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MME Form 7
(10-58)

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May 29, 1963

Memorandum

To: Director, Office of Minerals Exploration

From: F. M. Murphy, Mining Engineer
Division of Minerals

Subject: ARA Technical Assistance Proposal - Cuyuna Range Mineral Research

With reference to the report by the Director of the U. S. Bureau of Mines, which mentions (pages 2 and 3) that if the Applicant desires to explore its property for iron and manganese, the request should be made to OME, rather than ARA.

In February 1952, Adams Brothers Company of Duluth, Minnesota, submitted three applications to Defense Minerals Exploration Administration proposing exploration and metallurgical research on manganiferous materials. The applications, DMEA-2404-05-06, covered three sections of land on the Cuyuna Range.

In summary, the applications were denied because there was no economically feasible method whereby the iron and manganese could be extracted from the low grade material of the Cuyuna Range and, moreover, the proven and indicated reserves of this type of material on the Range were estimated at 500,000,000 tons.

In view of the estimated large reserves, this agency should not encourage the Cuyuna Range Minerals Research, Inc. to request further exploration in the area until such time as a feasible method has been found which would make such material exploitable on a commercial basis.

F. M. Murphy

FMMurphy/mm
5/29/63
cc: DMEA-2404
DMEA-2405
DMEA-2406
Director's Reading File
Mr. Murphy

43683

ADAMS BROTHERS COMPANY

12th Floor Fidelity Building

Duluth 2, Minnesota

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
DMEA
JUL 31 1952

July 25, 1952

United States
Department of the Interior
Defense Minerals Exploration Administration
Washington 25, D. C.

Re: Docket No. DMEA 2404-SE¼, SE¼, Sec. 20, T. 47N., R. 29N.
" " " 2405 NW¼, Sec. 29, T. 47N., R. 29N.
" " " 2406 SE¼, NE¼, Sec. 36, T. 47N., R. 29N.
Manganese, Crow Wing County, Minnesota

Gentlemen:

Three applications for assistance to explore for manganese on the Cuyuna range, Crow Wing County, Minnesota, pursuant to Mineral Order 5, under Defense Production Act of 1950, were made February 1, 1952, Your office assigned the above numbers to these applications.

The applications were denied by letter May 15, 1952.

We hereby request reconsideration of these applications, and submit the following in support of our request.

Yours truly,

ADAMS BROTHERS COMPANY

By Clyde M Pearce
Clyde M. Pearce

CMP:aw

CUYUNA RANGE MANGANESE IN THE STEEL INDUSTRY

The following paragraph copied from the 1948 edition of the "Minerals Yearbook" published by the United States Bureau of Mines in 1950 illustrates the critical position of the United States steel industry in regard to manganese.

"High requirements for manganese ore, coupled with dwindling supplies from some of the important world sources of this strategic commodity, caused increasing alarm in industry and Government during 1948. The demand was met only by reducing industry stocks by 27 percent. Without an early remedy to this situation, serious losses in steel production will result. All possible sources of manganese ore were reappraised during the year to determine what actions could be taken to increase supply to meet industrial demand, with a surplus large enough to permit the increase of industry inventories and accumulation in the National Strategic Stock Pile."

Manganese is an essential element in the production of pig iron and in the subsequent refining of the pig iron into steel. By the addition of manganiferous iron ore to the blast furnace charge, it is possible to produce pig iron containing from 1 to 2 percent of manganese. The manganese in the pig iron assists in the removal of sulphur in the blast furnace as well as in the subsequent steel making process by which the pig iron is converted to steel. Although a portion of the manganese in the pig iron is retained in the finished steel, additional manganese must be added in the form of a high grade alloy (80 percent manganese) to meet the manganese specifications for a particular steel product. In brief, we need manganese which can be derived from manganiferous iron ore (5 to 10 percent manganese) and we also need it in the form of an 80 percent alloy which can only be made from ores containing from 45 to 50 percent manganese.

Both uses of manganese are important and vital in our present

methods of steel production. It is important, therefore to explore our domestic reserves of manganese bearing minerals to provide an ample supply of manganiferous iron ore and also to have complete information on the chemical and mineralogical make up of the deposits to study ways and means for producing wherever possible ferromanganese, the 80 percent manganese alloy. Since our domestic reserves of material for making the 80 percent alloy are totally inadequate, the most critical problem is to obtain accurate information on the amount and character of domestic deposits and on the basis of such information proceed to develop processes for the production of ferromanganese.

The inadequacy of the domestic production of manganese for ferromanganese, and thereby for the steel industry, is illustrated in Table No. 1 below. A yearly average of 1,204,800 tons of manganese ore was used in the manufacture of ferromanganese in 1944 to 1948 inclusive, but only 104,074 tons or 8.6 percent of this was produced in the United States.

TABLE NO. 1

Ferromanganese produced in the United States and metalliferous materials consumed in its manufacture, 1944-48.

	Ferromanganese produced	Materials consumed (short tons)			
Year	Short tons	Manganese ore (35 percent or more Mn, natural)		Iron and manganiferous iron ores	Manganese ore used per ton of ferromanganese made (short tons)
		Foreign	Domestic		
1944	702,632	1,224,878	130,886	1,985	1,930
1945	619,760	1,111,075	120,420	5,364	1.987
1946	491,973	883,383	80,377	4,829	1.959
1947	614,626	1,075,043	109,987	1,340	1.928
1948	647,617	1,209,249	78,702	5,930	1.989

"Minerals Yearbook 1948" Page 777

The average yearly import of manganese ore from 1944 to 1948 inclusive was 1,100,726 tons or 91.4 percent of the demand of the steel industry, and of this 1,100,726 tons, 1,067,810 tons, or 97 percent was transported by water. Only 32,916 tons, or 3 percent, that from Mexico, could be brought in overland in an emergency. See Table No. 2 below:

TABLE NO. 2

Manganese ore used in manufacture of ferromanganese in the United States 1944-1948, by source of ore.

Source of Ore	1944 Gross weight (short tons)	1945 Gross weight (short tons)	1946 Gross weight (short tons)	1947 Gross weight (short tons)	1948 Gross weight (short tons)
Domestic	130,886	120,420	80,377	109,987	78,702
Foreign					
Africa	290,684	280,264	323,225	313,027	386,503
Brazil	227,410	275,117	161,456	139,300	159,668
Chile	464	5,498	2,194	8,298	5,195
Cuba	241,582	257,521	165,951	74,102	35,328
India	409,563	258,432	207,769	369,101	304,607
Mexico	46,495	21,791	22,492	33,382	40,420
New Zealand	536	-	-	-	-
Philippines, Republic of	8,144	-	-	2,196	7,763
U.S.S.R.	-	12,452	296	135,637	269,765
Grand Total	1,355,764	1,231,495	963,760	1,185,030	1,287,951
Mn. content, natural (%)	46.28	46.43	47.23	48.14	46.61

"Minerals Yearbook 1948" Page 777

Enemy submarines may stop all imports by water in time of war. Mines being developed in Labrador will produce some manganese, but this also will be water borne in the St. Lawrence River and subject to submarine attack. A reserve of manganese to supply the demand for many years can be developed on the Cuyuna range of Minnesota.

The ores of manganese are generally divided into three classifications; (1) "Manganese Ore" which contains 35 percent or more manganese, (2) "Ferruginous Manganese Ore" which contains 10 to 35 percent manganese, and (3) "Manganiferous Iron Ore" which contains 5 to 10 percent manganese.

The importance of Minnesota and the Cuyuna range, where the manganiferous ore is produced, to the production of manganese in the United States is shown in the following No. 3 and 4 tables. It is also worthy of note that, although the Cuyuna range produced 81 percent of the ores of manganese tonnage wise, it produced only 44 percent of the manganese content. It is also worthy of note that none of the Cuyuna range ores are used in the production of ferromanganese.

TABLE NO. 3.

Manganiferous iron ore shipped from mines in the United States, 1944-1948, by States, in short tons.

State	1944	1945	1946	1947	1948
Michigan	45,689	1,680	--	--	--
Minnesota	1,144,787	1,406,847	1,070,694	1,044,961	1,198,523
Total	1,190,476	1,408,527	1,070,694	1,044,961	1,198,523

"Minerals Yearbook" 1948, page 771.

TABLE NO. 4.

Manganese and manganiferous ores shipped from mines in the United States in 1948, by States.

	TOTAL SHORT TONS	
	Gross weight	Manganese content
Manganese ore:[1]		
Arizona	240	115
Arkansas	212	104
Montana	130,184	75,204
Tennessee	37	21
Virginia	427	172
TOTAL	131,100	75,616
Ferruginous manganese ore:[3]		
Arkansas	1,165	349
Montana	4,135	992
Nevada	8,707	2,264
New Mexico	122,879	12,779
Utah	2,694	821
Virginia	2,462	610
TOTAL	142,042	17,815
Manganiferous iron ore:[4]		
Minnesota	1,198,523	72,257

Note: 1. Containing 35 percent or more manganese (natural).
3. Containing 10 to 35 percent manganese (natural).
4. Containing 5 to 10 percent manganese (natural).
"Minerals Yearbook" 1948, page 773

Cuyuna range ores of manganese as mined today are of the manganiferous grade occuring in the oxidized areas of the iron and manganese bearing slates of Cuyuna range iron formation. Manganiferous ore has a very definite place in the steel industry as it is used, in its natural condition, or as a simple concentrate, as part of the blast furnace charge to furnish the manganese necessary for the chemical reactions in the blast furnace. The manganiferous ores are not inexhaustable and should be preserved for their present use. Only a small part, about five percent, of the manganese required in the steel industry is provided in the manganiferous ores.

The unoxidized carbonate slates on the Cuyuna range are an important potential source of manganese in addition to the manganiferous ores.

The following tables illustrate the small percentage of manganese ore produced in the United States, about 9.5 percent, in relation to that imported, and the distribution of the known domestic deposits.

TABLE NO. 5

Ratio of manganese used in pounds per short ton of steel manufactured from 1945 through 1949.

Year	Total mine shipments (U.S.)	General imports (Foreign)	Ferro-manganese	Spiegel-eisen	Silico-manganese	Manganese ore used directly	Total manganese used
1945	182,337	1,461,945 1/	12.0	0.6	0.9	0.1	13.6 2/
1946	143,635	1,749,223 1/	11.0	.5	1.0	.1	12.7 2/
1947	131,627	1,541,818 1/	11.7	.4	1.0	.1	13.2 2/
1948	131,100	1,256,597 1/	11.3	.3	1.0	.1	12.7 2/
1949	126,135	1,544,526 1/	11.8	.3	1.0	.1	13.2 2/

1/ Does not include amount of ore imported in form of ferromanganese and spiegeleisen.
2/ These data apply to consumption of manganese in the manufacture of steel ingots and that part of steel castings manufactured by companies that also produce steel ingots.

Paper by W. E. Lewis, U. S. B. of M., Hibbing, Minnesota, 4/5/51

Note: Mine shipments and general imports above are in short tons.

TABLE NO. 6

The ten largest manganese deposits of the United States exclusive of the CUYUNA RANGE in order of their content of metallic manganese (from U.S.G.S.)

	District	Ore, tons	Metallic manganese, tons	Average grade, percent
1.	South Dakota, Chamberlain district	77,000,000 1/	12,000,000 1/	15-1/2
2.	Maine, Aroostook County	200-300 million 2/ 15,000,000 3/	10,000,000 2/ 600,000 3/	4∓ 4∓
3.	Arizona, Artillery Peak	195,000,000 4/ 15,000,000 5/	7,500,000 4/ 975,000 5/	4∓ 6.5
4.	North and South Carolina	25,000,000 6/	1,000,000 6/	3-4?
5.	Montana, Butte district	5,000,000	850,000	17∓
6.	Colorado, Leadville dist.	4,000,000 6/	600,000 6/	15
7.	Nevada, Three Kids dist.	5,500,000	500,000	10
8.	Arkansas, Batesville dist.	1,725,000	439,000	25∓
9.	Nevada, Pioche district	4,000,000 6/	400,000 6/	10
10.	Montana, Philipsburg dist.	800,000	180,000	22.5

1/ Includes only the nodules beneath strippable cover. Contained in 2,000,000,000 tons of shale averaging 1½ percent manganese.

2/ Includes the entire Maple-Hovey ore body to a depth of 1,400 feet.

3/ Includes open pit ore only to depth of 200 feet.

4/ All types of ore.

5/ Hard ore only.

6/ Crude estimate, not based on exploration.

Paper by W. E. Lewis, U.S.B. of M., Hibbing, Minnesota, 4/5/51.

TABLE NO. 7

The four largest manganese deposits of the United States in order of their content of metallic manganese

District	Ore, tons	Metallic manganese, tons	Average grade, percent
1. MINNESOTA, CUYUNA RANGE	500,000,000 2/	10,000,000-25,000,000	2-10
2. South Dakota, Chamberlain district 7/	77,000,000 1/	12,000,000 1/	15-½
3. Maine, Aroostook County 7/	200-300 million 3/ 15,000,000 4/	10,000,000 3/ 600,000 4/	4∓ 4∓
4. Arizona, Artillery Peak 7/	195,000,000 5/ 15,000,000 6/	7,500,000 5/ 975,000 6/	4∓ 6.5

1/ Includes only the nodules beneath strippable cover. Contained in 2,000,000,000 tons of shale averaging 1½ percent manganese.

2/ Mostly open pit ore, unoxidized carbonate slate, lean oxidized material.

3/ Includes the entire Maple-Hovey ore body to a depth of 1,400 feet.

4/ Includes open pit ore only to depth of 200 feet.

5/ All types of ore.

6/ Hard ore only.

7/ From U.S.G.S.

Paper by W. E. Lewis, U.S.B. of M., Nibbing, Minnesota, 4/5/51

These tables indicate that the Cuyuna range of Minnesota has by far the largest potential reserves of manganese in the United States. The estimated reserve of 500,000,000 tons of ore averaging 2-10 percent manganese, say 5 percent manganese, is sufficient to supply the steel industry with all its manganese requirements for twenty to thirty years if developed and properly implemented with mining and metallurgical equipment.

The Chamberlain district deposit in South Dakota has been under investigation for many years and the reports indicate that the separation of the nodules from the shale is difficult and probably will be very costly if a method of separation is perfected.

Reports published since April, 1951 indicate that the manganese ores in the Aroostook County, Maine, are not amenable to known methods of concentration and therefore are of doubtful value at present.

It is understood that recent exploration work at Artillery Peak, Arizona, indicates the tonnage of the reserves of manganese may have been over estimated.

The reports indicate that the Cuyuna range slates are the only potential source of manganese in the United States which has not been investigated. The estimate of 500,000,000 tons of ore averaging 2-10 percent manganese must be based on geological theory and probably should only be classified as possible ore. The carbonate slates have never been explored as a source of manganese except possibly in the Blind Lake area which is about 6 miles north of Aitkin in Aitkin County, Minnesota, and about 16 miles northeast of the productive area of the Cuyuna range in Crow Wing County. The exploration on the Cuyuna range has been directed toward the discovery of iron and manganiferous iron ores. When slates were encountered the drilling was discontinued as they have been considered negative as a source of exploitable orebodies, and although found in many places, little or no effort has been made to prove their extent or characteristics. The Cuyuna range iron formation is covered by a thick bed of glacial drift and few if any outcrops have been found. The exploration has been done mostly by drilling following magnetic lines discovered by dip needle surveys.

The data on the manganese reserves in the United States and the critical position of the United States steel industry in regard to manganese furnished by Mr. Walter E. Lewis, Chief, Minerals Survey Branch, Mining Division, Region V, U. S. Bureau of Mines, Minneapolis, Minnesota, aroused the interest of Mr. Robert M. Adams, President of Adams Brothers Company of Duluth, Minnesota.

Mr. Paul Zinner, Director, Region V, U. S. Bureau of Mines, was contacted in Minneapolis in March 1951, and after examining specimens

and drill logs from Sec. 29-47-29, Crow Wing County, Minnesota, where Mr. Adams was interested, he explained the Bureau's manganese investigative program, expressed interest of the area, and referred the matter to Mr. A. B. Needham, Chief, Mining Division, and Mr. Walter E. Lewis, Chief, Minerals Survey Branch. Mr. Needham and Mr. Lewis expressed great interest in the area, suggested the further exploration, and advised that Federal funds were available to assist in such work on a basis of a loan for 75% of the cost to the explorer, who would furnish the other 25%. Mr. Zinner, Mr. Needham, and Mr. Lewis all concurred in the statement that the Section 29 Area appeared to be exactly what the Bureau was looking for as a possible source of manganese for the manufacture of ferromanganese. The area is well located geologically. There is promise of a large tonnage of manganese bearing carbonate slates. There is very little oxidation of the iron and manganese in the slates, therefore there was little chance of finding manganiferous orebodies. The area is very favorably located as to water supply and electric power. It is readily accessable by railroad, and truck roads. An ample supply of trained labor is available in the nearby Cuyuna range towns, which also provide housing, schools, and other facilities.

All the available data on previous explorations were given to Mr. Lewis who assembled them in standard size maps and drill logs.

Mr. Lewis and Dr. Frank F. Grout, geologist, examined all the available samples and selected samples to be sent to the Bureau's Metallurgical laboratory in Minneapolis. The laboratory tests were disappointing because the samples were inadequate. The samples were largely churn drill cuttings and not structurally representative of the material in the ground because of the crushing by the drill bits. The metallurgists wanted better samples but they were not available.

After numerous conferences, during which an exploration program was developed, the Bureau of Mines engineers cooperated in the prepar-

ation of applications to the Defense Minerals Administration, U. S. Department of the Interior, Washington, D. C. for assistance in the explorations, which applications were forwarded to Washington in February 1952. The following excerpts are from these applications:

SECTION 29 AREA MANGANESE

(b) The presence of manganese in this area has been known since the early days of the Cuyuna range of Minnesota.

The early prospectors on the Cuyuna were first attracted to the district by well defined lines of high magnetic intensity which were later found to be associated with orebodies. Extensive dip-needle surveys were made over much of the area now known as the Cuyuna range, and the lines of high magnetic intensity were followed in the exploration by drilling.

One of these magnetic lines occurs in Sections 29 and 30, Township 47 North, Range 29 West, in Crow Wing County, Minnesota. The area was first explored in 1906 as a possible source of iron ore. The glacial drift overburden was found to be from eighty feet to one hundred and fifty feet and more.

A greenish gray formation was found under the drift which was reported by various explorers as schist, slate and iron formation. Where there was oxidation and the formation was stained red, some of the drill cores and cuttings were assayed and found to carry from twenty to thirty percent iron. Manganese was not important at the time.

The Cuyuna range manganiferous ores were well known and attracted wide attention during the World War I period, 1915-1918, and the search for additional manganiferous ore deposits was intense. The Section 29 Area was again explored and abandoned because, although drill samples assayed between five and ten percent dry manganese in places, the percent of iron was low and the material was not a typical Cuyuna range manganiferous ore.

More recently, in 1949, the area was again explored in an attempt to find, by closer drilling, manganiferous ore lenses in the wide belt of manganese bearing schists and slates. After twelve holes were drilled by one company in Section 30 and five holes in Section 29 by another company, the area was again abandoned as a source of manganiferous ore suitable for blast furnace use.

When the critical shortage of manganese for ferromanganese was brought to the attention of Adams Brothers Company, who were recent explorers of Section 29, an investigation was started.

Although the material found in the Section 29 Area was evidently unsuitable for the preparation of manganiferous ore, it was thought it might be suitable for the preparation of ferromanganese.

A rough estimate of an area seven hundred feet wide and twenty-six hundred feet long, in the area where the most drilling data are available, showed 11,000,000 tons of material assaying 4.95 percent manganese and 25.58 percent iron which had been classified as slates and schists from the drill cores and cuttings.

The average depth of the drill holes included in the estimate was one hundred and fifteen feet in glacial drift and seventy-six feet in ledge. There is no evidence that the holes were drilled through the formation.

The remnants of the samples available from the drilling were found to be inadequate for the determination of the suitability of the material for the preparation of ferromanganese.

The explorations in the area indicate the presence of a large tonnage of manganese bearing carbonate slates which are unsuitable for the preparation of manganiferous ore for blast furnace use. These slates may be an economic source of manganese for other purposes.

The drilling to date has not determined the structure or the extent of the manganese bearing formations either in length, width or depth. It is proposed to determine these factors by further churn

and diamond drilling: First, by deeper holes to determine the structure and economic value of the material; then, if the formations are found to be suitable for the economic production of manganese, by shallower holes to determine the extent.

THE GENERAL PLAN

The general plan of this program together with the reasons for it is as follows. This area on the Cuyuna range has long been known as one of the areas of iron formation, containing manganese units, but it has not been developed, beyond exploratory drilling on various occasions by various parties. The material found by said drilling has not been of the type which is presently used on the Cuyuna range for blast furnace mixture. However, this material might be a source of obtaining manganese for other uses.

The formation might extend over a considerable area, both in length and width. Accordingly, over two miles of possible strike has been acquired; in the main, by leaseholds on privately held property and by application to the State of Minnesota on lands owned by it.

In general, the drilling has shown both oxide and carbonate, each containing more or less manganese. If this oxide-carbonate belt should have sufficient continuity in length, width and depth, it might afford a substantial amount of manganese bearing formation which, from a mining standpoint, would appear to have no particularly bad features.

Located as this ground is on the north part of the Cuyuna range, which district has all the necessary facilities for mining, a few of the favorable features for the development of a mine might be cited as follows:

A. The Mississippi River close by is a source of water.

B. The Minnesota Power & Light Company hi-line crossing the property.

C. Adequate roads from the towns of the Cuyuna range and passable automobile roads on the property.

D. Railroad transportation within reasonable spur-track length by the Northern Pacific and the Soo Line railways.

E. Nearby towns with schools and other facilities.

F. Favorable surface conditions for stripping prevail upon the Cuyuna range.

In view of the drilling which has been done to date and the character of the material thus made available for examination and assaying, the following questions present themselves:

A. Is the deposit continuous enough in length, width, and depth to provide ample tonnage for substantial open pit operation?

B. Will the average manganese content be sufficient?

C. Can the manganese be concentrated and extracted metallurgically and economically so as to compete with other sources of manganese?

The only way these questions can be answered would be, first, by further drilling to determine to some extent the limits of the formation and the apparent average manganese content; secondly, to drill several BX holes for the extraction of core for further testing purposes.

We plan on putting one drill on what might be termed area drilling; first, to try to find the North and South edges of the formation as well as enough indicated length and thickness. This work, of course, would show the average manganese content.

Another drill would drill in the present known heart of the area for the primary purpose of extracting core for determining the nature of the material.

In addition to the operation of drilling, samples would be taken to our sample house at Ironton and prepared and filed in the usual manner, assays being obtained from the Lerch Brothers laboratory in Crosby. At this stage the samples would thus be available for examination and for preparation for testing.

The drilling would naturally be guided from an engineering standpoint by the results being currently obtained and sufficient

geological services would be made available so that the geology would be studied concurrently with the drilling and naturally as a guide thereto.

As to tests, various possible methods would be investigated and tried out and metallurgical advice and facilities would be made available for this phase of work.

It would not be intended to drill out this formation to its uttermost limits; that would be too long and expensive and unwarranted at this stage. But while endeavoring to learn by the only present available method (testing drill cores) whether the material can be metallurgically and economically handled, it is, of course, equally important to find that there is a sufficiently large and continuous orebody containing sufficient manganese. Hence, the drilling program is for two purposes.

If this drilling program, together with the geological and metallurgical studies, demonstrated a worthwhile source of manganese units, then it would be reasonable to assume that the necessary development would follow.

The proposed investment would of course not permit any development. It would probably be inadequate for a complete exploration of the whole area but that is not necessary at this stage. It should be enough to cover sufficient drilling for the uses noted and sufficient technical studies to demonstrate whether the area warrants further development.

As to the qualifications of Adams Brothers Company, in 1949 Robert M. Adams formed this company to take over his new mining business in Minnesota and carry on his further explorations.

Cuyler Adams discovered the Cuyuna range about 1905, and the Adams family has been actively associated with the exploration and development of the range ever since.

Robert M. Adams started exploring on the range in 1915 and has continued from that time. The following properties resulted from

his work:

Maroco Mine
Evergreen Mine and Sintering plant
Hillcrest Group (Hillcrest, Arko and Alstead)
Mangan-Louise Group
Rabbit Lake Group
Virginia

End of excerpts.

The applications, which were accompanied by maps showing the location of the drill holes and logs showing the available assays, were sent to the United States Bureau of Mines, Regional Office in Minneapolis, Minnesota, early in February 1952, and from there sent to the office of the Defense Minerals Administration in Washington, D. C. where the following docket numbers were assigned:

Docket No. DMEA 2404 - SE-SW-Sec. 20-47-29

Docket No. DMEA 2405 - NW¼-Sec. 29-47-29

Docket No. DMEA 2406 - SE-NE-Sec. 30-47-29

The following letter denying the applications was received May 19, 1952:

UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration
Washington 25, D. C.

May 15, 1952

Adams Brothers Company
12th Floor, Fidelity Building
Duluth, Minnesota

Re: Dockets Nos. DMEA 2404, 2405, and 2406 - Manganese
SE¼, SW½, Sec. 20, T. 47N., R. 29 W.
NW¼ Sec. 29, T. 47N., R. 29 W.
SE¼, NE¼, Sec. 30, T. 47N., R. 29 W.
Crow Wing County, Minnesota

Gentlemen:

Your applications for exploration assistance and other data available to us have been carefully reviewed.

Although it is probable that your proposed drilling programs would add substantial tonnage of material containing approximately 5 percent manganese to the known large refractory reserves of this district, it is doubtful that the programs would result in a discovery

or development from which production might be made that would be of benefit to the present National Defense Program. We regret, therefore, to inform you that your applications are denied.

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

Sincerely yours,

/s/ C. C. Mittendorf

Acting Administrator
Defense Minerals Exploration
Administration

The question is why was this program of exploration for manganese on the Cuyuna range denied financial support by the government?

The reason given in the Mittendorf letter is not based on fact, unless the National Defense Program is very transitory and has no throught for the future. There are no "known large refractory reserves" of manganese on the Cuyuna range. Possible reserves, yes, but no proven reserves. The manganese bearing slates could hardly be classified refractory at this time, because they are unexplored, and, as the experimental work on their treatment is in its infancy, their metallurgical characteristics are largely unknown. If the National Defense Program is transitory and the interest is only in manganese ore deposits which can be made productive of high grade manganese ore now or in the immediate future, why all the publicity on low grade reserves and the abstract encouragement given to their development?

Geologists who know the Cuyuna range have advised that the area covered by the Section 28 Area project is one of the most, if not the most favorable location on the range in which to develop large reserves of manganese bearing carbonate slates. Dr. Frank F. Grout, retired, former Geologist of the Minnesota Geological Survey, and Professor of Geology and Minerology, University of Minnesota, Dr. G. M. Schwartz, Geologist of the Minnesota Geological Survey, and

Professor of Geology, University of Minnesota, Walter E. Lewis, Chief, Minerals Survey Division, Region V, U. S. Bureau of Mines, J. F. Wolff, Geologist, Duluth, Minnesota, recommended the area favorably as a probable source of manganese. The late Carl Zapffe, Geologist, Manager Iron Ore Properties, for the Northern Pacific Railway Company, recommended the area for exploration.

The Federal Government must believe that financial assistance is necessary for the development of a domestic supply of manganese, otherwise why the appropriation of money for the work and why the classification of manganese as one of the most critical minerals? The data published by the Government authorities point to the Cuyuna range as the location of probably the largest reserve of domestic manganese. The exploratory and metallurgical work necessary to prove and develop these lean ores is going to require both time and money. It cannot be done in a few weeks or a few months even though unlimited funds were available. The range first won prominence as a source of manganese during the first World War (1918) and the Federal Government proposed to finance a very large plant in which to produce manganese from the black ores, but the project died on the conference tables, which was probably just as well, because the proven ore reserves for a plant of the magnitude projected were not available. Further, if the manganiferous ores suitable for blast furnace use are eliminated, there are no proven reserves available for such a plant today.

Despite all the alleged importance of the manganese units on the Cuyuna range, no definite source of supply has been proven during the last thirty years. No reserves have been either blocked out or demonstrated to be metallurgically and economically available for the manufacture of ferromanganese.

Furthermore no adequate available supply of manganese has been proven elsewhere in the country, although Federal funds have been

used by various agencies in the search, notably in the southwestern states.

If the manganese in Cuyuna range carbonate slates is the greatest potential domestic reserve and a domestic supply of manganese is necessary to the security of the steel industry and the country, then Federal funds appropriated for the development of such a supply should be made available for exploratory and metallurgical work on the Cuyuna range.

The following exhibits are attached:

Exhibit A - Letter from Dr. Frank F. Grout

Exhibit B - Extract from the Engineering and Mining Journal issue of July 1942

Exhibit C - Map of Cuyuna Range.

UNIVERSITY OF MINNESOTA
MINNESOTA GEOLOGICAL SURVEY
MINNEAPOLIS 14

OFFICE OF THE DIRECTOR

July 11, 1952

Mr. Robert M. Adams
1203 Fidelity Bldg.
Duluth, Minnesota

Dear Mr. Adams:

It is reported to me that the U. S. Boards do not realize the need for exploration in Minnesota to make certain we have the best supplies of available low grade manganese in the country. I have worked on the problem in the Cuyuna Range since 1940, and have made some estimates of such material for the University of Minnesota, and for the U. S. Bureau of Mines. I feel, therefore, that I know the situation fairly well.

Enclosed find a brief paper published in Eng. Min. Journal, July, 1942. I would call your attention to two paragraphs on page 44. "A study of the drill records of the Survey file shows that they are wholly inadequate to determine the occurrence, thickness and grade of the carbonate rocks, though the amounts are known to be large". "Drill records" made in search for merchantable ore "commonly stop when they reach the green slate, and such records are incomplete". As a consequence my estimate of the amount of formation carrying 5 percent manganese, ranges from 150 to 250 million tons, and I did not feel too confident of the results (see the diagram in the paper cited).

Since that time Mr. Walter Lewis of the U. S. Bureau of Mines, Div. V, Minneapolis (2908 Colfax Ave.) presented the results of a careful "engineer's estimate" of such materials on the Cuyuna Range. He presented the results at Hibbing to a meeting of Engineers. It seems to be agreed that the Cuyuna has better prospects than any other district in the United States, to supply the emergency needs of the nation for manganese.

It is true, however, that a large part of the approved "engineer's estimate" is classified as very uncertain. In the classification in three groups, 1. Measured, 2. Indicated and 3. Inferred, much of the available formation is inferred. It is hardly a safe basis for establishment of a large industry. It needs a considerable exploration by drilling, so that the material may be classed as "measured".

Respectfully submitted,

Frank F. Grout

Frank F. Grout

FFG/ls
cc: G.M. Schwartz
Enc. 1

E&MJ, July 1942

Manganese for Emergency Use on the Cuyuna Range

State Survey data indicate an important tonnage suitable for concentrating to ferro-grade but too high in silica for normal times—Green carbonate slate has possibilities

Frank F. Grout
Department of Geology and Mineralogy
University of Minnesota
Minneapolis, Minn.

THE Minnesota Geological Survey undertook in 1941 to check the estimates of low-grade (5 to 15 percent Mn) manganiferous iron-bearing rocks on the north Cuyuna range[1] which might well be used to concentrate into ferro-grade (45 to 55 percent Mn). Most of the published estimates[2] of reserves have omitted reference to the formations carrying less than 45 or 50 percent of combined iron and manganese. It seems best to most of the miners and steel makers who know the range that merchantable ores carrying 50 percent of the combined metals should continue to supply the normal and now increasing demand for manganiferous iron ore. If ferro-grade is to be made, it is probably best to use non-merchantable formation, too high in silica to carry 50 percent of the combined metals. A review of all the old drilling data available is the basis of the following discussion. Grateful acknowledgment is made to operators and engineers who have contributed.

Underground mining is so costly that it seems likely early operation of any such manganese concentration plant on the Cuyuna range will depend largely on supplies within a few hundred feet of the surface. The tendency on the range is clearly to use open pits wherever possible.

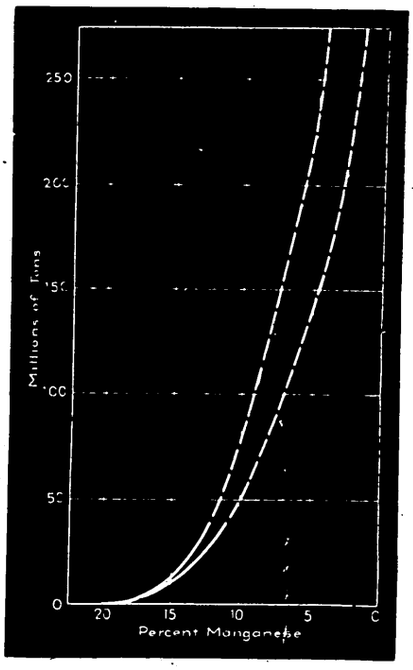
1. The "Black" Oxidized Formation—It may now be reported that the files of the Minnesota Geological Survey include drill data and assays which, by the usual methods of estimating, indicate 8,000,000 or 10,000,000 tons of oxidized "black" formation[3], assaying from 8 to 12 percent manganese, but containing too much silica to be merchantable in normal times; all in bodies from 300 to 3700 ft. long and in steeply dipping layers or lenses from 50 to 300 ft. thick; and all lying under less than 70 ft. of "surface" sand and gravel. Several recent drilling campaigns and some older ones are not available to the Survey and might raise the total appreciably. The files are available to authorized government officials in planning for development of such materials.

Add to this the associated merchantable manganiferous ores, the associated merchantable iron ores, the known extension of some of the deposits to greater depths, and the probable extensions laterally that have not been drilled, and it seems clear that the range has a supply for making ferro-grade for several years. Clearly the engineers on the range who question whether there is 1,000,000 tons of material for concentration of this sort must be thinking of merchantable "black ore." On the other hand, these who estimate several hundred million tons no doubt include the fresh unoxidized formation, which may assay 3 to 8 percent manganese in enormous tonnages. This may perhaps be justified if the grade and character are mentioned along with the tonnages, but it is the "black" oxidized material that has been most extensively tested in recent leaching experiments.

Few if any of the deposits so far discussed are in open pits from which the manganiferous "black" formation can be shoveled. If and when a plant is started for concentration of such material, stripping (or elaborate development) to open the deposit should begin promptly, because both the plant and the mine may take several months to reach satisfactory working capacity.

2. The "Carbonate Slate"—(This formation is also called green cherty carbonate, banded green slate, etc.) There are several statements in the published papers on the geology of the Cuyuna range that the manganiferous iron ores result largely from the weathering of a carbonate layer, or long lenses of carbonate, which carry manganese and iron in the original carbonate. The oxidation, leaching, and enrichment of carbonate to ore by natural processes may be seen to have occurred in a small way in a spur projecting into the North Hillcrest pit. Few other places are now exposed where such relations

Approximate form of curve relating tonnage and percent manganese in all kinds of deposits on the Cuyuna Range, within easy reach of surface. Larger tonnages not based on exact data



Published by permission of the Director of the Minnesota Geological Survey.

[1] E. C. Harder and A. W. Johnston: "The Cuyuna Iron Ore District." Minn. Geol. Survey Bull. 15, 1918. On page 134 the authors note that the south range has not shown much manganese.

[2] Carl Zapffe: "Reserves of Lake Superior Manganiferous Iron Ores." *Trans.*, A.I.M.E. Vol. 75, pp. 346-371, 1927. He says on page 365, "Who would venture a guess?" as to the tonnage of non-merchantable reserves.

[3] The differences between black and brown ore types were described by Carl Zapffe in "Manganiferous Iron Ores of the Cuyuna District," Minnesota, T.A.I.M.E. Vol. 71, pp. 371-385 (1925). The same or similar characters distinguish the oxidized rocks that are too lean to be merchantable.

Representative Analyses of Carbonate Slates

	1	2	3	4	5
Mn	4.14	7.99	9.10	1.76	2.24
Fe	26.55	25.86	22.31	28.06	27.59
SiO_2	26.20	28.14	34.92	30.15	40.70
Al_2O_3	[illegible]	2.70	1.65	.40	2.24
CaO	1.92	1.34	1.12	1.25	1.28
MgO	4.92	2.05	2.72	4.77	2.77
TiO_2	.....	.....	.....	0.02	Trace
P	0.224	0.193	0.063	0.290	0.250
CO_2	14.06	14.38	13.40	24.65	10.21
H_2O+	.....	.....	.....	0.36	.....

1. Trench, north part of Sagamore pit
2. North wall, Arko pit, 1941
3. Cross cut, Merritt mine, 178-foot level
4. Kennedy mine } Bull. 15, Minnesota Geological Survey
5. Mangan No. 2 mine }

can be seen. And it is not impossible that cherty (as well as carbonate) original beds may have carried some manganese, which natural processes could have concentrated to ore. The relation of manganese ore to carbonate formation, however, has been stated so often that a study of the carbonate is clearly in order. Interest has been expressed by geologists of the United States Geological Survey and of the Defense Commission.

Little seems to have been done with the metallurgical problem of extraction of manganese from such carbonate slate. Roasting turns it largely to oxide, after which manganese can be leached.

A study of the drilling records in the Survey file shows that they are wholly inadequate to determine the occurrence, thickness, and grade of these carbonate rocks, though the amounts are known to be very large.

About 70 new samples of these green slaty rocks were taken by Minnesota Geological Survey parties in 1941, from exposures in the mines and from available cores of old drilling. They contain manganese ranging from a fraction of 1 percent to 15.67 percent. Many samples assay from 3 to 8 percent. These agree reasonably well with earlier estimates, but clearly show that the carbonate in the area from Sections 27 and 28, T. 47 N., R. 29 W., to Sections 9 and 10, T. 46 N., R. 29 W., is notably higher in primary manganese than most of the carbonate in outlying areas.

This area is the same as that in which the best of the "black" oxidized deposits are known, and the same as the area in which the surface cover of sand and gravel is thinnest. All these combine to indicate a most favorable place for operation.

The distribution of the green carbonate slate is wide, but not all the green slate is rich in carbonate or manganese. Drill records commonly stop when they reach the green slate, and such records are incomplete. At the Milford mine and at the Pontiac mine the cores show considerable thicknesses of carbonate slate in continuous beds. Open pits show carbonate beds as much as 50 ft. thick in the Arko, North Hillcrest, East Mahnomen, and Sagamore mines, without exposing the contacts with other beds either above or below. Some investigators believe there are manganiferous carbonate beds up to 100 ft. thick at two horizons. An attempt is being made to check the horizons and thicknesses by further drilling, a liberal grant having been made from the research funds of the Graduate School of the University of Minnesota.

The continuity of the belt of original carbonate slate is strongly suggested by the wide distribution of known occurrences in the range and the fair uniformity of bedding in the slates exposed in the mines. On the other hand, there are known to be gaps in the belts of formation, faults can be seen in the mines, and in many places the carbonate has been found to be deeply oxidized.

Tonnage cannot be "estimated" by approved engineering methods, but some guesses based on reasonable assumptions may serve to show the large tonnage probably involved. If a bed 100 ft. thick could be traced 15 miles and, dipping steeply, could be mined for 200 ft. below the surface sand and gravel, it might yield perhaps 140,000,000 tons. If the gaps in the belt reduce it one half, there is still a large tonnage. It is further probable that two beds occur, and geologically it seems reasonable to guess at present that much more than 100,000,000 tons carrying 3 to 8 percent manganese may be available. At depths which are below 200 ft. the tonnage is much greater, but not likely to be available in open pits. Clearly, the formation below the zone of oxidation may contain a reserve of available manganese greater than that in the oxidized zone.

Furthermore, the roasting suggested in the foregoing as a preliminary to leaching will notably increase the percentage of metal in the residue. One sample from the Merritt mine had its manganese content increased from 6.73 percent to 8.0 percent by a roast treatment such as is planned as a preliminary to one of the leaching processes now under consideration. Several available bodies might assay 10 percent manganese after roasting. These may well be included in the emergency reserves if a method can be found to extract the manganese at moderate cost.

A Nickel Deposit Near Riddle, Ore.

THE RIDDLE NICKEL DEPOSIT, on the slopes of Nickel Mountain about 5 miles northwest of Riddle, Douglas County, Ore., was discovered in 1864. Since then much prospecting and preliminary development work has been done, but no ore has been shipped except small lots used for metallurgical tests. The deposit is described by William T. Pecora and S. Warren Hobbs in U. S. Geological Survey Bulletin 931-I.

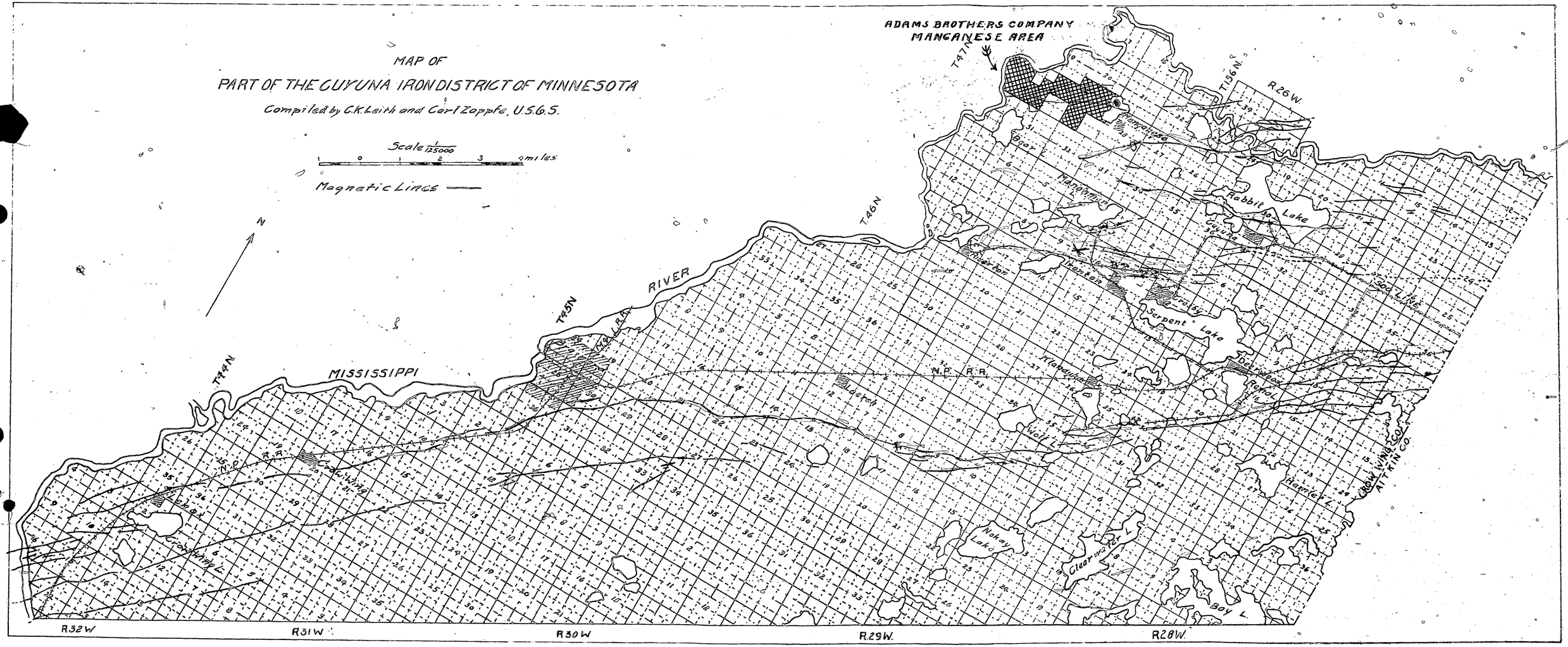
This deposit is a layered blanket, containing the nickel silicate garnierite, which rests upon unserpentinized peridotite. This blanket ranges in thickness from a few feet to a maximum of 60 or 70, but with an average of about 20 ft. It is best developed on terraces, flats, and gentle mountain slopes above an elevation of 2,000 ft. It consists of three layers: a top brick-red soil layer, an intermediate thick yellow limonitic layer with some quartz-garnierite boxwork, and a root layer composed of quartz-garnierite boxwork in nearly fresh bedrock that is a transitional phase between weathered material and fresh peridotite.

About 162 acres of ground are underlain by a blanket containing over 6,000,000 tons of material, 1 to 2 percent of which is probably nickel. Eighty thousand tons have been proved to contain 2 to 3 percent of nickel, and 75,000 tons have been proved to contain 1 to 2 percent of nickel.

▼

Nickel at Snipe Bay

A NICKEL-COPPER DEPOSIT at Snipe Bay, Baranof Island, Alaska, has recently been examined by the United States Geological Survey. Snipe Bay is a northeastward-trending indentation of the west coast, about 46 miles in an airline southeast of Sitka. The deposit consists of a dark, coarse-grained mass of basic igneous rock intruded into older quartzite and quartz schist. Neither the size nor the grade of the deposit is adequately known, but, from what was observed in natural exposures and in a few prospect holes, it is estimated that to a depth of about 130 ft. below the lowest point on the outcrop there is a reserve of at least 430,000 tons of low-grade nickel-bearing material. The deposit as a whole probably does not contain more than 0.3 percent each of nickel and copper, and, although it is fairly well situated for large-scale, low-cost development, it probably is too small and its percentage of nickel and copper too low to permit the profitable recovery of these metals at present prices.


MAP OF
PART OF THE CUYUNA IRON DISTRICT OF MINNESOTA
Compiled by C.K. Leith and Carl Zapffe, U.S.G.S.
Scale 1/125000
1 0 1 2 3 4 miles
Magnetic Lines
N
ADAMS BROTHERS COMPANY
MANGANESE AREA
T47N
T46N
T45N
T44N
T136N.
R26W.
R32W
R31W
R30W
R29W.
R28W.
MISSISSIPPI
RIVER
N.P. R.R.
Manganese
Bear L.
Manganese L.
Rabbit Lake
Cuyuna
Serpent Lake
Deerwood
Ladish
Wolf L.
Nokay Lake
Clearwater L.
Bay L.
Harriet L.
CROW WING CO.
AITKIN CO.

FILE COPY
SURNAME:

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

C
O
P
Y

JUN 23 1952

Adams Brothers Company
Duluth 2, Minnesota

Gentlemen:

In accordance with your request dated June 4, 1952, there are returned herewith exhibits filed with your applications, dockets DMEA No. 2404 and 2406.

Sincerely yours,

ROBERT E. ADAMS

Robert E. Adams
Administrative Officer
Defense Minerals Exploration
Administration

Enclosures

REAdams:sh
June 23, 1952

CC: Adm. Reading File
Mails and Files
R. E. Adams

FILE COPY
SURNAME:

Selfridge
Chapman
Hedges
Lemmon
FEJohnson

UNITED STATES
DEPARTMENT OF THE INTERIOR

DEFENSE MINERALS ADMINISTRATION
WASHINGTON 25, D. C.

C C
O O
P P
Y

5-15-52

Adams Brothers Company
12th Floor, Fidelity Building
Duluth, Minnesota

Re: Dockets Nos. DMEA 2404, 2405, and 2406 - Manganese
SE¼, SW¼, Sec. 20, T. 47 N., R., 29 W.
NW¼ Sec. 29, T. 47 N., R. 29 W.
SE¼, NE¼, Sec. 30, T. 47 N., R. 29 W.
Crow Wing County, Minnesota

Gentlemen:

Your applications for exploration assistance and other data available to us have been carefully reviewed.

Although it is probable that your proposed drilling programs would add a substantial tonnage of material cantaining approximately 5 percent manganese to the known large refractory reserves of this district, it is doubtful that the programs would result in a discovery or development from which production might be made that would be of benefit to the present National Defense Program. We regret, therefore, to inform you that your applications are denied.

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

Sincerely yours,

/S/ C. O. Mittendorf (fw)

Acting Administrator
Defense Minerals Exploration
Administration

TLChapman:FEJohnson:ls
5/13/52

cc: Adm. Reading File
Docket
G. C. Selfridge
T. L. Chapman
Operating Committee
Field Team, Region 5
N. B. Melcher, USBM
T. P. Thayer, USGS

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : Acting Administrator, DMEA DATE: May 8, 1952

FROM : Iron and Ferro-Alloy Division, DMEA

SUBJECT: Denial of exploration projects in the amount of $100,030.00
Dockets Nos. DMEA 2404, 2405, and 2406
Adams Brothers Company
SE¼, SW¼, Sec. 20, T. 47 N., R. 29 W.
NW¼ Sec. 29, T. 47 N., R. 29 W.
SE¼, NE¼, Sec. 30, T. 47 N., R. 29 W.
Crow Wing County, Minnesota

The denial of the subject applications by this Division is based on the following information:

(1) The measured, indicated and inferred reserves of manganiferous-bearing material of this district, containing approximately 5 percent manganese, amount to about 500 million tons (See Bureau of Mines' memorandum). The relatively small tonnage that would be added to the above reserves would be of no help to the present war effort.

(2) The metallurgical problems of these refractory ores have not been completely worked out up to the present time and until such a time as these problems have been satisfactorily completed, there is little use in adding to the present reserves.

(3) The "ores" in this area are covered by about 170 feet of overburden, which is frequently inundated by the floods of the Mississippi River. Hence mining would be a problem as stripping would necessitate the removal of about four tons of waste for each ton of "ore" mined. The pits would be wet and would possibly be flooded in flood seasons. Underground mining is not feasible for this grade of ore in this area.

G. C. Selfridge

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

EXPLORATION

Subject: DMEA-2406
Re: Exploration Loan
Cuyuna Range Property
March 4, 1952

Mr. Robert M. Adams, President
Adams Brothers Company
12th Floor Fidelity Building
Duluth 2, Minnesota

My dear Mr. Adams:

This will acknowledge receipt of your application dated February 1, 1952 for a loan under the Defense Production Act of 1950.

Your application was assigned Docket Number DMEA-2406 and referred to the Iron and Ferro-Alloys Division.

Kindly refer to DMEA-2406 in any future correspondence relating to your application.

Kindly forward another copy of form MF-103 and MF-100 with attachments to each to this office.

Sincerely yours,

ROBERT E. ADAMS

Robert E. Adams
Acting Administrative Officer

Enclosures (2)

Form MF-103
(Revised June 1951)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No.

MF-103 Should Be Filed With General Technical Data Form MF-100

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

Not To Be Filled in by Applicant

Docket No. DMEA-2406
Metal or Mineral
Date Received 3-3-52
Amount $
Participation (Government %)

Name and address of applicant

ADAMS BROTHERS COMPANY
12TH FLOOR FIDELITY BUILDING
DULUTH 2, MINNESOTA

Date February 1, 1952

If you have already filed MF-100, give date filed _____, type of assistance requested _____,

DMA Docket Number (if available) _____

$ 22,240

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four copies each, of the signed application form, General Technical Data Form MF-100, and answers to questions as specified, to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive office thereof, with your name and address on each sheet of the application and all accompanying papers. If you have previously filed MF-100, it is not necessary to file it again. However, you should indicate in space provided above the type of assistance previously applied for (loans, procurement contracts, etc.) and DMA Docket Number, if available. *When a question is inapplicable it should be so stated in the form.* Additional sheets should be attached in answering any questions or in supplying additional information. IF YOU CANNOT ANSWER A QUESTION, SO STATE.

1. (*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 attached sheet.

   (*b*) If you are not the owner of the property, submit a copy of the lease, purchase option, or other agreements under which you are authorized to operate the property with each copy of your application. See attached sheet.

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

   NOTE: (1) 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 (*c*) 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.

   (2) If applicant is not the owner of the property or if there are any liens or encumbrances against the property, copy of agreements of claimants, lienors, encumbrances, and lessors subordinating their interests in the property to the interest of the Government under the Exploration Project Contract will be required for attachment to the Contract.

2. (*a*) What metals or minerals do you expect to find? See attached sheet.

   (*b*) Furnish statement of the geologic features of your property, giving type of ore deposit and reasons for expecting to find commercial ore bodies. Illustrate with maps or sketches. If you have a geologic or Defense Mineral Administration report, or assay maps showing width and grade, please send them with application, stating whether or not you wish to have them returned. See attached sheet.

DEPARTMENT OF THE INTERIOR
Defense Mineral Administration
RECEIVED
MAR 3 - 1952

16—64067-2

The information requested in questions 3, 4, 5, 6, 7, 8, and 9 below should be answered specifically and in detail, as this information will be attached to and incorporated as part of the Exploration Project Contract, if such contract is entered into with you by the Government.

ANSWER EACH QUESTION ON SEPARATE SHEETS OF PAPER AND SUBMIT A COPY OF EACH ANSWER FOR EACH COPY OF YOUR APPLICATION.

3. (*a*) Describe fully the proposed work and give the total cost of the project.

   (*b*) State the time required to start the project and to complete it.

4. Submit a map or sketch of the property involved showing a plan (and cross section, if needed) of the present mine workings and the *location of the proposed exploration work* as related to geologic features, such as contacts, veins, ore-bearing beds, etc.

5. Furnish an itemized list 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. None.

6. Furnish a detailed list of additional facilities, buildings, and fixtures to be purchased, installed, or erected by you, with the estimated cost of each item. None.

7. Furnish a detailed list of operating equipment, separated into items to be—

   (*a*) Rented

   (*b*) Purchased

   (*c*) Furnished by you

   with the rental, purchase price, or depreciation of each item, as the case may be, to be charged as a cost of the project.

8. Furnish an itemized schedule of labor, by numbers and classes (miners, muckers, etc.) and of supervisors by numbers and positions, with the maximum wages or salaries to be paid to each. See Item 9.

9. Furnish a detailed list with estimated cost of each item for materials, supplies, engineering, assaying, accounting, power, water, utilities, and any other items not provided for above.

10. (*a*) How much are you prepared to invest in the proposed project?

    (*b*) Is this amount sufficient to pay your part of the cost of the project, in accordance with the regulations on Government participation (Sec. 9 of MO–5)?

11. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

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.

ADAMS BROTHERS COMPANY
(Name of company)

By [signature]
(Signature of authorized official)

February 1, 1952
(Date)

President
(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—64067-2

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

1. (a) While the belt of manganese bearing formation may extend northeast and southwest through the south part of Section 20, through the northwesterly part of Section 29, across Section 30, all in Township 47, Range 29, and into the Southeast quarter (SE¼) of Section 25, Township 47, Range 30, the exploration will be limited to a smaller area. See 1 (c).

(b) The applicant holds under lease the Southeast quarter of the Northeast quarter (SE¼ of NE¼), Section 30, Township 47, Range 29.

(c) The explorations contemplated would be upon the Southeast quarter of the Northeast quarter (SE¼ of NE¼), Section 30, Township 47, Range 29.
A copy of the lease is attached.

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

2. (a) Manganese.

(b) Section 29 Area Manganese.

The presence of manganese in this area has been known since the early days of the Cuyuna Range of Minnesota.

The early prospectors on the Cuyuna were first attracted to the district by well defined lines of high magnetic intensity which were later found to be associated with ore bodies. Extensive dip-needle surveys were made over much of the area now known as the Cuyuna Range, and the lines of high magnetic intensity were followed in the exploration by drilling.

One of these magnetic lines occurs in Sections 29 and 30, Township 47 North, Range 29 West, in Crow Wing County, Minnesota. The area was first explored in 1906 as a possible source of iron ore. The glacial drift overburden was found to be from eighty feet to one hundred and fifty feet and more.

A greenish gray formation was found under the drift which was reported by various explorers as schist, slate and iron formation. Where there was oxidation

and the formation was stained red, some of the drill cores and cuttings were assayed and found to carry from twenty to thirty per cent iron. Manganese was not important at the time.

The Cuyuna Range manganiferous ores were well known and attracted wide attention during the World War I period, 1915-1918, and the search for additional manganiferous ore deposits was intense. The Section 29 Area was explored and abandoned because, although drill samples assayed between five and ten per cent dry manganese in places, the per cent of iron was low and the material was not a typical Cuyuna Range manganiferous ore.

More recently, in 1949, the area was again explored in an attempt to find, by closer drilling, manganiferous ore lenses in the wide belt of manganese bearing schists and slates. After twelve holes were drilled by one company in Section 30 and five holes in Section 29 by another company, the area was again abandoned as a source of manganiferous ore suitable for blast furnace use.

When the critical shortage of manganese for ferromanganese was brought to the attention of Adams

Brothers Company, who were recent explorers of Section 29, an investigation was started.

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A rough estimate of an area seven hundred feet wide and twenty-six hundred feet long, in the area where the most drilling data are available, showed 11,000,000 tons of material assaying 4.95 per cent manganese and 25.58 per cent iron which had been classified as slates and schists from the drill cores and cuttings.

The average depth of the drill holes included in the estimate was one hundred and fifteen feet in glacial drift and seventy-six feet in ledge. There is no evidence that the holes were drilled through the formation.

The remnants of the samples available from the drillings were found to be inadequate for the determination of the suitability of the material for the preparation of ferro-manganese.

The explorations in the area indicate the presence of a large tonnage of manganese bearing carbonaceous

slates which are unsuitable for the preparation of manganiferous ore for blast furnace use. These slates may be an economic source of manganese for other purposes.

The drilling to date has not determined the structure or the extent of the manganese bearing formations either in length, width or depth. It is proposed to determine these factors by further churn and diamond drilling: First, by deeper holes to determine the structure and economic value of the material; then, if the formations are found to be suitable for the economic production of manganese, by shallower holes to determine the extent.

It is estimated that the preliminary exploration program in the SE¼-NE¼, Section 30-47-29, should include three (3) structure holes and six (6) areal holes, which would require approximately one thousand (1000) feet of drilling through surface and seven hundred and forty (740) feet of drilling in ledge.

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

3. (a) It is estimated that the preliminary exploration program in the SE¼-NE¼, Section 30-47-29, should include three (3) structure holes and six (6) areal holes, which would require approximately one thousand (1000) feet of drilling through surface and seven hundred and forty (740) feet of drilling in ledge.

(b) The drilling could start about May 1, 1952, and the program could be completed within two years.

Note proposed drilling program outlined on map:

O Areal

Os Structure

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

4. See attached maps:

   1. Map of area.
   2. Map showing geology and proposed drilling program.
   3. Logs of drilling.
   4. Geological map.

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

7. (a), (b) and (c)

Adams Brothers Company will contract with ADEX Corporation to do the drilling.

Two complete churn and diamond drill outfits equipped for drilling BX holes in ledge will be furnished.

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

9. Drilling

1000 ft. surface drilling @ $5.00	$ 5,000	
740 ft. ledge drilling @ $10.50	7,800	
Carbon loss, estimated	780	
		$13,580

Note: This particular ledge drilling will involve especial care, hence delays and more than ordinary cost.

Geology	
At the rate of $600 a month	1,480
Engineering	
At the rate of $500 a month	1,700
Sampling	
At the rate of $200 a month (Including preparation and filing)	,980
Assays	
Estimated	600
Metallurgy	
Estimated	1,900
Overhead	
Travel, office, misc.	2,000
	$22,240

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

10. (a) $5,560.00

(b) Yes.

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

11. The general plan of this program together with the reasons for it is as follows. This area on the Cuyuna Range has long been known as one of the areas of iron formation, containing manganese units, but it has not been developed, beyond exploratory drilling on various occasions by various parties. The material found by said drilling has not been of the type which is presently used on the Cuyuna Range for blast furnace mixture. However, this material might be a source of obtaining manganese for other uses.

The formation might extend over a considerable area, both in length and width. Accordingly, over two miles of possible strike has been acquired; in the main, by leaseholds on privately held property and by application to the State of Minnesota on lands owned by it.

In general, the drilling has shown both oxide and carbonate, each containing more or less manganese. If this oxide-carbonate belt should have sufficient continuity in length, width and depth, it might afford a substantial amount of manganese bearing formation which, from a mining standpoint, would appear to have no particularly bad features.

Located as this ground is on the north part of the Cuyuna Range, which district has all the necessary facilities for mining, a few of the favorable features for the development of a mine might be cited as follows:

A. The Mississippi River close by is a source of water.

B. The Minnesota Power & Light Company hi-line crossing the property.

C. Adequate roads from the towns of the Cuyuna Range and passable automobile roads on the property.

D. Railroad transportation within reasonable spur-track length by the Northern Pacific and the Soo Line railways.

E. Nearby towns with schools and other facilities.

F. Favorable surface conditions for stripping prevail upon the Cuyuna Range.

In view of the drilling which has been done to date and the character of the material thus made available for examination and assaying, the following questions present themselves:

A. Is the deposit continuous enough in length, width, and depth to provide ample tonnage for substantial open pit operation?

B. Will the average manganese content be sufficient?

C. Can the manganese be concentrated and extracted metallurgically and economically so as to compete with other sources of manganese?

The only way these questions can be answered would be, first, by further drilling to determine to some extent the limits of the formation and the apparent average manganese content; secondly, to drill several BX holes for the extraction of core for further testing purposes.

We plan on putting one drill on what might be termed area drilling; first, to try to find the North and South edges of the formation as well as enough indicated length and thickness. This work, of course, would show the average manganese content.

Another drill would drill in the present known heart of the area for the primary purpose of extracting core for determining the nature of the material.

In addition to the operation of drilling, samples would be taken to our sample house at Ironton and prepared and filed in the usual manner, assays being obtained from the Lerch Brothers laboratory in Crosby. At this stage the samples would thus be available for examination and for preparation for testing.

The drilling would naturally be guided from an engineering standpoint by the results being currently obtained and sufficient geological services would be made available so that the geology would be studied concurrently with the drilling and naturally as a guide thereto.

As to tests, various possible methods would be investigated and tried out and metallurgical advice and facilities would be made available for this phase of work.

It would not be intended to drill out this formation to its uttermost limits; that would be too long and expensive and unwarranted at this stage. But while endeavoring to learn by the only present available method (testing drill cores) whether the material can be metallurgically and economically handled, it is, of course, equally important to find that there is a sufficiently large and continuous ore body containing sufficient manganese. Hence, the drilling program is for two purposes.

If this drilling program, together with the geological and metallurgical studies, demonstrated a worthwhile source of manganese units, then it would be reasonable to assume that the necessary development would follow.

The proposed investment would of course not permit any development. It would probably be inadequate for a

complete exploration of the whole area but that is not necessary at this stage. It should be enough to cover sufficient drilling for the uses noted and sufficient technical studies to demonstrate whether the area warrants further development.

As to the qualifications of Adams Brothers Company, in 1949 Robert M. Adams formed this company to take over his new mining business in Minnesota and carry on his further explorations.

Cuyler Adams discovered the Cuyuna Range about 1905, and the Adams family has been actively associated with the exploration and development of the Range ever since.

Robert M. Adams started exploring on the Range in 1915 and has continued from that time. The following properties resulted from his work:

Maroco Mine
Evergreen Mine and Smelting plant
Hillcrest Group (Hillcrest, Arko and Alstead)
Mangan-Louise Group
Rabbit Lake Group
Virginia

Form MF-103
(Revised June 1951)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.1.

MF-103 Should Be Filed With General Technical Data Form MF-100

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

Not To Be Filled in by Applicant

Docket No. DMEA-2406
Metal or Mineral
Date Received 3-3-52
Amount $
Participation (Government %)

ADAMS BROTHERS COMPANY
12TH FLOOR FIDELITY BUILDING
DULUTH 2, MINNESOTA

Name and address of applicant

Date February 1, 1952

If you have already filed MF-100, give date filed _____, type of assistance requested _____,

DMA Docket Number (if available) _____

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four copies each, of the signed application form, General Technical Data Form MF-100, and answers to questions as specified, to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive office thereof, with your name and address on each sheet of the application and all accompanying papers. If you have previously filed MF-100, it is not necessary to file it again. However, you should indicate in space provided above the type of assistance previously applied for (loans, procurement contracts, etc.) and DMA Docket Number, if available. *When a question is inapplicable it should be so stated in the form.* Additional sheets should be attached in answering any questions or in supplying additional information. IF YOU CANNOT ANSWER A QUESTION, SO STATE.

1. (*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 attached sheet.

   (*b*) If you are not the owner of the property, submit a copy of the lease, purchase option, or other agreements under which you are authorized to operate the property with each copy of your application. See attached sheet.

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

   NOTE: (1) 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 (*c*) 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.

   (2) If applicant is not the owner of the property or if there are any liens or encumbrances against the property, copy of agreements of claimants, lienors, encumbrances, and lessors subordinating their interests in the property to the interest of the Government under the Exploration Project Contract will be required for attachment to the Contract.

2. (*a*) What metals or minerals do you expect to find? See attached sheet.

   (*b*) Furnish statement of the geologic features of your property, giving type of ore deposit and reasons for expecting to find commercial ore bodies. Illustrate with maps or sketches. If you have a geologic or engineering report, or assay maps showing width and grade, please send them with application, stating whether or not you wish to have them returned.

   See attached sheet.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 3 - 1952

16—64067-2

The information requested in questions 3, 4, 5, 6, 7, 8, and 9 below should be answered specifically and in detail, as this information will be attached to and incorporated as part of the Exploration Project Contract, if such contract is entered into with you by the Government.

ANSWER EACH QUESTION ON SEPARATE SHEETS OF PAPER AND SUBMIT A COPY OF EACH ANSWER FOR EACH COPY OF YOUR APPLICATION.

3. (*a*) Describe fully the proposed work and give the total cost of the project.

   (*b*) State the time required to start the project and to complete it.

4. Submit a map or sketch of the property involved showing a plan (and cross section, if needed) of the present mine workings and the *location of the proposed exploration work* as related to geologic features, such as contacts, veins, ore-bearing beds, etc.

5. Furnish an itemized list 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. None.

6. Furnish a detailed list of additional facilities, buildings, and fixtures to be purchased, installed, or erected by you, with the estimated cost of each item. None.

7. Furnish a detailed list of operating equipment, separated into items to be—

   (*a*) Rented

   (*b*) Purchased

   (*c*) Furnished by you

   with the rental, purchase price, or depreciation of each item, as the case may be, to be charged as a cost of the project.

8. Furnish an itemized schedule of labor, by numbers and classes (miners, muckers, etc.) and of supervisors by numbers and positions, with the maximum wages or salaries to be paid to each. See Item 9.

9. Furnish a detailed list with estimated cost of each item for materials, supplies, engineering, assaying, accounting, power, water, utilities, and any other items not provided for above.

10. (*a*) How much are you prepared to invest in the proposed project?

    (*b*) Is this amount sufficient to pay your part of the cost of the project, in accordance with the regulations on Government participation (Sec. 9 of MO–5)?

11. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

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.

ADAMS BROTHERS COMPANY
(Name of company)

By [signature]
(Signature of authorized official)

February 1, 1952
(Date)

President
(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—64067-2

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

1. (a) While the belt of manganese bearing formation may extend northeast and southwest through the south part of Section 20, through the northwesterly part of Section 29, across Section 30, all in Township 47, Range 29, and into the Southeast quarter (SE¼) of Section 25, Township 47, Range 30, the exploration will be limited to a smaller area. See 1 (c).

(b) The applicant holds under lease the Southeast quarter of the Northeast quarter (SE¼ of NE¼), Section 30, Township 47, Range 29.

(c) The explorations contemplated would be upon the Southeast quarter of the Northeast quarter (SE¼ of NE¼), Section 30, Township 47, Range 29.
A copy of the lease is attached.

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

2. (a) Manganese.

(b) Section 29 Area Manganese.

The presence of manganese in this area has been known since the early days of the Cuyuna Range of Minnesota.

The early prospectors on the Cuyuna were first attracted to the district by well defined lines of high magnetic intensity which were later found to be associated with ore bodies. Extensive dip-needle surveys were made over much of the area now known as the Cuyuna Range, and the lines of high magnetic intensity were followed in the exploration by drilling.

One of these magnetic lines occurs in Sections 29 and 30, Township 47 North, Range 29 West, in Crow Wing County, Minnesota. The area was first explored in 1906 as a possible source of iron ore. The glacial drift overburden was found to be from eighty feet to one hundred and fifty feet and more.

A greenish gray formation was found under the drift which was reported by various explorers as schist, slate and iron formation. Where there was oxidation

and the formation was stained red, some of the drill cores and cuttings were assayed and found to carry from twenty to thirty per cent iron. Manganese was not important at the time.

The Cuyuna Range manganiferous ores were well known and attracted wide attention during the World War I period, 1915-1918, and the search for additional manganiferous ore deposits was intense. The Section 29 Area was explored and abandoned because, although drill samples assayed between five and ten per cent dry manganese in places, the per cent of iron was low and the material was not a typical Cuyuna Range manganiferous ore.

More recently, in 1949, the area was again explored in an attempt to find, by closer drilling, manganiferous ore lenses in the wide belt of manganese bearing schists and slates. After twelve holes were drilled by one company in Section 30 and five holes in Section 29 by another company, the area was again abandoned as a source of manganiferous ore suitable for blast furnace use.

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Brothers Company, who were recent explorers of Section 29, an investigation was started.

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The average depth of the drill holes included in the estimate was one hundred and fifteen feet in glacial drift and seventy-six feet in ledge. There is no evidence that the holes were drilled through the formation.

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It is estimated that the preliminary exploration program in the SE¼-NE¼, Section 30-47-29, should include three (3) structure holes and six (6) areal holes, which would require approximately one thousand (1000) feet of drilling through surface and seven hundred and forty (740) feet of drilling in ledge.

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

3. (a) It is estimated that the preliminary exploration program in the SE¼-NE¼, Section 30-47-29, should include three (3) structure holes and six (6) areal holes, which would require approximately one thousand (1000) feet of drilling through surface and seven hundred and forty (740) feet of drilling in ledge.

(b) The drilling could start about May 1, 1952, and the program could be completed within two years.

Note proposed drilling program outlined on map:

O Areal

Os Structure

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

4. See attached maps:

   1. Map of area.
   2. Map showing geology and proposed drilling program.
   3. Logs of drilling.
   4. Geological map.

Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

7. (a), (b) and (c)

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Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

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Enclosure to Application
Form MF-103

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

10. (a) $5,560.00

(b) Yes.

Enclosure to Application
Form MF-103

11. The general plan of this program together with the reasons for it is as follows. This area on the Cuyuna Range has long been known as one of the areas of iron formation, containing manganese units, but it has not been developed, beyond exploratory drilling on various occasions by various parties. The material found by said drilling has not been of the type which is presently used on the Cuyuna Range for blast furnace mixture. However, this material might be a source of obtaining manganese for other uses.

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Located as this ground is on the north part of the Cuyuna Range, which district has all the necessary facilities for mining, a few of the favorable features for the development of a mine might be cited as follows:

A. The Mississippi River close by is a source of water.

B. The Minnesota Power & Light Company hi-line crossing the property.

C. Adequate roads from the towns of the Cuyuna Range and passable automobile roads on the property.

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Evergreen Mine and Smelting plant
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Mangan-Louise Group
Rabbit Lake Group
Virginia

Form MF-103
(Revised June 1951)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.1.

MF-103 Should Be Filed With General Technical Data Form MF-100

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

Not To Be Filled in by Applicant

Docket No. DMEA-2406
Metal or Mineral
Date Received 3-3-52
Amount $
Participation (Government %)

ADAMS BROTHERS COMPANY
12TH FLOOR FIDELITY BUILDING
DULUTH 2, MINNESOTA

Name and address of applicant

Date February 1, 1952

If you have already filed MF-100, give date filed _____, type of assistance requested _____,

DMA Docket Number (if available) _____

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four copies each, of the signed application form, General Technical Data Form MF-100, and answers to questions as specified, to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive office thereof, with your name and address on each sheet of the application and all accompanying papers. If you have previously filed MF-100, it is not necessary to file it again. However, you should indicate in space provided above the type of assistance previously applied for (loans, procurement contracts, etc.) and DMA Docket Number, if available. *When a question is inapplicable it should be so stated in the form.* Additional sheets should be attached in answering any questions or in supplying additional information. IF YOU CANNOT ANSWER A QUESTION, SO STATE.

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

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DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 3 - 1952

16-62067-2

The information requested in questions 3, 4, 5, 6, 7, 8, and 9 below should be answered specifically and in detail, as this information will be attached to and incorporated as part of the Exploration Project Contract, if such contract is entered into with you by the Government.

ANSWER EACH QUESTION ON SEPARATE SHEETS OF PAPER AND SUBMIT A COPY OF EACH ANSWER FOR EACH COPY OF YOUR APPLICATION.

3. (*a*) Describe fully the proposed work and give the total cost of the project.

   (*b*) State the time required to start the project and to complete it.

4. Submit a map or sketch of the property involved showing a plan (and cross section, if needed) of the present mine workings and the *location of the proposed exploration work* as related to geologic features, such as contacts, veins, ore-bearing beds, etc.

5. Furnish an itemized list 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. None.

6. Furnish a detailed list of additional facilities, buildings, and fixtures to be purchased, installed, or erected by you, with the estimated cost of each item. None.

7. Furnish a detailed list of operating equipment, separated into items to be—

   (*a*) Rented

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8. Furnish an itemized schedule of labor, by numbers and classes (miners, muckers, etc.) and of supervisors by numbers and positions, with the maximum wages or salaries to be paid to each. See Item 9.

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10. (*a*) How much are you prepared to invest in the proposed project?

    (*b*) Is this amount sufficient to pay your part of the cost of the project, in accordance with the regulations on Government participation (Sec. 9 of MO–5)?

11. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

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.

ADAMS BROTHERS COMPANY
(Name of company)

By /s/ Robert M. Adams
(Signature of authorized official)

February 1, 1952
(Date)

President
(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.

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ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

1. (a) While the belt of manganese bearing formation may extend northeast and southwest through the south part of Section 20, through the northwesterly part of Section 29, across Section 30, all in Township 47, Range 29, and into the Southeast quarter (SE¼) of Section 25, Township 47, Range 30, the exploration will be limited to a smaller area. See 1 (c).

(b) The applicant holds under lease the Southeast quarter of the Northeast quarter (SE¼ of NE¼), Section 30, Township 47, Range 29.

(c) The explorations contemplated would be upon the Southeast quarter of the Northeast quarter (SE¼ of NE¼), Section 30, Township 47, Range 29.
A copy of the lease is attached.

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ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

2. (a) Manganese.

(b) Section 29 Area Manganese.

The presence of manganese in this area has been known since the early days of the Cuyuna Range of Minnesota.

The early prospectors on the Cuyuna were first attracted to the district by well defined lines of high magnetic intensity which were later found to be associated with ore bodies. Extensive dip-needle surveys were made over much of the area now known as the Cuyuna Range, and the lines of high magnetic intensity were followed in the exploration by drilling.

One of these magnetic lines occurs in Sections 29 and 30, Township 47 North, Range 29 West, in Crow Wing County, Minnesota. The area was first explored in 1906 as a possible source of iron ore. The glacial drift overburden was found to be from eighty feet to one hundred and fifty feet and more.

A greenish gray formation was found under the drift which was reported by various explorers as schist, slate and iron formation. Where there was oxidation

and the formation was stained red, some of the drill cores and cuttings were assayed and found to carry from twenty to thirty per cent iron. Manganese was not important at the time.

The Cuyuna Range manganiferous ores were well known and attracted wide attention during the World War I period, 1915-1918, and the search for additional manganiferous ore deposits was intense. The Section 29 Area was explored and abandoned because, although drill samples assayed between five and ten per cent dry manganese in places, the per cent of iron was low and the material was not a typical Cuyuna Range manganiferous ore.

More recently, in 1949, the area Sec 29 was again explored in an attempt to find, by closer drilling, manganiferous ore lenses in the wide belt of manganese bearing schists and slates. After twelve holes were drilled by one company in Section 30 and five holes in Section 29 by another company, the area was again abandoned as a source of manganiferous ore suitable for blast furnace use.

When the critical shortage of manganese for ferromanganese was brought to the attention of Adams

Brothers Company, who were recent explorers of Section 29, an investigation was started.

Although the material found in the Section 29 Area was evidently unsuitable for the preparation of manganiferous ore, it was thought it might be suitable for the preparation of ferro-manganese.

A rough estimate of an area seven hundred feet wide and twenty-six hundred feet long, in the area where the most drilling data are available, showed 11,000,000 tons of material assaying 4.95 per cent manganese and 25.58 per cent iron which had been classified as slates and schists from the drill cores and cuttings.

The average depth of the drill holes included in the estimate was one hundred and fifteen feet in glacial drift and seventy-six feet in ledge. There is no evidence that the holes were drilled through the formation.

The remnants of the samples available from the drillings were found to be inadequate for the determination of the suitability of the material for the preparation of ferro-manganese.

The explorations in the area indicate the presence of a large tonnage of manganese bearing carbonaceous

slates which are unsuitable for the preparation of manganiferous ore for blast furnace use. These slates may be an economic source of manganese for other purposes.

The drilling to date has not determined the structure or the extent of the manganese bearing formations either in length, width or depth. It is proposed to determine these factors by further churn and diamond drilling: First, by deeper holes to determine the structure and economic value of the material; then, if the formations are found to be suitable for the economic production of manganese, by shallower holes to determine the extent.

It is estimated that the preliminary exploration program in the SE¼-NE¼, Section 30-47-29, should include three (3) structure holes and six (6) areal holes, which would require approximately one thousand (1000) feet of drilling through surface and seven hundred and forty (740) feet of drilling in ledge.

ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

3. (a) It is estimated that the preliminary exploration program in the SE¼-NE¼, Section 30-47-29, should include three (3) structure holes and six (6) areal holes, which would require approximately one thousand (1000) feet of drilling through surface and seven hundred and forty (740) feet of drilling in ledge.

(b) The drilling could start about May 1, 1952, and the program could be completed within two years.

Note proposed drilling program outlined on map:

O Areal

Os Structure

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[illegible] COMPANY

Duluth [illegible], Minnesota

4. See attached maps:

   1. Map of area.
   2. Map showing geology and proposed drilling program.
   3. Logs of drilling.
   4. Geological map.

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7. (a), (b) and (c)

Adams Brothers Company will contract with ADEX Corporation to do the drilling.

Two complete churn and diamond drill outfits equipped for drilling BX holes in ledge will be furnished.

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ADAMS BROTHERS COMPANY

Duluth 2, Minnesota

9. **Drilling**

1000 ft. surface drilling @ $5.00	$ 5,000		
740 ft. ledge drilling @ $10.50	7,800		
Carbon loss, estimated	780		
			$13,580

Note: This particular ledge drilling will involve especial care, hence delays and more than ordinary cost.

Geology

At the rate of $600 a month	1,480

Engineering

At the rate of $500 a month	1,700

Sampling

At the rate of $200 a month (Including preparation and filing)	900

Assays

Estimated	600

Metallurgy

Estimated	1,900

Overhead

Travel, office, misc.	2,000
	$22,240

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10. (a) 25,560.00

(b) Yes.

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11. The general plan of this program together with the reasons for it is as follows. This area on the Cuyuna Range has long been known as one of the areas of iron formation, containing manganese units, but it has not been developed, beyond exploratory drilling on various occasions by various parties. The material found by said drilling has not been of the type which is presently used on the Cuyuna Range for blast furnace mixture. However, this material might be a source of obtaining manganese for other uses.

The formation might extend over a considerable area, both in length and width. Accordingly, over two miles of possible strike has been acquired; in the main, by leaseholds on privately held property and by application to the State of Minnesota on lands owned by it.

In general, the drilling has shown both oxide and carbonate, each containing more or less manganese. If this oxide-carbonate belt should have sufficient continuity in length, width and depth, it might afford a substantial amount of manganese bearing formation which, from a mining standpoint, would appear to have no particularly bad features.

Located as this ground is on the north part of the Cuyuna Range, which district has all the necessary facilities for mining, a few of the favorable features for the development of a mine might be cited as follows:

A. The Mississippi River close by is a source of water.

B. The Minnesota Power & Light Company hi-line crossing the property.

C. Adequate roads from the towns of the Cuyuna Range and passable automobile roads on the property.

D. Railroad transportation within reasonable spur-track length by the Northern Pacific and the Soo Line railways.

E. Nearby towns with schools and other facilities.

F. Favorable surface conditions for stripping prevail upon the Cuyuna Range.

In view of the drilling which has been done to date and the character of the material thus made available for examination and assaying, the following questions present themselves:

A. Is the deposit continuous enough in length, width, and depth to provide ample tonnage for substantial open pit operation?

B. Will the average manganese content be sufficient?

C. Can the manganese be concentrated and extracted metallurgically and economically so as to compete with other sources of manganese?

The only way these questions can be answered would be, first, by further drilling to determine to some extent the limits of the formation and the apparent average manganese content; secondly, to drill several BX holes for the extraction of core for further testing purposes.

We plan on putting one drill on what might be termed area drilling; first, to try to find the North and South edges of the formation as well as enough indicated length and thickness. This work, of course, would show the average manganese content.

Another drill would drill in the present known heart of the area for the primary purpose of extracting core for determining the nature of the material.

In addition to the operation of drilling, samples would be taken to our sample house at Ironton and prepared and filed in the usual manner, assays being obtained from the Lerch Brothers laboratory in Crosby. At this stage the samples would thus be available for examination and for preparation for testing.

The drilling would naturally be guided from an engineering standpoint by the results being currently obtained and sufficient geological services would be made available so that the geology would be studied concurrently with the drilling and naturally as a guide thereto.

As to tests, various possible methods would be investigated and tried out and metallurgical advice and facilities would be made available for this phase of work.

It would not be intended to drill out this formation to its uttermost limits; that would be too long and expensive and unwarranted at this stage. But while endeavoring to learn by the only present available method (testing drill cores) whether the material can be metallurgically and economically handled, it is, of course, equally important to find that there is a sufficiently large and continuous ore body containing sufficient manganese. Hence, the drilling program is for two purposes.

If this drilling program, together with the geological and metallurgical studies, demonstrated a worthwhile source of manganese units, then it would be reasonable to assume that the necessary development would follow.

The proposed investment would of course not permit any development. It would probably be inadequate for a

complete exploration of the whole area but that is not necessary at this stage. It should be enough to cover sufficient drilling for the uses noted and sufficient technical studies to demonstrate whether the area warrants further development.

As to the qualifications of Adams Brothers Company, in 1949 Robert M. Adams formed this company to take over his new mining business in Minnesota and carry on his further explorations.

Cuyler Adams discovered the Cuyuna Range about 1905, and the Adams family has been actively associated with the exploration and development of the Range ever since.

Robert M. Adams started exploring on the Range in 1915 and has continued from that time. The following properties resulted from his work:

Maroco Mine
Evergreen Mine and Smelting plant
Hillcrest Group (Hillcrest, Arko and Alstead)
Mangan-Louise Group
Rabbit Lake Group
Virginia