCT 1 8 1951

Mr. Clinton C. Knox
Acting Executive Officer, Region VI
Defense Minerals Administration
Joplin, Missouri

Re: Docket DMA 1248X
Contract Idm-E-82
Arkansas Manganese Co.
Mena, Arkansas

Dear Mr. Knox:

The delay in answering your letter of October 3, 1951 in regard to the Operator's contract for drilling in the subject docket, has been on account of the time required in search for a copy of it here, without success.

Under these circumstances, it will be necessary for you to obtain a copy of the Operator's contract with the driller and mail it to this office for examination by the General Counsel in order to resolve the question of Governmental liability in case of cancellation of the Exploration Contract.

In any event, it appears that as of today there could be but 25 days maximum for the contract to run; probably much less depending on the date of commencement which we do not have, as none of the Operator's monthly reports have been received at this office.

Sincerely yours,

(signed) FRANK E. JOHNSON ACTING

10-18

C. O. Mittendorf, Director
Production Expansion Division

PBBlakemore/hmj
Typed: 10-18-51

cc to: Reports and Records
Adm. Reading File
Mr. Mittendorf, Olund
Region VI
Mr. Blakemore
Mr. Holderer
Docket

400

FILE COPY
SURNAME:

Blakemore
Mittendorf
(fw)

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

October 9, 1951

not stripped R&R.

MEMORANDUM

To: General Counsel, DMA

From: Administrator, DMA

Subject: Docket DMA-1248X - Contract Idm-E82
Arkansas Manganese Co, Inc

Attached hereto entire file on captioned Contract. Your advice is requested at this time on account of the cancellation by Government before completion of program covered in Contract and the probable liability of Government for its share of unexpended but perhaps contracted for drilling by a contractor engaged by the Operator, also, the liability for "services for the duration of the Contract."

C. O. Mittendorf (a. fr.)

a. 2. e.

Attachment

PBBlakemore/jem

cc to: Adm. Reading File
Reports & Records
Messrs. Mittendorf, Olund
Mr. Blakemore
Docket

Mr. Beakenuse
Manganese Project

DEFENSE MINERALS ADMINISTRATION
WASHINGTON, D. C.

UNITED STATES
DEPARTMENT OF THE INTERIOR

OCT 5 1 09 PM '51

DEFENSE MINERALS ADMINISTRATION

WASHINGTON 25, D. C.

DEPARTMENT OF THE INTERIOR
RECEIVED
OCT 5 1951
Defense Minerals Administration
Production Expansion Division

Joplin, Missouri
October 3, 1951

Mr. C. O. Mittendorf, Chairman
Production Expansion Division
Defense MineralsAdministration
Department of Interior
Washington 25, D. C.

Re: Docket DMA 1248X
Contract Idm-E82
Arkansas Manganese Co.
Mena, Arkansas

Dear Mr. Mittendorf:

On the basis of a Bureau of Mines metallurgical report this office suggested, in a letter to you dated September 20, 1951, that the subject contract be terminated. We were advised of your full accord in a letter dated September 25, 1951. Mr. Fryklund, Geological Survey presently acting for David Gallagher in Survey matters, was then visiting the property to observe the exploration status. A copy of his memorandum to me is enclosed. Mr. Crittenden of the U. S. Geological Survey, also happened to be there on a short visit at the same time.

The owners, at our request, have furnished us with a metallurgical report by the Denver Equipment Company, a copy of which is enclosed.

Therefore, we have indefinitely delayed giving official notice of termination to the operator but have warned them verbally of the possibility. At our suggestion they are starting to drill a deep hole in the center of the syncline. Also they will collect the recent churn drill material for possible further metallurgical tests.

The operator, through Bob McElwaine their consulting geological engineer, telephoned us today that the drilling contract was approved by your office at the time the original DMA contract (Idm-E82) was approved. I didn't find any reference to the drilling contract in this office. If this drilling contract does not have a cancellation clause, isn't the Government liable for 75 percent of the cost of the contracted drilling? If it does happen to be true that the Government is liable for this cost, I would say that the project should be completed as written. It is the

opinion of Mr. Fryklund that the geologic results might justify the cost to the Government in any case even though, with present metallurgical knowledge, no ore will be developed.

Sincerely yours,

Clinton C. Knox

Clinton C. Knox for
David Gallagher, Executive
DMA Field Team, Region VI

/jd

Enclosures

DEFENSE MINERALS
ADMINISTRATION
WASHINGTON, D. C.
OCT 5 1 09 PM

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
XXXXXXXXXXXXXX D. C.
Joplin, Missouri
September 27, 1951

Memorandum

To: Clinton C. Knox, Acting Executive DMA Field Team, Region VI

From: Verne C. Fryklund, Jr., Geological Survey

Subject: Cancellation of Arkansas Manganese Company Contract 1248 (Idm-782)

I spent one day at the property of Arkansas Manganese Company with Bob McElwaine the company's consulting engineer. Max Crittenden, U.S.G.S. commodity geologist for manganese was with us in the afternoon. The exploration appears to be competently directed and will undoubtedly produce the results expected when the contract was signed. Coring had just started in hole No. 5, which is the deepest hole into the syncline, and it was apparent that the grade was visibly somewhat better than at the outcrops.

There is a possibility that there will be a greater concentration of manganese near the axis of the syncline at or near the present water table; and at least one hole should test this hypothesis before the contract is terminated. Mr. Crittenden was consulted on this matter and he agreed that such a hole should be drilled and evaluated before termination.

An additional point raised by Mr. McElwaine was that a metallurgical report submitted to the applicant by Denver Equipment Company gave much more favorable results than the Bureau of Mines metallurgical results (the Bureau's conclusions were told him verbally). A copy of the Denver Equipment Company report is being sent to Joplin. It is apparent that the company did not enter into the exploration contract without metallurgical advice even if the Government did not feel it necessary.

It is my suggestion that the contract should not be terminated until a deep hole is drilled on the axis of the syncline, and the metallurgical report of the Denver Equipment Company is examined.

Verne C. Fryklund, Jr.

Verne C. Fryklund, Jr.

/jd

Attention: P. B. Blakemore

ON-SITE REPORT

FILE COPY
SURNAME:

400

Blakemore
Mittendorf

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

SEP 25 1951

G.E.R.

Mr. David Gallagher
Executive Officer, Region VI
Defense Minerals Administration
221 West 3rd Street
Joplin, Missouri

Re: Docket DMA 1248X
Contract ~~Icm-182~~
Arkansas Manganese Co.
~~Mena~~, Arkansas

Dear Mr. Gallagher:

In reference to your letter of September 20, 1951 in which it is proposed to terminate the subject exploration contract on September 30, 1951 on account of the very unfavorable metallurgical report on samples of manganiferous material, you are advised that I am in full accord with your proposed action.

Sincerely yours,

C. O. Mittendorf (J.H.)

C. O. Mittendorf, Director
Production Expansion Division

JF 9/25

PBBlakemore/meh
Typed: 9/24/51
cc to: ~~Rep~~ Reports and Records
Adm. Reading File
Messr. Mittendorf, Olund
Mr. Blakemore
Mr. Holderer
Mr. N. B. Melcher
Mr. Thayer
Region VI
Docket

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
~~WASHINGTON~~
Joplin, Missouri
September 20, 1951

DEFENSE MINERALS
ADMINISTRATION
WASHINGTON, D. C.
SEP 24 8 37 AM '51

OFFICAL FILE COPY

To	Init.	Date
400	D. E. C	9-24
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Mr. C. O. Mittendorf
Chairman, Production Expansion Division
Defense Minerals Administration
Department of Interior
Washington 25, D. C.

Re: Docket DMA 1248X
Contract I-DMA-E82
Arkansas Manganese Co.
Mena, Arkansas

Dear Mr. Mittendorf:

Enclosed is a copy of a memorandum from L. T. McElvenny, a copy of a memorandum from R. G. Knickerbocker and a copy of a metallurgical report by the Rolla Station of the Bureau of Mines.

These enclosures were received in this office on September 20, 1951. The subject samples to be tested were submitted by this DMA Field Team April 3, 1951.

A preliminary metallurgical report was received August 12, 1951 but we can find no record in this office indicating that a copy had been sent to Washington. We regret that the preliminary report was not sent you but as the contract was signed July 27, 1951 it was apparently not a fatal omission on our part.

The metallurgical report, or samples which averaged about 6 percent manganese, is very unfavorable and showed that only 27.3 percent of the manganese in the crude ore can be recovered as a concentrate running 46.1 manganese.

It is obvious that the exploration contract should never have been approved without metallurgical information, which admittedly should have been sent from this office long before now. I believe this contract should be terminated at the close of this first months work, September 30, 1951, under Section 16 of the subject exploration contract.

Mr. Fryklund, acting for the Geological Survey on the DMA Field Team in this office will visit this property the first part of next week and make an informal examination of the work which has been done.

Sincerely yours,

Clinton C. Knox

C. C. Knox for
David Gallagher, Executive
DMA Field Team, Region VI

/jd

C
O
P
Y

September 19, 1951

Memorandum

To: Executive Field Team, Defense Minerals Administration
General Delivery, Joplin, Missouri

From: L. T. McElvenny

Subject: Final Report on the Minerals Dressing and Analysis of Manganese Ores from Mena, Polk County, Arkansas

Attached are the original and one copy of the subject report and a copy of Mr. Knickerbocker's memo to me, dated September 17, 1951.

The samples were taken by Howard Berliner from a deposit that was being explored by the Arkansas Manganese Co. (Newton and McElwaine); which later received exploration contract I-DMA-E82, under Docket 1248X.

The report indicates that only 27.3 percent of the manganese in the crude ore can be recovered as concentrates running 46.1 percent manganese. It is evident, therefore, that exploration of the deposit is not justifiable.

L. T. McElvenny

Attachments 3

C
O
P
Y

September 17, 1951

Memorandum

To: Mr. L. T. McElvenny

From: R. G. Knickerbocker

Subject: Minerals dressing and analysis of manganese ores from Mena, Polk County, Arkansas, for the Defense Minerals Administration, Joplin, Missouri

The attached is a report by M. M. Fine and R. B. Fisher on the minerals dressing and analysis of the Mena, Arkansas manganese ores, samples of which were submitted by M. Howard Berliner in a memorandum dated April 3, 1951.

A laboratory investigation was conducted on a composite of a selected group of samples submitted for that purpose. Briefly, the results of gravity concentration, flotation, roasting and magnetic separation showed a 27.3 percent recovery of the manganese at a grade of 46.1 percent Mn, 3.1 percent Fe, 25.8 percent SiO_2, 3.0 percent Al_2O_3 and 0.16 percent P. This very low recovery of a sub-grade product is due to the very intimate association of the manganese oxides and novaculite which precludes the ready production of ferrograde material by mineral dressing methods. This extreme interlocking is well illustrated in typical photomicrographs of polished sections of the ore which are included in the report.

No further mineral dressing work on these samples is contemplated.

Hydro and pyrometallurgical laboratory investigations are not considered necessary on these samples at this time since it is understood that the lack of tonnage and high cost of mining these scattered ore deposits would eliminate the application of these methods of extraction of manganese.

R. G. Knickerbocker

Enclosures 5

FINAL REPORT ON THE MINERALS DRESSING AND ANALYSIS OF MANGANESE ORES FROM MENA, POLK COUNTY, ARKANSAS

By M. M. Fine and R. B. Fisher

A group of eight manganese samples from Mena, Arkansas, was submitted to the Minerals Technology Division for the Defense Minerals Administration by M. Howard Berliner of Joplin, Missouri, on April 3, 1951. The samples were designated A-1 to A-4 and B-1 to B-4, inclusive, and originated in the N1/2, SE1/4 of Section 28, T.3S., R.30W., Polk County, Arkansas. The "A" samples were stated to represent four types of ore classified as claystone, sandy, conglomerate, and massive novaculite and occurring as sedimentary beds that had been collected from several trenches that cut the outcrop of the ore over a strike length of about 600 feet. The "B" samples were channel cuts across the first three types and a larger sample of the fourth.

In accordance with a request in the covering memorandum, the "A" samples were examined individually and the "B" samples were combined in a stated proportion for the milling test.

Preliminary Examination
Sample A-1

Sample A-1 was essentially an intergrowth of manganese oxides in novaculite, iron oxide-stained chert, manganese-stained clay and quartz sand grains. A few clusters of a hydrous iron phosphate were also observed.

The manganese oxides, principally psilomelane with small amounts of pyrolusite and braunite, showed various types of occurrence. Among these were sponge-like networks of chert and manganese oxides with a few larger rhombs of the latter ranging from 40 to 70 microns in width. The rhombs in turn were speckled with chert inclusions of from 2 to 5 microns in size. A few veinlets of manganese oxide ranging from 1 to 100 microns in width were noted in other specimens.

A fair amount of chert gangue, low in manganese content, was evident in a sample crushed to minus 1/4-inch. Most of the manganese oxide, however, remained locked with gangue in sizes less than 200-mesh. This is evident from an examination of figures 1 to 3 which are photomicrographs of typical polished sections. All are 200 diameter magnification and the size of the individual grains may be compared with the outline of a 200-mesh opening. In figure 1, note the numerous inclusions of novaculite (dark areas), some of them less than 1 micron in size, in the manganese oxides (light areas). The rhombs of manganese oxide speckled with silica are presented in figure 2. The veinlet of manganese oxide in figure 3 ranges in width from 2 to 74 microns, the groundmass being a dense intergrowth of manganese oxides, silica and iron oxide (gray areas).

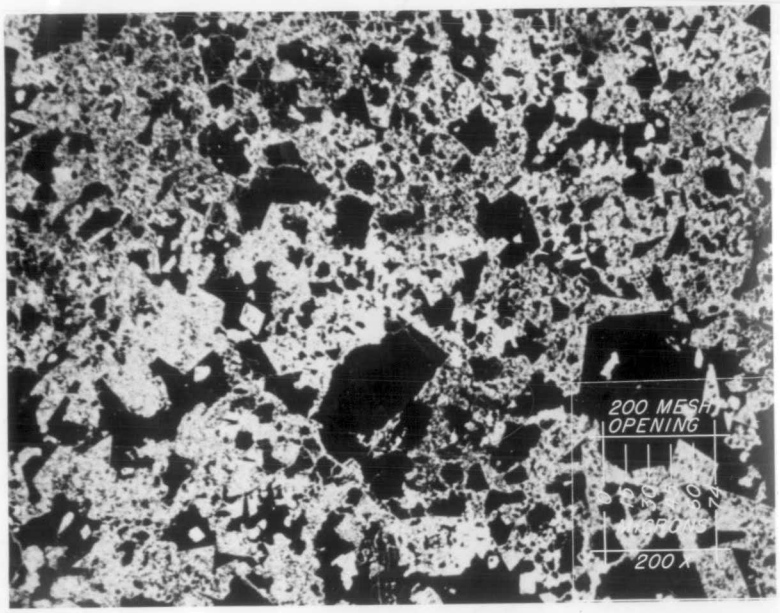


Figure 1. - Sponge-like structure in Mena, Arkansas ore.

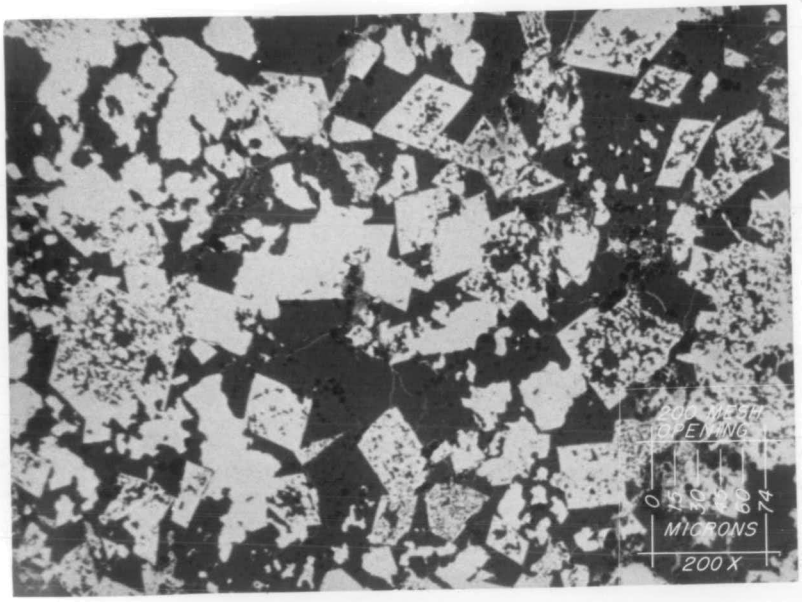


Figure 2. - Manganese rhombs speckled with silica.

Figure 3. - Manganese veinlet in iron oxide and novaculite.

Although the sections shown were specimens of sample A-1 only, the extremely close association of the mineral components was equally characteristic of the other samples as well.

Sample A-2

Sample A-2 was novaculite chert, sand grains, manganese and iron oxide grains and stained chert and clay. The quartz sand was cemented by chert and psilomelane-type manganese oxide. The latter also occurred as fracture filling. Virtually all manganese grains were less than 45 microns in size with a few areas larger than 250 microns.

Sample A-3

This sample was essentially iron and manganese oxide stained chert, white to gray chert with clay surface coatings and crack fillings. A few sand grains and a very small amount of hydrous iron phosphate were found.

Manganese oxide occurred as veinlets in the chert ranging from 1 to 100 microns, most of them less than 50, and as inclusions less than 35 microns in diameter.

Sample A-4

Sample A-4 was composed of novaculite chert with stringers, veinlets and inclusions of psilomelane-type manganese oxides ranging from 5 to 150 microns. Small amounts of iron and manganese oxide occurred as staining.

Chemical analyses of all samples are presented in table 1.

TABLE 1. - Chemical analysis of Mena, Arkansas manganese samples

No.	Analysis, percent							
	Mn	Fe	SiO_2	Al_2O_3	P	Cu	Pb	Zn
A-1	11.7	10.6	54.6	4.6	0.60	0.02	*	0.04
A-2	7.2	7.0	70.1	4.0	.39	.02	*	.03
A-3	7.2	6.0	72.5	3.2	.31	.04	*	.04
A-4	4.8	1.2	88.6	.55	.07	.06	*	.03
B-1	4.8	8.1	72.5	3.0	.37	.03	*	.03
B-2	5.3	6.5	75.5	1.8	.31	.02	*	.05
B-3	6.2	7.8	70.1	4.1	.39	.03	*	.04
B-4	8.4	1.0	83.1	.97	.09	.06	*	.03

*Less than 0.01 percent.

Float-Sink Tests

In order to complete the examination of the "A" samples, each was crushed to minus 3/4-inch and sized on various screens down to 200-mesh. The coarser fractions were separated in heavy organic liquids of 2.93 and 2.73 specific gravity, the finer sizes (minus 10- plus 200-mesh) in the 2.93 liquid only. These data are detailed in tables 2 to 5, respectively.

It may be noted that on all samples, some float products relatively low in manganese were produced. None of the sink products, however, were high grade. Excessive amounts of iron were present in the heavy fractions from samples A-1, A-2 and A-3 and all samples were much too high in silica (insoluble). The conclusions drawn from these small tests were that gravity concentration could be utilized to reject some coarse gangue but would yield no acceptable concentrates.

TABLE 2. - Float-sink analysis, sample A-1

Product		Weight, percent	Analysis, percent Mn	Fe	Insol.	Percent of total Mn
3/4" to 3/8" Sink	2.93	27.4	16.6	14.3	45.1	40.7
Sink	2.73	8.3	7.1	-	-	5.3
Float	2.73	7.0	2.4	-	-	1.5
3/8" to 4-mesh Sink	2.93	15.1	17.6	13.2	44.7	23.8
Sink	2.73	3.7	6.3	-	-	2.1
Float	2.73	4.2	2.3	-	-	.9
4- to 10-mesh Sink	2.93	9.7	16.7	12.5	44.1	14.5
Sink	2.73	2.5	5.1	-	-	1.1
Float	2.73	3.2	1.5	-	-	.4
10- to 28-mesh Sink		3.4	18.2	14.1	42.5	5.5
Float		3.0	2.0	-	-	.5
28- to 65-mesh Sink		1.3	16.9	15.2	40.5	2.0
Float		2.1	.86	-	-	.1
65- to 200-mesh Sink		.5	15.9	17.1	38.0	.7
Float		1.2	.88	-	-	.1
Minus 200-mesh		7.4	1.2	-	-	.8
Composite		100.0	11.2	-	-	100.0

TABLE 3. - Float-sink analysis, sample A-2

Product		Weight, percent	Analysis, percent Mn	Fe	Insol.	Percent of total Mn
3/4" to 3/8" Sink	2.93	9.3	18.0	9.4	50.1	24.0
Sink	2.73	17.4	9.3	-	-	23.2
Float	2.73	13.6	4.0	-	-	7.8
3/8" to 4-mesh Sink	2.93	5.4	15.4	11.1	51.2	11.9
Sink	2.73	6.7	8.1	-	-	7.8
Float	2.73	7.5	2.3	-	-	2.5
4- to 10-mesh Sink	2.93	3.6	17.2	11.0	50.8	8.9
Sink	2.73	2.8	6.8	-	-	2.7
Float	2.73	7.5	1.3	-	-	1.4
10- to 28-mesh Sink		1.4	18.1	11.5	46.9	3.6
Float		7.6	1.3	-	-	1.4
28- to 65-mesh Sink		.7	17.2	16.1	39.7	1.7
Float		8.9	.57	-	-	.7
65- to 200-mesh Sink		.3	16.8	20.2	32.7	.7
Float		8.9	.84	-	-	.4
Minus 200-mesh		4.4	2.0	-	-	1.3
Composite		100.0	7.0	-	-	100.0

TABLE 4. - Float-sink analysis, sample A-3

Product		Weight, percent	Analysis, percent Mn	Fe	Insol.	Percent of total Mn
3/4" to 3/8" Sink	2.93	6.4	17.5	9.2	52.1	18.8
Sink	2.73	9.2	7.8	-	-	12.0
Float	2.73	20.8	3.0	-	-	10.4
3/8" to 4-mesh Sink	2.93	5.6	17.3	9.9	49.9	16.2
Sink	2.73	7.6	8.0	-	-	10.2
Float	2.73	16.5	1.8	-	-	5.0
4- to 10-mesh Sink	2.93	3.3	18.5	11.0	43.7	10.2
Sink	2.73	3.2	6.7	-	-	3.6
Float	2.73	12.3	1.2	-	-	2.5
10- to 28-mesh Sink		1.7	17.4	14.0	41.1	5.0
Float		6.7	1.5	-	-	1.7
28- to 65-mesh Sink		.7	17.3	17.1	35.8	2.0
Float		3.0	.92	-	-	.5
65- to 200-mesh Sink		.3	17.6	18.6	34.3	.9
Float		1.6	1.7	-	-	.4
Minus 200-mesh		1.1	3.4	-	-	.6
Composite		100.0	6.0	-	-	100.0

TABLE 5. - Float-sink analysis, sample A-4

Product		Weight, percent	Analysis, percent Mn	Fe	Insol.	Percent of total Mn
3/4" to 3/8" Sink	2.93	1.1	27.9	2.1	55.6	5.5
Sink	2.73	3.5	14.5	-	-	11.1
Float	2.73	47.7	2.8	-	-	29.3
3/8" to 4-mesh Sink	2.93	1.8	24.4	2.3	49.2	9.6
Sink	2.73	2.4	14.7	-	-	7.7
Float	2.73	21.3	2.8	-	-	13.1
4- to 10-mesh Sink	2.93	.9	26.8	2.2	45.7	5.3
Sink	2.73	1.0	14.5	-	-	3.1
Float	2.73	12.1	2.3	-	-	6.1
10- to 28-mesh Sink		.5	30.5	2.2	38.4	3.3
Float		4.5	2.4	-	-	2.4
28- to 65-mesh Sink		.2	32.4	3.0	32.3	1.4
Float		1.5	1.7	-	-	.6
65- to 200-mesh Sink		.1	31.6	3.8	28.0	.7
Float		.7	1.4	-	-	.2
Minus 200-mesh		.7	3.8	-	-	.6
Composite		100.0	4.6	-	-	100.0

Mineral Dressing Tests

Gravity concentration was the first in a series of processes applied to the Mena ore in an endeavor to recover a ferrograde product. A composite of the "B" samples, containing 5.8 percent manganese, was crushed to minus 3/4-inch and sized on 3/8-inch, 4- and 10-mesh sieves. The sizes coarser than 10-mesh were separated in a ferrosilicon heavy medium of 2.70 specific gravity to reject a tailing low in manganese. The sink products were crushed to minus 10-mesh, combined with the primary undersize, classified and tabled. No clean concentrates were recovered on the table but it was possible to reject an additional amount of low manganese tailing. The net results of the gravity processes showed a manganese recovery of 59.6 percent in 24.1 percent of the original weight and at a grade of 14.3 percent Mn, 13.7 percent Fe, 45.0 percent SiO_2, 3.3 percent Al_2O_3 and 0.48 percent P. Other details of this step may be found in table 6.

TABLE 6. - Results of gravity concentration

Product	Weight, percent	Analysis, percent					Percent of total Mn
		Mn	Fe	SiO_2	Al_2O_3	P	
Table concentrate ...	24.1	14.4	13.7	45.0	3.3	0.48	59.6
Table middling	18.0	5.5	-	-	-	-	17.0
Table tailing	10.2	2.4	-	-	-	-	4.2
Heavy medium tailing.	40.4	2.2	-	-	-	-	15.3
Slimes	7.3	3.1	-	-	-	-	3.9
Composite	100.0	5.8	-	-	-	-	100.0

The silica content of the gravity concentrate was lowered, but not sufficiently so, by flotation. The table product was ground to minus 150-mesh, conditioned with a fatty acid in an alkaline pulp and the manganese oxides were floated. The rougher froth was cleaned three times to yield the flotation concentrate shown in table 7. The grade had been raised to 30.8 percent Mn, 11.2 percent Fe, 22.5 percent SiO_2, 3.0 percent Al_2O_3 and 0.54 percent P but the recovery at that grade was only 30.0 percent of the total manganese in the crude ore.

TABLE 7. - Flotation of gravity concentrate

(Metallurgical data)

Product	Weight, percent	Analysis, percent					Percent of total Mn in	
		Mn	Fe	SiO_2	Al_2O_3	P	Feed	Crude ore
Concentrate ..	22.8	30.8	11.2	22.5	3.0	0.54	50.4	30.0
Middling	24.8	11.2	-	-	-	-	19.9	11.9
Tailing	52.4	7.9	-	-	-	-	29.7	17.7
Composite	100.0	13.9	-	-	-	-	100.0	59.6

(Operating data)

Reagents	Pounds per ton of feed					
	Conditioners		Roughers	Cleaners		
	1	2		1	2	3
Sodium silicate	4.0	-	-	-	-	-
Soda ash	2.0	-	-	-	-	-
Liqro(tall oil)	-	0.54	-	-	-	-
Fuel oil No. 3	-	.96	-	-	-	-
pH	8.5	-	-	-	-	-
Time, minutes..	5	5	7	7	7	7

It is possible to raise the manganese content to well over 40 percent by removing most of the iron in such a product as the flotation concentrate. The latter was roasted in air for a half hour at 700° C. and then for an equal period of time in a hydrogen atmosphere at 450° C. The reduced material was separated in a low intensity, wet-magnetic separator to yield the products shown in table 8. The grade of the nonmagnetic product was 46.1 percent Mn, 3.1 percent Fe, 25.8 percent SiO_2, 3.0 percent Al_2O_3 and 0.16 percent P, but the recovery at that grade was only 27.3 percent of the total manganese in the crude ore. The process of roasting and magnetic separation had lowered the phosphorus content but the silica was still far above specifications.

TABLE 8. - Roasting and magnetic separation

Product	Weight, percent	Analysis, percent					Percent of total Mn in	
		Mn	Fe	SiO_2	Al_2O_3	P	Feed	Crude ore
Magnetic	31.2	10.1	-	-	-	-	9.0	2.7
Nonmagnetic ..	68.8	46.1	3.1	25.8	3.0	0.16	91.0	27.3
Composite	100.0	34.8	-	-	-	-	100.0	30.0

Summary and Conclusions

A composite of manganese ores from Mena, Polk County, Arkansas, was the subject of a mineral dressing investigation at the Rolla, Missouri laboratories of the Bureau of Mines. A sequence of operations including gravity concentration, flotation, roasting and magnetic separation recovered 27.3 percent of the manganese at a grade of 46.1 percent Mn, 3.1 percent Fe, 25.8 percent SiO_2, 3.0 percent Al_2O_3, and 0.16 percent P.

In spite of the very low recovery, the final product was excessively high in silica. The recovery could be increased somewhat by reprocessing some of the middlings but little can be done about the grade. The extremely close association, shown in the photomicrographs, between manganese oxides and novaculite illustrates the principal difficulty in the treatment of these ores by physical methods. A finer grind, to minus 400-mesh, prior to flotation might yield a better rejection of silica but it is questionable that such a step would yield a ferrograde product. A polished section study of the flotation concentrate mentioned in the body of this report showed that grinding to minus 20 microns would liberate only 60 percent of the locked silica grains. The economics of grinding hard novaculite to such a fine size are questionable.

The results of the study show that the tested samples are not amenable to the economic production of ferrograde manganese concentrates by mineral dressing procedures.

FILE COPY 400
SURNAME:

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

SP Warren
Mittendorf

July 30, 1951

G.E.C.

Contract Services Section
General Accounting Office
4th Floor - New GAO Building
Washington 25, D. C.

Re: Docket No. DMA-1248X
Arkansas Manganese Company
Exploration Project Contract
No. Idm-E82

Gentlemen:

Enclosed for recording in your office is the original of an executed Exploration Project Contract between the Operator named in the above reference and the Government of the United States.

Sincerely yours,

C. O. Mittendorf

C. O. Mittendorf, Director
Production Expansion Division

Enclosure (1)

SPWarren/ecl

cc to: Admr's. Reading File
Messrs. Mittendorf - Olund
Reports & Records
Holderer
Thayer
Region VI Field Team (2)
Docket
Warren

FILE COPY 400
SURNAME:

SPWarren
Mittendorf

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

July 30, 1951

Arkansas Manganese Company
100 Professional Building
Fort Smith, Arkansas

Re: Docket No. DMA-1248X
Arkansas Manganese Company
Exploration Contract

Gentlemen:

Enclosed you will please find a copy of the exploration contract covering the Arkansas Manganese Company project. The contract bears the number Idm-E82, which is the register number which, along with the docket number, is to be referred to on all correspondence. The effective date of the contract is July 27, 1951.

Also included are four copies of Monthly Progress Reports and one copy of an information bulletin which attempts to set forth the answers to many questions which have arisen in connection with the exploration program.

You are requested to advise Mr. David Gallagher, Executive Officer, DMA Field Team, Region VI, 221 West 3rd Street, Joplin, Missouri, when the work is started under this approved project.

Sincerely yours,

C. O. Mittendorf

C. O. Mittendorf, Director
Production Expansion Division

Enclosures (6)

SPWarren/ecl
cc to: Admr's. Reading File
Messrs. Mittendorf - Olund
Reports & Records
Holderer
Thayer
Docket
Region VI (2)
Warren

FILE COPY
SURNAME:

SPWarren
Mittendorf (2)

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

July 30, 1951

AIR MAIL

Mr. David Gallagher
Executive Officer
DMA Field Team, Region VI
221 West 3rd Street
Joplin, Missouri

Re: Docket No. DMA-1248X - Idm-E82
Arkansas Manganese Company
Exploration Contract

Dear Mr. Gallagher:

We are enclosing one signed and approved copy of Exploration Contract No. DMA-1248X - Idm-E82, Arkansas Manganese Company, 100 Professional Building, Fort Smith, Arkansas. A copy of this contract will be forwarded to the Region Finance Officer by the Washington Finance Officer together with their accounting instructions.

Sincerely yours,

C. O. Mittendorf

C. O. Mittendorf, Director
Production Expansion Division

Enclosure (1)

SPWarren/ecl

cc to: Admr's. Reading File
Messrs. Mittendorf - Olund
Reports & Records
Holderer
Thayer
Docket
Miss Terry
Warren

FILE COPY
SURNAME:

Guthrie

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

July 23, 1951

Memorandum

Confidential

To: Chief, Production Expansion Division

From: General Counsel

Subject: Arkansas Manganese Company, exploration project contract — DMA-1248X

The contract in the captioned case is approved as to legal form and sufficiency subject to the change of the date to that upon which the Government signs.

Your file is returned herewith.

J. L. Hofflund

J. L. Hofflund
General Counsel

Attachment

RRGuthrie/bjl

Copy to: R. R. Guthrie
J. L. Hofflund
/chron.
Files

FILE COPY
SURNAME:

SPWarren
Mittendorf

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

July 19, 1951

Memorandum

TO: J. L. Hofflund

FROM: C. O. Mittendorf

SUBJECT: DMA No. 1248-X
Arkansas Manganese Company
100 Professional Building
Fort Smith, Arkansas

There will accompany this memorandum an Exploration Project Contract with captioned applicant.

Five other copies of this contract, small map and exhibits are available except for copies of the large map. These are in the mail and should be available soon after you have completed your review of this application.

May we have your comments?

C. O. Mittendorf

Attachment

SPWarren/meh
cc to: Mr. Mittendorf, Mr. Olund
Mr. Hofflund
FILES

Dmma 1248

DENVER EQUIPMENT COMPANY
Ore Testing Division
Denver, Colorado

DEFENSE MINERALS
ADMINISTRATION
WASHINGTON, D. C.
OCT 5 1 09 PM '51

July 18, 1951

Mr. Robert B. McElwaine
P. O. Box 127
Little Rock, Arkansas

Reference: Our Ore Test No. CC-18297

Dear Sir:

The following report summarizes the results of laboratory concentration tests conducted upon a sample of manganese ore submitted by the Arkansas Manganese Corporation of Mena, Arkansas. The sample which was received on April 23, 1951, consisted of one drum having a gross weight of 210 pounds.

OBJECT OF TEST

The purpose of the test work was to investigate concentration of the submitted sample by gravity and flotation methods. It was desired to determine if a high grade manganese concentrate could be produced that would be suitable for the manufacture of ferro-manganese. The feasibility of producing a lower grade concentrate for the manufacture of spiegeleisen was also to be considered in respect to the economics of operation presented by the two grades of concentrate.

Conditions for milling such as water, transportation, and power were said to be desirable.

PREPARATION OF SAMPLE

The sample which was received in lump form was crushed to 3/4 inch in a jaw crusher. The crushed ore was mixed and one-half reduced to 1/4 inch in crushing rolls. The 1/4 inch ore was thoroughly mixed and one-half of it (1/4th the total sample) further reduced to minus 10 mesh using rolls in closed circuit with a vibrating screen. A head sample for assaying purposes was cut from the minus 10 mesh ore using a Jones Sampler. The balance of the 10 mesh ore was reserved for test work. The coarser crushed fractions were examined and then stored.

DESCRIPTION OF ORE

The submitted sample represents a manganese dioxide ore associated with a siliceous breccia. Examination of the ore showed that the manganese is closely associated with the gangue and that coarse concentration would not be applicable to produce a

finished grade of manganese concentrate. Selected particles of apparently good grade show a siliceous residue when treated with hydrochloric acid. The fine mineralization and coatings of manganese on the gangue particles indicated that fine grinding would probably be required.

Following is a partial chemical analysis of the head sample:

Manganese, percent - - - -	12.0
Silica, percent - - - - -	66.5
Iron, percent - - - - - -	5.5
Phosphorus, percent - - -	0.34
Calcium Carbonate, percent	0.44

The minus 10 mesh ore has a specific gravity of 2.9 and a pH of 5.5 when pulped with an equal weight of Denver city water which has a pH of 7.5.

DESCRIPTION OF TESTS

The data sheets attached and numbered D-1 through D-9 show the conditions and results of the tests. A summary of the tests follows.

TEST NUMBER 1 — Denver Mineral Jig, Denver Concentrating Table, Regrinding and Flotation of Table Tailing

Gravity concentration was investigated by means of jigging and tabling as shown on page D-1. The combined gravity concentrate assayed 31.4% Mn and represented 39.6% of the total manganese present in the head ore. The grade was limited due to combined silica and it was evident that gravity concentration could not produce a high grade concentrate or high recovery.

Flotation treatment of manganese ores has been of limited application in practice due mostly to the inability to develop an effective reagent combination that would produce a satisfactory grade and recovery.

Flotation of the table tailing after regrinding to 65 mesh was investigated. The reagent combination employed has been found applicable on certain psilomelane ores previously tested. The flotation conditions and results are shown on pages D-2 and D-3. Flotation produced only partial concentration of the manganese. Excessive silica (free and combined) was floatable with the manganese and produced only a low grade concentrate.

TEST NUMBER 2 — FLOTATION TREATMENT, TABLING OF FLOTATION TAILING

The head ore was ground and floated using a different reagent combination as shown on page D-4. The results of this test were not encouraging as the concentrate was low grade.

The flotation tailing was tabled to produce a table concentrate, middling, sand tailing, and slime tailing. The table concentrate assayed 36.4% manganese which is the maximum grade of concentrate produced by the testwork described in this report. Assays of the table tailing products (page D-5) showed that an important amount of the manganese is locked with the silica. Microscopic examination of the products confirmed this fact.

TEST NUMBER 3 — FLOTATION TREATMENT

An entirely different reagent combination was investigated which consisted of using manganese sulphate as an activator with large amounts of kerosene and a relatively large amount of vegetable oleic acid. The reagent quantities used appear excessive but are not necessarily so since impure manganese sulphate could be prepared from the ore using cheap sulphurous acid and a crude oleic acid could be used. Numerous tests were made using this reagent combination, and it was found that definite activation of the manganese resulted. The concentrate yield was low, but it was found after considerable experimentation that the conditioning operation was very important and that it was absolutely necessary to do the conditioning without sucking air into the pulp. This was accomplished by flooding the impeller and eliminating the vortex created by agitation. Taking this fact into consideration, it was found that the recovery could be increased substantially. A typical test is shown on page D-6 and D-7. The ore was ground to 100 mesh prior to flotation. The rougher flotation concentrate was cleaned three times. This test produced a moderately high recovery (81.0%) but the grade of final concentrate was only 26.6% manganese. A screen analysis of the concentrate and assays of the principal screen sizes showed that the manganese content was virtually the same in all sizes. These results are shown on page D-7.

TEST NUMBER 4 — FLOTATION TREATMENT

This test was similar to Test Number 3 except a reduced amount of reagent was employed for the purpose of lowering the reagent cost and attempting to produce a higher grade concentrate at a sacrifice in recovery. A slightly higher grade concentrate was produced, but this was still far from the desired grade and at a definite sacrifice in recovery.

See page D-8 and D-9 for the conditions and results of this test.

REMARKS AND CONCLUSION

The results of the tests herein described show that the submitted sample does not respond to flotation or gravity treatment to produce a high grade manganese concentrate. Test Number 3 produced a reasonably good recovery of the manganese, but the grade is regarded as too low for marketing. The occurrence of the manganese in close association with the siliceous gangue is responsible for the low grade concentrates produced. It will be noted that the concentrate of Test Number 3 was 81.9% minus 200 mesh, but that the concentrate contained excessive silica as the chief impurity.

Exploratory tests other than the tests shown herein in detail were made, but the results judged by visual and microscopic examination failed to show a satisfactory separation. Desliming of the minus 10 mesh ore to remove natural clay prior to grinding and flotation was investigated, but no appreciable advantage was noted.

The ore sample previously tested under Order Number AC-11594 responded favorably to concentration because of its coarse mineralization. It is understood, however, that only a limited tonnage of this ore is available, and that the principal tonnage is represented by the sample tested herein. No recommendations for treatment of this ore can be made due to the negative results obtained by conventional ore dressing means.

Phosphorus assays were not made on the concentrates because a satisfactory grade of manganese concentrate was not produced. Samples of the test products were requested for your examination but since the desired separation was not made it is doubtful that this is necessary. The principal products will be retained at our laboratory for a limited time and will be forwarded to you if requested.

Respectfully submitted,

DENVER EQUIPMENT COMPANY

/s/ Clarence Thom
C. Thom, Director
Ore Testing Division

/s/ H. J. Gisler
H. J. Gisler, Manager
Ore Testing Division (HWH)

2 Copies to Customer

DATA SHEET NO. D-1

Metallurgical Results

Report No. CC-18297 Test No. 1

Type of Test: Gravity Test - Denver Mineral Jig & Tabling

Sample Identification: Head Ore Crushed to Minus 10 Mesh

Test Procedure: The -10 mesh head ore was treated on the Denver Mineral Jig which produced a jig concentrate and tailing. The tailing was screened at 20 mesh and the oversize ground to -20 mesh. The total jig tailing (now -20) was tabled to produce a table concentrate and table tailing.

	Product	Percent Weight	% Mn	% Fe	% Insol	% SiO_2	% P	% $CaCO_3$	% Recovery Mn
	Head Sample Assay		12.0	5.5	-	66.5	0.34	0.44	
	Calculated Heads	100.0	12.1	-	-				100.0
1	Denver Jig Conct.	5.5	29.4	6.8	35.8				13.3
2	Table Concentrate	9.8	32.6	7.5	27.8				26.3
3	Table Tailing	84.7	8.6						60.4
	Combined 1 and 2	15.3	31.4	7.2	30.7				39.6

Remarks: The table tailing was reground and floated as described on the following page D-2. A summary of the results of this test are shown on page D-3.

DATA SHEET NO. D-2

Flotation Test Data: Conditions and Reagents

Sample
Identification: Table Tailing as Produced on page D-1 Report No.: CC-18297 Test No. 1

Test Procedure: The table tailing as produced on page D-1 was thicknened and ground to minus 65 mesh. The ground pulp was then conditioned and floated to produce a rougher flotation concentrate and tailing. The rougher concentrate was cleaned once to produce a cleaned flotation concentrate and cleaner middling. The conditions are shown below.

Grinding and Treatment				Reagents: Pounds per ton heads--(2)				
Operation	Time Min.	Percent Solids	pH	C.S.	S.S.	O.E.	M.I.C.	
Grinding(1)	30	65	-	No Reagents in Grind				
Conditioner	10	19	9.5	2.0	1.0	-	-	See page D-3 for a summary of this test.
Rougher Flotation	15	19	9.5	-	-	4.5	0.04 (Stage Added)	
Cleaner Flotation	8	-	9.6	1.0	1.0	1.0	0.02	

Grinding (1)

Time, minutes --
Classification, mesh 65
Sands reground, minutes 30

(2) Reagent Symbols: (Pounds per ton of original feed)

C.S. - Caustic Soda
S.S. - Sodium Silicate
O.E. - Oleic Acid - Emcol X-25 Mixture (3:1 by weight) and Fed as an emulsion with water.
M.I.C. - Methyl Isobutyl Carbinol Frother

Summary of Results Test No. 1

Sample
Identification Head Ore Crushed to Minus 10 Mesh

Report No. CC-18297

	PRODUCT	% Weight	ASSAYS % Mn	% Fe	% Insol	% SiO_2	Percent Recovery Mn
	Head Sample Assay		12.0	5.5	-	66.5	
	Calculated Head Assay	100.0	12.1	-	-		100.0
1	Denver Jig Conct.	5.5	29.4	6.8	35.8		13.3
2	Table Concentrate	9.8	32.6	7.5	27.8		26.3
3	Cleaned Flot. Conct.	5.5	27.5	9.5	33.4		12.5
4	Flot. Cleaner Midd.	20.0	11.9				19.6
5	Flotation Tailing	59.2	5.8				28.3
	Combined 1 and 2	15.3	31.4	7.2	30.7		39.6
	Combined 1, 2, and 3	20.8	30.4	7.8	31.4		52.1

REMARKS:

Screen Analysis of Flotation Feed

Mesh	%Wgt.
+65	Trace
+100	3.5
+150	10.0
+200	14.8
-200	71.7
	100.0

DATA SHEET NO. D-4

FLOTATION TEST DATA: Conditions and Reagents

Sample
Identification: Head Ore Crushed to Minus 10 Mesh

REPORT NO. CC-18297 TEST No.2

TEST PROCEDURE: The head ore was ground to minus 65 mesh and floated to produce two successive rougher flotation concentrates under different conditions. The concentrates were not cleaned. The final flotation tailing was tabled for additional information.

Grinding & Treatment				Reagents: Pounds per ton heads - (2)				
Operation 1500 Grams	Time Min.	% Solids	pH	C.S.	O.A.	M.A.A.	O.T.	
Grinding (1)	20	67	7.7	2.6	-	-	-	See page D-5 for the results of this test.
Conditioner	3	15	10.4	2.6	-	-	-	
Froth No. 1	11	15	10.4	-	1.6	0.02	-	
Froth No. 2	5	13	10.0	-	-	-	0.8	

Grinding (1)

Time, minutes 20
Classification, mesh 65
Sands reground, minutes --

Reagent Symbols:

C.S. - Caustic Soda
O.A. - Oleic Acid - Aerosol Mixture (10:1 By Weight)
M.A.A. - Methyl Amyl Alcohol
O.T. - Oleic Acid - Tergitol Mixture (4:1) Fed as an Emulsion.

SUMMARY OF RESULTS TEST NO. 2

Sample
Identification Head Ore Crushed to Minus 10 Mesh

Report No. CC-18297

	PRODUCT	ASSAYS					% RECOVERY
		% Weight	% Mn	% Fe	% Insol	% SiO_2	Mn
	Head Sample Assay	100.0	12.0	5.5	-	66.5	
	Calculated Heads	100.0	11.8	-	-		100.0
1	Froth No. 1	12.9	22.2	9.3	42.9		24.4
2	Froth No. 2	11.8	18.2	7.4	54.7		18.3
	Table Conct.	4.0	36.4	6.6	23.5		12.4
	Table Middling	11.9	17.8				18.0
	Table Sand Tailing	36.6	5.8				18.1
	Table Slime Tailing	22.8	4.6				8.8
	Combined 1 and 2	24.7	20.3	(Combined Flotation Concts.)			42.7
	Combined 1, 2 and 3	28.7	22.5	(Total conct.)			55.1

REMARKS: Regrinding of the table middling and subsequent retreatment would increase the above over all recovery but no improvement in concentrate grade could be expected.

DATA SHEET NO. D-6

FLOTATION TEST DATA: CONDITIONS AND REAGENTS

Sample
Identification Head Ore Crushed to -10 Mesh REPORT NO. CC-18297 TEST NO. 3

TEST PROCEDURE: The minus 10 mesh head ore was ground to 100 mesh and a rougher flotation concentrate produced under intense flotation conditions. The rougher concentrate was cleaned three times. The final recleaned flotation concentrate was screened into three sizes and each size assayed to show the manganese content and impurities present.

Grinding and Treatment				Reagents: Pounds per ton heads--(2)				
Operation	Time Min.	% Solids	pH	M.S.	Kero	O.A.	S.S.	NaCN
Grinding (1)	25	50	-	No Reagents in Grind				
Conditioner	6	30	6.5	5.0	27.0	10.0	-	-
Rougher Flotation	6	10	6.5	No Reagents				
Cleaner No. 1	3	-	7.0				2.0	-
Cleaner No. 2	3	-	7.2				2.0	-
Cleaner No. 3	3	-	7.4				2.0	0.5

Grinding (1)

Time, minutes 25
Classification, mesh 100
Sands reground, minutes --

(2) Reagent Symbols:

M.S. - Manganese Sulphate ($MnSO_4 \cdot 4H_2O$
Kero - Kerosene
O.A. - Vegetalbe Oleic Acid
S.S. - Sodium Silicate
NaCN - Sodium Cyanide

DATA SHEET NO. D-7

FLOTATION TEST DATA: METALLURGICAL RESULTS

Sample
Identification Head Ore Crushed to -10 Mesh

REPORT NO. CC-18297 TEST NO. 3

PRODUCT	% Weight	ASSAYS % Mn	% Fe	% Insol	% SiO_2
Head Sample Assay		12.0	5.5	-	66.5
Calculated Heads	100.00	11.8	-	-	
Recleaned Flot. Conct.	35.8	26.6	10.1	33.1	
Combined Flot, Middlings	30.3	4.9			
Flotation Tailing	33.9	2.2			

SCREEN ANALYSIS AND ASSAYS OF RECLEANED FLOT. CONCT. SIZES

-100, +200 Mesh	18.1	27.2	7.4	37.9
-200, +325 Mesh	20.6	26.8	8.0	36.0
-325 Mesh	61.3	25.0	11.0	23.9
	100.0			

PRODUCT	% Weight	% RECOVERY Mn	Fe	Insol
Flotation Feed	100.00	100.0	-	-
Recleaned Flot. Conct.	35.8	81.0	-	-
Combined Flot. Middlings	30.3	12.6	-	-
Flotation Tailing	33.9	6.4	-	-

SCREEN ANALYSIS OF Flot. Feed

Mesh	% Weight
+100	1.3
+150	4.4
+200	13.1
-200	81.2
	100.0

DISTRIBUTION OF Mn IN RECL. FLOT. CONCT. SIZES

-100, +200 Mesh	18.1	19.1	13.8	23.7
-200, +325 Mesh	20.6	21.4	16.9	25.6
-325 Mesh	61.3	59.5	69.3	50.7
	100.0			

DATA SHEET NO. D-8

FLOTATION TEST DATA: CONDITIONS AND REAGENTS

Sample
Identification Head Ore Crushed to Minus 10 Mesh

REPORT NO. CC-18297 TEST NO. 4

TEST PROCEDURE: This test was similar to Test No. 3 except a reduced amount of reagent was employed for the purpose of lowering the reagent cost and attempting to produce a higher grade concentrate at a sacrifice in recovery. The grind was 100 mesh.

Grinding and Treatment				Reagents: Poundsper ton heads--(2)					
Operation	Time Min.	% Solids	pH	M.S.	Kero	O.A.	P.O.	S.S.	NaCN
Grinding (1)	25	50	-	No reagents in grind					
Conditioner	8	30	6.5	5.0	18.0	2.5	-	-	-
Rougher Flotation	7	10	6.5	-	-	0.5	0.08	-	-
Cleaner No. 1	3	-	7.0	-	-	-	-	2.0	0.2
Cleaner No. 2	4	-	7.2	-	1.8	1.0	-	2.0	0.2

Grinding (1)

Time, minutes 25
Classification, mesh 100
Sands regound, minutes --

(2) Reagent Symbols:

M.S. - Manganese Sulphate
Kero - Kerosene
O.A. - Vegetable Oleic Acid
P.O. - Pine Oil
S.S. - Sodium Silicate
NaCN - Sodium Cyanide

DATA SHEET NO. D-9

FLOTATION TEST DATA: METALLURGICAL RESULTS

Sample
Identification Head Ore Crushed to Minus 10 Mesh

REPORT NO. CC-18297 TEST NO. 4

PRODUCT	% Weight	ASSAYS % Mn	% Fe	% Insol
Head Sample Assay		12.0	5.5	-
Calculated Head Assay	100.0	11.9		
Recleaned Flot. Conct.	14.8	32.4	9.8	29.3
Cleaner Midd No. 2	8.0	16.1		
Cleaner Midd No. 1	33.0	10.4		
Flotation Tailing	44.2	5.4		

PRODUCT	% Weight	% RECOVERY Mn
Flotation Feed	100.0	100.0
Recleaned Flot. Conct.	14.8	40.3
Cleaner Midd No. 2	8.0	10.8
Cleaner Midd No. 1	33.0	28.8
Flotation Tailing	44.2	20.1

SCREEN ANALYSIS OF

Mesh	% Weight
Same Grind as Test No. 3	

MEMBER AIME

INDUSTRIAL NON-METALLIC MINERALS A SPECIALTY

EXPLORATION

ROBERT B. McELWAINE

CONSULTING MINING GEOLOGIST

RECTOR BUILDING

P. O. Box 127

LITTLE ROCK, ARKANSAS

PHONE 2-1434

July 17, 1951

Via AIR MAIL

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 18 1951
LANDON F. ENGEL
Executive Secretary

Mr. Sam Warren
Defense Minerals Administration
Department of The Interior
Room 4070
Washington, D. C.

Dear Mr. Warren:

Enclosed please find six copies of the map for the exploration project for the Arkansas Manganese Company, Incorporated of Fort Smith, Arkansas as per our telephone conversation of today.

Thanking you for your earnest efforts to expedite this matter, I am

Cordially yours,

R. B. McElwaine

R. B. McElwaine

RBM:hc

cc: Mr. R. W. Newton, President
Arkansas Manganese Company, Inc.,
100 Professional Building
Fort Smith, Arkansas

Barnadette

ARKANSAS MANGANESE CO., INC.

OFFICES: 100 PROFESSIONAL BUILDING

TELEPHONE 8995

Fort Smith, Arkansas

OFFICERS & DIRECTORS

R. W. NEWTON
PRESIDENT

GLENN C. CLICK
VICE PRESIDENT

WESLEY ADAMS
TREASURER

VICTOR HOWARD
SECRETARY

JAMES M. TAYLOR, JR.
ASST. SECRETARY

July 14, 1951

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 13 1951
LANDON F. SIMMEL
Executive Secretary

Mr. S. Power Warren
Department of The Interior
Defense Minerals Administration
Washington, 25, D. C.

Re: DMA-1248X
Exploration Loan

Dear Mr. Warren:

Enclosed you will find an Amendment to Form MF-200 under Exhibit "A". Also, find enclosed conformed copies of Contracts covering Churn Drilling and Core Drilling, and two conformed copies of Contracts covering drifting.

Please advise us by long distance collect upon approval, so that we can start work immediately.

We sincerely trust that you find these papers in order.

Yours very truly,

ARKANSAS MANGANESE CO., INC.

By Victor Howard
Victor Howard, Secretary

VH:FK

Encls/

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 13 1951
MINERAL
Receiving Section

Defense Minerals Administration
Washington, 25, D. C.

Re: DMA-1248X
Exploration Loan
Amendment to Form MF-200 dated June 30, 1951

EXHIBIT "A" AMENDED

A summary of the estimated cost of the proposed exploration project is shown below:

3,000 feet of churn drilling @ $3.25	$9,750.00
200 feet of NX diamond coring @ $15.00	3,000.00
200 feet of drifting @ $20.00	4,000.00
Engineering and Supervisory Expense	3,000.00
Sample Containers, freight and Analyses to Bruce-Williams Laboratories, Joplin, Missouri	250.00
	$20,000.00

WESTMORELAND MANGANESE EXPLORATION PROJECT
Independence County, Arkansas

Project: DMA 2002
Hole No. 88
Elev. at collar: 660'
Depth of hole: 42'

Page Property
SE¼ of SW¼ Sec. 4, T.14N., R.7W.
Date Started: 12/4/51
Date Completed: 12/5/51

Churn Drill Hole Log

Depth	Description
0.0	Surface
5.0	Chert, clay
20.0	Brown clay, chert
25.0	Mn. trace
30.0	Mn., brown clay, chert
32.5	
42.0	

Bottomed on Plattin limestone.

ASSAYS

Section From To	Percent Manganese	Percent Iron	Percent Phosphorus
30.0-32.5	3.06	7.40	Hole Composite 1.78
32.5-35.0	2.76		
35.0-37.5	1.99		
37.5-40.0	2.18	7.20	
40.0-42.5	1.99		

WESTMORELAND MANGANESE EXPLORATION PROJECT
Independence County, Arkansas

Project: DMA 2002
Hole No. 92
Elev. at collar: 711'
Depth of hole: 52'

New Southern Hill Property
SE¼ of NW¼ Sec. 4, T.14N., R.7W.
Date Started: 12/4/51
Date Completed: 12/6/51

Churn Drill Hole Log

0.0	Surface
5.0	Bedded brown chert
15.0	Bedded red chert
35.0	Chert, brown clay
45.0	Chert, brown clay, Mn. stain
47.5	Mn. and clay
50.0	
52.0	

Bottomed on Plattin limestone.

ASSAYS

Section From To	Percent Manganese	Percent Iron	Percent Phosphorus
47.5-50.0	2.24	7.40	Hole Composite 0.96
50.0-52.0	3.22		

WESTMORELAND MANGANESE EXPLORATION PROJECT
Independence County, Arkansas

Project: DMA 2002
Hole No. 93
Elev. at collar: 713'
Depth of hole: 75'

Page Property
SE¼ of SW¼ Sec. 4, T.14N., R.7W.
Date Started: 12/5/51
Date Completed: 12/7/51

Churn Drill Hole Log

0.0 – 5.0	Surface
5.0 – 35.0	Bedded chert, clay
35.0 – 75.0	Bedded chert, brown clay

Bottomed on Kimmswick lime.

WESTMORELAND MANGANESE EXPLORATION PROJECT
Independence County, Arkansas

Project: DMA 2002
Hole No. 94
Elev. at collar: 688'
Depth of hole: 87'

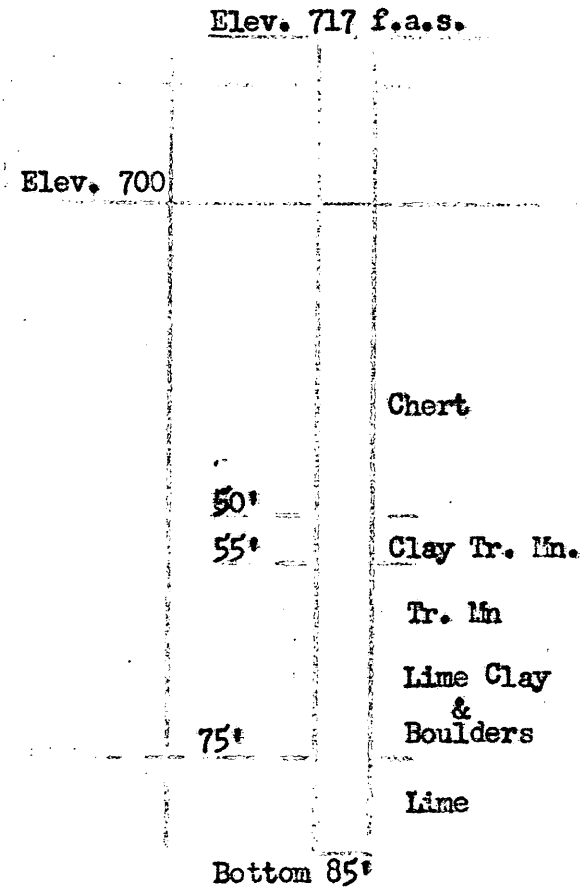
Page Property
SE¼ of SW¼ Sec. 4, T.14N., R.7W.
Date Started: 12/6/51
Date Completed: 12/7/51

Churn Drill Hole Log

0.0	Surface
5.0	Bedded chert, red clay
25.0	Bedded chert, brown clay
35.0	Bedded chert, red clay
45.0	Chert, brown clay
55.0	Dark chert, clay
70.0	Chert, dark clay
85.0	
87.0	Bottomed on Kimmswick lime.

SECTION OF CHRUN DRILL HOLE BM-1

Southern Min. & Mn. Co. Property
NE¼ -SW¼ Sec. 4, T-14-N; R-7-W.
Klondike Ridge
Location coords: 5807-N 5971-W
Started: April 5, 1951
Completed: April 12, 1951



REMARKS: From drilling the evidence indicated a lime pinnacle.

SECTION OF CHURN DRILL HOLE BM - 2

Southern Min. & Mn. Co. - Property
NE¼ - SW¼ Sec. 4, T-14-N; R-7-W.
Klondike Ridge
Location coords: 5765-N, 5523-W
Started April 6, 1951
Completed April 12, 1951

Elev. 715 f.a.s.

5'

Elev. 700'

	Chert
40'	Clay
42½'	Clay
45'	Clay
47½'	Clay
50'	Clay
52½'	Clay
55'	Clay
57½'	Clay
60'	Clay
62½'	Chert Tr. Mn
65'	Chert Tr. Mn.
67½'	Chert Tr. Mn.
70'	Chert Tr. Mn.
72½'	Clay
75'	Clay
78½'	LIME

Bottom 78½

ASSAYS

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
40	42½	2.86		
42½	45	2.98	6.50	
45	47½	2.70		
47½	50	2.52	5.20	
50	52½	2.61		
52½	55	2.01	4.50	0.54
55	57½	3.04		Comp. Hole
57½	60	2.22	5.60	
70	72½	2.52		
72½	75	2.70	8.50	

SECTION OF CHURN DRILL HOLE BK-3

Southern
Min. & Mn. Co. Property
Klondike Ridge
Location: NE$\frac{1}{4}$ SW$\frac{1}{4}$ Sec. 4, T-14N R-7-W
Location coords: 6313-N, 5879-W
Started: April 13, 1951
Completed: April 16, 1951

El. 700 Elev. 702 f.a.s.

5' Topsoil

Chert

50'

55' Clay - Tr. Mn.

Clay

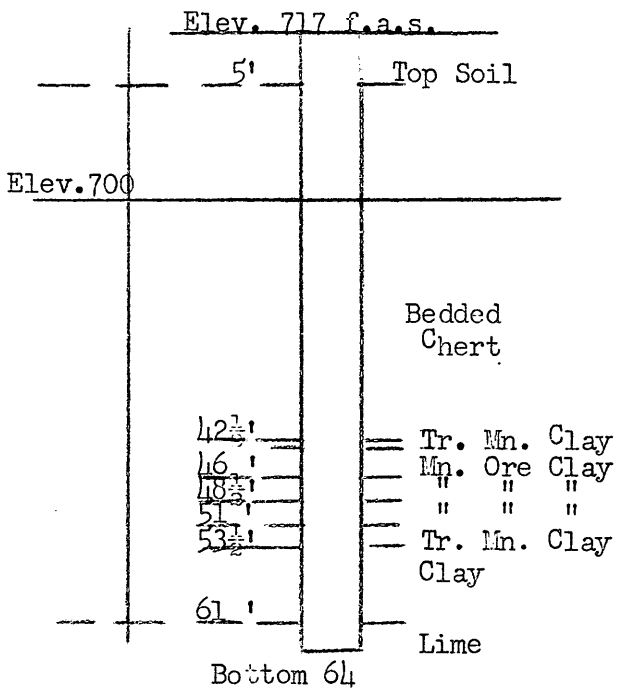
80'

Lime

Botton 85

REMARKS: No samples taken.

SECTION OF CHRIN DRILL HOLE BM-4



Southern Min. & Mn. Co. Property
Klondike Ridge
NE¼ SW¼ Sec. 4 T-14-N R-7-W
Location coords: 5912-N, 5586-W
Started: April 13, 1951
Completed: April 16, 1951

ASSAY

Section		Percent	Percent	Percent
From	To	Manganese	Iron	Phosphorus
43½	46	3.55	Comp.	
46	48½	3.68	Hole	Comp.Hole
48½	51	4.25	11.30	1.45

SECTION OF CHURN DRILL HOLE BL-5

Southern Min. & Mn. Co. Property
Klondike Ridge
NE¼ SW¼ SEC. 14 T-14N R-7-W
Location coords: 6100-N, 5664-W
Started: April 17, 1951
Completed April 18, 1951

Elev. 712 f.a.s.

5' Top soil

Elev. 700'

38'
42½'
45'
47½'

Chert

Mn. Ore Clay
Mn. Ore Clay
" " "
" " "

Clay

60'

Lime

Bottom 65

ASSAY

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
38	40	1.35		
40	42½	1.60	9.00	
42½	45	2.40		Comp. Hole
45	47½	1.87	11.80	0.77

SECTION OF CHURN DRILL HOLE EM-6

Southern Min. & Mn. Co. Property
Southern Hill
NW¼ SE¼ Sec. 4, T-14-N R-7-W
Location coords: 54880N, 4474-W
Started: April 17, 1951
Completed: April 19, 1951

Elev. 744.3 f.a.s.

5' Top Soil

Chert

El. 700'

90'
93'
95'
97½'
100'
102½'
105'
107½'
110'
112½'
115'

Clay Mn. Ore
" " "
" " "
" " "
" " "
" " "
" " "
" " "
" " "
" " "

120' Clay Chert
Lime

Bottom 123

ASSAY

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
90	93	3.80		
93	95½	3.15	9.90	
95	97½	1.83		
97½	100	1.23	5.40	
100	102½	1.31		
102½	105	1.56	4.40	
105	107½	1.44		
107½	110	1.75	4.00	
110	112½	2.11		Comp. Hole
112½	115	2.42	5.50	0.29

SECTION OF CHURN DRILL HOLE BM-7

Elev. 765 f.a.s.

	5'	Top Soil
		Chert
Elev.700'	65'	
	70 '	Clay Tr. Mn
	72½'	Clay Mn. Ore
	75'	" " "
	77½'	" " "
	80 '	" " "
	82½'	" " "
	85'	" " "
		Clay Chert
	105'	
		Lime
	Bottom 108	

Southern Min. & Mn. Co. Property
Southern Hill
NW¼ SE¼ Sec. 4, T-14-N R-7-W
Location coords: 6117-N, 3985-W
Started: April 19, 1951
Completed: April 20, 1951

ASSAY

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
70	72½	4.75		
72½	75	8.30	12.50	
75	77½	9.75		
77½	80	7.32	15.00	
80	82½	6.50		Comp. Hole
82½	85	4.29	10.40	0.36

SECTION OF CHURN DRILL HOLE BM-8

Elev. 744 f.a.s.

Southern Min. & Mn. Co. Property
Southern Hill
NW¼ SE¼ Sec. 4 T-14-N R-7-W
Location coords: 5353-N, 4045-W
Started: April 20, 1951
Completed: April 24, 1951

REMARKS: No samples taken.

	5'	Top soil
Elev. 700		
		Chert
	105'	
		Clay Tr. Mn.
	110'	
		Clay
	120'	
		Lime
	Bottom 123	

SECTION OF CHRUN DRILL HOLE BM-9

Elev. 766 f.a.s.

5' Top soil

Chert

Elev. 700

80'
82½'
85'
87½'
90'
92½'
95'
97½'
100'

Clay Tr. Mn.
Clay Mn. Ore
" " "
" " "
" " "
" " "
" " "

Clay

117½'

Lime

Bottom 120

Southern Min. & Mn. Co. Property
Southern Hill
NW¼ SE¼ Sec. 4, T-14-N R-7-W
Location coords: 5827-N, 3919-W
Started: April 23, 1951
Completed: April 25, 1951

ASSAY

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
32½	85	10.88		
85	87½	6.34	14.60	
87½	90	7.36		
90	92½	6.13	14.40	
92½	95	4.54		
95	97½	10.94		Comp. Hole
97½	100	4.93	11.40	1.38

SECTION OF CHURN DRILL HOLE BM-11

Southern Min. & Mn. Co. Property
Southern Hill
NW¼ SE¼ Sec. 4, T-14-N R-7-W
Location coords: 5650-N, 3950-W
Started April 25, 1951
Completed April 26, 1951

Elev. 763 f.a.s.

5' Top soil

Chert

47½'
50'
52½'
55'
57½'
60'

Clay Tr. Mn.
Clay Mn. Ore
" " "
" " "
Clay
Lime

Elev. 700'

Bottom 762

ASSAY

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
47½	50	3.36		
50	52½	3.06	14.40	
52½	55	2.15		Comp. Hole
55	57½	2.05	7.00	2.50

SECTION OF CHRUN DRILL HOLE BH-14

Westmoreland Mn. Corp. Property
SE¼ NE¼ Sec. 4, T-14-N R-7-W
Location coords: 6815-N, 3412-W
Started: April 26, 1951
Completed: April 30, 1951

Elev. 759 f.a.s.

5' Top soil

Chert

20'
22½'
25'
27½'
30'

Clay Tr. Mn.
" " "
" " "
Clay
Lime

Bottom 32½

Elev. 700

ASSAY

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
22½	25	1.69		Comp.Hole
25	27½	1.62	8.00	1.11

SECTION OF CHURN DRILL HOLE BI-15

Elev. 763 f.a.s.

5' Top Soil

Chert

Elev. 700

150'

Clay Tr. Mn.

157½'

160'

Clay Mn. Ore

162½'

" " "

165'

" " "

Lime - Botto 168

Southern Min. & Mn. Co. Property
NW¼ SE¼ Sec. 4, T-14N R-7-W
Location coords: 6276-N, 3908-W
Started: April 30, 1951
Completed: May 3, 1951

ASSAY

Section From	Section To	Percent Manganese	Percent Iron	Percent Phosphorus
157½	160	2.30		
160	162½	3.00	7.80	Comp. Hole
162½	165	2.60	8.50	1.69

ARKANSAS MANGANESE CO., INC.

OFFICES: 100 PROFESSIONAL BUILDING
TELEPHONE 8995
Fort Smith, Arkansas

OFFICERS & DIRECTORS
R. W. NEWTON
PRESIDENT
GLENN C. CLICK
VICE PRESIDENT
WESLEY ADAMS
TREASURER
VICTOR HOWARD
SECRETARY
JAMES M. TAYLOR, JR.
ASST. SECRETARY

July 7, 1951

Mr. S. Power Warren
Department of The Interior
Defense Minerals Administration
Washington, 25, D.C.

Re: DMA-1248X
Exploration Loan

Dear Mr. Warren:

Enclosed you will find Form MF-200 executed in sextiplicate with Exhibits A, C and D attached. There were no Exhibits B and E. You will also find one Map of our area, with a circle in red showing the claims to be explored. You will also find one Map covering the work to be done on the project, showing the drill holes and the drifts to be made. If you need five additional copies of this Map, please advise us and we will secure these additional five copies, but this is the only one we have at present.

We sincerely trust that this is the information you need to complete this project. Hoping to hear from you at an early date, we are

Yours very truly,

ARKANSAS MANGANESE CO., INC.

By Victor Howard
Victor Howard, Secretary

VH:FK

Encls/

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 9 - 1951
LANDON F. STROBEL
Executive Secretary

Arkansas Manganese Co., Inc.
Fort Smith, Arkansas

D. M. A. Docket No. DMA-1248-X

EXHIBIT "A"

Description of exploration project and the work to be performed.

1. Drilling (To be done under contract)

This should consist of churn drill holes to the top of the ore zone, casing of the holes with NX casing and diamond coring with NX size bits through the ore zone. This work is described in the geologic and engineering report accompanying the applicant's original application for an exploration loan.

The location and spacing of the drill holes can be determined to the best advantage as the drilling progresses and it may prove expedient to vary from the tentative layout of the holes as outlined on the attached map. The churn drilling is not to exceed an approximate total of 3,000 feet. The diamond core drilling is not to exceed an approximate total of 200 feet with the following exception: If the diamond core drilling is not too excessive in cost and sufficient money is available toward the completion of the project, it may be desirable to drill one inclined diamond core drill hole on the north limb of the syncline as indicated on the attached map. This would be contingent upon agreement after consultation with Government representatives.

2. Drifting

This should consist of two tunnels totaling about 200 feet of drifting. One is the extension of the new inclined adit down the dip of M-horizon an additional 80 feet as described in the above mentioned geologic and engineering report. The other tunnel proposed is at the outcrop of M-horizon on the north limb of the syncline. It is to be driven 100 feet into the mountain side and along the strike of the ore horizon and two 10 foot crosscuts are to be made near the heading with one being to the right and one to the left of the main drift. Both tunnel locations are indicated on the attached map.

EXHIBIT "A" CONTINUED

3. Other

Additional work consisting of sampling, analyses, metallurgical investigation, and preparation of a geologic and engineering report is to be done.

A summary of the estimated cost of the proposed exploration project is shown below:

3,000 feet of churn drilling @ $3.00	$9,000.00
200 feet of NX diamond coring @ $15.00	3,000.00
200 feet of drifting @ $15.00	3,000.00
Engineering	2,000.00
Miscellaneous and contingent expense	2,000.00
Metallurgical expense	700.00
Sample containers, freight and analyses	300.00
	$ 20,000.00

It might prove feasible and desirable to do more or less drilling or drifting than that outlined above and thus some variance from the schedule may be of benefit to the project. This would be based upon agreement with representatives of the Government as to the advisability of varying from the general schedule as set out above.

Arkansas Manganese Company, Inc.
Fort Smith, Arkansas
DMA Docket No. DMA - 1248 - X

EXHIBIT "C"

Operating equipment to be rented, purchased, or furnished by the operator.

	Rental for two months
1. Equipment to be rented	
(a) Rubber mounted, portable, diesel driven 220 C.F.M. displacement air compressor	$680.00
(b) 3½" automatic air drifter, air and water hose, drill steel, post and arm, and cross bar	350.00
(c) One mine car	50.00
2. Equipment to be purchased	
(a) Bits (for rock drill)	100.00
(b) Minor tools, parts, etc.	100.00
(c) Blasting machine and galvanmeter	75.25

	Rental value for two months
3. Equipment to be furnished by operator.	
(a) Air hoist	100.00
(b) Pipe, rail, hand tools, water tank, pump, etc.	100.00
(c) Schramm portable air compressor (105 C.F.M. displacement for auxiliary service)	200.00

Arkansas Manganese Company, Inc.
Fort Smith, Arkansas
DMA Docket No. DMA - 1248-X

EXHIBIT "D"

Itemized schedule of labor and supervisors.

1. Experienced machine operator (will act as mine foreman) per hour $2.00

2. Two muckers, per hour each ---------- 1.00

3. One sampler (for drilling project) per hour ---------- 1.00

4. Operator's general manager, per month ---------- 500.00

5. Consulting mining geologist (To supervise and direct drilling and sampling including locating of holes as drilling proceeds, handle samples for analyses, do necessary mapping, advise and consult on problems connected with the drifting, consult on metallurgical problems and handle correspondence connected with same, and prepare geologic and engineering report upon completion of project.) Will contract to do this job for $2,000.00.

FILE COPY
SURNAME:

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

Holderer
Strobel

June 29, 1951

Hon. Boyd Tackett
House of Representatives
Washington 25, D. C.

Dear Mr. Tackett:

I have your letter of June 26 regarding application of the Arkansas Manganese Company, Inc. for an exploration lean under Docket No. DMA-1248-x

This application is under consideration but at the moment we are not in a position to say what the final outcome for it will be. We are very much interested in securing manganese from Arkansas and our engineers are giving very serious attention to the type of deposits covered in the application of the Arkansas Manganese Company, as well as the ore bearing clay beds near Batesville.

Sincerely yours,

JAMES BOYD
Administrator

GBHolderer:mem

cc: Adm. Reading File
Mr. Strobel
Mr. Holderer
Dep.Admin. - rm. 4617
Files

BOYD TACKETT
4TH DIST., ARKANSAS

WASHINGTON ADDRESS:
1517 HOUSE OFFICE BUILDING

~~LANDON F. STROBEL~~
Holdrum

COMMITTEE ON
EDUCATION AND LABOR

SECRETARIES:
PARKER WESTBROOK
RUTH COLLINS
MARY E. PERKINS

Congress of the United States
House of Representatives
Washington

Marsh - Copy - Control
(No attachments)
6/29/51

Approved by Holdrum 6/29 JB

June 26, 1951.

Mr. Landon F. Strobel
Executive Secretary
Department of the Interior
Defense Minerals Administration
Washington 25, D. C.

Subject: DMA-1248X
Re: Exploration Loan

Dear Mr. Strobel:

May I take this opportunity to express my interest in the application of the Arkansas Manganese Company, Inc. for an exploration loan under the Defense Production Act of 1950.

I am acquainted with the members of this company and am hopeful that the loan can be approved. I feel optimistic about the successful mining of manganese ore in the area in which exploration is to be conducted and I feel that this work will be to the better interest of our national defense.

Yours sincerely,

Boyd Tackett

Boyd Tackett

mp

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUN 28 1951
LANDON F. STROBEL
Executive Secretary

BUREAU OF MINES
MAIL ROOM
WASHINGTON, D. C.
JUN 27 12 54 PM '51

Called ~~Howard~~ Vreton in Ft Smith on July 2-51

~~He prom~~ Sent him five copies of the Exploration Project Contract. He promised to fill them out and send us

Got contracts from ~~Howard~~ Victor Howard but found them inadequate. ~~He~~ Called Mr O'Elwaine in Little Rock and suggested contracts for churndrilling, core drilling and drifting plus a sum for supervision and engineering. He was O.K.

Letter from Howard. Made up Exhibits. Asked Mr Elwaine for maps this on July 18

Betty has corrected copy.

Memo being written for Mitt July 19-51.

10-51

6/22/51

Index - DMA-1248-X Manganese.

Arkansas Manganese Co.
Fort Smith, Arkansas

For approval.

1. 2 - Copies MF 100
2. 2 - " - 103
3. 2 - " Report by R.B. McElwaine

FILE COPY
SURNAME:

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

May 28, 1951

Subject: DMA-1248X
Re: Exploration Loan

Mr. Victor Howard
Secretary
Arkansas Manganese Company, Inc.
100 Professional Building
Fort Smith, Arkansas

My dear Mr. Howard:

Receipt is acknowledged of your application and attachments of May 16, 1951 for an exploration loan under the Defense Production Act of 1950.

The application was assigned Docket Number DMA-1248X and was referred to Mr. P. R. Bradley, Chief, Manganese Branch on May 25, 1951.

In any future correspondence relating to your application, kindly refer to DMA-1248X.

Sincerely yours,

LANDON F. STROBEL
jhs

Landon F. Strobel
Executive Secretary

LFSTROBEL:jhs
cc: Strobel-2
Files
Bradley
Lyon

?

6/5/51

Defense Minerals Administration

Review of Application for Exploration Assistance

For approval

Docket No. 1248-X

Commodity Manganese

Total Amount $20,000—

Govt. Participation $15,000

1. Name and Address of Applicant Arkansas Manganese Corp, 100 Professional Bg, Fort Smith, Arkansas.

2. Location of Property Approx. NE¼ SE¼ Sec 28 T3S R30W Polk Co. Arkansas.

3. Mineral or metal Manganese Is it listed in Section 9 of MO-5?

If not, application will be rejected.

4. Geologic probability of discovery—based on data in application (question #16, 17, 18, 20 and 22)*

Mines or Survey reports, etc., do you rate chances:

a) Good ✓

b) Poor

c) None

d) Don't know—needs field examination

e) Is there an alternative and favorable project?
(If so, attach an explanation)

5. Is the applicant's right to the property clearly stated? Unpatented mining claim held by company. (question 5, 6, 7)

6. If applicant is a lessee, is a copy of the lease attached? —

Does the lease have sufficient time to run to cover a future productive period? —

*question numbers are those of MF-103

7. Are subordination agreements necessary? No

a) MF-201? _____

b) MF-202 _____

8. From the data presented, does the proposed project appear feasible from the point of view of:

a) Available manpower yes

b) Equipment and supplies _____
(Question 14 plus general knowledge of availability)*

c) Accessibility (question 12)* yes

d) Water (question 13)* yes

e) Power (question 13)* yes

Is a field check needed on any of these points? No

9. Does the experience of the applicant appear to be adequate to assure that he can properly conduct the proposed project? (question 4)* _____

Is a field check needed on this point? No

10. Exhibit A. (questions 21 and 22)*

a) Is the project adequately described? yes

If not, are there sufficient data given so that you can describe the project? _____ If so, attach a draft.

b) Is there an adequate map or sketch of the proposed work? yes

c) Is the proposed work "exploration" under the definition of Section 8, MO-5? yes

If not, what part of it is? _____

Is this part a worthwhile exploration project? yes

d) Are the cost estimates detailed? yes (See #2 p. 26, att. report)

Can they be summarized, as on page 2 of Procedural Instruction 5-A, from the available data?_____ If so, attach a draft.

e) Are the cost estimates reasonable?_____

f) Should more information be requested from applicant?_____

g) Is a field examination necessary to complete Exhibit A?_____

11. Exhibit B (question 23-d)*

a) Is it applicable?_____

b) If so, are sufficient data furnished?_____ If so, attach a draft.

c) Is a field check needed?_____

12. Exhibit C (question 23-e, f and g)*

a) Is it applicable?_____

b) Sufficient data?_____ If so, attach a draft.

c) Are rents and charges reasonable?_____

d) Is a field check needed?_____ _____

13. Exhibit D (question 23-a, b)*

a) Are there sufficient data?_____

b) Is the schedule adequate for the work proposed?_____

c) Is the schedule excessive for the work proposed?_____

d) Are the proposed wages and salaries reasonable?_____

e) Is a field check needed?_____

14. Exhibit E (question 23-c)*

a) Is it applicable? _____

b) Sufficient data? _____

c) Reasonable? _____

d) Field check needed? _____

15. In your judgment, can the proposed work be done in the proposed time? applicant asks 90 days

(All exploration must be completed within two years)

16. If field examination is not needed, attach your recommendation.

17. If field examination is needed, do you have any special instructions for the field team not indicated by your answers to the foregoing question? Drilling and sampling must be done by same outfit meeting the approval of local DMA representatives.

Reviewed by: S. B. Holdeen

Approved Tom Lyon

Date 6/22/51

97692

MAY 21 1951

Dma-1248X

ARKANSAS MANGANESE CO., INC.

OFFICES: 100 PROFESSIONAL BUILDING

TELEPHONE 8995

Fort Smith, Arkansas

OFFICERS & DIRECTORS

R. W. NEWTON
PRESIDENT

GLENN C. CLICK
VICE PRESIDENT

WESLEY ADAMS
TREASURER

VICTOR HOWARD
SECRETARY

JAMES M. TAYLOR, JR.
ASST. SECRETARY

May 18, 1951

The Defense Minerals Administration
Regional No. 6 Defense Office
221 West 3rd Street
Joplin, Missouri

Attn: Dave Gallagher

Gentlemen:

Enclosed you will find Form MF-100 and Form MF-103 Filed in Quadruplicate.

You will also find reports from R. B. McElwaine, Consulting Mining Geoligist, who has given reports on the application for experation loans.

If these papers are not in order, will you please advise us, so that we can give you any further information that you need.

Thanking you very much, we are

Very truly yours,

ARKANSAS MANGANESE COMPANY, INC.

Victor Howard

Victor Howard, Secretary

VH/pg
Encls.

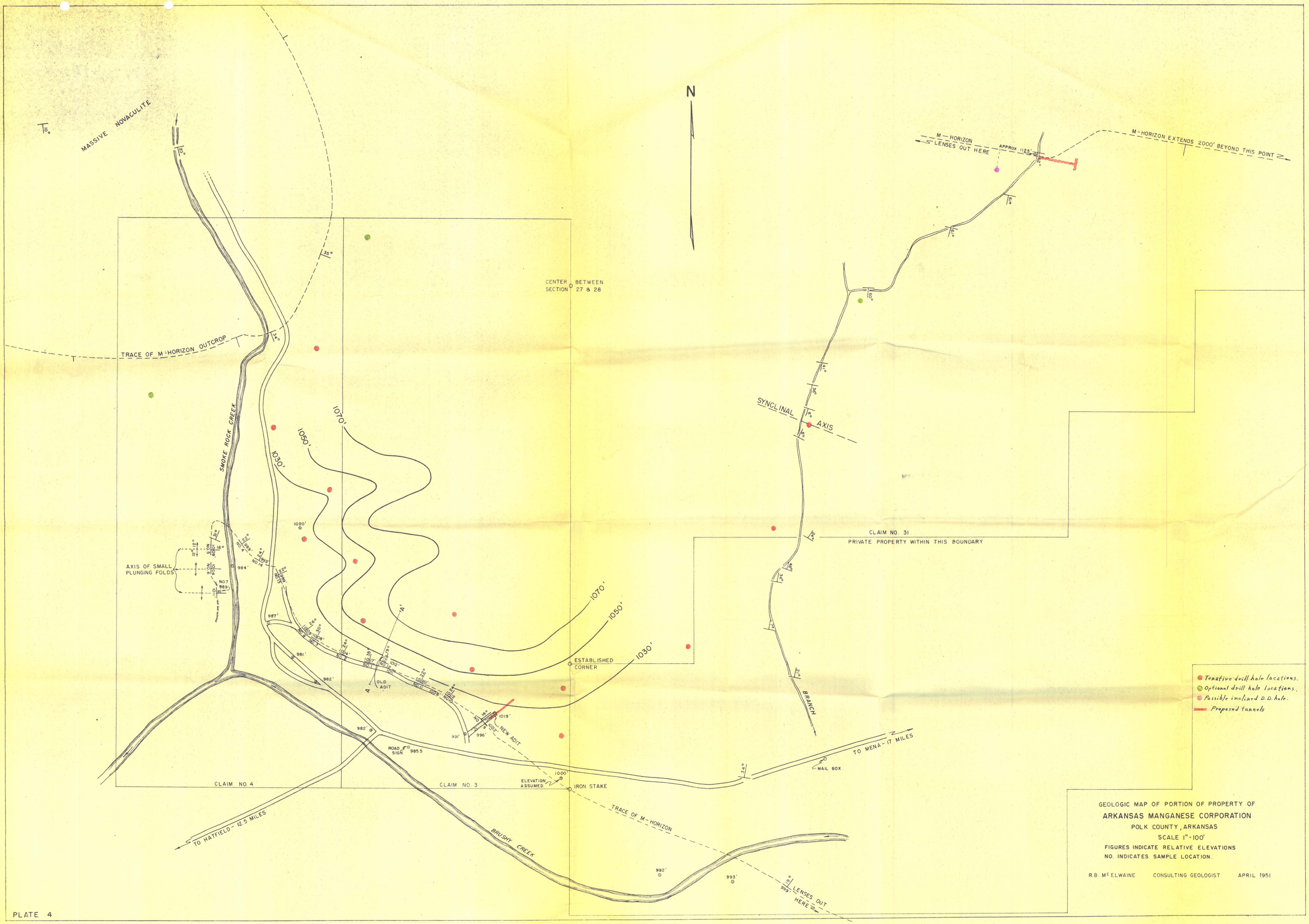
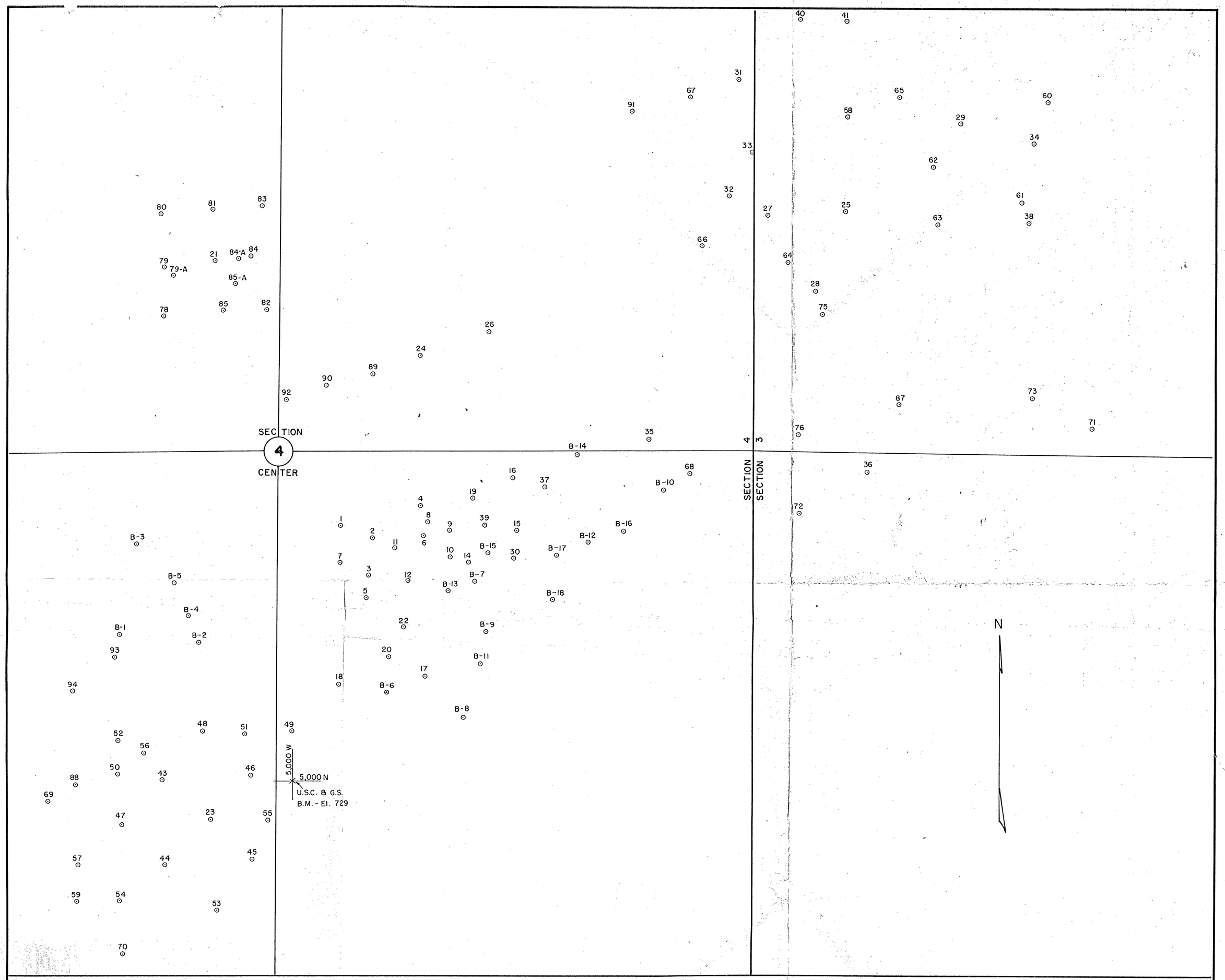

N
MASSIVE NOVACULITE
TRACE OF M-HORIZON OUTCROP
SMOKE ROCK CREEK
CENTER BETWEEN SECTION 27 & 28
1070'
1050'
1030'
1020'
AXIS OF SMALL PLUNGING FOLDS
NO.7
989'
984'
987'
981'
982'
991'
996'
1019'
1002'
OLD ADIT
NEW ADIT
A
A'
ESTABLISHED CORNER
ROAD SIGN
985.5
CLAIM NO. 4
CLAIM NO. 3
ELEVATION ASSUMED
1000'
IRON STAKE
TRACE OF M-HORIZON
BRUSHY CREEK
TO HATFIELD - 12.5 MILES
992'
993'
LENSES OUT HERE
M-HORIZON LENSES OUT HERE
APPROX. 1125'
M-HORIZON EXTENDS 2000' BEYOND THIS POINT
SYNCLINAL AXIS
CLAIM NO. 31
PRIVATE PROPERTY WITHIN THIS BOUNDARY
BRANCH
MAIL BOX
TO MENA - 17 MILES
Tentative drill hole locations.
Optional drill hole locations.
Possible inclined D.D. hole.
Proposed tunnels
GEOLOGIC MAP OF PORTION OF PROPERTY OF
ARKANSAS MANGANESE CORPORATION
POLK COUNTY, ARKANSAS
SCALE 1"-100'
FIGURES INDICATE RELATIVE ELEVATIONS
NO. INDICATES SAMPLE LOCATION.
R.B. McELWAINE CONSULTING GEOLOGIST APRIL 1951

PLATE 4



LEGEND

⊙ 00 PROJECT DRILL HOLES

⊙ B-00 BUREAU OF MINES DRILL HOLE

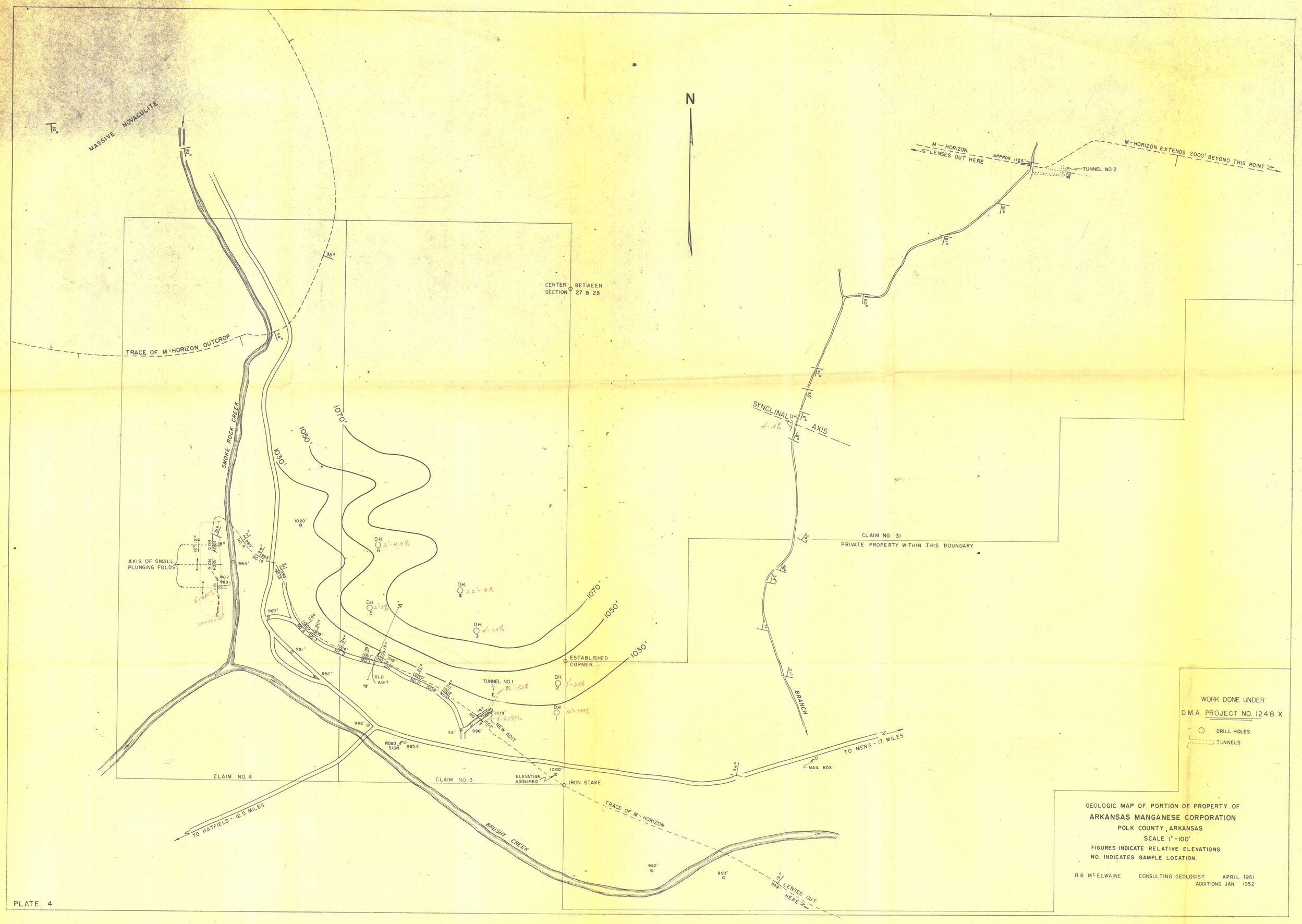
SCALE 1" = 300'

WESTMORELAND MANGANESE CORPORATION
DRILL HOLE LOCATION MAP

Portions of sections 3 & 4, T14N, R7W, Independence County, Arkansas showing test holes drilled under D.M.A. Exploration projects No. 197-X and No. 2002. Also U.S. Bureau of Mines drill holes of 1951. All holes plotted from co-ordinates furnished by U.S. Bureau of Mines. Section divisions plotted from Mehlburger map of May, 1951

R.B. McElwaine
Consulting Mining Geologist

Little Rock, Arkansas
January, 1952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987'
981'
982'
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996'
1019'
1000'
992'
993'
995'
DH 6 2'-4.9%
DH 5 2'-5%
DH 4 1.2'-9%
DH 3 4'-7.4%
DH 2 7'-3.2%
DH 1 12'-1.89%
OLD ADIT
TUNNEL NO.1
7½'-5.3%
3'-6.7% Mn
NEW ADIT
ESTABLISHED CORNER
ROAD SIGN 985.5
ELEVATION ASSUMED
IRON STAKE
CLAIM NO. 4
CLAIM NO. 3
TO HATFIELD - 12.5 MILES
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TUNNEL NO. 2
M-HORIZON EXTENDS 2000' BEYOND THIS POINT
SYNCLINAL AXIS
DH 7 14'-.5%
CLAIM NO. 31
PRIVATE PROPERTY WITHIN THIS BOUNDARY
BRANCH
TO MENA - 17 MILES
MAIL BOX
WORK DONE UNDER
D.M.A. PROJECT NO. 1248 X
DRILL HOLES
TUNNELS
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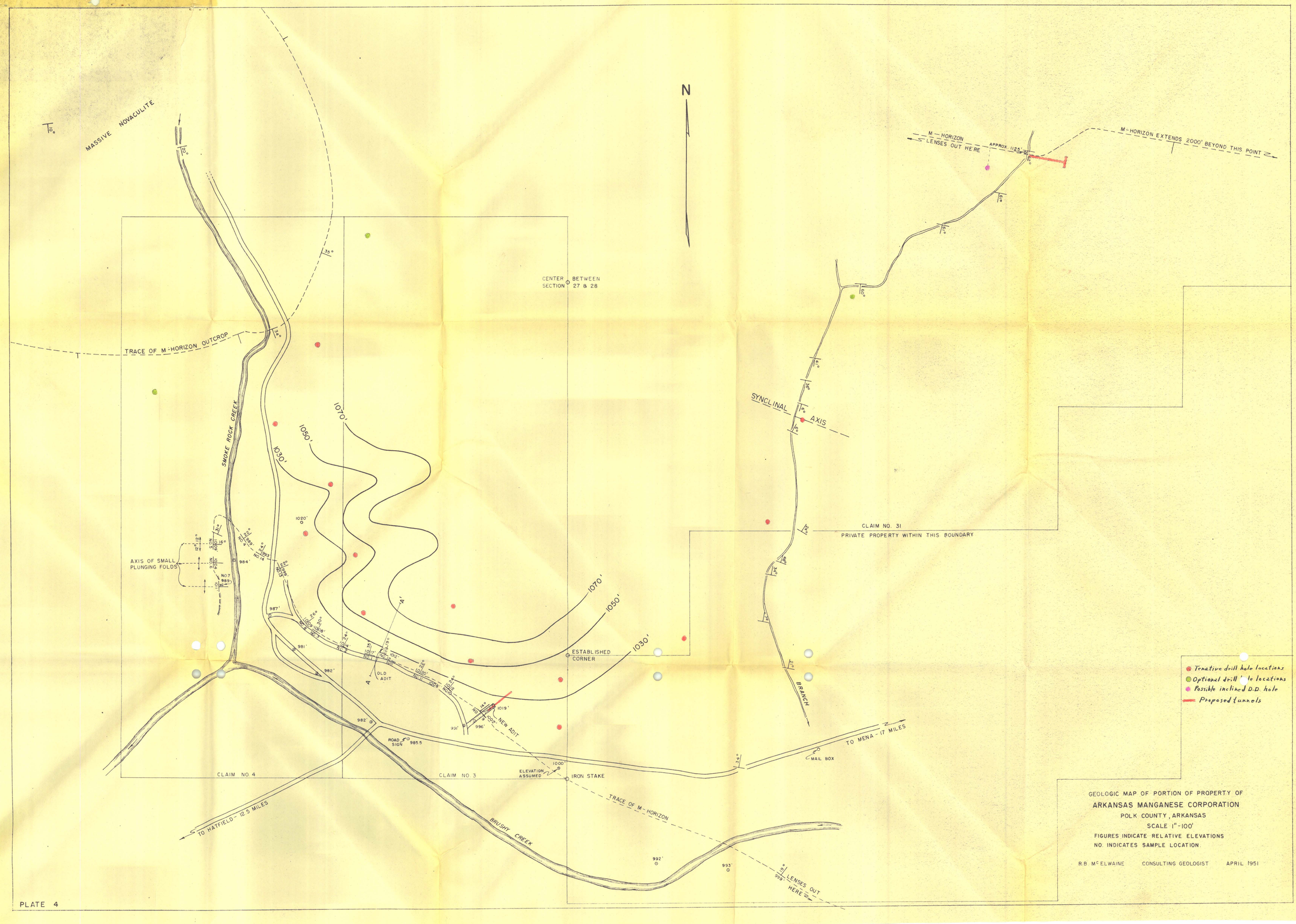
R.B. McELWAINE CONSULTING GEOLOGIST APRIL 1951
ADDITIONS JAN 1952

PLATE 4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