REPORT

of the

Legislative Commission

ON

Taxation of Iron Ore

Submitted to

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Legislative Commission

ON

Taxation of Iron Ore

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INDEX

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Preliminary Statement

On April 23, 1951, the Legislature created a Commission to investigate and study all matters relating to the taxation of iron ore. (Laws of Minnesota, 1951, Chapter 714). The Commission is composed of 16 members, eight from the House of Representatives appointed by the Speaker and eight from the Senate, appointed by the Committee on Committees. It should be noted that the Commission is made up of an equal number of majority and minority members of both Houses, and this plan of equal representation was carried out in the selection of officers of the Commission and in the appointment of its subcommittees.

The purposes for which the Commission was created are stated in Section Two of the Act, which reads as follows:

> "Such Commission shall make a comprehensive, detailed and complete investigation and study of all the factors contributing to a sound iron ore tax policy for this state, including information regarding the quality and extent of Minnesota's iron ore reserves and those in other parts of the world. The cost of developing Minnesota iron ores and those in other parts of the world; the advisability of using the Lake Erie price as a tax base; the impact of National Defense considerations; and the possible construction of the St. Lawrence Waterway by either Canada or the United States or both, upon the Minnesota iron ore industry, and other related factors, for the purpose of formulating a stable and fair policy for the taxation of iron ore and in order that the state shall receive the maximum possible benefit from this natural resource."

The Commission which we have designated as "Commission on Taxation of Iron Ore" met on August 7, 1951, and elected its officers. Senator Thomas P. Welch was elected Chairman, Representative Fred A. Cina, First Vice Chairman, Senator B. G. Novak, Second Vice Chairman and Representative Lloyd Duxbury, Jr., Secretary. At this meeting, O. A. Blanchard was appointed Director and Martha May Wylie, Secretary to the Director. On August 1, 1952, Mr. Frank Downing, Engineer and former head of the Mining Division of the Tax Department, was engaged as Consultant.

To familiarize the members with the methods employed in mining iron ore in Minnesota, the Commission made a five day inspection trip of the Cuyuna and Mesabi Ranges. Before inspecting any mines, engineers explained in detail the techniques used by the various operators in mining and processing the ore and the geology of both ranges.

The first day was devoted to the Cuyuna Range where the ore bodies are vertical and narrow. The Commission visited various mines and were shown the different methods used to produce merchantable iron ore which consisted of drying with artificial heat, jigging, heavy media, gravity concentration, washing and sintering.

Four days were spent on the Mesabi Range where the ore bodies are horizontal, wide and deep. From this range about one and three-quarters billion tons of iron ore have been shipped. Here, where most of our iron ore and about 95% of our high grade direct shipping ore is located, the mining companies were using every known process to produce merchantable iron ore from low grade ore. In one case they were actually recovering iron ore from an old tailings basin. On this Range both open pit and underground mines were inspected. Plants were inspected using crushing and screening, ordinary washing, jigging, heavy media, and the Humphrey Spiral, (for recovering ore from old tailings). The Erie Taconite Plant north of Aurora, using magnetic separation after fine grinding of the taconite was visited. There the fine powdered ore recovered is made into pellets. At the Extaca Plant of the Oliver Mining Company at Virginia, very fine portions of natural iron ore are prepared for shipment and blast furnace use by processes known in the industry as nodulizing and sintering.

After the tour of the range, the Commission was divided into subcommittees to explore the following subjects:

1. Quality and Extent of Minnesota Iron Ore Reserves and Competitive Reserves Elsewhere. Membership: Representatives Cina, Chairman, Duxbury and Goodin; Senators Novak, Wright and Welch.
2. Cost of Mining and Developing Minnesota Iron Ores and Competitive Ores in Other Parts of the World. Membership: Senators Sletvold, Chairman, Miller, Elmer Peterson; Representatives Forbes, LaBrosse and A. I. Johnson.
3. Advisability of Using the Lake Erie Price as a Tax Base; and Other Pertinent Tax Data. Membership: Senators Miller, Chairman, C. E. Johnson, Vukelich; Representatives A. I. Johnson, Bergerud, Dunn.
4. Impact of National Defense Considerations. Membership: Representatives Dunn, Chairman, Goodin; Senators C. E. Johnson and Sletvold.
5. St. Lawrence Waterway. Senators Elmer Peterson, Chairman, Wright; Representatives Forbes and LaBrosse.

In quest of first hand information on the subjects assigned, certain members of the Commission made trips to the Alabama Ore field and steel plant at Birmingham, Alabama, the Canadian

fields at Steep Rock Lake, Ontario and Labrador-Quebec; and to the steel plants at Pittsburgh and Morrisville, Pennsylvania, Sparrows Point, Baltimore, Maryland. Others went to Washington, D. C. to get information on the impact of National defense considerations and the Great Lakes St. Lawrence Waterway. Hearings were held by the subcommittees and all parties interested were given an opportunity to be heard.

The subcommittees made written reports of their findings to the Commission and the substance of these reports is included under the various chapters in this report.

The Commission as a whole held many hearings on the various subjects assigned relating to iron ore taxation and the administration of the law. Engineers, geologists, the Commissioner of Taxation, representatives of labor organizations, tax organizations, the mining companies, both large and small, fee owners of mining property, and individuals were all given an opportunity to present their views to the Commission.

The Commission makes the following report.

Glossary of Terms Used in This Report

ALUMINA — Oxide of aluminum; clay.

BENEFICIATION — Any process of treating low grade iron ore material, beyond simple crushing and screening, to remove impurities or moisture from the crude material, thereby increasing the iron content of the product, which is called **concentrate.**

BESSEMER ORE — Ore containing phosphorus in the amount of .045% or less.

CONCENTRATE — The product of any method or process of ore beneficiation.

DIRECT SHIPPING ORE — Ore that can be used without beneficiation.

DRIED IRON — The metallic iron content of iron ore when dried at 212 degrees Fahrenheit.

GROSS TON (U.S.) OR LONG TON (BR.) — 2,240 pounds. Adopted from Great Britain along with our other units of weights and measures. Iron ore is bought and sold by the gross ton. Common carriers base their freight charges on the number of gross tons shipped.

HEAVY MEDIA CONCENTRATION — A process using a medium heavier than the rock particles in the ore material being treated, but lighter than the iron ore particles being recovered. (In this process the iron ore particles over 1/4 inch in size can be separated from the particles of rock.)

HEMATITE — Non-magnetic iron ore. Chemically it contains two parts iron to three parts oxygen.

IRON ORE MATERIAL OR LOW GRADE IRON ORE — Iron-bearing material having low iron content, and a high content of silica, alumina, or moisture, or a combination of all three.

JIGGING — Washing of ore material, followed by use of jigs, with combined vibration and rising water current through the ore.

LEACH — To percolate slowly through a mass, (such as rock) gradually removing the more soluable elements. In the case of iron-bearing rocks, the leaching action is that of very slow breaking down over long periods of time.

MAGNETITE — Magnetic iron ore. Chemically it contains three parts iron to four parts oxygen.

MANGANIFEROUS IRON ORE — Iron ore containing not less than two per cent of manganese, and usually not more than thirty per cent manganese. (Most Minnesota manganiferous ores have a manganese content of two to ten per cent.)

MERCHANTABLE IRON ORE — Marketable; acceptable for use in making steel. This term includes **direct shipping ore** and **concentrate.**

MOUTH OF MINE — The point at or near the mine at which the loaded ore cars are released to the railroad company for shipment. This, in the case of direct shipping ore, may be at the actual mouth of the mine; in the case of concentrate, it would be the point near the treating plant, where the loaded cars of the finished product are released to the common carrier for shipment.

NATURAL IRON — The metallic iron content of iron ore as it occurs in its natural bed; or before drying the ore at 212 degrees Fahrenheit.

NET TON U. S. & BR. — 2,000 pounds. Used as the unit applied to manufactured iron and steel.

NON-BESSEMER ORE — Ore containing more than .045 per cent of phosphorus.

NODULIZING — A process similar to that of **pelletizing,** but using a different method, and a degree of heat slightly higher than that used in pelletizing. The product (nodules) will average

slightly smaller and possibly harder than the 5/8-inch to 3/4-inch **pellets.**

PAINT ROCK — Iron and aluminum in combination with silicon and oxygen.

PELLETIZING — A process involving first the forming of very fine ore particles into balls or **pellets** having about 10 percent of moisture; and second the roasting of the pellets at a temperature below that of actual melting, to harden them so that they will stand handling without excessive breakage.

SILICA — Silicon dioxide; sand; quartz; flint.

SINTERING — A process for agglomerating, or compacting together (by heat) the very fine particles of iron ore common in some mines, so that the product can be used in the blast furnace.

SPECIFIC GRAVITY — The ratio of the weight of any given volume of a substance to the weight of an equal volume of water.

SPIRALS — Machines using the principle of centrifugal force combined with rising water current, to recover ore particles smaller than 1/4-inch in size, and larger than 60-mesh size.

TACONITE — Iron-bearing rock, known as chert, very dense and hard.

WASHING OF ORE — The removal of impurities, such as free silica or free alumina by use of water.

Brief History of Iron Mining in Minnesota

EARLY MINING DAYS IN MINNESOTA.

The discovery of iron ore in Minnesota was reported by J. G. Norwood in 1850. Thus the year 1950 marked the centennial of that notable event.

Thirty-four years after the Norwood discovery, the first iron ore was shipped from the Vermilion Range, a shipment of 62,124 tons from the Soudan Mine. In 1892, the first Mesabi Range shipment went forward from a shaft at the Mountain Iron Mine. The actual knowledge of existence of Mesabi iron ore dates back much further. 1911 saw the first shipment of iron ore from the Cuyuna Range's Kennedy Mine.

Strangely enough, the Vermilion's first ore came from an open cut at the Soudan Mine, while the Mesabi's initial shipment was mined from a shaft. This situation was soon reversed, and for many years nearly all of the Vermilion's ore has been from underground mines; while on the Mesabi, underground mining has steadily declined until, in recent years, it has accounted for less than six per cent of the total output.

OPERATING CHANGES.

Year by year, the quantity of earth and rock to be removed to uncover ore is increasing. The early rule of one foot of overburden, for each foot of ore uncovered, has long ago been discarded. Later a rough limit of 100 to 140 feet was estimated as the practical limit of stripping even with deep underlying ore. These figures have now been doubled.

In early days, 5 cubic yard cars and small "dinkey" engines were used in removal of overburden from open pit ore. In 1906, 7 cubic yard cars came into use, on standard gauge railroad tracks. By 1911, 24-yard cars were common, and these were soon followed by 30-yard cars. A number of 40-yard cars are now on order, for use in some of the larger open pit mines. Even more remarkable is the transition, first from hand labor and use of teams and scrapers in removal of overburden, to use of the railroad, or "A-frame" type of coal-fired steam shovel; then the electric shovel; then the caterpillar-mounted full revolving shovel, still in common use; and more recently, the heavy dragline, used with screening bin, and conveyors that move the earth a mile or more from pit to waste pile.

In the larger pits, with favorable grades, railroad haulage still holds its place in open pit work.

LAKE DRAINAGE FOR MINING.

Mainly to aid in the production of ore to meet the demand in World War II, it was decided to drain Syracuse Lake, on the Eastern Mesabi, to permit removal of overburden, and the mining of more than 10 million tons of ore. Since 1943, over 7 million tons have been mined.

In the western part of the pit area, where stripping was in progress in 1942-43, the depth of overburden was 130 feet. In the southeast part of the present pit, where excavation is pushing southward, the combined depth of surface and rock capping exceeds 350 feet.

On the Cuyuna Range, the eastern lobe of Rabbit Lake was pumped out in years 1947-50, and a large dredge was brought in for removal of a large quantity of lake-bed mud, or peat. This part of the work completed, the dredge was dismantled. The pit area, lying inside a roughly circular area enclosed by a dyke, was

pumped out, and removal of clay, sand and boulders, roughly two-thirds of the original volume, was continued with standard equipment. Mining of ore began in 1952, but was interrupted by abnormal flood conditions.

These two examples emphasize the acute demand for iron ore, vital for winning the war, and for overtaking the pent-up demand accumulated during war years.

It has been pointed out by some writers that more than one-third of all the iron ore mined in Minnesota in this century, up to the end of the late war, went to meet the needs of World Wars I and II.

RECENT MINING DEVELOPMENTS.

In Stuntz Township, in St. Louis County, the Mahoning No. 4 was opened in 1949, in the N½ of the NW ¼, Section 10-57-21. This is a fairly good ore body, and should be active for about ten years. The same is true of the Section 18 Mine, opened in 1947, with both direct shipping ore and wash ore.

The South Agnew Mine, formerly operated as an underground mine was developed for open pit mining in 1946 and 1947. This operation pioneered the use of heavy drag-line removal of surface stripping, and long conveyors for moving earth for over a mile to waste piles.

The old Morton Mine, where shaft sinking and initial underground development were carried on by Tod-Stambaugh Co. in 1912-17, is now being developed as an open pit by the Hanna Company, using the same equipment that served to open the South Agnew.

In the Chisholm-Fraser area, the Fraser-d'Autremont-Shenango look like a single operation. The Fraser group is being extended to include the Humphreys, the Alworth, and the St. Clair properties. Another new pit is the Forster, east of the Fraser. The first shipment was made from this pit in 1950.

Near Buhl, the old Wanless underground mine, which produced 2½ million tons in the years 1914-28, and abandoned, was re-opened in 1950 by Cleveland-Cliffs Co. as an open pit. Also, in the same district, in 1951, a new open pit was developed by the Snyder Mining Company, including their Whiteside Mine (formerly underground) and the Kosmerl Mine of Oliver.

In the Virginia area, a large sintering and nodulizing plant was built by Oliver Iron Mining Co. in 1950-51.

On the eastern Mesabi, the Schley Mine, first mined by shaft in the years 1910-23, then by open pit from 1941-45, was re-opened and widened by Inter-State Iron Co. in 1950, for 1951 production.

The St. James Mine, at Aurora, formerly worked as an underground mine, was opened for pit mining in 1951, by the St. James Mining Co. (Oglebay, Norton & Co.)

TACONITE. For many years, the need of experimental work on taconite was urged by Professor E. W. Davis, in charge of the Mines Experiment Station at the University of Minnesota. With the able assistance of Messrs. John J. Craig and H. H. Wade, much valuable pioneer work was accomplished by the Station in perfecting the separation of iron particles from iron bearing (taconite) rock by use of fine grinding and magnetic classifiers. The iron ore thus recovered is a very fine powder and cannot be shipped or used in a blast furnace in that form. This necessitated a long and persistent study of methods for compacting this fine powder into pellets, called agglomerating. Methods have been found.

The attention of the major mining companies was actively aroused by the terrific impact of World War II on the formerly large reserves of high-grade, open pit ore in the Mesabi Range; and several experimental plants were built to carry on the work of making iron ore from taconite, the hard, close-grained iron-bearing rock from which, through ages of time, nature has been producing iron ore.

First came the experimental laboratory of Pickands-Mather & Co. at Hibbing; the larger experimental laboratory of the Oliver Company in Duluth; experimental work at the Battelle Institute, Columbus, Ohio; and continued studies at the Minnesota Mines Experiment Station. This was followed by the building of the Erie Taconite Pilot Plant of Pickands-Mather & Co. near Aurora, in 1947; the Extaca Plant of Oliver Mining Division of U. S. Steel Company, at Virginia, in 1950-51; the plant now being completed by Reserve Mining Company at Babbit, Minnesota; the taconite plant of Oliver, now under construction near Mountain Iron; to be followed by the projected new commercial plant of Erie Mining Company, a few miles east of the present Erie Plant; and the projected large plant of Reserve Mining Company at Beaver Bay.

Though the cost of the taconite treatment will be high, it may be one of the most dependable sources of iron ore; and from that standpoint alone, vital to the prosperity of Minnesota and our National security.

The following estimates of production of taconite concentrate in Minnesota in the future were obtained by the Subcommittee on Reserves, from various sources in Washington, D. C.

1952	500,000 tons
1953	1,000,000 tons
1954	1,500,000 tons
1955	2,500,000 tons

(1) For Beneficiation of Taconite, see Beneficiation.
(2) For Reserves of Taconite, see Reserves.
(3) For other data, see Chapter on Taconite and Great Lakes St. Lawrence Waterway.

BENEFICIATION

Introduction

PRIMITIVE METALLURGY ACTION OF HEAT

It has been said that the art of metallurgy was born at the campfire of a savage; and that the accidental melting of metal in a stone led the way to steel. Heat was then, and still is, one of the **main elements needed in making iron and steel from iron ore.**

BENEFICIATION AND CONCENTRATE DEFINED

Beneficiation is any process used to treat low-grade iron ore to make it into a **merchantable product**, or a product, known as **concentrate** that can be economically used in the **manufacture of steel.** With waning supplies of **direct shipping ore** in Minnesota, mining men are finding that they now have to depend more and more on some form of upgrading of the leaner classes of ore, to make a product that is really fit for effective use in the blast furnace.

These different forms of treatment, beyond simple crushing and screening, include **washing, jigging, heavy media separation, use of spirals, flotation, drying,** and **sintering.**[1]

(1) Percentage of concentrate in total iron ore production in Minnesota

	% of Concentrate in shipments
1910	0.6
1920	12.5
1930	18.2
1940	18.8
1950	30.5

ACTION OF WATER IN CONCENTRATION OF IRON ORE

What **heat** is to the smelting of **iron ore, water** is to the vital process of changing **ore material** into **iron ore;**[2] thus mechanically hastening the age-long natural processes of concentration due to the leaching* action of underground water. Simple washing combines the action of water with the effect of differences in specific gravity of ore and rock.[3]

TACONITE CONCENTRATION NEEDS BOTH HEAT AND WATER

The preceding paragraph applies to most siliceous iron ores in Minnesota that can be improved by some type of washing. **Taconite,** however, hard, tough, and extremely abrasive, needs both heat and plenty of water in its transformation to "**manufactured ore.**"

CRUSHING AND SCREENING

Crushing and screening, formerly classed as two of the various forms of beneficiation, are now regarded as part of (1) the **mining operation** in the case of direct shipping ore; or (2) the **beneficiating plant operation,** in the case of ore that has to be concentrated. This is due to the current general recognition of the importance of ore preparation as to **sizing,** to make the ore more readily reducible in the blast furnace. If crushing and screening were now counted as true beneficiation methods, the ratio of concentrate to total ore shipped, instead of being 30%, would be nearly 100%.

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(2) An exception to this general statement is the use of heat to drive off the excess of moisture in certain types of ore, not treatable by washing, to save on freight. The amount of ore so treated is relatively small. Another exception is sintering, using heat to improve the structure of fine powdery ore and to drive off moisture to save on freight.

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(3) Specific Gravity of:

Hematite (iron ore)	5.1
Quartz (silica)	2.65
Slate (Silica & alumina)	2.50

Definition:

* LEACH—To percolate slowly through a mass, (such as rock); gradually removing the more soluble elements. In the case of iron-bearing rocks, the action is that of very slow disintegration over long periods, with increasing percolation of underground water. Where natural conditions were favorable to this leaching action, as in the central part of the Mesabi Range, the ore is high in iron, and quite low in silica and alumina. On the western Mesabi Range, the disintegration, or **breaking down,** of the ore-bearing rock, has been only partly completed. The ore material here varies widely in quality, from hard, rocky ore material to good wash ore. However, there is very little good direct shipping ore in this part of the Mesabi Range.
In the case of magnetic taconite, the work of breaking down the rock, requiring ages of time by natural forces, is done in a matter of hours, by crushing and fine grinding, followed by magnetic separation of the ore particles from the rock particles.

ORE WASHING

Experimental work by the Oliver Company on the Western Mesabi Range led to the building of the Trout Lake Concentrator at Coleraine, in Itasca County, in 1908. This plant, still the largest of its kind in Minnesota, has been in operation for over 40 years. Early machines have been remodeled or replaced. The process of ore beneficiation has been in a state of progressive change, with many improvements in machines and methods. This plant, originally employing only straight washing of ore by use of water only, now also makes use of heavy media, and other recent methods. Being built in three sections, it is well adapted to changing techniques.

EARLY HISTORY

Oddly enough, the original plant contained one feature long neglected by the industry in general, and actually discarded at the Trout Lake Plant with removal of the large vibrating tables[4] some years later, which were first used to recover the finer particles of iron ore. The tables have been replaced by other machines, which do the work effectively and need less floor space.

BENEFICIATION

Beneficiation, or rather **concentration,** is not fully achieved by the use of any one machine. Certain peculiarities or characteristics of the crude ore material are studied, taking into account the following differences between the iron ore particles and those of the accompanying rock:

PRELIMINARY STEPS

1. Physical structure of ore material, whether coarse or fine, hard or soft, clayey or sandy.
2. Differences in **size range** of ore particles and rock particles.
3. Differences in **weight of ore** and rock particles (specific gravity).*
4. Differences in **hardness** of ore and rock.

(4) One of the oldest of all gravity concentration methods.

STRAIGHT WASHING

1. A large amount of fine sandy material would suggest a straight washing process as the step following coarse screening.

CRUSHING AND SCREENING

2. Large rock particles are removed by coarse screening and go to waste piles. Large ore chunks are reduced to desired size by crushing, followed by either straight washing or heavy media treatment.

GRAVITY METHODS

3. This principle suggests the method of treatment in most Minnesota plants. Straight washing, jigging, heavy media and spirals all make use of this principle.

ABRASION AND FLOTATION

4. If the ore particles are softer than the rock, or where a thin coating of ore is found to cover rock grains, abrasion may remove the ore as fine particles, recoverable by spirals or by flotation.

PLANT DESIGN FITTED TO SPECIAL TYPES OF ORE MATERIAL

Since no one machine can cover the entire process of iron ore concentration, the plant has to be designed to fit the type and peculiarities of the ore material to be treated. A modern plant, designed to treat ore from several mines, would probably include units for crushing, screening, straight washing, heavy media, and possibly flotation.

Following the building of the Trout Lake Plant by the Oliver Company, other companies soon became active in the work of ore beneficiation. Well up in front were Butler Brothers, whose pioneering work in the Nashwauk area has been notable indeed. As in the Oliver Company, some of the former Butler men are now among the top operators on the Central and Western Mesabi Range, the home of "wash" ore. Also, on the Eastern Mesabi, Stanley Mining Company have been doing an outstanding job on hard, rocky ore material.

* See Glossary on page 7.

In fact, all the major companies, and also some of the smaller companies, entering the field since 1940, have made very good progress in solving the increasingly difficult problems of treating complex and rocky ores.

NATURE OF CRUDE ORE MATERIAL

Most crude wash ore contains very coarse particles of rock, and also a large amount of fine decomposed taconite, resembling sand. The iron ore particles are mainly in the intermediate size range.

ORE WASHING BRIEF DESCRIPTION

Simple washing of "sandy" ore combines the use of water with the difference in specific gravity as between ore and rock. Enough water is used to make a fluid mixture, which is kept in motion and also under steady concentration by the action of an upward water current, which lifts the sandy particles so that they are drained off in the overflow at the lower end of the classifier. The heavier iron ore particles settle to the bottom, and are moved upward along the inclined trough of the machine by a rotating spiral blade, and discharged on a conveyor at the upper end, going to the shipping bin. The weight of the concentrate will generally average about 55 to 60 per cent of the weight of crude ore treated.

JIGGING

In most wash ore deposits, the bulk of the silica to be removed to produce a good concentrate is in the form of fine "sand". This part of the concentration has been described. When this step has been completed, and the fine silica bearing ore material is gone, the remaining ore material consists mainly of ore and rock in the sizes above one-half inch. Jigs will work on sizes from one-quarter inch to one and one-half inch.

The use of jigs has been quite general in some parts of the Mesabi Range. Like ordinary washing, this method makes use of a rising current of water, aided by a device that creates repeated surges of water through the stream of ore. Good results are obtained on some types of ore when crushed to between one-quarter inch and one inch size. As

generally applied, however, jigs have somewhat the same limitations as straight washing, as far as the finer ore particles are concerned.

There is one jigging plant in the Virginia area,[3] using jigs of special design, which for the past 3 years has been producing a usable grade of concentrate from a lean ore stockpile that, at first glance, does not appear to have any promise at all as washable material. Here, however, the recovery, measured in weight of concentrate as compared to weight of crude ore going into the plant, is quite low, due to the large amount of impurities in the crude ore material.

Ordinarily, the recovery, or the ratio of weight of concentrate to weight of crude ore to the jig plant, runs from 30 to 50 per cent. Until quite recently, three jig plants were in operation on the Mesabi Range.

HEAVY MEDIA

The Heavy Media process was developed to replace the use of jigs. This is now a standard process on the Mesabi Range. Feed ore going to the heavy media plant is usually pre-washed to remove fine material, and then crushed to pass a one-inch screen.[4]

The terms **"heavy media"** or ("heavy medium"), **"sink-float"**, and **"high-density"** are synonymous. The commonly used term is **"heavy media"**, in which finely ground ferrosilicon, with a silica content of 15 per cent, is held in suspension in water, forming a solution with a specific gravity of 2.7 to 3.3. The ore particles or pieces above one-quarter inch size settle to the bottom of the cone-shaped body of the separating unit, then go to the shipping bins, while the rock particles rise to the top, and are removed to waste pile. (Here again, the range of sizes of ore particles from one-quarter inch down to 60-mesh are now being recovered by special units described further on in this section.)

(3) Charleson Plant, Virginia, Minn.

(4) Some of the concentration plants are now producing entirely heavy media concentrate.

This machine gives good results on ore materials where fairly good separation can be obtained in the size range above one-quarter inch diameter.

The ferro-silicon can be readily recovered for re-use with relatively small loss.

HUMPHREY SPIRAL

The most difficult step in beneficiation, as far as size of ore particles is concerned, appears to be in the range from one-quarter inch diameter down to 60-mesh. (60 screen openings per lineal inch.)

For this step, use is made of the principle of centrifugal force, in combination with water, in a cone-shaped vessel.

One process,[a] described as among the most successful in handling this size of ore material, makes use of what is called "abrasion grinding", followed by treatment in Humphrey spirals. In this process, the relative **hardness** of the ore and rock particles comes into play. Here, the rock particles, which are partly decomposed taconite, are easily reduced to fine sizes in a ball mill using less than the usual number of steel grinding balls.

When the ore and fine silica next go through a Humphrey Spiral using a whirling and rising water current, the fine silica particles are floated out in the overflow, while the iron ore pieces settle to the bottom.

"DUTCH STATE CYCLONE"

This process, also using the principle of centrifugal force in combination with a rising and whirling water current, is described by Holt as follows:[b]

Ore material with particles too fine for treatment by heavy media is mixed with finely ground magnetite and water. The mixture is pumped to the Cyclone unit, (which operates on the same principle as the Humphrey Spiral, the rising and whirling current of the medium). The overflow,

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(a) Holt, Grover J. Manager Minnesota Mines Cleveland-Cliffs Iron Co. Progress in Iron Ore Beneficiation Canadian Mining and Metallurgical Bulletin, Nov. 1950, p. 636.

(b) (Same as above) (Same as above—p. 637)

carrying the waste material, and the underflow, containing the concentrate, are each put through a separator to recover the magnetic medium. As to results, Mr. Holt has this to say: "This process for treating fines may, when perfected, approach in efficiency the sink-float process (heavy density) on the coarse sizes."

FLOTATION

Referring to oil flotation, Mr. Holt notes experimental work on iron ore in Minnesota using this process; and observes that the future of oil flotation for iron ores will rest in the ability to apply the method economically.

ORE BENEFICIATION

As pointed out by G. J. Holt in his 1946 article[c], "almost every man-made or natural force known today, except atomic energy, has been turned toward the problem of iron ore concentration. Processes involving gravity, hydraulics, buoyancy, magnetism, electrostatics, heat, and centrifugal force have been tested in attempting to solve the future of our iron ore industry."

BENEFICIATION OF TACONITE

MAGNETIC TACONITE

The magnetic taconite is located mainly on the eastern end of the Mesabi Range. The Erie experimental plant, near Aurora, built in 1947 and the Reserve Mining Co. plant, built in 1952, at Babbitt, Minnesota, are in the magnetic taconite area. U. S. Steel's Extaca Plant at Virginia may be used later for experimental work on taconite. This company is also building a new taconite reduction plant at Mountain Iron.

SEPARATION OF FINE ORE FROM ROCK PARTICLES

In this taconite, which is very hard and tough, the iron particles are very fine, and the material needs not only repeatedly finer crushing, but extremely fine grinding. It has been proved that the iron particles can be recovered on a commercial scale. Agglomeration[d], the final step, has proved more

AGGLOMERATION GENERAL NOTE

(c) Grover J. Holt—Late Developments in Beneficiation of Iron Ores. Blast Furnace and Steel Plant—Jan. 1946.

(d) Making into porous, semi-fused chunks, by sintering; or into marble-size pellets by high heat in a special furnace.

difficult, but now appears nearer to success on a substantial scale. This has to be done to make the product usable in the blast furnace, since the fine ore particles would be blown out of the top of the furnace by the high air pressure.

SINTERING

Sintering of the finely ground taconite is made difficult due to the impossibility of getting enough air through the bed of fine ore on the sintering machine. This is one method used to agglomerate or put together fine particles of ore (too fine for use in the blast furnace) into coarser pieces that will withstand handling, and that can be used to advantage in the blast furnace. Briefly, this process includes the following steps: 1. A mixture of fine ore and coke, in the ratio of 100 parts of crude ore and 15 parts of coke, with a small amount of petroleum, is made in an enclosed bin above the head of the sintering machine. The mixture of ore and fuel is fed on to the moving steel bar conveyor in a flat bed varying in depth from 8 inches to 15 inches, over the full 6-foot width of the Dwight-Lloyd sintering machine. Carried along at 5 to 6 feet per minute, the fuel in the mixture is ignited as it passes under a row of burning gas jets. Induction fans, set below the moving load, pull the fire downward through the ore bed, and the burning under induced draft continues for the full length of travel, or over 100 feet. By that time the fuel has all burned out, and the ore, semi-fused into a spongy, white-hot mass, breaks off from the bed as it projects over the end pulley and slides down a steel chute, breaking into smaller chunks, as it drops into a steel bin under a cooling spray. Then it is taken by a bucket conveyor to a storage bin for further cooling before loading into ore cars. It should be noted that sintering merely improves the physical structure of the ore, but does not reduce or remove any of the impurities in the ore, beyond driving off all moisture.

The method of agglomeration by pelletizing has been the subject of much work and study both on the Mesabi Range, at the Uni-

versity of Minnesota Mines Experiment Station[e], and at the Battelle Institute, at Columbus, Ohio.

AGGLOMERATION BY PELLETIZING

In this process, the fine iron powder, partially de-watered in a centrifugal drum, is passed through a revolving cylinder. As the ore is repeatedly turned over, it forms into small pellets (much like the effect of rolling a snowball in melting snow), most of which are strong enough to permit careful handling by conveyor to a special furnace for hardening, after which they will stand shipment.

These pellets, having a high percentage of voids, are said to be highly desirable blast furnace feed.

NODULIZING

Nodulizing, or making of nodules, is another process used to form the fine ore particles into small balls, hardened by heat. At some nodulizing plants in the Pittsburgh district, about 7½ percent of finely crushed limestone is mixed with the fine ore. This limestone serves two purposes: first is that of a binder, making harder nodules, that are not easily broken in handling; and second, to serve as the flux needed to absorb the impurities in the molten iron, when the nodules are reduced in the blast furnace.

The nodulizing process makes use of a long rotary kiln, lined with firebrick, and gas fired to nearly 2200 degrees F. The mixture of fine ore and crushed and ground limestone is fed into the upper end of the long, rotating inclined cylinder. This is rotated rather slowly, the ore being tumbled over and over as it rises and drops on the inside of the heated tube, taking the form of small nodules, not over one-half inch in diameter, hard enough to withstand handling without breakage.

OPERATING PROBLEMS

Some problems in connection with taconite reduction:

1. Drilling and blasting. The drilling problem has been solved by what is known as "jet piercing", using kerosene, oxygen and superheated steam. The combined heat and

(e) See Information Circular No. 6, Jan. 17, 1951, by E. W. Davis and H. H. Wade—Agglomeration of Iron Ore by the Pelletizing Process.

moisture, blown against the bottom and sides of the blast-hole cause the rock surface to chip, or spall, and the pieces are blown out of the hole by the high pressure of the steam jet. Remarkable progress in drilling 8-inch to 10-holes is made by this method.

The drill holes, about 30 feet deep, are usually about 20 feet apart, and spaced about 12 feet back from the crest of the cut, and are fired in series for best breakage. Secondary blasting is avoided by use of a "skull-cracker", or heavy iron or steel weight, attached by chain or cable to the end of a power shovel boom, and allowed to drop on the larger chunks, most of which break up readily under this treatment.

CRUSHING

2. Aside from abrasion, always heavy with any hard rock, the job of crushing gives little trouble.

FINE GRINDING

3. Fine grinding also causes heavy wear on movable parts.

WATER

4. Water supply is a major problem in the processing of taconite on the Range, though not in the projected Beaver Bay plant of Reserve Mining Company. The Erie and Babbitt plants get water from lakes in the area, using a long supply pipe line. Roughly two-thirds of the water can be reused after settling out clear in the waste settling basin.

5. Waste disposal is also a serious problem at plants on the Range, since the quantity of rejects will be at least double the amount of concentrate recovered. As the waste is pumped from the plant to waste reservoirs in suspension in water, larger areas will be needed for settling basins, and impounding dikes will have to be built ever higher as the sands accumulate.

Brief History of Iron Ore Taxation

Our first law taxing iron ore and mining products was enacted on November 22, 1881, at a special session of the Legislature. (1881 Extra Session, Chap. 54). The act imposed a tonnage tax of one (1) cent for each gross ton of iron ore mined and shipped or disposed of and this tax was in lieu "of all the taxes or assessments upon the capital stock, personal property and real estate used in producing the ore". The tax was to be distributed 50% to the General Revenue Fund of the state and 50% to the county or counties in which the mines were located. The law was entitled "An Act to encourage mining in this state by providing a uniform rule for the taxing of mining property and products."

In 1896 the Attorney General, in an opinion, declared the law unconstitutional and in 1897 the Legislature repealed the law. In 1898 the State Supreme Court, in the case of State of Minnesota vs Lakeside Land Co., 71 Minn. 283, held the tonnage tax law of 1881 unconstitutional because it was in conflict with Article 9, Section 1, of the State Constitution. During the time the Act was in force taxes collected thereunder amounted to $100,600.09.

Since the repeal of the tonnage act of 1881, iron ore, whether mined or unmined, has been taxed like other property on the ad valorem basis, but at 50% of its full and true value, which is higher than the percentage of full and true value on any other class of property.

Originally, Article 9 of the State Constitution provided that "taxes to be raised in this state shall be as nearly equal as may be; that all property on which taxes are to be levied shall have a cash valuation and be equalized and uniform throughout the state and that property should be taxed according to its **true value in money.**"

In 1906, this Section of the Constitution was amended, by what is commonly called the "wide open tax amendment" and provides that "taxes shall be uniform upon the same class of subjects." Article 9 of the Constitution was amended in 1922 so that every person, co-partnership, company, joint stock company, corporation or association, engaged in the business of mining or producing iron ore or other ores in this state, is required to pay an occupation tax on the value of all ores mined or produced. This tax is in addition to all other taxes provided by law. The first occupation tax law enacted by the Legislature under the amendment fixed the rate at 6% of the value. This rate remained in effect until 1937. It has been amended several times and the rate at present is 12%.

In 1923, the Legislature enacted the "Royalty Tax Law" which imposes a tax on all royalty received during each calendar year, for permission to explore, mine, take out and remove ore from land in this state. The Royalty tax was originally 6% and has gradually increased to the present 12%.

A digest of the present laws and an explanation of how they are administered follows:

DIGEST OF MINNESOTA LAWS APPLICABLE TO IRON ORE TAXATION AD VALOREM TAX

Under our tax laws the word "person" includes firm, company, or corporation. Minnesota Statutes 1949, Section 272.03, Subdiv. 9.

1. GENERAL PROVISION MINN. STATUTES 1949, SEC. 272.01 PROPERTY SUBJECT TO TAXATION

All real and personal property in this state, and **all personal property of persons residing therein,** including the property of corporations, partnerships, banks, banking companies and bankers, is taxable, **except such as is by law exempt** from taxation.

2. M. S. 1949 SEC. 272.03 SUBDIVISION 1 REAL PROPERTY DEFINED

For the purposes of taxation, **real property** includes **the land itself,** and **all buildings, structures,** and **improvements** or **other fixtures** attached thereto, and **all rights or privileges belonging or pertaining to it, and all mines, minerals, quarries fossils,** and **trees on or under it.** (Thus it is clear that special effort was made to obtain a definition that is **all-inclusive.**)

3. M. S. 1949 SEC. 272.04 MINERAL, GAS, COAL, AND OIL OWNED APART FROM LAND

This section provides for the assessment and taxation of **mineral interests** that may be owned separately from interests in the surface of the land; and for their identical treatment both as to taxation and as to sale for delinquent taxes.

4. MINN. STATUTES 1949 SEC. 272.05, RESERVED TIMBER OR MINERAL RIGHTS

This section deals with lands conveyed or **transferred either to the U. S. or to the State of Minnesota,** or to **any governmental subdivision** of either one, in which the **timber or mineral rights** are **reserved by the owner.** It provides for the same tax treatment of such rights as would apply to other real property, regarding both taxation and sale for delinquent taxes.

5. M. S. 1949 SEC. 273.01 LISTING AND ASSESSMENT TIME

All real property subject to taxation shall be listed and assessed **every even numbered year** with reference to its value on **May 1st preceding the assessment, and all real property becoming taxable in any intervening year shall be listed and assessed** with reference to **its value on May 1st of each year.** Personal property, however, is assessed on May 1st of each year.

Provision is also made in this section for the **assessment of mineral lands** leased by the State **after May 1 of any year**, on the basis of **value of all ore shipped therefrom before May 1 of the next year.**

(This provision avoids the escapement of tax, on lands leased after May 1, on ore that may be mined before the following May 1. By mutual agreement, between the Department of Taxation and the Mining Company, this same provision has been followed in the case of privately owned mineral property.)

6. M. S. 1949 SEC. 273.02 OMITTED PROPERTY
6-a SUBDIVISION 1 DISCOVERY
6-b SUBDIVISION 2 LIMITATION

This section provides for entry on the tax records of any real or personal property found to have been omitted or undervalued in any preceding year; such entry being for the year or years originally omitted.

A time limit of six years is herein provided for **entry of omitted property** in the records; and for **correction of the valuation or classification of real property,** the time limit is **one year after December 1** of the year in which the property **was assessed** or **should have been assessed.**

6-c SUBDIVISION 3 RIGHTS NOT AFFECTED

Rights of a good faith purchaser of property **acquired prior to the correction of assessed value thereof** by the county auditor are not affected. In the case of **rights adversely affected** by action of the auditor, **application may be made** for reduction under the provisions of Sec. 270.07, relating to powers of the **Commissioner of Taxation.**

7. MINN. STATUTES 1949 SEC. 273.11 VALUATION OF PROPERTY

All property to be valued by itself, at its true and full value. Value of **land,** and of **buildings or structures,** to be **listed separately.**

8. M. S. 1949
SEC. 273.12
ASSESSMENT OF
REAL PROPERTY

Duties of assessor: To consider every factor that affects market value, including **other comparable lands,** so as to **secure uniformity,** and **avoid discrimination.**

9. M. S. 1949
SEC. 273.13
CLASSIFICATION
OF PROPERTY

All real and personal property, **subject to general property tax,** and **not subject to any gross earnings or other lieu tax,** comes under this section.

9-a SUBDIVISION 1
HOW CLASSIFIED
9-b SUBDIVISION 2
CLASS 1—IRON
ORE, MINED OR
UNMINED

To be assessed under **Class 1, at 50 percent of its full and true value. Unmined ore to be assessed with and as part of real estate** where same is located. **Underground ore (ore mined by underground methods)** and **placed in stockpile after August 1 of any year** and **before the next May 1 . . . for 2 taxable years after being mined, shall be listed and assessed in the district where mined, at its unmined rate. Ore and land to be valued separately.**

9-c CLASS 1-a
ORE PROCESSED
WITHIN
MINNESOTA

All direct products of the blast and open hearth furnaces that are utilized in the form produced, and are not further processed, shall constitute class 1-a, and shall be valued and assessed at **15% of the full and true value thereof.**

10-a M. S. 1949
SEC. 273.14 SUBD. 1
DEFINITIONS

WORDS, TERMS AND PHRASES

. . . The following words, terms and phrases, for purposes of Sections 273.14 to 273.16, are given these meanings: "person" may be an individual, co-partnership, company, joint stock company, corporation, or association.

10-b SUBD. 2
PERSON

10-c SUBD. 3
DEPOSIT

10-d SUBD. 4
LOW-GRADE
IRON-BEARING
FORMATIONS

A body of iron-bearing materials best mined as a unit. Commercial iron-bearing deposits, exclusive of paint rock, located below surface, which in their natural state need **beneficiation to make them fit for use; and which then produce, in tons, less than 50% of the original tonnage of crude ore material delivered to the treating plant; and which must be mined using good engineering and metallurgical practice to produce such concentrate.**

10-e SUBD. 5
BENEFICIATION

The process of concentrating that part of the crude ore entering the beneficiating plant by removal of silica and moisture therefrom.

10-f SUBD. 6
CONCENTRATES

Products of a beneficiating plant, so improved as to be fit for blast furnace use.

10-g SUBD. 7
TONNAGE RECOVERY

Ratio of weight of concentrate to weight of crude ore entering beneficiating plant.

11. M. S. 1949
SEC. 273.15
CLASSIFICATIONS OF LOW-GRADE IRON ORE

Low-grade iron-bearing formations defined in Sec. 273.14 are classified according to **recovery** ratio, as follows:

For tonnage recovery between 49 and 50%, the assessed value is 48½% of full and true.

For tonnage recovery between 48 and 49 **50%, assessed value is 47% of full and true.**

For each further drop of 1% in tonnage recovery, the percentage of assessed to full and true value is to be cut another 1½% of the full and true value; but the assessed value is not to go below 30% of the full and true value in any case.

The land, exclusive of such formations, is to be assessed as otherwise provided by law.

12. M. S. 1949
SEC. 273.16
DETERMINATION OF CLASSIFICATION

Classifications of iron-bearing formations under sections 273.14 to 273.16 are to be determined as follows:

Anyone mining low-grade ore such as above described, whose tonnage recovery of concentrate for a taxable year has been below 50%, may file a petition with the commissioner of taxation, requesting classification of their deposit under the provisions of Sections 273.14 to 273.16. The taxpayer must furnish such data and information as the commissioner may require. The commissioner then submits such petition and data to the University of Minnesota Mines Experiment Station. The latter considers the deposit referred to in the petition as a unified commercial operation; and, based on all data furnished, next files a written report thereon with the commissioner of taxation, who, after hearing duly held, may approve or disapprove such report. If a reclassification is made covering such deposit, the commissioner of taxation has to give appropriate notice thereof to the interested taxing districts.

If the commissioner disapproves such classification, his findings and order thereon may be reviewed by a writ of certiorari from the supreme court on petition of the aggrieved party presented to the court within 30 days after date of such order. Such classifications are also subject to further review by the Mines Experiment Station, from time to time, upon request of the commissioner of taxation, or upon further petition by the taxpayer. Valuations determined hereunder are subject to the provisions of sections 270.19 to 270.26.

13. M. S. 1949 SEC. 273.19 LESSEES AND EQUITABLE OWNERS

This section relates to property held under lease for a term of 3 years or more, or under purchase contract either from the State or from any religious, scientific, or benevolent institution, or any railroad or other organization whose property is not taxed like other property; or when the property is school or other state land, and is considered, for tax purposes, as belonging to the current holder thereof.

The ad valorem tax goes to the state, counties, townships, school districts and local taxing districts according to the levy of the respective taxing units.

OCCUPATION TAX

1. CONSTITUTION OF MINNESOTA, ARTICLE IX SECTION 1

Following the fundamental provision, in Article IX, Section 1 of the Constitution, that the power to tax shall never be suspended, or contracted away, comes the specific provision, in Section 1-A, for the **occupation tax.**

2. SECTION 1-A PROVIDING FOR OCCUPATION TAX
(a) OCCUPATION TAX NOT A "LIEU TAX"
(b) TIME OF PAYMENT OF OCCUPATION TAX

The constitution provides that **anyone engaged in the business of mining or producing iron ore or other ores in this State,** shall pay to the State of Minnesota an **occupation tax on the valuation of all ores mined or produced,** which tax **shall be in addition to all other taxes provided by law,** said tax to be due and payable from such person . . . **on May 1 of the calendar year next following the mining or producing thereof.**

(c) VALUATION OF ORE AS BASIS OF TAX

The **valuation of ore** for the purpose of determining the **amount of tax** to be paid shall be ascertained in the manner and method **provided by law.** (Method to be described later.)

(d) APPORTIONMENT OF OCCUPATION TAX

Funds derived from the tax herein provided for shall be apportioned: **fifty percent to the State General Revenue Fund, forty percent to the Permanent School Fund, and ten percent to the Permanent University Fund.**

3. MINN. STATUTES 1949 SEC. 298.01 OCCUPATION TAX ON PRODUCING ORES

This section repeats the provision, number 1-A, Article IX, of the State constitution, for payment of the occupation tax by **producers of iron ore in Minnesota;** and states the rate of such tax as 11% for 1947 and each year thereafter, computed on the **valuation of ores mined or produced** by any person during the preceding calendar year.

4. MINN. STATUTES 1949 SEC. 298.011, VALIDATED BY THE CONSTITUTIONAL AMENDMENT TO ART. IX SEC. 1 ADOPTED NOV. 27, 1950 VETERANS' COMPENSATION FUND

This section sets forth: "Notwithstanding the provisions of Section 1-A of Article 9 of the constitution, a portion of the **proceeds of the occupation tax, on the valuation of all ores mined or produced, . . . equal to the proceeds of a tax of 1% on such valuation . . . shall be paid into the veterans' compensation fund before the remaining funds derived from the occupation tax are apportioned by Sec. 1-A of Article IX of the constitution."**

This amendment when approved by the people and proclaimed, all as provided by law, was made effective Jan. 1, 1949. In the event that the provisions of the preceding sentence are held unconstitutional, the remaining provisions of this Section are to stand as valid and continue in full force and effect. "This section of the constitution shall expire on Dec. 31, 1958, except as to the proceeds of the occupation taxes theretofore levied and thereafter collected."

5. M. S. 1949 SEC. 298.02 SUBDIVISION 1 AS AMENDED BY LAWS 1951, CH. 664, LOW GRADE ORE; CREDIT FOR COST OF LABOR

Any taxpayer coming under the provisions of Sec. 298.01 may qualify for a **credit for high labor costs of mining, development, or beneficiation,** as defined in this section, as follows:

(a) This applies to **underground mines, and to open pit mines** where **over 50% of the crude ore produced has been beneficiated**

by processes more difficult than ordinary crushing and washing; and allows a credit of 10% of labor cost at such mines in excess of 50 cents and not over 65 cents per ton of concentrate produced; and 15% of that part of cost of such labor above 65 cents per ton of concentrate produced.

(b) **Other mines. (Open pit). On the first 100,000 tons** allow a credit computed in the same manner as under (a). **On all concentrate in excess of 100,000 tons from any mine, 10% of labor cost in excess of 80 cents per ton of concentrate;** provided that the maximum allowable credit be limited to 75% of the computed gross tax, in the case of **underground** and **taconite operations,** and to 60% as applied to **all other operations,** of the total of the tax computed under the provisions of M. S. 1949, Sec. 298.01.

6. M. S. 1949 SEC. 298.02, SUBD. 2. CREDIT IN LIEU OF COST OF LABOR

In lieu of the **labor credit,** at the election of taxpayer, **a credit** may be allowed against the occupation tax, as follows: **two-thirds of one percent** of the **gross tax for each one percent of the total production of iron ore from any mine which is made into pig iron, sponge iron, or powdered iron within the State.**

7. M. S. 1949 SEC. 298.03 VALUE OF ORE HOW ASCERTAINED

The law specifies **the value of the ore, where brought to the surface of the earth, as the basis of the tax; "such value to be determined by the Commissioner of Taxation."**

SPECIFIED STATUTORY DEDUCTIONS UNDER SEC. 298.03

(1) Mining (cost of labor and supplies).
(2) Development—open pit.
(3) Development—underground.
(4) Royalty paid.
(5) That part of the realty tax allocated to ore mined in calendar year.
(6) The amount or amounts of all the foregoing subtractions shall be determined by the commissioner of taxation.

8. M. S. 1949 SEC. 298.04 ORES SUBJECT TO TAX

This section provides that **all ores mined or produced after** December 31, 1936, shall be subject to the provisions of Sections 298.01, 298.03 and 298.04.

9. M. S. 1949 SEC. 298.05 MINING COMPANIES TO REPORT ANNUALLY

Producers of iron ore are required hereby to file, on or before March 1 of each year, with the Commissioner of Taxation, under oath, a report, in such form and containing such information as the Commissioner may require, covering the operations of each of their mines during the preceding calendar year.

10. M. S. 1949 SEC. 298.06 COMMISSIONER TO DETERMINE TAX

Upon receipt by the Commissioner of Taxation of such report, he shall determine . . . whether the report is correct or not; and if found correct, he must, on or before May 1, determine the amount of tax due from each person.

11 M. S. 1949 SEC. 298.07 WHEN REPORT IS INCORRECT COMMISSIONER TO FIX AMOUNT OF TAX

. . . If the report is found by the Commissioner to be incorrect . . . he shall find and determine the amount of tax due from such person.

12. M. S. 1949 SEC. 298.08 PROCEDURE WHEN NO REPORT IS FILED. PENALTY

If any iron ore producer in Minnesota fails to make the report as required under Sec. 298.05, at the time and in the manner therein provided, the commissioner of taxation shall . . . **ascertain the kind and amount of ore mined or produced, together with its valuation, and determine the amount of the tax due. . . . There shall be added thereto a penalty for failure to report, equal to 10% of the tax imposed, to be treated as part of the tax.**

13. M. S. 1949 SEC. 298.11 TIME FOR PAYMENT OF TAXES. PENALTIES

If the tax provided for in Secs. 298.01-298.16 is not paid before June 15 of the year when due . . . a penalty of 10% thereof shall immediately accrue; and 1% per month is added to such tax until paid.

14. M. S. 1949 SEC. 298.17 OCCUPATION TAXES TO BE APPORTIONED

All occupation taxes, except the 1% dedicated to the veterans' compensation fund, are distributed as follows: 50% to the State General Revenue Fund; 40% to the Permanent School Fund; and 10% to the Permanent University Fund.

15. M. S. 1949 SEC. 298.19 ORE-CARRYING ROADS TO REPORT TO COMMISSIONER

Every railroad company or other common carrier receiving iron ore for original shipment from any Minn. mine is required to report in writing to the Commissioner of Taxation, on or before May 10 and November 10 of each year. The report is to state the **number of tons received for shipment, as provided in Secs. 298.19 and 298.20, up to and including the last day of April and the last day of October of each year; including the total tons received for shipment from each mine, and tons received since the date of the last preceding report. The report also has to show the place where the ore was received for shipment, and name of shipper in each case.**

16. M. S. 1949 SEC. 298.22 SUBDIVISION 1 AS AMENDED BY LAWS 1951, CH. 713, SEC. 31, SUBD. 1

This section provides that, beginning May 1, 1941, (to Apr. 30, 1942) 5%; and beginning May 1, 1942, 10% of all amounts credited into the general revenue fund, from the proceeds of the **occupation tax**, is appropriated to the **Iron Range Resources and Rehabilitation Commission.** This section also creates the office of Commissioner thereof, who is to be appointed by the Governor, with advice and consent of the Senate. **This Commissioner is authorized to use such amounts of this appropriation as he may deem necessary and proper in developing the remaining natural resources** of any county in need as a result of **removal of its natural resources;** and in the vocational training and rehabilitation of its residents.

DIGEST OF MINNESOTA LAWS APPLICABLE TO IRON ORE TAXATION ROYALTY TAX

1. M. S. 1949 SECTION 299.01 TAX ON SEVERANCE OF ORE FROM LAND RATE

This section provides for a tax of 11 percent upon all **royalty received during each calendar year, for permission to explore, mine and remove ore from land in Minnesota.**

2. M. S. 1949 SECTION 299.011 VETERANS' BONUS TAX ON ROYALTIES

This new section provides for a 1% tax **on all royalty received in each calendar year after 1948,** in addition to the 11% tax levied by Section 299.01. **Proceeds of this 1% tax** are deposited in the state treasury to the

credit of the **Veterans' Compensation Fund.** This section became effective January 1, 1949, and is to expire on December 31, 1958, **except as to the collection of taxes theretofore levied and unpaid.**

3. M. S. 1949 SECTION 299.02 DEFINITIONS SUBD. 1. ROYALTY

Royalty, as here defined, is the amount in money or value of property received by any person having any right, title, or interest in or to any tract of land in this state for permission to mine and remove ore therefrom.

SUBD. 2. PERSON

The word "person" includes individuals, co-partnerships, associations, companies and corporations.

4. M. S. 1949 SECTION 299.03 REPORTS TO COMMISSIONER OF TAXATION

This section provides for a report to be made by each **recipient of royalty on mineral lands in Minnesota.** This report is to be made and filed with the Commissioner of Taxation on or before February 1 of each **year,** reporting the **amount of royalty received by such recipient during the preceding calendar year;** also such other information as the Commissioner may require.

5. M. S. 1949 SECTION 299.04 CONTENTS OF REPORTS BY PAYORS OF ROYALTY

This section prescribes the duty of every person **paying royalty,** on or before February 1, to file with the Commissioner a report covering the preceding calendar year, showing

(1) **the number of tons mined from each tract of land on which he pays royalty;**
(2) **the amount of royalty paid on each tract of land separately;**
(3) **the name and post-office address of each person to whom royalty is paid;**
(4) and such other information as the Commissioner of Taxation may require.

6. M. S. 1949 SECTION 299.05 TAX ON ROYALTIES ASSESSMENT BY COMMISSIONER

This section provides for the determination, by the Commissioner, of the amount of tax due; and, on or before May 1 of each year, he is to make a certificate of tax due, and the amount paid thereon; and file one copy of the certificate with the State Auditor on or before May 1 of each year, and one copy with the State Treasurer.

7. M. S. 1949 SECTION 299.08 LIEN OF TAX

This section makes the royalty tax a specific lien upon the land from which the ore is removed and provides that every person paying royalty to another which is subject to the tax, shall withhold the amount of the tax upon such royalty and remit the same to the State Treasurer.

8. M. S. 1949 SECTION 299.13

The proceeds of the 11% royalty tax are credited to the State General Revenue Fund.

DIGEST OF MINNESOTA LAWS APPLICABLE TO IRON ORE TAXATION TACONITE AND IRON SULPHIDES

1. M. S. 1949 SEC. 298.23 TACONITE AND IRON SULPHIDES DEFINED

Taconite: ferruginous chert, compact, siliceous, fine-grained and **hard, which cannot be made merchantable by simple methods of beneficiation.**

Iron sulphides are defined as chemical combinations of **iron** and sulphur, known as pyhrrotite, pyrites, or marcasite, that cannot be made merchantable **except by methods beyond ordinary washing.**

2. M. S. 1949 SEC. 298.24 AS AMENDED BY LAWS 1951, CH. 613

This section provides for a tax on taconite and iron sulphide concentrates, of 5 cents per ton of merchantable iron ore concentrate as produced, plus 1/10 cent per gross ton for each 1% that the iron content of the concentrate exceeds 55%, when dried at 212° Fahrenheit.

3. M. S. 1949 SEC. 298.25 ADDITIONAL TAXES

The above tax is **in addition to the occupation tax and the royalty** tax, but **is in lieu of any other taxes except those on the land, and on other products than iron ore or iron sulphides,** that come under the general property tax law.

4. M. S. 1949 SEC. 298.26 TAX ON UNMINED TACONITE OR IRON SULPHIDES

This section provides in any year when at least 1000 tons of iron ore concentrate are not produced, for **a tax on the unmined taconite or iron sulphides at the mill rate prevailing in the taxing district, with the provision that the tax shall not exceed $1.00 per acre.**

5. M. S. 1949
SEC. 298.27
COLLECTION
AND PAYMENT
OF TAX

This section specifies that the tax provided by Section 298.24 **is to be collected and paid in the same manner and at the same time as provided by law for payment of occupation tax.** The same is true as to form and manner of filing of reports; as to hearings; and as to collection of the tax, including provisions for penalties and for appeals.

6. M. S. 1949
SEC. 298.28
APPORTION-
MENT OF
PROCEEDS

The Taconite Tax is distributed as follows:
One fourth to city, village or town;
One fourth to the school district;
One fourth to the county;
One fourth to the state.

EXEMPTION FROM INCOME TAX—M. S. 1949, Section 290.05

(2) Corporations, individuals, estates, and trusts engaged in the business of mining or producing iron ore; but if any such corporation, individual, estate, or trust engages in any other business or activity or has income from any property not used in such business it shall be subject to this tax computed on the net income from such property or such other business or activity. Royalty, (as defined in section 299.02) shall not be considered as income from the business of mining or producing iron ore within the meaning of this section.

IRON ORE TAXATION **AD VALOREM TAX LAWS**

ADMINISTRATION

MINN. STATUTES
1949
SEC. 273.11
VALUATION OF
PROPERTY

This section reads in part as follows: "All property shall be assessed at its full and true value in money. . . . In valuing property upon which there is a **mine** or quarry, it shall be valued at such price as such property, including the **mine** or quarry, would sell for at a fair, voluntary sale, for cash."

M. S. 1949
SEC. 273.13
CLASSIFICATION
OF PROPERTY
SUBDIV. 2
Class I.

"Iron ore, whether **mined** or **unmined,** shall constitute Class One and shall be valued and assessed at 50 per cent of its full and true value."

Not enough sales of iron ore property have been made to establish any dependable basis of value. For this reason other methods had to be found to obtain the proper and fair value of such property for purposes of taxation.

The members of early tax commissions in Minnesota gave this problem a great deal of

time and study. One of their first difficulties was the question of how to insure the reasonably correct determination of the amount and grade of ore in the many mineral properties in Minnesota.

FOR DETAILS OF THIS AGREEMENT SEE CHAPTER ON "ORE RESERVES"

The 1909 agreement made by the Tax Commission and the Board of Regents of the University of Minnesota has proved to be a most fortunate solution of that problem. The work done for the former Tax Commissions and for the present Department of Taxation by the School of Mines of the University of Minnesota acting as engineers for the Department of Taxation in making estimates of ore reserves has been of great value to the State.

The Tax Commission of 1908, in their method of classification of iron ore deposits for determination of value for tax, used a method somewhat similar to that in use today. Assuming a life of 20 years and a discount rate of 4 percent,* they valued the iron ore known at that time; and, based on these results, developed what is known as the "Class Rate" system. This first valuation included four or five classes. Later the number of classes was increased to nine.

The highest class rate was 33 cents per ton, (assessed value) for open pit ore of high grade that could be developed and mined at low cost. From that top rate, the other rates on open pit ore ranged downward, based on the grade of ore and costs of mining. Similarly, there were several classes of underground ore, the rates grading downward from 24 cents as the **assessed value** of **ore in the ground.** Over the years, there were four horizontal increases in all class rates on iron ore, each adding 5 percent to the former rates. These increases were made in the years 1910, 1912, 1914, and 1920. By 1920, the original rate of 33 cents, first applied to open pit ore in the Hull-Rust and Mahoning mines at Hibbing, had become

* Compounded annually. The factor for 20 years at 4% compounded annually is .4564, or nearly the same as the Hoskold factor for 25 years at 6% and 3% (.4575).

40.1 cents, a rate that held for over 20 years. Other rates were likewise increased.

There have been no horizontal (or general) reductions in class rates at any time. The Oliver Iron Mining Company and others, in the Ore Tax case of 1934, protested the use of class rates, and urged the method of present worth of future profits. The lower court approved the present worth method of valuing iron ore properties for taxation, and the decision was affirmed by the Supreme Court in 1936. (198 Minn. 385). The Tax Commission, however, did not give effect to the decision of the Court until 1938; and it was left to the present Commissioner of Taxation, in the valuations of 1940, to make a real beginning at the task of changing over from the class rate system to that by present worth, commonly known as the application of the Hoskold formula.[1]

A brief explanation of the general method of the use of this formula is as follows: First obtain the expected total future net income (profit) during the life of the mine. Since it cannot be known definitely when any one mine will be exhausted, engineers make use of what is known as the **Range life**, or the expected term in which all of the presently known ore will be mined out. The Hoskold formula makes use of two interest rates, the first, known as the **risk rate,** (now fixed at 6%) being that assumed to give a fair return on money invested in the mine; and the other, a lower rate, termed the **capital return rate,** (now fixed at 3%) being the rate which, compounded annually over the mine life, will amount to the present mine value. The factors to be applied for the various interest rates and terms of years, are shown tabulated in Baxter & Parks Valuation Handbook, and need not be worked out for each valuation.

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(1) To show the principle here involved, this example is used: Brown sells Smith a house for $10,000, taking Smith's note, payments to be $1000 per year for 10 years. Soon afterwards, Brown, needing ready cash to meet an emergency, asks Smith to pay him the cash value of the note in a lump sum. Smith then discounts the note at 4%, compounded annually, and pays Brown the present cash value, or $8,110.90.

VALUATION BY METHOD OF PRESENT WORTH OF FUTURE PROFITS

The change-over was of necessity a gradual one. By 1950, most of the major deposits in St. Louis County were being valued by the present worth method. On most underground property, and on a small number of open pit reserves having mainly low grade ores, with high development costs, it was found that the present worth method showed no value, or at best a small value. In the case of underground properties, some of them producing mines, the former class rates were retained. In others, a lower rate was established as a result of the computations. In the case of underground reserve properties, as yet undeveloped, there has been a change in rates, usually a decrease from the former class rates, based on the iron content of the ore.

MARGINAL PROPERTIES

In the case of a few low-grade open pit reserves, some of which contain large tonnages, but with very high estimated development costs, the values were what are referred to in the 1934 Court case as "upset" or arbitrary "lump sum" values. With the rapid advances being made in furnace techniques, and in improved methods of beneficiation, it could not be said that any sizeable iron ore deposit had **no value**. However, no calculation by present worth methods would show substantial value. Therefore, in the case of such a property, a lump sum value is recommended to the Commissioner by his mining engineers and, when given his approval, is certified to the County Auditor.

It is estimated that well over 80 per cent of the reserve tonnage in St. Louis County, including most of the direct shipping ore, is being valued by the present worth method, under the **Hoskold formula,** heretofore explained. Two copies of form 110 showing the actual working out of the May 1, 1950 valuations, one on an active mine, and the other on a reserve property, are shown on pages 50 to 57, inclusive.

EXISTING LAWS

The 13 sections of Minnesota law that apply to the ad valorem tax on iron ore have been briefly summarized. These sec-

tions form the foundation for what is done by the Mining Division of the Department of Taxation, in working out detailed valuations of the principal mineral properties. The engineers then recommend to the Commissioner the results of their calculations.

PRELIMINARY DISCUSSIONS

In the preliminary discussions preceding the valuations, also in the progress of the work, matters of purely technical knowledge or experience are decided by the engineers. Any matters involving policy are referred to the Commissioner.[1]

PROCEDURE IN CALCULATIONS OF VALUE

Reference is now made to form 110, Sheet No. 1 of the valuation form of this report. At the upper left are: the name of the mining company that controls the property being valued, the name of the mine, or of the mineral property (if undeveloped), and the name of the tax district in which the property is situated. At the upper right is shown the legal description, including the subdivision or subdivisions, also the section, township and range numbers.

Next comes the date of the calculation, taken at May 1 of the year of the valuation.

Part 1 of the calculation is headed: **ESTIMATED FUTURE INCOME PER TON.**

The first item, **A, Reserve Tonnage in Ground,** is next shown as the tonnage estimated by the School of Mines at May 1 of the current year, expressed in gross tons of open pit ore, of underground ore, and total ore in the property being valued.

Since it would not be possible for the engineers of the School of Mines to review all mineral properties, or even all operating mines, every year, the tonnage shown is either: (1) that found by the School of Mines for May 1 of the current year, or (2) that last determined by the School of Mines, corrected by shipments from the date of their latest estimate to May 1 of the current year.

(1) Thus the Mining Division, working with the Commissioner of Taxation, carries out the administration of the Minnesota laws affecting valuation of iron ore; also acting in accord with the rulings of the Supreme Court in the case of State vs. Oliver Mining Co. (198 Minn. 385) and Village of Aurora, et al, vs. Commissioner, (217 Minn. 64).

EXCEPTIONS

The foregoing is the general procedure. There have been a few exceptions. In cases where new ore has been found by the mining company, but the School of Mines review could not be completed in time for the equalization for the current year, the company's increased figure has been used for that one year, and then corrected or revised in the review made by the School of Mines for May 1 of the succeeding year. However, it has not been customary, in cases of a **decrease** in tonnage as shown by mining company estimates beyond that due to shipments, to make downward changes without a School of Mines review of the property in the current year.

Another exception occurred many years ago on the eastern Mesabi Range, where the property being estimated had not been explored by drilling. Guided by the results of drilling on adjoining lands, the School of Mines made their estimate of tonnage and grade of ore in the property, based on what had been found on the adjacent explored lands. While this is not a frequent occurrence, it has happened in several cases, in different districts on the Mesabi Range. In a recent instance, ore had been proved by drilling of lands one half mile apart. At the request of the Commissioner, the owners agreed to an arbitrary estimate for the year 1951, of ore in the half mile strip that had not been drilled, thereby adding substantially to the mineral valuation of that year. The company was not bound to make any such agreement in the absence of drilling.

PROCEDURE IN CALCULATIONS OF VALUE (con't)

The second item is on **line B, Lake Erie Market Value Per ton.** This term has been in use for many years. The best reason for its use is that the greater part of ore from Minnesota goes by boat to Lake Erie ports, there to be transferred to railroad cars for shipment to various furnaces, at widely varying distances from Lake Erie, and at greatly different costs for railroad freight. But the one point of **stable ore value,** accepted by both buyers and sellers of ore, is the **port of transfer,** which, in most cases, is the

LAKE ERIE VALUE OF ORE

Lake Erie Port. Ore values are quoted there at rail of vessel and are accepted as freely as the price of wheat or corn on the Duluth or Chicago Board of Trade, or the price of livestock at South St. Paul, Chicago, or Omaha.

For reasons of business economy, the ore price set, usually early in each year, generally holds throughout the year. Some operators claimed that certain mines are operated on too narrow a margin to work without knowledge of the value of standard ore grades for that far in advance. For reasons of budget and intelligent planning a value guaranteed for a year is desirable to the mine operator, the steel-making company and the State of Minnesota.

Values are quoted on old Range ore, including the ores mined in Michigan and on the Vermilion Range of Minnesota. Ores of the Mesabi and Cuyuna Ranges are in one group as Mesabi Bessemer or Mesabi non-Bessemer, and are quoted; and this group also includes Fillmore County.

The value most commonly quoted is that for **Mesabi non-Bessemer ore.** The figure of $8.30 per gross ton, set December 2, 1950, was "frozen" by Federal action, and remained in effect through 1951 and the first half of 1952. As announced in Skillings Mining Review of September 20, 1952, the Office of Price Stabilization, on September 12, 1952, issued ceiling price regulation No. 169, establishing ceiling prices for sales of iron ore produced in Minnesota, Wisconsin, or Michigan and delivered on and after July 26, 1952, at an increase of 75 cents per ton above ceiling prices established by OPS regulation of January, 1951.**

** OPS ceiling prices per gross ton for ore delivered on and after July 26, 1952, for standard grades of iron ore of 51.50% natural iron content, produced in Minnesota, Wisconsin, or Michigan, and delivered at rail of vessel at lower lake ports are as listed hereunder, subject to the adjustment for transportation charges and taxes thereon since December 1, 1950:

Mesabi Range Non-Bessemer	$9.05
Mesabi Range Bessemer	9.20
Old Range Non-Bessemer	9.30
Old Range Bessemer	9.45
High Phosphorous	9.05

Prices to reflect all changes after December 1, 1950, in established rail freight from mines to upper lake ports, in established vessel freight rates from upper to lower lake ports and in taxes on any such rates.

The quoted market value of $9.05 per gross ton at Lake Erie means the value of **Mesabi non-Bessemer ore containing 51.5%** of natural iron. The first thing done with a 5-foot sample of iron ore, after it has been collected at the drill, is to dry it at 212° F. Its iron content in its dried state is fairly dependable.[a] But the complete analysis made by the chemist includes the percentage of moisture as found by the loss in weight on drying. If the ore sample, before drying, weighs 10 lbs. and its dry weight is 9 lbs., the loss is 1 lb., or 10% of the weight of the original ore. Then, if the analysis shows 60% in metallic iron in the dried ore, the engineer multiplies the 60% by 90% (since 10% of the original ore was water), and the product, or 54%, is the "natural" iron content of the ore.

"DRIED" IRON VS. "NATURAL" IRON

At the top of sheet 2 of form 110 is space for entering the different tonnages of ore in the mine, as reported by the School of Mines, and the average analysis of each tonnage; and the computed total tonnage of Bessemer ore with its average analysis;[b] the total non-Bessemer ore with its average analysis, also the manganiferous grade, if any, is entered on a separate line, with its average analysis.

COMPUTATION OF ORE VALUE AT LAKE ERIE

The next step is the computation of value of ore at Lake Erie, usually based on an average of a four-year period, of which the last is the current year. The same four-year period is taken for costs of mining, development, beneficiation and transportation. While the taxing authorities are not bound to use any statistical period, this method usually is preferred as giving a fairer average, both as to ore values and as to costs of operation. The use of only the one current year for ore value might be ruled out as inconsistent since that figure should be matched by use of the current year's costs

(a) Analysis includes: 1. Dried iron; 2. Phosphorus; 3. Silica; 4. Alumina; 5. Manganese; 6. Moisture. From Nos. 1 and 6, the natural iron is computed.

(b) In some of the older drilling, it has been found from the analyses of the ore when mined and sampled, that part of the silica in the ore when washed up from the bottom of the drill-hole, was separated out and washed away in the process of recovering the ore sample, leaving a sample lower in silica, and higher in iron, than the actual average silica and iron content of the ore in the ground. This difference ran from ½% to 2% or more in metallic iron, with a corresponding error in silica. More recent drilling, using improved methods of sample recovery, gives closer results.

which cannot be accurately known before the following year. This is further explained in a later section.

REVISION OF ANALYSIS

The "Revision for Analysis", referred to in 198 Minn. 385, was adopted to correct the conditions above described, where drilling results were not found fairly well borne out by the analysis of the ore when mined. While many of the properties in that case were reserve properties, and undeveloped for mining, others had been operated, but were later closed down. The experience at these mines, as regards higher silica in the ore as mined than that indicated by analysis of drill sample, formed the basis of the so-called "Revision of Analysis" allowed by the Court.

In recent years few mines have been opened without careful advance structure drilling, hence the need of any revision of drill analysis will gradually disappear.

YEAR 1950 TAKEN AS EXAMPLE

(P. 28 of Transcript of Testimony Nov. 20, 21, 1951)

In the valuations made in 1950, the arithmetical average of the non-Bessemer price for the years 1947, '48, '49, and '50 was $6.625. During part of those years, there were **increases in transportation cost after the price announcement had been made,** such increases being **automatically added to the value of ore,** since they were specified, **at the time of the price announcement,** as being **"for buyer's account".** Those increases brought the average non-Bessemer ore value up to $6.696. The 1950 Lake Erie non-Bessemer value of 51.50% natural iron ore was **$7.70,** or about **$1.00 more** than the value used in the calculations.

The question has been asked: Why use an ore value, in 1950 valuations, that is **$1.00 less than the actual value for that year?**

The answer to that is: If the Commissioner were to use the current value, he should also use current costs. But the current costs cannot be accurately known until too late for the current year's equalization, which has to be certified to the county auditor on or before November 15 of each year.

Therefore, to be consistent, use is made of ore values, and operating and transportation costs, for the **same term of years.**

While it is true that the 1950 ore value was known at the time of the valuation, and the exact cost figures were not then known, it was held that the known costs for the preceding 3 years, and the **estimated 1950 costs,** would give a fairly close average cost for the 4-year period.

PROFIT PER TON

What is important is a fair estimate of what is known as the "profit spread", or **average profit per ton,** on any mine being valued. The foregoing method is believed to be the one best suited to that purpose.

VALUE OF ORE

The value of the ore at Lower Lake ports having been found by the use of the usual premiums or penalties for structure and premiums for low phosphorus content (in the case of Bessemer ore); and the penalties for low iron and high silica; the value of each grade or group of ore is extended, and the weighted average value is then computed for the total reserve of ore in the mine.

Before entering this value on line B, the allowance of ½ percent is made for **shrinkage,** an allowance made uniformly to all companies.

OPERATING COSTS

Having determined the value of the ore at Lake Erie, the next step is to determine the deductible costs, to arrive at the **net value.**

ACTIVE MINES

If the mine being valued is an **active mine,** with several years' record of shipments, a careful study is made of the records of that mine, and also of other mines near by, over the past 3 years, as shown by reports made for determinations of the occupation tax. Next, the estimate is made of the costs for the current year. These studies cover the items of **MINING, BENEFICIATION, MISCELLANEOUS,** (C-3 on sheet 2 of form) and **RAIL AND LAKE FREIGHT.** The above estimated costs averaged for the 4-year period are entered on sheet 1 of the form. The study also includes the costs of these items over the range as a whole.

C-1 MINING
C-2 BENEFICIATION
C-3 MISCELLANEOUS
C-6 RAIL AND LAKE FREIGHT

C-4
DEVELOPMENT

Cost per ton for development, taken as of the date of the valuation, is found by multiplying the number of cubic yards of remaining surface and of rock stripping by the unit cost of each for the 4-year period; and dividing the result by the total number of tons of open pit ore remaining in the mine on May 1 of the current year.

C-5

On preceding pages, items C-1 to C-4 and item C-6 have been discussed. Item C-5, MINE PLANT is allowed at the range average cost for the 4-year period.

C-7

Item C-7, **MARKETING EXPENSE**, has been given an allowance, uniform to all companies at 5 cents per ton.

C-8

Item C-8, **SOCIAL SECURITY TAXES** were originally computed at an average cost of 2 cents per ton for open pit ore, and 6 cents per ton for underground ore, and that allowance has been made uniformly in all present worth calculations by the Department of Taxation up to and including 1951. It is expected that this item will show an increase in 1952 and future years.

C-9

Item C-9, **AD VALOREM TAX FOR OPERATING PERIOD.** This tax is computed by a formula involving the use of the factors tabulated at the top of sheet 3 of form No. 110.

H, in the case of iron ore is 0.5 (Ratio of assessed value to full and True)

L, **tax period,** varies with the estimated operating life of the mine being valued.

M, the **mill rate** divided by 1000.* The estimated mill rate being 145 mills, M would be .145.

F, the **Hoskold factor**, depends on the range life term used in the valuation. This is gradually decreasing as the ore is being depleted. The term used in 1950 was 30 years.[2]

P, the **Lake Erie value of ore,** has already been discussed.

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* To reduce mills to decimal part of $1.00.

2 The factor for 30 years, at 6% and 3%, is .41142.

C, includes cost items C-1 to C-8, plus interest (C-12).

S, includes C-1 to C-8 only.

D, or **depletion,** taken at 15% of gross mine value.

B, the reciprocal of the operating life. That is, the percentage of the operating life that applies to the operations of the one calendar year.

The foregoing items are included in varying proportions, in the somewhat involved formula for the tax. It was found necessary to include all of the factors that in any way affect the tax. The formula has been held by some as being too complicated. It was worked out by Mr. McAdams, the present Chief Mining Engineer of the Department of Taxation, and has been in use for the past six years.

C-10

Item C-10 is the occupation tax allowance, obtained by the method outlined on sheet 3 of form No. 110. Here are deducted from the market value of ore, as used on Sheet 1, the sum of items C-1 to C-9 inclusive. Item C-9 is computed as directed in Minn. Statutes 1949, Section 298.03, paragraph (5): "A percentage of the ad valorem taxes . . . equal to the percentage that the tons mined or produced during such year bears to the total tonnage in the mine." Actually, assuming an average annual production per year for the term of years entered opposite "Natural Operating Life" at bottom of sheet 3; and if that number of years is ten, then 1/10 of the ad valorem tax would be the part allowed in C-10. The sum of those 9 items, taken from the Lake Erie value, leaves what is termed "profit". While the rate of the occupation tax is 12%, after the labor credit allowance, the average rate is 10.5 percent, the allowance actually deducted, as indicated under item C-10, on page 3 of form 110.

C-11

FEDERAL INCOME TAX

Starting with a 12% tax in 1934, of which but 8% was then deductible, the 1950 Federal tax was figured at 38%. This rate has now become 52%.

This calculation form also appears on

Sheet 3. First, for computing the depletion allowance, take from the Lake Erie value of ore the items of transportation and marketing expense, leaving what is termed gross value at the mine. 15% of the **gross value** is usually taken as the depletion allowance. In case the amount so figured exceeds **50% of the net profit,** the latter is used as the depletion allowance instead of 15% of the **gross value.**

Then from the Lake Erie market value of ore is taken the sum of items C-1 to C-10 plus the depletion allowance, leaving net profit for Federal Tax. This, multiplied by the current rate of tax, gives the Federal tax per ton.

C-12

INTEREST

Interest on development, plant and working capital. The method of computing the interest is given near the bottom of Sheet 3 of form 110. Note that the interest rate was set at 5% by the Board of Tax Appeals in 1943. Costs for development and plant are entered from Sheet 1 of the form. The total of these two costs is next multiplied by 5% **times 50% of the operating life, plus* one,** giving the interest on plant and development, to be entered in the table at the right.

The form shows, on sheet 3, below the computation of interest on plant and development, the method of figuring the interest on working capital. What has been done more recently was to take the average as worked out on a large number of operating mines, or about 5 cents per ton, and enter that figure in the small table at the right, on Sheet 3. Adding that to the interest allowed for development and plant from the table above, gives the total allowance for **interest on development, plant and working capital.**

D

These various items having been entered on Sheet 1, their totals entered opposite **D** and subtracted from **B,** the market value per ton, leaving the amount to be entered

E

opposite **E,** the estimated future income per ton.

* It is assumed that the interest charge on plant and development will decline uniformly over the mine life. The total of the annual interest charges is computed by the simple arithmetical formula for the summation of a series.

PART II
APPLICATION OF
HOSKOLD
FORMULA

Then comes the second part of the valuation, the calculation of present worth of the estimated future income per ton, by use of the Hoskold formula. In the case of operating mines, fairly well developed, there is no deferment period; and the full range life is entered on the line just above Part II, and also in the space opposite "F".

The Hoskold factor for 6% and 3%, over a term of years called the Range Life, ranges from .41142 for 30 years to .45752 for 25 years. That is, each dollar due in equal yearly payments over a 30-year term is now worth $.41142; and each dollar due in equal yearly payments over a 25-year term is now worth $.45752 at discount rates of 6% and 3%. The factor is entered as indicated on form 110, and the product of that factor by the remainder opposite "E" is the amount of item "F". The space opposite "G" remains blank in the case of active mines, there being no inactive taxes; and "H" is the same as "F". Also, since there is no period of deferment, "I" is the same as "F". Then the full and true value ("J") is the product of "A", the tonnage in reserve, by the final computed present worth per ton ("I"); and the assessed value is 50 percent of "J". A detailed copy of an actual valuation of an operating and a reserve mine is shown on pages 50 to 57.

UNDEVELOPED
OR RESERVE
PROPERTIES

RESERVE PROPERTIES — (UNDEVELOPED FOR MINING) Here the procedure is similar to that outlined for the active mines. However, since there is yet no record of mine operation to be applied direct, many of the cost factors will have to be obtained by study of operating mines in the same area, or in areas having similar physical conditions. Among such factors are C-1 to C-5; (Mining, Beneficiation, Miscellaneous costs, Development, and Plant); C-9 (Ad valorem tax for operating period); C-10 (Occupation Tax); C-11, (Federal Income Tax, involving items C-1 to C-10); and C-12, (interest on Development, Plant, and Working Capital); Item C-6, (Transportation & Marine Insurance); and Item C-7, (Marketing Expense) are uniform for all mines,

whether active or reserve properties. Item C-8 (Social Security Taxes) may be taken at the Range average.

The main difference in procedure is in Part II, the computation of present worth. Here, assuming a Range Life of 30 years on May 1, 1950, the three-year deferment period is used as the average time for getting the property developed and ready to produce iron ore. Therefore Item F, instead of using the Hoskold factor for 30 years, takes the factor for 27 years .43798, as compared to the 30-year factor at 6% and 3% or .41142.

Next, the inactive tax, at a rate below that for the active mines, is computed for the 3-year inactive period assumed for time of development, and entered opposite G. This is subtracted from F, leaving H, the balance before deferment at 5%. To this balance is applied the deferment factor of .86384 (the factor for 3 years at 5%), giving the result "I," the final present worth per ton. Then the product of item A, (number of tons in reserve) by I, the present worth per ton, gives the final full and true total value.

Following the first calculations of value of the various major ore deposits by the Mining Division, informal discussions are held with the engineers of the several mining companies. There is a discussion of the different items of cost, and where there are any apparent errors, it may be necessary to make certain changes. As has been stated, questions involving matters of policy are referred to the Commissioner. Minor differences of opinion or judgment can usually be adjusted between engineers.

The time of the annual hearings before the Commissioner, on mineral property valuations is usually set about October 20. Notices of the tentative valuations are mailed out to the companies at least five days before the date of the hearing, and usually an effort is made to allow a week or ten days. In cases where there is a decrease in assessed value, beyond that due to mining of ore, in excess of $15,000, notice has to be sent to the city,

town, or village where the property is located, also to the school district, and to the county.

At the mineral hearings, a record is made of all those present and all of those interested are given an opportunity to be heard by the Commissioner. A record is made of the proceedings and the transcript is used in making up the list of final values. In case of changes, the engineers review the particular calculations that are involved, taking into account the protests by taxpayer, or by communities, and making such changes as they consider to be warranted.

They then make their recommendations of assessed value to the Commissioner. When approved by the Commissioner, the valuations are certified to the Auditor of the County in which the ore deposit is located.

It should be emphasized that the work of the engineers of the Mining Division has to do with **valuing** the iron ore properties, recommending their findings to the Commissioner of Taxation. The tax levy is made in the county, and its subdivisions, where the ore deposits occur.

STOCKPILES

Form No. 116 has been prepared by the Commissioner for valuing iron ore that has been mined and stockpiled, and which remains in stockpile on May 1 of the assessment years.

DISTRIBUTION

The ad valorem tax goes to the state, counties, townships, school districts and local taxing districts according to the levy of the respective taxing units.

Dept. of Taxation - No. 110

ACTIVE MINE

COMPANY:_____

PROPERTY_____ DESCRIPTION _____

TAX DISTRICT:_____

COMPUTATION AS OF May 1 1950 OF PRESENT WORTH OF ESTIMATED FUTURE INCOME FROM OPERATION

PART I: ESTIMATED FUTURE INCOME PER TON

ITEM		OPEN PIT	UNDERGROUND	TOTAL
A	Reserve Tonnage in Ground May 1, 19 50	2,273,593	676,497	2,950,090
B	Lake Erie Market Value Per Ton	6.652		
C	Estimated Costs Per Ton:			
	1. Mining	.525		
	2. Beneficiation P. 4	.115		
	3. Miscellaneous P. 4	.186		
	4. Development (Future)	.748		
	5. Plant (Future)	.187		
	6. Rail & Lake Freight & Marine Insurance	2.432		
	7. Marketing Expense	.050		
	8. Social Security Taxes	.020		
	9. Ad Valorem Realty Tax for operating period	.302		
	10. Occupation Tax	.249		
	11. Federal Income Tax	.461		
	12. Interest on Development, Plant, and Working Capital.	.425		
D	Total of Item C	5.700		
E	Estimated Future Income (Item B minus Item D)	.952		

PART II: COMPUTATION OF PRESENT WORTH (Range Life: 30 yrs. _____)

F	Present Worth of Item E: O.P. 30 Years at 6 % & 3 % (Factor .41143 U.G. ____ Years at ___ % & ___ % (Factor _____)	.3916		
G	Less Inactive Taxes: O.P. ____ Years and return at ___ % U.G. ____ Years and return at ___ %			
H	Balance Present Worth Before Deferment			
I	Present Worth Per Ton: O.P. Deferred ____ Years at __ % (Factor _____) U.G. Deferred ____ Years at __ % (Factor _____)	.3916		
J	Final Computed Present Worth (Item A times Item I)	$ 890,340		

Assessed Value (OP) 2,273,593 @ .1958 $ 445,170

U.G. Merchantable ore 428,457 @ .07 29,992

U.G. Concentrate 248,040 @ .01 2,480

2,950,090 $ 477,642

(1949 basis $ 471,748)

1950 increase $6,751 or 1.4%, after 1949 shipment of 437,478 tons

PROPERTY: _____

COST DETAILS AND COMPUTATIONS 6.696 N.B. base; .130019 unit value

(A) & (B) ORE TONNAGES: ANALYSES: SELLING VALUES (Per Ton):

Ore (Incl. Conc'ts.)	TONS S.M. 5-1-49	IRON Orig.	IRON Disc.	Phos.	SILICA Orig.	SILICA Disc.		Moisture	Nat'l. Iron	Lake Erie Value
Open pit										
Non-Bess	1 824 400	56.85		.064	9.57			10.00	51.17	6.653
Non-Bess.W.C.	449 493	57.00		.060	9.00			8.00	52.44	6.818
	2 273 593									6.6856
							Less 1/2%			.0334
Underground							Lake Erie value			6.652
Non-Bess	428 457	56.39		.077	9.05			10.00	50.75	
Non-Bess W.C.	248 040	57.50		.060	10.00			8.00	52.90	
Total U.G.	676 497									
GRAND TOTAL	2 950 090									

METHOD OF MINING AND QUANTITIES INVOLVED

	TONS OF ORE Open Pit	TONS OF ORE Underground	WASTE MATERIAL IN ORE Material	WASTE MATERIAL IN ORE Tons	WASTE MATERIAL IN ORE Cu. Yds.	STRIPPING Material	STRIPPING Cu. Yds.
Direct			Lean Ore			Surface	
Conc'ts (Wash)			Rock (Solid)			Lean Ore	
Conc'ts (Jig)			Rock (Broken)			Rock (Solid)	
						Rock (Broken)	

(C) ESTIMATED COSTS PER TON:	OPEN PIT	UNDERGROUND

ITEM C-1, MINING:

Method	Material	Tons	COST Per Ton	COST Total	
O.P.	Direct Ore				
	Concentrates				
	Lean Ore				
					Tons of Ore
Total O.P.					.525
Underground					

ITEM C-2, BENEFICIATION:

(Concentrating, crushing and screening, etc.)
Including transportation to plant, plant depreciation, interest and taxes on plant. .115

ITEM C-3, MISCELLANEOUS:

(Administration, Legal, Fire Insurance, Medical and Hospital, Compensation, Stockpile Loading, Taxes on Stockpile and Equipment. .186

ITEM C-4, DEVELOPMENT:

Method	Stripping	Cu. Yds.	Cost per C.Y.	Total Cost	
O.P.	Surface	2,062,578	.35	721,902	
	Rock	1,350,789	.50	695,395	
	~~Leases~~ P.P.M.	756,737	.40	302,695	
	Special Costs				O. pTons of Ore
	Total			1,699,992	2,273,593 .748
Shaft and U.G. Development				$	

ITEM C-5, PLANT: (4 x .170) plus (1 x .255) ÷ 5 .187

Open Pit $ ÷ Tons =
Underground $ ÷ Tons =

PROPERTY: _____

ITEM C-9, AD VALOREM TAX PER TON (ACTIVE):

Factors:		Open Pit	Underground
H	Factor (Ratio Assessed Value to T. & F. Value)	.50	
L	Tax period	8.00	
M	Mill Rate ÷ 1000	.09183	
F	P.W. Factor	.41142	
A	HLMF	.15112	
P	Lake Erie Value	6.652	
C	C-1 to C-8 plus C-12 (Costs during active period)	3.641	
S	C-1 to C-8	4.263	
D	Depletion (15% Gross Value at Mine)	.626	
B	Reciprocal of Operating Life	.067	

4.263
Minus .748
3.515
Plus .126
3.641

O.P. Tax per ton = $\frac{.15112\ (3.6919 - 3.641 \text{ plus } 1.897 \text{ plus } .2379 = .15112\ (2.1855) = .3022}{1 \text{ plus } .15112\ (.62 - .0044)} \qquad \frac{}{1.09303}$

U.G. Tax per ton = _____

ITEM C-10, OCCUPATION TAX:

Market Value of Ore, Item B
Less Items C-1 to C-8, Incl.
Proportion of Real Property Tax 1/15 x .3022
Occupation Tax Profit
Tax = 10.5 % (O.P.) and _____ % (U.G.) of Profit

O.P.	U.G.	O.P.	U.G.
		6.652	
4.263			
.020		4.283	
		2.369	
		.249	

ITEM C-11, FEDERAL INCOME TAX:

Market Value of Ore, Item B
Less Transportation & Marketing Expense
Gross Value at the Mine
Depletion allowance, 15% of Gross Value
NOTE: If depletion allowance above exceeds 50% of the net profit, use 50% of net profit
Market Value of Ore, Item B
Less Items C-1 to C-10, incl.
Depletion allowance
Net profit for Federal Income Tax
Tax = 38 % of Profit

6.652	
2.482	
4.170	
.626	

6.652	
4.814	
.626	
5.440	
1.212	
.461	

ITEM C-12, INTEREST ON DEVELOPMENT, PLANT & WORKING CAPITAL:

	INITIAL Open Pit	INITIAL Underground	FUTURE Open Pit	FUTURE Underground
Development:	.748			
Plant:	.187			
TOTAL	a	b	c	d
Computation of Interest (a)	.935 x 5 % x .50 (15 Yrs. + 1)			
(b)	x % x .50 (Yrs. + 1)			
(c)	x % x .50 (Yrs. + 1)			
(d)	x % x .50 (Yrs. + 1)			

	.374		

Plt. only .075

Working Capital:

	Open Pit Cost	Open Pit Mo.	Open Pit Cost x Mo.	Open Pit Interest	Underground Cost	Underground Mo.	Underground Cost x Mo.	Underground Interest
Mining				Multiply Total by monthly interest return rate				Multiply Total by monthly interest return rate
Miscellaneous								
Transportation								
Supplies *					*			
Taxes								
TOTAL					TOTAL			

.051	.051
.425	.126

Total Interest Per Ton

* Mining Cost x 40%

15	yrs.

Natural Operating Life
Average Annual Shipment
Average Monthly Shipment

MINING COST

1948	.621	on 313,757 tons, of which	21,350 T. was concentrate
1949	.488	on 437,478 tons, of which	120,891 T. " "
1950*	.488	on 440,000 tons,* of which	120,000 T. " "
	1.597	1,191,235	262,241 T.

(1.597 ÷ 3 = .532) $\frac{262,241 \text{ conc.}}{1,191,235 \text{ total}}$ = 22%; 5-1-'50 51.50 reservs: $\frac{449,493}{2,273,593 \text{ Total}}$ = 19.8%

Use .525

BENEFICIATION (Crushing & Screening in 1948 & 1949 Av..0965)

On reserve at 5 - 1 - 50 =

449,493 T. @ .190	=	85,404
1,824,100 T. @ .0965	=	176,938
2,273,593 T. Av..115	=	262,342

MISCELLANEOUS

1,824,100 @ .165	=	300,976
449,493 @ .239	=	120,914
2,273,593 av..186	=	421,890

PLANT

1,824,100 @	.16
449,493 @	.24
2,273,593 av.	.175

Dept. of Taxation - No. 110

RESERVE PROPERTY

Sheet No. 1

COMPANY: _____

PROPERTY _____ DESCRIPTION _____

TAX DISTRICT: _____

COMPUTATION AS OF MAY 1 19 50 OF PRESENT WORTH OF ESTIMATED FUTURE INCOME FROM OPERATION

PART I: ESTIMATED FUTURE INCOME PER TON

ITEM		OPEN PIT	UNDERGROUND	TOTAL
A	Reserve Tonnage in Ground May 1 1950	2,921,000	2,146,692	
B	Lake Erie Market Value Per Ton	6.348		
C	Estimated Costs Per Ton:			
	1. Mining	.510		
	2. Beneficiation	.025		
	3. Miscellaneous	.170		
	4. Development (Future)	.641		
	5. Plant (Future)	.160		
	6. Rail & Lake Freight & Marine Insurance	2.432		
	7. Marketing Expense	.050		
	8. Social Security Taxes	.020		
	9. Ad Valorem Realty Tax for operating period	.277		
	10. Occupation Tax	.243		
	11. Federal Income Tax	.471		
	12. Interest on Development, Plant, and Working Capital.	.311		
D	Total of Item C	5.310		
E	Estimated Future Income (Item B minus Item D)	1.038		

PART II: COMPUTATION OF PRESENT WORTH (Range Life: 30 years _____)

F	Present Worth of Item E: O.P. 27 Years at 6 % & 3 % (Factor .43798) U.G. ____ Years at ____ % & ____ % (Factor ____)	.4546		
G	Less Inactive Taxes: O.P. 3 Years and return at 5 % U.G. ____ Years and return at ____ %	.0597		
H	Balance Present Worth Before Deferment	.3949		
I	Present Worth Per Ton: O.P. Deferred 3 Years at 5 % (Factor .86384) U.G. Deferred ____ Years at ____ % (Factor ____)	.3412		
J	Final Computed Present Worth (Item A times Item I)	$996,646		

Assessed value (O.P.) 2,921,000 @ 17.06 498,323

(U.G.) 2,146,692 @ 6.0 $ 128,818

Total 5,067,692 $ 627,141

PROPERTY: _____

COST DETAILS AND COMPUTATIONS

(A) & (B) ORE TONNAGES: ANALYSES: SELLING VALUES (Per Ton):

Ore (Incl. Conc'ts.)	TONS	IRON Orig.	IRON Disc.	Phos.	SILICA Orig.	SILICA Disc.		Moisture	Nat'l. Iron	Lake Erie Value	
Open Pit & Underground											
Non Bessemer	4 358 807	57.06	56.56	.076	9.21	9.92		12.00	49.77		
	447 954	55.58	55.08	.068	8.51	9.22		13.00	47.92		
	261 201	52.23	51.73	.060	15.23	15.94		10.00	46.56		
	5 067 962					10.17	(.0119)		49.44	6.3798	
							Less 1/2%			.0319	
Open Pit	2 921 000									6.3479	
Underground	2 146 962										

METHOD OF MINING AND QUANTITIES INVOLVED

	TONS OF ORE: Open Pit	TONS OF ORE: Underground	WASTE MATERIAL IN ORE: Material	WASTE MATERIAL IN ORE: Tons	WASTE MATERIAL IN ORE: Cu. Yds.	STRIPPING: Material	STRIPPING: Cu. Yds.
Direct			Lean Ore			Surface	
Conc'ts (Wash)			Rock (Solid)			Lean Ore	
Conc'ts (Jig)			Rock (Broken)			Rock (Solid)	
						Rock (Broken)	

(C) ESTIMATED COSTS PER TON:						OPEN PIT	UNDERGROUND
ITEM C-1, MINING:							
Method	Material	Tons	COST Per Ton	COST Total			
O.P.	Direct Ore						
	Concentrates						
	Lean Ore						
					Tons of Ore		
Total O.P.						.510	
Underground							
ITEM C-2, BENEFICIATION: (Concentrating, crushing and screening, etc.) Including transportation to plant, plant depreciation, interest and taxes on plant.						.025	
ITEM C-3, MISCELLANEOUS: (Administration, Legal, Fire Insurance, Medical and Hospital, Compensation, Stockpile Loading, Taxes on Stockpile and Equipment.						.170	
ITEM C-4, DEVELOPMENT:							
Method	Stripping	Cu. Yds.	Cost per C.Y.	Total Cost			
O.P.	Surface	4,461,400	.42	$1,873,788			
	Rock						
	Lean Ore						
	Special Costs				Tons of Ore		
	Total			O.P.	2,921,000	.641	
Shaft and U.G. Development				$			
ITEM C-5, PLANT:							
Open Pit $	÷	Tons =				.160	
Underground $	÷	Tons =					

PROPERTY: _____

ITEM C-9, AD VALOREM TAX PER TON (ACTIVE):

Factors:	Open Pit	Underground	
H Factor (Ratio Assessed Value to T. & P. Value)	.50	.50	
L Tax period	6.50	6.50	
M Mill Rate ÷ 1000	.10960		
F P.W. Factor	.41142		
A HLMF	.14655		
P Lake Erie Value	6.348		
C C-1 to C-8 plus C-12 (Costs during active period)	3.470		
S C-1 to C-8	4.008		
D Depletion (15% Gross Value at Mine)	.580		
B Reciprocal of Operating Life	.083		

O.P. Tax per ton = $\frac{.14655\ (3.5231 - 3.470 \text{ plus } 1.7836 \text{ plus } 1.2204) = .30147}{1 \text{ plus } .14655\ (.62 - .0054)} = \frac{.2766}{1.09007}$

U.G. Tax per ton = _____

ITEM C-10, OCCUPATION TAX:

Market Value of Ore, Item B
Less Items C-1 to C-8, Incl.
Proportion of Real Property Tax 1/
Occupation Tax Profit
Tax = 10.5 % (O.P.) and _____ % (U.G.) of Profit

	O.P.	U.G.	O.P.	U.G.
Market Value of Ore, Item B			6.348	
Less Items C-1 to C-8, Incl.	4.008			
Proportion of Real Property Tax 1/	.023		4.031	
Occupation Tax Profit			2.317	
Tax = 10.5 % (O.P.) and _____ % (U.G.) of Profit			.243	

ITEM C-11, FEDERAL INCOME TAX:

Market Value of Ore, Item B			6.348
Less Transportation & Marketing Expense			2.482
Gross Value at the Mine			3.866
Depletion allowance, 15% of Gross Value			.580

NOTE: If depletion allowance above exceeds 50% of the net profit, use 50% of net profit

Market Value of Ore, Item B			6.348
Less Items C-1 to C-10, incl.	4.528		
Depletion allowance	.580		5.108
Net profit for Federal Income Tax			1.240
Tax = 38 % of Profit			.471

ITEM C-12, INTEREST ON DEVELOPMENT, PLANT & WORKING CAPITAL:

	INITIAL		FUTURE	
	Open Pit	Underground	Open Pit	Underground
Development:	.641			
Plant:	.160			
TOTAL	a	b	c	d

Computation of Interest:
(a) .801 x 5 % x .50 (12 Yrs. + 1)
(b) _____ x ____ % x .50 (_____ Yrs. + 1)
(c) _____ x ____ % x .50 (_____ Yrs. + 1)
(d) _____ x ____ % x .50 (_____ Yrs. + 1)

	.260			.052

Working Capital:

	Open Pit					Underground				
	Cost	Mo.	Cost x Mo.	Interest		Cost	Mo.	Cost x Mo.	Interest	
Mining					Multiply Total by monthly interest return rate					Multiply Total by monthly interest return rate
Miscellaneous										
Transportation										
Supplies *						*				
Taxes										
TOTAL						TOTAL				

	.051			.051
Total Interest Per Ton	.311			.103

* Mining Cost x 40%

Natural Operating Life	12	years
Average Annual Shipment		
Average Monthly Shipment		

L. E. Value 1947 - 50 average = $ 6.696 (N.B.)

Unit value .130019

49.16 x .130019 = 6.392

- Silica.0119
- shrinkage 1/2%(.032).044

6.348

MINING COST

.3 x .35 = .105

.4 x .45 = .180

.3 x .75 = .225

.510

INACTIVE TAX

3 yrs. $\frac{T - (1.379)(.1096)(.4546)}{1 \text{ plus } (1.379 \times .1096)} = \frac{.0687}{1.151} = .0597$

ADMINISTRATION

OCCUPATION TAX REPORTS. ITEMS REPORTED BY TAXPAYER

A standard report form No. 37, prepared by the Commissioner of Taxation, is mailed to each mine operator about January 1. Two copies of this form, filled in showing the computations on one high cost and one low cost mine appear on pages 65 to 96. On these forms, for reporting mining operations of any specified mine for the preceding calendar year, are given all of the items required for making out the calculation of the occupation tax. On page 1 is the name of the mine being reported. Page 2 shows all of the legal descriptions included in the mine; and begins the record of **open pit development**. Sec. A covers the years before 1921; and Sec. B covers years from 1921 to date. (This is because the Occupation Tax Law became effective in the year 1921).

DEVELOPMENT

Development costs are amortized and the total of unamortized costs appears on line 5 of Sec. 1-B. This total is combined with the estimated total of future expenditures, on line 7. This total, divided by the estimated tonnage in the mine at the beginning of the year, line 8, gives the average development cost per ton, shown on line 9. This multiplied by the number of tons produced in the preceding calendar year, gives the total development allowance for the year.

On page 3 of the report is supplementary data on the open pit development account; and on pages 3 and 4 is the full underground development account. Page 4 also shows a summary of the direct ore and concentrate mined in the calendar year.

TONS AND ANALYSIS OF ORE PRODUCED IN CALENDAR YEAR

On page 5 of the report are listed the several tonnages of **Bessemer, non-Bessemer,** and **Manganiferous** ores mined or produced in the last calendar year, with total tons of each class, with its average analysis in **natural iron, phosphorus, manganese, silica, alumina,** and **moisture;** and the market value of the ore at lower lake ports for the calendar year involved.

SCREEN ANALYSIS

Also, on page 5 of the report, is a request for results of the screen analyses of the season's ore, by grades,—Bessemer, non-Bessemer, and manganiferous. Ores having more than 27 percent of particles passing through a 40-mesh screen[a] are given a structure penalty allowance, graduated according to the percentage of contained material finer than 40 mesh, reaching a maximum allowance of 20 cents at 39 percent. For all percentages of such fine material over 39 percent, the allowance remains unchanged at 20 cents per ton.

STOCKPILED ORE AND ANALYSIS

Space is provided at the bottom of page 5 for tonnages of Bessemer, non-Bessemer, and Manganiferous ores removed from the mine but not listed under item 3, at top of page 5, for which separate analyses were kept; or, tonnages shown under item 3, page 5, which were placed in stockpile and not shipped in the calendar year; each to be shown with its complete analysis.

At the top of page 6 of the report is a form for reporting the following items: Total tons mined, loss by beneficiation, and net production in tons; also the summary of the development cost.

OPEN PIT MINING COSTS

On page 6 also appears the detail of the open pit mining costs under 17 separate subdivisions, showing totals for open pit labor, supplies, and total mining cost.

ADMINISTRATION AND COSTS

At the top of page 7 is the form for reporting the Administration and miscellaneous costs.

UNDERGROUND MINING COSTS

Also on page 7, is the form for reporting full details of the underground mining costs and admiinstration costs, fully itemized as in the case of open pit costs.

10-A

On page 8 of the report are given the items of miscellaneous expense not reported under 9-B and 9-D, which are allowed in full.

(a) This means 40 screen openings per lineal inch.

10-B

The following items on page 8 are requested as part of the report, **but are not allowable as deductions** for purposes of occupation tax.

Administration—Offices outside of Minnesota

Contributions, donations entertainment, Association dues, advertising, discounts, etc.

Contingent expense

Legal expenses

Maintenance of dwellings and misc. bldgs.

Depletion, interest, etc.

Idle Mine expense

The form next covers the Statutory and non-Statutory deductions allowable in arriving at the taxable value.

TENTATIVE DETERMINATION OF TAX

The engineers of the Mining Division of the Department of Taxation, using the information furnished in the report of the mining company (Form No. 37) enter the essential data on the form No. 37-A made by the Commissioner for the orderly and uniform determination of the tax, following the provisions of the occupation tax law as previously quoted.

The first step is the **tentative determination** of the tax. The heading shows the name of the operating company, the name of the mine being reported, and the calendar year of the operations reported.

MARKET VALUE DEFINED

Lines 1 to 4 of Form 37-A are self-explanatory. Line 5 shows the lower lake value of the ore mined or produced in the calendar year reported.

MARKET VALUE HOW COMPUTED

Using the published lower lake price for standard Mesabi Range non-Bessemer ore of 51.50% natural iron, adjusted for analyses of actual average natural iron and silica, also for any changes in rate of rail or lake transportation and taxes thereon since the latest previous price publication for iron ore at lower lake ports; the ore value is computed, at lower lake ports, for the calendar year of the report. Since ore settlements are made

on upper railroad weights minus an allowance for shrinkage, this item is also deducted, and the remainder is the **net value of the ore at lower lake ports,** the figure to be entered on Line 5. (Shrinkage is claimed at 1% of upper railroad weights. The Commissioner allows for shrinkage at ½%, for the reason that ½% is considered to be more nearly the true shrinkage change, or loss, in handling ore between upper R. R. weighing stations and lower lake weights.)

LINES 6 & 7 STOCKPILE LOADING AND BENEFICIATION

These items need no further explanation.

LINE 8 TRANSPORTATION

Transportation cost includes the following items: (1) Upper rail freight rate effective at the date of the latest previous price announcement; (2) Lake vessel freight rate effective at that date; (3) in case of a midyear change in ore prices*, any increases in either rail or lake freight**, from date (1) above, to the date of ore price change; (4) all taxes on such changes, (if increases). The sum of the foregoing items will apply to the tonnage produced from January 1 of the calendar year in question to the effective date of the price change.

Similarly, the cost of transportation for the remainder of the calendar year includes the following: (1) Rail and lake freight rates effective at date of price change; (2) any increases in either rail or lake freight between date of midyear price change and the end of the calendar year; (3) all taxes on such increases.

LINE 9 MARKETING

Claimed at 10c per ton, this item has been uniformly allowed to all companies at 5c per ton, as more nearly representing actual sales or marketing costs.

LINE 10

Miscellaneous (minor) costs: Cargo analysis and marine insurance. Items 6 to 10 are the **non-statutory** deductions; their total subtracted from the Lake Erie value of ore, leaves the **value at the mouth of the mine.**

---

* For example, the change by OPS on Sept. 12, 1952, effective July 26, 1952.

** This clause, known as "buyer's account" clause, has become standard practice within the past few years; being a clause accompanying the price announcement each year, stating that any increases after that date shall be for "Account of the purchaser". This has the effect of a like increase in ore value.

M. S. 1949
SEC. 298.03
STATUTORY
DEDUCTIONS
(From value at
mouth of mine)

Then come the statutory deductions specified in the law:

(1) Mining cost in calendar year
(2) Development cost (open pit)
(3) Development cost (underground)
(4) Depreciation of mine plant and equipment
(5) Royalty paid in calendar year
(6) Miscellaneous items, including costs of engineering, laboratory, and miscellaneous items under 10-A of the company report
(7) Percentage of ad valorem taxes levied for such year equal to the percentage that the tons mined or produced bears to the total tonnage in the mine
(8) The amount or amounts of all the foregoing subtractions to be determined by the Commissioner of Taxation

VALUE OF ORE
FOR TAX

The remainder after deducting the sum of the above items, from the value at mouth of mine, is **Line 15** of Form 37-A—**Value of ore for purpose of tax.**

GROSS TAX
FOR LABOR
CREDIT Line 16

11 percent of the amount on Line 15 is shown as "Gross Tax at 11%."
(It is on this amount that the labor credit is computed)

VETERANS'
COMPENSATION
LINE 17

1 percent of the amount on Line 15 is set aside to apply on the Veterans' Compensation Fund.

TOTAL GROSS
TAX
LINE 18

The total of amounts on lines 16 and 17 of Form 37-A is the Total Gross Tax of 12%.

LABOR CREDIT
LINE 19

Line 19 shows the amount of the labor credit, computed as per Section 298.02.

NET TAX
LINE 20

Line 20, the amount remaining after deducting from the total gross tax, Line 18 the amount of the labor credit (Line 19) is the net amount of the tentative occupation tax due and payable.

EXAMPLES TAX COMPUTATIONS FOR 1950 OPERATIONS OF TWO MESABI MINES

From page 65 to page 75 of the report is shown a copy of a company report on 1950 operations of a low-cost mine; and on page 76 to page 79 is Form 37-A showing the detailed calculation as indicated above. Note that there is no labor credit. Page 80 to page 95 shows similar data on a high-cost mine for 1950, where all of the ore was treated by heavy media concentration. Note the substantial labor credit shown on Form 37-A, on page 96 of this report.

M. S. 1949 SEC. 298.09 AS AMENDED

Provision is herein made for the mailing of notice to each taxpayer, stating:

(1) The amount of tax tentatively found to be due from him.

(2) On May 15, or on the first secular day after May 14, a hearing is held. Taxpayers are present, and may protest any items in the calculation of tax. The calculations are hereafter reviewed in the Mining Division and the revised results are discussed with the Commissioner.

(3) After the hearing, the Commissioner makes his order either affirming or modifying the original determination.

M. S. 1949 SEC. 298.10 AS AMENDED

The Commissioner certifies the amount of taxes to the State Auditor on or before June 1. The Auditor makes a draft on each taxpayer for the amount of tax certified and delivers the draft to the State Treasurer for collection.

AUDITS

All company reports and all calculations of occupation tax are subject to audit by an expert accountant regularly employed by the Department of Taxation who has full access to all company records, wherever such records are kept. Such audits are made within three years after certification of the tax and may result either in increases or decreases from the tax as originally certified.

DISTRIBUTION

An occupation tax of 11% is distributed as follows:

50% to the State General Revenue Fund;

40% to the Permanent School Fund, and

10% to the Permanent University Fund.

Since 1949 an additional occupation tax of 1% goes to the Veterans' Compensation Fund. Ten percent of the amount going to the State General Revenue Fund is appropriated to the Iron Range Resources and Rehabilitation Commission.

STATE OF MINNESOTA
DEPARTMENT OF TAXATION

OCCUPATION TAX REPORT

OF

"A"

(OPERATING COMPANY)

(POST OFFICE ADDRESS)

Made pursuant to the provisions of Section 298.05, Minnesota Statutes 1949, as Amended

COVERING OPERATIONS OF THE

_____ **Mine**

During the calendar year ending December 31, 1951

N. B. It is the purpose of this form to provide for a complete return of all data relating to each mine operated during the calendar year 1951. However, if such a return is made, it must not be assumed by operator that all the costs and other data herein reported will be considered or allowed in determining the amount of occupation tax due upon the mining operations of this property.

It is important that this form be followed closely, that is, distribution of costs must be made in keeping with headings shown herein.

Explanatory notes have been inserted at various places, a thorough understanding of which will aid in completing the report properly.

Dept. of Taxation No. 37—

Legal description of property operated during the calendar year 1951.

Lots 1,2,3, & 4 Sec. 1-57-21

Lots 1, 2, 3, & 4, Sec. 2-57-21

SW¼ - SE¼ Sec. 35-58-21

NW¼ - SE¼ Sec. 2-57-21

E½ SW¼ SE¼

Insert Legal Description: Twp., Range and Sec. and Mark with X each forty in Mining Unit.

Twp. No. 57				Rge. No. 21			
	Sec.	35			Sec.		
		x					
	Sec.	2			Sec.	1	

1. Extent and cost of all development work on said property at close of calendar year 1951, in following details:

NOTE: Please read and observe carefully: Costs under Item 1 or any subdivision thereof, must not include "taxes," "interest," "purchase of fee," "inspection costs," or any other expenses incurred upon acquisition of property or otherwise which are not directly attributable to the development of same.

OPEN PIT OPERATIONS

A. Extent and cost of open pit development.—Conditions as of January 1, 1921:

NOTE: Information requested under Subdivision A is for the purpose of determining "unamortized expenditures" for open pit development as of January 1, 1921. Therefore, all information should be based on the earliest data available subsequent to this date. Subdivision A need not be answered if development work was begun subsequent to January 1, 1921.

1.	Total expenditures for stripping or other open pit development to December 31, 1920 (C-1, P. 3)	$ 3,281,112
2.	Total cubic yards of all materials removed by stripping, applicable to above expenditures	13,428,820
3.	Estimated cubic yards of all materials remaining to be removed	6,344,012
4.	Grand total cubic yards of stripping (A-2 + A-3)	19,772,832
5.	Per cent of total yards moved to total stripping (A-2 ÷ A-4)	67.92
6.	Total tonnage shipped prior to January 1, 1921	31,339,297
7.	Estimated tonnage of open pit ore remaining in property as of January 1, 1921	49,998,816
8.	Grand total tonnage in property at the beginning of operations (A-6 + A-7)	81,338,113
9.	Estimated tonnage of ore developed by stripping removed prior to January 1, 1921 (A-8 × A-5)	55,244,086
10.	Estimated tonnage of ore developed by stripping removed prior to January 1, 1921 and remaining unmined as of that date (A-9 — A-6)	23,905,549
11.	The average development cost per ton of ore developed by stripping removed prior to January 1, 1921 (A-1 ÷ A-9)	$ .0594
12.	Balance of expenditures unamortized as of January 1, 1921 (A-10 × A-11)	$ 1,419,989

B. Extent and cost of open pit development.—Conditions under law effective January 1, 1921:

NOTE: Subdivision B relates wholly to the status of open pit development and to expenditures therefor, applicable to all open pit ore produced subsequent to January 1, 1921. Under Item B-1 should be shown only the balance, if any, carried forward from Subdivision A-12. Item B-2 comprehends expenditures for all open pit development subsequent to January 1, 1921. Expenditures for open pit development other than for development actually done by present operator may be included under this item, but where included should be so indicated and the nature of such expense must be fully explained under remarks.

1.	Balance of expenditures unamortized January 1, 1921 (A-12)	$ 1,419,989
2.	Expenditures for open pit development subsequent to January 1, 1921; (C-2+3, P. 3) (19.... to 1951, inclusive) (See Note)	$ 2,555,896
3.	Total expenditures (B-1 + B-2)	$ 3,975,885
4.	Amortization allowed by commission years 19..... to 1950, inclusive	$ 3,974,283
5.	Total expenditures unamortized (B-3 — B-4)	$ 1602
6.	Estimated future expenditures (Full details under subdivision C-4, P. 3)	$ 981,336
7.	Total costs unamortized, plus estimated future expenditures (B-5 + B-6)	$ 982,938
8.	Estimated tonnage of ore in or at property, January 1, 1951, applicable to expenditures shown under B-7. (This estimate should include any ore mined, applicable to these expenditures, which may be in stockpile or otherwise not shipped)	11,120,578
9.	Average cost per ton (B-7 ÷ B-8)	$ .0884
10.	Total tonnage produced in year 1951	1,118,609
11.	Proportionate amount of development costs unamortized, applicable to tons produced in 1951 (B-10 × B-9)	$ 1,602
12.	Balance of actual expenditures unamortized December 31, 1951 (B-5 — B-11)	$ None

C. Supplementary to and in support of subdivisions A and B, a subdivision of the total stripping removed and the cost thereof as of December 31, 1951 is required in the following detail:

	Surface	Rock Solid	Rock Broken	Other Materials	Grand Total
1. Stripping prior to January 1, 1921:					
1. Total yards moved					13,428,820
2. Total expenditures to January 1, 1921	$	$	$	$	$ 3,281,112
3. Average cost per cu. yd.	$	$	$	$	$ .2443
2. Stripping for period of 1921 to 1950, inclusive:					
1. Total yards moved					8,232,537
2. Total cost, 1-1-21-12-31-50	$	$	$	$	$ 2,554,294
3. Average cost per cu. yd.	$	$	$	$	$ .3103
3. Stripping during year ending December 31, 1951:					
1. Total yards moved					None
2. Total cost to 12-31-51	$	$	$	$	$ 1602
3. Average cost per cu. yd.	$	$	$	$	$ None
Grand Total, Items 1, 2 and 3					
1. Total yards moved					21,661,357
2. Total cost of stripping	$	$	$	$	$ 5,837,008
3. Average cost per cu. yd.	$	$	$	$	$ .2695
4. Estimated cu. yds. of stripping remaining, and cost of removing same as of December 31, 1951:					
a. Est. total yds. remaining	1,676,853	310,703			1,987,286
b. Estimated cost of removal	$ 670,633	$ 310,703	$	$	$ 981,336
c. Average cost per cu. yd.	$ .40	$ 1.00	$	$	$ .4938
5. Grand total expenditures for stripping incurred and to be incurred as of 12-31-51 (C-1 to C-4, incl.)					
a. Total yards of stripping					23,648,643
b. Total costs for same	$	$	$	$	$ 6,818,344
c. Average cost per cu. yd.	$	$	$	$	$ .2883

6. Total initial tonnage of ore available for open pit mining within the proposed stripping area 110,070,988

7. Average stripping cost per ton (5-b ÷ 6) .... $ .0619

8. Total tonnage produced, open pit operations, subsequent to January 1, 1921, to year 1950, inclusive 63,414,775

UNDERGROUND OPERATIONS

D. Extent and cost of underground development.—Conditions as of January 1, 1921:

NOTE: Notes which appear under the general heading of Item 1, Subdivision A and B of open pit development, are equally applicable to underground development. Please read and observe carefully.

1. Total expenditures to December 31, 1920:
   - a. Shafts .... $
   - b. Drifts (Main levels) or other development where capitalized .... $
   - Total .... $
2. Total tonnage produced prior to January 1, 1921 ....
3. Estimated tonnage of ore available for mining January 1, 1921 with facilities existing at that time ....
4. Total tonnage applicable to above expenditures (D-2 + D-3) ....
5. Average cost per ton (D-1 ÷ D-4) .... $
6. Balance of expenditures unamortized as of January 1, 1921 (D-3 × D-5) .... $

E. Extent and cost of underground development.—Conditions under law effective January 1, 1921:

1. Balance of expenditures unamortized January 1, 1921 (D-6) .... $
2. Expenditures incurred subsequent to January 1, 1921 (19........ to 1950, inclusive):
   - a. Shafts .... $
   - b. Drifts (Main levels) where capitalized .... $
   - c. Other development where capitalized .... $
   - Total January 1, 1921 to December 31, 1950 .... $
3. Expenditures actually incurred in 1951 only:
   - a. Shafts .... $
   - b. Drifts (Main levels) where capitalized .... $
   - c. Other development where capitalized .... $
   - Total for year 1951 .... $

E. Underground Development (Contd.)

4. Grand total expenditures above (E-1, E-2 and E-3) - - - - - - - - - - - - - - - - $..........
5. Estimated tonnage of ore available for mining, applicable to total expenditures under E-4
   a. Total underground tonnage produced, subsequent to January 1, 1921 to year 1950, inclusive - ....tons.
   b. Estimated tonnage available for mining as of January 1, 1951 - - - - - - ....tons.
   Total tonnage - ....
6. Average cost per ton (E-4 ÷ E-5) - $..........
7. Amortization allowed by Commission 19........ to year 1950, inclusive - - - - - - - - - - - $..........
8. Total expenditures unamortized (E-4 — E-7) - - - - - - - - - - - - - - - - - $..........
9. Estimated tonnage of ore available for mining January 1, 1951, applicable to development costs unamortized as shown under E-8 - ....
10. Average cost per ton (E-8 ÷ E-9) - $..........
11. Tons of ore produced from underground during year 1951 - - - - - - - - - - - - - ....
12. Proportionate amount of development costs unamortized, applicable to underground ore produced in the year 1951 (E-11 × E-10) - $..........
13. Balance of costs unamortized December 31, 1951 (E-8 — E-12) - - - - - - - - - - - - $..........
14. Memoranda:
   a. Total depth of shaft in feet up to December 31, 1951 - - - - - - - - ....feet.
   b. Average cost per foot of sinking shaft up to December 31, 1951 - - - - - - - - - - - - $..........
   c. Average cost per foot of sinking shaft in 1951 or the last preceding year in which development was done $..........

2. **Total tonnage of ore mined or produced from the property above described, during the calendar year 1951, in detail as indicated below:**

NOTE: This statute contemplates that all ores mined or produced in any calendar year are subject to tax. Tonnages reported hereunder, when shipped in the year mined, must be based upon railroad shipping weights (long tons) wherever possible. Where through failure to ship the ore in the year mined, it is necessary to apply factors other than railroad weights in determining these tonnages, any differences in tonnages disclosed through subsequent shipping of the ore so mined, should be reported.

METHOD OF OPERATION AND GROSS TONS MINED BY EACH METHOD

Legal Descriptions from which the ore was mined	OPEN PIT		UNDERGROUND		TOTAL TONNAGE MINED	
	Direct Ore Tons	Concentrate Ore Tons	Direct Ore Tons	Concentrate Ore Tons	Direct Ore Tons	Concentrate Ore Tons
Lots 1, 2, 3 & 4, Sec. 1-57-21)						
)						
Lots 1, 3 & 4) Sec. 2-57-21)						
)	) 1,118,609					
NW¼ SE¼)						
)						
N½ SW¼ SE¼)						
GRAND TOTAL						

3. Gross tons, grade and average analysis of ore mined or produced in 1951.

	Gross Tons	Nat. Iron %	Dry Phos. %	Nat. Mn. %	Dry Silica %	Dry Alum. %	Moist %
A. Bessemer	496,509	57.70	.034	.37	3.56		9.68
Total Tonnage and Average Analysis	622,100	53.28	.079	.36	7.37		10.85
B. Non-Bessemer							
Total Tonnage and Average Analysis							
C. Manganiferous							
Total Tonnage and Average Analysis							
GRAND TOTAL TONNAGE AND AVERAGE ANALYSIS	1,118,609						

4. Market value at Lake Erie Ports of ore mined or produced in 1951 as follows:

	Gross Tons	Per Ton Market Value at L. E. Ports	Total Market Value Lake Erie Ports	Remarks
A. Bessemer	341,167	$ 9.4384	$ 3,220,071*	Shipped prior to 8-28
	155,342	9.5152	1,478,110*	Shipped after Aug. 28
Total	496,509			
B. Non-Bessemer	339,738		2,869,903*	Shipped prior to 8-28
	282,362		2,406,938*	Shipped after 8-28
Total	622,100			
C. Manganiferous				
Total				
GRAND TOTAL	1,118,609	$ 8.9173	$ 9,975,022	

*The market value of this ore is less than the market value of standard Mesabi ore due to the necessary structure penalties. The fineness of this ore should be given consideration in arriving at its value

NOTE: Screen analyses of season's shipment for Bessemer, Non-Bessemer and Manganiferous grades of ore are required as part of this report. The screen analyses should be complete and must show at least the percentage of material passing through a 40-mesh screen.

All tonnages of ores and iron-bearing materials, either (1) not shown under Item 3 which were removed from the mine in 1951 and for which separate analyses were kept, or (2) shown under item 3 which were placed in stockpile in 1951 and not shipped from the range in 1951, must be listed below, showing gross tons and analyses. Report (1) and (2) separately. Give information on any concentration tests which may have been made on any such material. Report open pit and underground tonnages separately. Give legal description of land on which any such stockpiles are located.

Type of Material	Gross Tons	Nat. Iron %	Dry Phos. %	Nat. Mn. %	Dry Silica %	Dry Alum. %	Moist %

Detailed Information With Reference to the Cost of Mining and Producing Ore During the Calendar Year 1951

	Open Pit	Underground	Grand Total Gross Tons
5. Total mined, gross tons	1,118,609		
6. Loss due to beneficiation, gross tons	None		
7. Production, gross tons	1,118,609		

8. Cost of Development. (Under this item should be shown development costs applicable only to the tonnage mined during the calendar year.)

OPEN PIT		UNDERGROUND		TOTAL	
Average cost per net ton	Total Cost	Average cost per net ton	Total Cost	Average cost per net ton	Total Cost
.0014	1.602			.0014	1.602
$	$	$	$	$	$

9. Cost of supplies used and labor performed at the mine in separating the ore from the ore body, including hoisting or conveying same to the surface of the earth.

OPEN PIT

	LABOR		SUPPLIES		TOTAL	
	Per Ton	Total	Per Ton	Total	Per Ton	Total
A. Operating Costs:						
1. Power Shovels a. Operating	$ .0296	$ 33,110	$ .0143	$ 16,027	$ .0439	$ 49,137
b. Mtce & Repairs						
2. Locomotive & Cars a. Operating	.0977	109,315	.0554	61,958	.1531	171,273
b. Mtce & Repairs						
3. Trucks a. Operating						
b. Mtce & Repairs						
4. Conveyors a. Operating						
b. Mtce & Repairs						
5. Track Expense	.0531	59,344	.0083	9,284	.0614	68,628
6. Roadways						
7. Drilling & Blasting	.0099	11,056	.0117	13,036	.0216	24,092
8. Pumping & Drainage	.0043	4,782	.0007	800	.0050	5,582
9. Water Supply						
10. Scramming	.0926	103,596	.0352	39,336	.1278	142,932
11. Open Pit Supervision						
12. General Pit Expense	.0308	34,487	.0173	19,339	.0481	53,826
13. Mine Employees Bonus or Vacation Pay						
14. Lean Matl & Waste Pile Exp. (Tons or Yds. 720 (Material	.0001	95		65	.0001	160
15. Stocking Merchantable Ore						
16. Contract Mining			.0083	9,328	.0083	9,328
17. Miscl. (Detail fully) a. $						
b.						
c.						
d.						
e.						
TOTAL (A-1 thru A-17)	$ .3181	$ 355,785	$ .1512	$ 169,173	$ .4693	$ 524,958

B. Administration and Miscellaneous Costs:

OPEN PIT

(Note: Report only costs incurred within Minnesota and directly attributable to mining operations. Report other administrative items under 10-A and B.) [1]	LABOR Per Ton	LABOR Total	SUPPLIES Per Ton	SUPPLIES Total	TOTAL Per Ton	TOTAL Total
1. Mine Office—Mine and clerical	$ .0573	$ 64,161	$ .0170	$ 19,041	$ .0744	$ 83,202
2. Range Office—Mine supervision and clerical	.0097	10,867	.0004	472	.0101	11,339
3. Duluth or other central office in Minnesota — Mine supervision and clerical	.0110	12,312	.0023	2,562	.0133	14,874
4. Engineering	.0164	18,351	.0011	1,235	.0175	19,586
5. Laboratory (Assaying, Sampling, Etc.)	.0129	14,363	.0105	11,775	.0234	26,138
6. Experimental Expense						
7. Miscellaneous (detail fully)						
a. ..... $						
b. ..... $						
c. ..... $						
Total administrative expense	$ .1073	$ 120,054	$ .0314	$ 35,085	$ .1387	$ 155,139
TOTAL OPEN PIT OPERATING COSTS (A + B)	$ .4254	$ 475,839	$ .1826	$ 204,258	$ .6080	$ 680,097

UNDERGROUND

C. Operating Costs:

	LABOR Per Ton	LABOR Total	SUPPLIES Per Ton	SUPPLIES Total	TOTAL Per Ton	TOTAL Total
1. Mining	$	$	$	$	$	$
2. Timbering						
3. Tramming						
4. Conveyors						
5. Pumping						
6. Hoisting						
7. Repairs						
8. U. G. Supervision						
9. Gen'l U. G. Expense						
10. Gen'l Surface Exp.						
11. Miscl. (Detail fully)						
a. ..... $						
b. ..... $						
c. ..... $						
d. ..... $						
TOTAL (C-1 thru C-11)	$	$	$	$	$	$

D. Administration and Miscellaneous Costs: (See note above)

1. Mine Office—Mine supervision and clerical						
2. Range Office—Mine supervision and clerical						
3. Duluth or other central office in Minnesota — Mine supervision and clerical						
4. Engineering						
5. Laboratory (Assaying, Sampling, Etc.)						
6. Experimental Expense						
7. Miscl. (detail fully)						
a. ..... $						
b. ..... $						
c. ..... $						
d. ..... $						
Total administrative expense	$	$	$	$	$	$
TOTAL UNDERGROUND OPERATING COSTS (C+D)	$	$	$	$	$	$

10. Miscellaneous items of expense not included under items 9-B and D:

	OPEN PIT		UNDERGROUND		TOTAL	
	Average cost per net ton	Total Cost	Average cost per net ton	Total Cost	Average cost per net ton	Total Cost
A.						
1. Insurance on buildings and equipment used in operations	$.0021	$ 2,398	$	$	$	$
2. Personal injury expense actually paid:						
a. Premiums for compensation and liability insurance $						
b. Medical and hospital expenses $						
c. Settlement of injury or death claims $						
d. Safety or other miscellaneous expenses (give details) $						
Total, a to d	$.0008	$ 873	$	$	$	$
3. Total personal property taxes (Levied in the year 1951 and payable in 1952) 3a+3b. $						
a. Personal property taxes levied in 1951 on mining equipment and other personal property actually used in or attributable to mining operations:						
Total taxable valuation $						
Total taxes levied	.0129	14,399				
b. Total stock pile tax:						
1. Total tons						
2. Total tax $						
c. Ore in stockpile May 1, 1951, placed therein subsequent to May 1, 1950. Tons						
d. Proportion of total stockpile taxes levied in 1951 applicable to tonnage under 3-c						
4. Social Security taxes paid in 1951	.0097	10,888				
5. Pensions	.0174	19,501				
6. Group Insurance - etc.	.0089	9,930				
Total, Item 10-A	$.0518	$ 57,989	$	$	$	$
B.						
1. Administration, offices outside of Minnesota	$	$	$	$	$	$
2. Contributions, donations, entertainment, etc.	.0003	266				
3. Association dues, assessments, advertising, discounts, exchange, etc.						
4. Contingent expenses, such as clubhouse, garden prizes, examinations, etc.						
5. Legal expenses	.0020	2,250				
6. Maintenance and upkeep of misc. real estate and dwellings	.0011	1,192	Labor 11,962 Supplies 10,770			
7. Depletion, interest, charges, etc.						
8. Idle mine expense (mines idle during year 1951)						
9. Costs not included above	.0155	17,381	Misc. Cleveland expense			
Total, Item 10-B	$.0189	$ 21,089	$	$	$	$
Total, Misc. Expense, (10-A and B)	$.0707	$ 79,078	$	$	$	$

	OPEN PIT		UNDERGROUND		TOTAL	
	Average cost per net ton	Total cost	Average cost per net ton	Total cost	Average cost per net ton	Total cost
11. Total Royalty accruing on tonnage mined in 1951	$ .1250	$ 139,815	$	$	$	$
SUBDIVIDE ABOVE TOTAL ROYALTY INTO:						
A. Portion represented by advance royalty credits, applied on 1951 tonnage $						
B. Portion represented by liquidated royalties applied on 1951 tonnage $						
C. Balance (Item 11 — A + B) currently paid or accrued upon ore produced during year 1951 $						
12. Total Amount of Realty Taxes, exclusive of Special Assessments, levied in 1951 (payable in 1952), upon the legal descriptions shown on page 2 $ 431,107						
Amount of Ad Valorem Taxes levied in 1951 applicable to the tonnage mined in 1951	$ .0361	$ 40,395	$	$	$	$
13. Mine Plant and Equipment (Exclusive of Beneficiating Plants)						
A. Standard Mine Plant and Equipment — Additions and betterments in 1951. $ 125,563						
1. Gross capital investment Dec. 31, 1951 $						
2. Depreciation for 1951	$ .0449	$ 50,224	$ (6% of	$ 2,547,387.98	x 32.86%)	$
3. Total charged off at close of 1951 $						
B. Motorized Equipment — Additions and betterments in 1951. $ 343,360						
1. Gross capital investment Dec. 31, 1951 $						
2. Depreciation for 1951	$ .0782	$ 87,457	$ (25% of	$ 1,064,605.91	x 32.86%)	$
3. Total charged off at close of 1951 $						

STOCKPILE LOADING, BENEFICIATION, TRANSPORTATION AND MARKETING EXPENSE

14. Stockpile Loading:						
A. Shipments from stockpile, 1951						
1. Tons Shipped						
2. Cost of Loading $						
3. Cost per ton $						
B. Tonnage Stockpiled in 1951						
1. Total Tons Stockpiled						
2. Cost per ton (A-3) $						
3. Cost Applicable to tons Stockpiled, B-1 × B-2	$	$	$	$	$	$
15. Beneficiation (Detail on Page 10)	Tons conc. produced					
A. Washing						
B. Drying						
C. Crushing & Screening						
D. Sintering						
E. Jigging						
F. Heavy medium						
G. Pelletizing						
H. Flotation						
Total cost of beneficiation		$		$		$

16. Transportation.	OPEN PIT		UNDERGROUND		TOTAL	
	Average cost per net ton	Total cost	Average cost per net ton	Total cost	Average cost per net ton	Total cost
A. Rail freight (Based on rates in effect year 1951) - - -						
.....tons $.....per ton						
.....tons $.....per ton						
.....tons $.....per ton	$.....	$.....	$.....	$.....	$.....	$.....
B. Vessel freight (Based on rates in effect year 1951) - - -						
.....tons $.....per ton						
.....tons $.....per ton	.....	.....	.....	.....	.....	.....
.....tons $.....per ton						
C. Vessel unloading (Based on rates in effect year 1951) - -	.....	.....	.....	.....	.....	.....
D. Federal Transportation tax	.....	.....	680,905	ton @ 2,772,503 (Shipments to 8-28		
Total Transportation Expense	$2.8027	$3,135,132	$437,704	tons @ 2.849,691 (Shipts after 8-28		
17. Other costs incidental to transportation and marketing - - - -						
A. Marine Insurance - - - -	$.0020	$2,237	$.....	$.....	$.....	$.....
B. Marketing expense $.....	$.0500	$55,950	$Commission		$.....	$.....
C. Cargo analysis expense - - - $.....	.0072	8,011	Cleve. exp.			
D. Miscellaneous items not expressly enumerated. (Detail fully under remarks) - - - $.....	.0150	16,779 (A)				
Total Item 17 - - - - -	$.0742	$82,957	$.....	$.....	$.....	$.....
Total Cost of Transportation and Marketing (Items 16 & 17)	$2.8769	$3,218,089	$.....	$.....	$.....	$.....
GRAND TOTAL COSTS, YEAR 1951 (Items 8 to 17) - - - - - - - -	$3.8412	$4,296,757	$.....	$.....	$.....	$.....

DETAILED INFORMATION WITH REFERENCE TO BENEFICIATING ORES MINED FROM THE.....

..... MINE, DURING THE CALENDAR YEAR 1951

	Washing Plants	Drying Plants	Sintering Plants	Crushing and Screening Plants
1. Government description of tract upon which plant is located.....				
2. Plant and Equipment:				
A. Additions and betterments in 1951 - - - - - -	$.....	$.....	$.....	$.....
(Detail of these items must accompany report.)				
3. Gross capital investment for depreciation as shown by your books at close of year 1951 -	.....	.....	.....	.....
4. Amount charged off to depreciation year 1951 - - - -	.....	.....	.....	.....
5. Total amount charged off to depreciation at close of year 1951 - - - - - - - -	.....	.....	.....	.....
6. Net investment outstanding in plant and equipment at close of year 1951 - - - - - -	$.....	$.....	$.....	$.....
DETAILED COSTS OF BENEFICIATION AS SUMMARIZED UNDER ITEM 15, PAGE 9:				
7. A. Transportation expense, mine to plant - - - -	$.....	$.....	$.....	$.....
B. Labor:				
1. Beneficiation - - -	.....	.....	.....	.....
2. Maintenance - - -	.....	.....	.....	.....
3. Superintendence and clerical at plant - - -	.....	.....	.....	.....
4. Miscellaneous - - - (Detail fully under remarks.)	.....	.....	.....	.....
Total Labor - - - - -	$.....	$.....	$.....	$.....
C. Supplies				
1. Plant - - - - -	$.....	$.....	$.....	$.....
2 Maintenance - - -	.....	.....	.....	.....
3. Electric power - - -	.....	.....	.....	.....
4. Miscellaneous - - - (Detail fully under remarks.)	.....	.....	.....	.....
Total Supplies - - - -	$.....	$.....	$.....	$.....

	Washing Plants	Drying Plants	Sintering Plants	Crushing and Screening Plants
D. Miscellaneous other than labor and supplies:				
1. Workmen's compensation (Actual costs only, no reserve funds.)	$	$	$	$
2. Fire and other insurance necessary to plant				
3. Other items, Social Sec., etc. (Detail under remarks.)				
E. Taxes:				
1. Levied in the year 1951 (payable in 1952) on real estate connected with plant				
2. Levied in the year 1951 (payable in 1952) on personal property connected with plant				
F. Depreciation as per item 4, page 10				
G. Interest on beneficiating plant investment				
GRAND TOTAL COST	$	$	$	$

SUMMARY OF OCCUPATION TAX TOTALS

Item		Cost Per Ton	Total	Total
4.	Gross Tons 1,118,609 L. E. Value Ton	$ 8.9173		$ 9,975,022
	Non-Statutory Deductions:			
16.	Transportation	$ 2.8027	$ 3,135,132	
17.	Other Transportation Items	.0742	82,957	
15.	Beneficiation			
14.	Loading Stockpile Ore			
	Total Non-Statutory Deductions	2.8769		$ 3,218,089
	Value of Ore at Mouth of Mine	6.0404		$ 6,756,933
	Statutory Deductions:			
8.	Development	$ .0014	$ 1,602	
9-A&C	Labor & Supplies	.4693	524,958	
9-B&D	Administration	.1387	155,139	
10-A.	Miscellaneous	.0518	57,989	
11.	Royalty	.1250	139,815	
12.	Taxes on Ore Mined	.0361	40,395	
13.	Depreciation of Plant & Equipment	.1231	137,681	
	Total Statutory Deductions	.9454	1,057,579	$
	Taxable Value	5.0950	5,699,354	$

REMARKS (A) This is royalty tax required to be paid under terms of these leases to permit shipment of ore from the mine.

State of .....
County of ..... } ss.

I, ... do solemnly swear that I am the ..... (Official title)

of ..... (Operating company); that the foregoing report was made by me, or under my supervision, and that the matters therein set forth have been transcribed from the records of this Company and are true and correct to the best of my knowledge and belief.

Subscribed and sworn to before me this ..... day of ..... 1952.

Notary public .....

My commission expires .....

FORM NO. 37-A

DEPARTMENT OF TAXATION

STATE OF MINNESOTA

TENTATIVE DETERMINATION UNDER MINNESOTA STATUTES 1949, SECTION 298, AS AMENDED, OF THE AMOUNT OF OCCUPATION TAX DUE FROM _____ ON MINING OPERATIONS OF _____ MINE, DURING THE CALENDAR YEAR 1951.

1.	Character of operation: Open Pit X Underground				
2.	Total tonnage mined during the calendar year 1951	1,118,609 tons.			
3.	Loss by beneficiation	tons.			
4.	Net marketable tonnage mined	1,118,609 tons.			
5.	Market value of net tonnage mined	Per Ton $ 8.9174	Total Value		$9,975,038.69
	NON STATUTORY DEDUCTIONS: COSTS BEYOND MOUTH OF MINE				
6.	Cost of loading ore from stockpile, ore mined in 1951	tons Per Ton $	Total Cost $		
7.	Cost of beneficiation	Per Ton $	Total Cost $		
8.	Transportation cost	Per Ton $	Total Cost $3,135,132.31		
9.	Marketing Expense	Per Ton $	Total Cost $ 55,650.80		
10.	Misc. (See detail on reverse side)	Per Ton $	Total Cost $ 2,237.00		
	Total - Items 6 to 10	Per Ton $	Total Cost		$3,193,020.11
	Value of Ore At Mouth of Mine	Per Ton $	Total Value		$6,782,018.58
	STATUTORY DEDUCTIONS				
11.	Cost of Development	Per Ton $	Total Cost $ 1,602.00		
12.	Cost of Mining				
	a. Labor	Per Ton $	Total Cost $ 355,785.00		
	b. Supplies	Per Ton $	Total Cost $ 169,173.00		
	c. Administrative Expense—Mine and District Offices	Per Ton $	Total Cost $ 94,541.00		
	d. Administrative Expense—Duluth or other central office in Minnesota	Per Ton $	Total Cost $ 14,874.00		
	e. Deprec. of Mine Plant & Equipm't	Per Ton $	Total Cost $ 124,592.00		
	f. Misc. (See detail on reverse side)	Per Ton $	Total Cost $ 103,713.00		
13.	Royalty	Per Ton $	Total Cost $ 139,815.00		
14.	Ad valorem taxes on ore mined %	Per Ton $	Total Cost $ 40,515.99		
	Total - Items 11 to 14	Per Ton $	Total Cost		$1,044,610.99
15.	Value of ore for purpose of tax				$5,737,407.59
16.	Gross Tax upon such value at 11%				$ 631,114.83
17.	Special Tax for Veterans Adjusted Compensation (Sec. 298.011) (1% of No. 15)				$ 57,374.08
18.	Total Gross Tax (16+17)				$ 688,488.91
19.	Credit for Labor as per Sec. 298.02				$
20.	Net Amount of Tax Due and Payable (18-19)				$ 688,488.91

Item 7. Cost of Beneficiation

Transportation		$
Labor		
Supplies		
Miscellaneous		
Taxes		
Depreciation* (See detail below)		
Interest** (See detail below)		
Total		$
*1. Plant Investment—12/31/50		$
2. Additions—Year 1951	$	
3. Retirements—Year 1951		
4. Net Additions		
5. Amount to Depreciate at 12/31/51		
6. Depreciation allowed to 12/31/50	$	
7. Less Depreciation retired in 1951		
8. Net Depreciation Allowance		
9. Depreciation @ 6% on Item 5		
10. Total Depreciation to 12/31/51		
11. Undepreciated Balance—12/31/51		
Depreciation Allowance for 1951		
Depreciation as above—Item 9		
Add Loss—Deduct profit on equipment and rentals		
Depreciation Allowance for 1951		
**Undepreciated Balance as at 12/31/50		$
Interest @ 6% on 12/31/50 Undepreciated Balance		

Item 10. Miscellaneous

Marine Insurance	$ 2,237.00
Cargo Analysis	
Other Items	
Total	$ 2,237.00

Item 12f. Cost of Mining — Miscellaneous

Engineering	$ 19,586.00
Laboratory	26,138.00
Item 10-A	57,989.00
Item	
Total	$ 103,713.00

Item 12e. Depreciation

	Standard Plant		Motorized Equipment	
1. Investment — 12/31/50		$ 2,421,825.00		$ 721,246.00
2. Additions — Year 1951	$ 125,563.00		$ 343,360.00	
3. Retirements — Year 1951				
4. Net Additions		125,563.00		343,360.00
5. Amount to Depreciate at 12/31/51		2,547,388.00		1,064,606.00
6. Depreciation allowed to 12/31/50	$ 2,179,642.00		$ 546,013.00	
7. Less Depreciation retired in 1951				
8. Net Depreciation Allowance	$		$	
9. Depreciation @ 6% on Item 5	113,007.00		266,152.00	
10. Total Depreciation to 12/31/51		2,292,649.00		812,165.00
11. Undepreciated Balance—12/31/51 (to 10% res)		254,739.00		252,441.00
Depreciation Allowance for 1951				
Depreciation as above — Item 9		$ 113,007.00		$ 266,152.00
Allocated to Nos. 3 & 4 (67.14%)		75,873.00		178,694.00
Depreciation Allowance for 1951		37,134.00		87,458.00

SUPPLEMENTAL WORKSHEET

Property_____

ITEM 5 Lake Erie Value

Grade of Ore	Tons	Nat Fe		Phos	Silica	Thru 40M	Value/ton	Total
Bessemer	496,509	57.70		.034	3.56	55.37	9.3828	4,658,644.65
		(9.4673)		(.1155)		(-20.00)		
Non-Bessemer	622,100	53.28		.079	7.37	43.04	8.3869	5,217,490.49
		(8.5869)				(-20.00)		
Buyer's Acct.								
Thru 8-27	680,905						.10300	70,133.22
After 8 - 27	437,704						.18025	78,896.15

Gross value		10,025,164.51
Less ½% shrinkage		50,125.82
Lake Erie value	8.9174	9,975,038.69

ITEM 8. Transportation

	Tons		Cost/ton	Total
Thru 8-27	680,905		2.772503	1,887,811.16
After 8-27	437,704		2.849691	1,247,321.15
			2.8027	3,135,132.31

ITEM 14. Ad Valorem Tax Allowance

Description	District	SD	Reserve(tons)	Assessed Value	Mill Rate	Tax (mineral)
Group 1	Hibbing V.	27	2,957,617	1,040,490	128.44	133,640.54
Group 1	Stuntz T	27	4,991,092	1,907,596	98.89	188,642.17
Group 2	Stuntz	27	4,813,264	1,412,693	98.89	139,701.21

Production 1,118,609	= 8.77%	Total tax		461,983.92
Reserve 12,761,973		Allow 8.77 %		40,515.99

ITEM 19. Credit For Labor

Total labor cost				
Tons produced				
Labor cost per ton				
Excess of 50¢ & not more than 65¢		x .10		
Excess of 65¢		x .15		
Labor credit earned _____ tons x				
Excess of 80¢		x .10		NONE
Labor credit earned _____ tons x				
Total labor credit earned				
Maximum credit allowable ____ % x gross tax @ 11% _____				
Credit not used under limitation				

DEPARTMENT OF TAXATION
STATE OF MINNESOTA

FINAL DETERMINATION UNDER MINNESOTA STATUTES 1949, SECTION 298, AS AMENDED, OF THE AMOUNT OF OCCUPATION TAX DUE FROM _____ ON MINING OPERATIONS OF _____ MINE, DURING THE CALENDAR YEAR 1951.

1. Character of operation: Open Pit X Underground _____
2. Total tonnage mined during the calendar year 1951 1,118,609 tons.
3. Loss by beneficiation _____ tons.
4. Net marketable tonnage mined 1,118,609 tons.
5. Market value of net tonnage mined _____ Per Ton $_____ Total Value $_____

NON STATUTORY DEDUCTIONS: COSTS BEYOND MOUTH OF MINE

6. Cost of loading ore from stockpile, ore mined in 1951 _____ tons Per Ton $_____ Total Cost $_____
7. Cost of beneficiation _____ Per Ton $_____ Total Cost $_____
8. Transportation cost _____ Per Ton $_____ Total Cost $_____
9. Marketing Expense _____ Per Ton $_____ Total Cost $_____
10. Misc. (See detail on reverse side) _____ Per Ton $_____ Total Cost $_____

Total - Items 6 to 10 _____ Per Ton $_____ Total Cost $_____

Value of Ore At Mouth of Mine _____ Per Ton $_____ Total Value $_____

STATUTORY DEDUCTIONS

11. Cost of Development _____ Per Ton $_____ Total Cost $_____
12. Cost of Mining
    a. Labor _____ Per Ton $_____ Total Cost $_____
    b. Supplies _____ Per Ton $_____ Total Cost $_____
    c. Administrative Expense—Mine and District Offices _____ Per Ton $_____ Total Cost $_____
    d. Administrative Expense—Duluth or other central office in Minnesota _____ Per Ton $_____ Total Cost $_____
    e. Deprec. of Mine Plant & Equipm't _____ Per Ton $_____ Total Cost $_____
    f. Misc. (See detail on reverse side) _____ Per Ton $_____ Total Cost $_____
13. Royalty _____ Per Ton $_____ Total Cost $_____
14. Ad valorem taxes on ore mined _____ % Per Ton $_____ Total Cost $_____

Total - Items 11 to 14 _____ Per Ton $_____ Total Cost $_____

15. **Value of ore for purpose of tax** $5,737,407.59
16. **Gross Tax upon such value at 11%** $631,114.83
17. **Special Tax for Veterans Adjusted Compensation (Sec. 298.011) (1% of No. 15)** $57,374.08
18. **Total Gross Tax (16+17)** $688,488.91
19. **Credit for Labor as per Sec. 298.02** $_____
20. **Net Amount of Tax Due and Payable (18-19)** $688,488.91

STATE OF MINNESOTA
DEPARTMENT OF TAXATION

OCCUPATION TAX REPORT

OF

"B"

(OPERATING COMPANY)

(POST OFFICE ADDRESS)

Made pursuant to the provisions of Section 298.05, Minnesota Statutes 1949, as Amended

COVERING OPERATIONS OF THE

_____ **Mine**

During the calendar year ending December 31, 1951

N. B. It is the purpose of this form to provide for a complete return of all data relating to each mine operated during the calendar year 1951. However, if such a return is made, it must not be assumed by operator that all the costs and other data herein reported will be considered or allowed in determining the amount of occupation tax due upon the mining operations of this property.

It is important that this form be followed closely, that is, distribution of costs must be made in keeping with headings shown herein.

Explanatory notes have been inserted at various places, a thorough understanding of which will aid in completing the report properly.

Dept. of Taxation No. 37—

Legal description of property operated during the calendar year 1951.

	Insert Legal Description: Twp., Range and Sec. and Mark with X each forty in Mining Unit.								
SW-NE Sec. 36-59-18	Twp. No. 59				Rge. No. 18				
NW-SE Sec. 36-59-18									
SW-SE Sec. 36-59-18		Sec 36	X			Sec.			
			X						
			X						
		Sec.				Sec.			

1. **Extent and cost of all development work on said property at close of calendar year 1951, in following details:**

NOTE: Please read and observe carefully: Costs under Item 1 or any subdivision thereof, must not include "taxes," "interest," "purchase of fee," "inspection costs," or any other expenses incurred upon acquisition of property or otherwise which are not directly attributable to the development of same.

OPEN PIT OPERATIONS

A. Extent and cost of open pit development.—Conditions as of January 1, 1921:

NOTE: Information requested under Subdivision A is for the purpose of determining "unamortized expenditures" for open pit development as of January 1, 1921. Therefore, all information should be based on the earliest data available subsequent to this date. Subdivision A need not be answered if development work was begun subsequent to January 1, 1921.

1. Total expenditures for stripping or other open pit development to December 31, 1920 (C-1, P. 3) - - - $.....
2. Total cubic yards of all materials removed by stripping, applicable to above expenditures - - - - - - .....
3. Estimated cubic yards of all materials remaining to be removed - - - - - - - - - - - - .....
4. Grand total cubic yards of stripping (A-2 + A-3) - - - - - - - - - - - - - - - - .....
5. Per cent of total yards moved to total stripping (A-2 ÷ A-4) - - - - - - - - - - - - - - .....
6. Total tonnage shipped prior to January 1, 1921 - - - - - - - - - - - - - - - - .....
7. Estimated tonnage of open pit ore remaining in property as of January 1, 1921 - - - - - - - - .....
8. Grand total tonnage in property at the beginning of operations (A-6 + A-7) - - - - - - - - .....
9. Estimated tonnage of ore developed by stripping removed prior to January 1, 1921 (A-8 × A-5) - - - .....
10. Estimated tonnage of ore developed by stripping removed prior to January 1, 1921 and remaining unmined as of that date (A-9 — A-6) - .....
11. The average development cost per ton of ore developed by stripping removed prior to January 1, 1921 (A-1 ÷ A-9) - $.....
12. Balance of expenditures unamortized as of January 1, 1921 (A-10 × A-11) - - - - - - - - - - $.....

B. Extent and cost of open pit development.—Conditions under law effective January 1, 1921:

NOTE: Subdivision B relates wholly to the status of open pit development and to expenditures therefor, applicable to all open pit ore produced subsequent to January 1, 1921. Under Item B-1 should be shown only the balance, if any, carried forward from Subdivision A-12. Item B-2 comprehends expenditures for all open pit development subsequent to January 1, 1921. Expenditures for open pit development other than for development actually done by present operator may be included under this item, but where included should be so indicated and the nature of such expense must be fully explained under remarks.

1. Balance of expenditures unamortized January 1, 1921 (A-12) - - - - - - - - - - - - - - - - $.....
2. Expenditures for open pit development subsequent to January 1, 1921; (C-2+3, P. 3) (1948 to 1951, inclusive) (See Note) - $ 875,185.04
3. Total expenditures (B-1 + B-2) - $ 875,185.04
4. Amortization allowed by commission years 19..... to 1950, inclusive - - - - - - - - - - - - $ 629,909.39
5. Total expenditures unamortized (B-3 — B-4) - $ 245,275.65
6. Estimated future expenditures (Full details under subdivision C-4, P. 3) - - - - - - - - - - $ 276,175.10
7. Total costs unamortized, plus estimated future expenditures (B-5 + B-6) - - - - - - - - - - $ 521,450.75
8. Estimated tonnage of ore in or at property, January 1, 1951, applicable to expenditures shown under B-7. (This estimate should include any ore mined, applicable to these expenditures, which may be in stockpile or otherwise not shipped) - 465,588
9. Average cost per ton (B-7 ÷ B-8) - $ 1.120
10. Total tonnage produced in year 1951 - - - - - - - - - - Allowed - - (245,275.65) - - 291,617
11. Proportionate amount of development costs unamortized, applicable to tons produced in 1951 (B-10 × B-9) $ 326,610.68
12. Balance of actual expenditures unamortized December 31, 1951 (B-5 — B-11) - - - - - - - - - $ — 81,335.03

C. Supplementary to and in support of subdivisions A and B, a subdivision of the total stripping removed and the cost thereof as of December 31, 1951 is required in the following detail:

	Surface	Rock Solid	Rock Broken	Other Materials	Grand Total
1. Stripping prior to January 1, 1921:					
1. Total yards moved - -					
2. Total expenditures to January 1, 1921 - - -	$	$	$	$	$
3. Average cost per cu. yd.	$	$	$	$	$
2. Stripping for period of 1921 to 1950, inclusive:					
1. Total yards moved - -	753,170		284,506	15,047	1,052,723
2. Total cost, 1-1-21-12-31-50	$ 468,369.19	$	$ 197,024.40	$ 1,766.57	$ 667,160.16
3. Average cost per cu. yd.	$ .6219	$	$ .6925	$ .1174	$ .6337
3. Stripping during year ending December 31, 1951:					
1. Total yards moved - -	106,581		134,439		241,020
2. Total cost to 12-31-51	$ 61,808.06	$	$ 146,216.82	$	$ 208,024.88
3. Average cost per cu. yd.	$ .5799	$	$ 1.0876	$	$ .8631
Grand Total, Items 1, 2 and 3					
1. Total yards moved - -	859,751		418,945	15,047	1,293,743
2. Total cost of stripping	$ 530,177.25	$	$ 343,241.22	$ 1,766.57	$ 875,185.04
3. Average cost per cu. yd.	$ .6171	$	$ .8193	$ .1174	$ .6765
4. Estimated cu. yds. of stripping remaining, and cost of removing same as of December 31, 1951:					
a. Est. total yds. remaining	14,000		241,570	2,074	257,644
b. Estimated cost of removal	$ 9,100.00	$	$ 265,727.00	$ 1,348.10	$ 276,175.10
c. Average cost per cu. yd.	$ .65	$	$ 1.10	$ .65	$ 1.0719
5. Grand total expenditures for stripping incurred and to be incurred as of 12-31-51 (C-1 to C-4, incl.)					
a. Total yards of stripping	873,751		660,515	17,121	1,551,387
b. Total costs for same -	$ 539,277.25	$	$ 608,968.22	$ 3,114.67	$ 1,151,360.14
c. Average cost per cu. yd.	$ .6172	$	$ .9220	$ .1819	$ .7421

6. Total initial tonnage of ore available for open pit mining within the proposed stripping area - - - - 1,008,289

7. Average stripping cost per ton (5-b ÷ 6) - - - - - - - - - - - - - - - - - - $ 1.1419

8. Total tonnage produced, open pit operations, subsequent to January 1, 1921, to year 1950, inclusive - - 542,701

UNDERGROUND OPERATIONS

D. Extent and cost of underground development.—Conditions as of January 1, 1921:

NOTE: Notes which appear under the general heading of Item 1, Subdivision A and B of open pit development, are equally applicable to underground development. Please read and observe carefully.

1. Total expenditures to December 31, 1920:
   - a. Shafts - - - - - - - - - - - - - - - - - - $
   - b. Drifts (Main levels) or other development where capitalized - - - - - - $
   - Total - $
2. Total tonnage produced prior to January 1, 1921 - - - - - - - - - - - - - - -
3. Estimated tonnage of ore available for mining January 1, 1921 with facilities existing at that time - -
4. Total tonnage applicable to above expenditures (D-2 + D-3) - - - - - - - - - - -
5. Average cost per ton (D-1 ÷ D-4) - - - - - - - - - - - - - - - - - - $
6. Balance of expenditures unamortized as of January 1, 1921 (D-3 × D-5) - - - - - - - - $

E. Extent and cost of underground development.—Conditions under law effective January 1, 1921:

1. Balance of expenditures unamortized January 1, 1921 (D-6) - - - - - - - - - - - $
2. Expenditures incurred subsequent to January 1, 1921 (19........ to 1950, inclusive):
   - a. Shafts - - - - - - - - - - - - - - - - - $
   - b. Drifts (Main levels) where capitalized - - - - - - - - - - - $
   - c. Other development where capitalized - - - - - - - - - - - $
   - Total January 1, 1921 to December 31, 1950 - - - - - - - - - - - - - $
3. Expenditures actually incurred in 1951 only:
   - a. Shafts - - - - - - - - - - - - - - - - - - $
   - b. Drifts (Main levels) where capitalized - - - - - - - - - - - $
   - c. Other development where capitalized - - - - - - - - - - - $
   - Total for year 1951 - - - - - - - - - - - - - - - - - - - $

E. Underground Development (Contd.)

4. Grand total expenditures above (E-1, E-2 and E-3) - - - - - - - - - - - - - - - - - $.....
5. Estimated tonnage of ore available for mining, applicable to total expenditures under E-4
   a. Total underground tonnage produced, subsequent to January 1, 1921 to year 1950, inclusive - .....tons.
   b. Estimated tonnage available for mining as of January 1, 1951 - - - - - - .....tons.
   Total tonnage - .....
6. Average cost per ton (E-4 ÷ E-5) - $.....
7. Amortization allowed by Commission 19..... to year 1950, inclusive - - - - - - - - - - - - - - - $.....
8. Total expenditures unamortized (E-4 — E-7) - $.....
9. Estimated tonnage of ore available for mining January 1, 1951, applicable to development costs unamortized as shown under E-8 - .....
10. Average cost per ton (E-8 ÷ E-9) - $.....
11. Tons of ore produced from underground during year 1951 - .....
12. Proportionate amount of development costs unamortized, applicable to underground ore produced in the year 1951 (E-11 × E-10) - $.....
13. Balance of costs unamortized December 31, 1951 (E-8 — E-12) - - - - - - - - - - - - - - - - - $.....
14. Memoranda:
   a. Total depth of shaft in feet up to December 31, 1951 - - - - - - - - - .....feet.
   b. Average cost per foot of sinking shaft up to December 31, 1951 - - - - - - - - - - - - - - - - - $.....
   c. Average cost per foot of sinking shaft in 1951 or the last preceding year in which development was done $.....

2. Total tonnage of ore mined or produced from the property above described, during the calendar year 1951, in detail as indicated below:

NOTE: This statute contemplates that all ores mined or produced in any calendar year are subject to tax. Tonnages reported hereunder, when shipped in the year mined, must be based upon railroad shipping weights (long tons) wherever possible. Where through failure to ship the ore in the year mined, it is necessary to apply factors other than railroad weights in determining these tonnages, any differences in tonnages disclosed through subsequent shipping of the ore so mined, should be reported.

METHOD OF OPERATION AND GROSS TONS MINED BY EACH METHOD

Legal Descriptions from which the ore was mined	OPEN PIT		UNDERGROUND		TOTAL TONNAGE MINED	
	Direct Ore Tons	Concentrate Ore Tons	Direct Ore Tons	Concentrate Ore Tons	Direct Ore Tons	Concentrate Ore Tons
SW-NE Sec. 36-59-18		17,560				17,560
NW-SE Sec. 36-59-18	91,692	182,365			91,692	182,365
GRAND TOTAL	91,692	199,925			91,692	199,925

3. Gross tons, grade and average analysis of ore mined or produced in 1951.

	Gross Tons	Nat. Iron %	Dry Phos. %	Nat. Mn. %	Dry Silica %	Dry Alum. %	Moist %
Before 8-28-51	67,026						
A. Bessemer - - - - - - After 8-28-51	13,793						
Total Tonnage and Average Analysis - - - - - -	80,819	52.22	.032	.70	13.82	.70	8.09
Before 8-28-51	157,745						
B. Non-Bessemer - - - - - After 8-28-51	53,053						
Total Tonnage and Average Analysis - - - - - -	210,798	46,838	.062	.87	15.01	1.977	13.53
C. Manganiferous - - - - -							
Total Tonnage and Average Analysis - - - - - -	291,617	48.35	.054	.83	14.68	1.62	12.02
GRAND TOTAL TONNAGE AND AVERAGE ANALYSIS							

4. Market value at Lake Erie Ports of ore mined or produced in 1951 as follows:

	Gross Tons	Per Ton Market Value at L. E. Ports	Total Market Value Lake Erie Ports	Remarks
		$	$	
A. Bessemer - - - - - - -	80,819	8.3748	676,844.82	
Total	80,819	8.3748	676,844.82	
B. Non-Bessemer - - - - -	210,798	6.8568	1,445,413.84	
Total	210,798	6.8568	1,445,413.84	
C. Manganiferous - - - - -				
Total				
GRAND TOTAL	291,617	$ 7.27756	$ 2,122,258.66	

NOTE: Screen analyses of season's shipment for Bessemer, Non-Bessemer and Manganiferous grades of ore are required as part of this report. The screen analyses should be complete and must show at least the percentage of material passing through a 40-mesh screen.

All tonnages of ores and iron-bearing materials, either (1) not shown under Item 3 which were removed from the mine in 1951 and for which separate analyses were kept, or (2) shown under item 3 which were placed in stockpile in 1951 and not shipped from the range in 1951, must be listed below, showing gross tons and analyses. Report (1) and (2) separately. Give information on any concentration tests which may have been made on any such material. Report open pit and underground tonnages separately. Give legal description of land on which any such stockpiles are located.

Type of Material	Gross Tons	Nat. Iron %	Dry Phos. %	Nat. Mn. %	Dry Silica %	Dry Alum. %	Moist %
Concentrates	9,949	48.67	.062	1.26	16.29	1.19	9.60

Detailed Information With Reference to the Cost of Mining and Producing Ore During the Calendar Year 1951

	Open Pit	Underground	Grand Total Gross Tons
5. Total mined, gross tons	523,946		523,946
6. Loss due to beneficiation, gross tons	232,329		232,329
7. Production, gross tons	291,617		291,617

8. Cost of Development. (Under this item should be shown development costs applicable only to the tonnage mined during the calendar year.)	OPEN PIT		UNDERGROUND		TOTAL	
	Average cost per net ton	Total Cost	Average cost per net ton	Total Cost	Average cost per net ton	Total Cost
	$1.1200	$326,610.68	$	$	$1.120	$326,610.68

9. Cost of supplies used and labor performed at the mine in separating the ore from the ore body, including hoisting or conveying same to the surface of the earth.

OPEN PIT

	LABOR		SUPPLIES		TOTAL	
	Per Ton	Total	Per Ton	Total	Per Ton	Total
A. Operating Costs:						
1. Power Shovels a. Operating	$.3209	$93,592.63	$.3775	$110,068.72	$.6984	$203,661.35
b. Mtce & Repairs						
2. Locomotive & Cars a. Operating						
b. Mtce & Repairs						
3. Trucks a. Operating						
b. Mtce & Repairs						
4. Conveyors a. Operating						
b. Mtce & Repairs						
5. Track Expense						
6. Roadways						
7. Drilling & Blasting			.0208	6,078.72	.0208	6,078.72
8. Pumping & Drainage	.0054	1,561.01	.0052	1,508.46	.0106	3,069.47
9. Water Supply						
10. Scramming						
11. Open Pit Supervision						
12. General Pit Expense	.0376	10,971.77	.0598	17,442.08	.0974	28,413.85
13. Mine Employees Bonus or Vacation Pay						
14. Lean Matl & Waste Pile Exp. (Tons or Yds. (Material						
15. Stocking Merchantable Ore						
16. Contract Mining						
17. Miscl. (Detail fully) a. $ b. c. d. e.						
TOTAL (A-1 thru A-17)	$.3639	$106,125.41	$.4633	$135,097.98	$.8272	$241,223.39

B. Administration and Miscellaneous Costs:

OPEN PIT

(Note: Report only costs incurred within Minnesota and directly attributable to mining operations. Report other administrative items under 10-A and B.)	LABOR Per Ton	LABOR Total	SUPPLIES Per Ton	SUPPLIES Total	TOTAL Per Ton	TOTAL Total
1. Mine Office—Mine supervision and clerical	$	$	$	$	$	$
2. Range Office—Mine supervision and clerical	.0565	16,479.49	-.0015	-455.58	.0550	16,023.91
3. Duluth or other central office in Minnesota — Mine supervision and clerical						
4. Engineering	.0226	6,590.30	.0084	2,455.82	.0310	9,046.12
5. Laboratory (Assaying, Sampling, Etc.)	.0088	2,572.73	.0099	2,879.51	.0187	5,452.24
6. Experimental Expense						
7. Miscellaneous (detail fully)						
a. ..... $						
b. ..... $						
c. ..... $						
Total administrative expense	$.0879	$ 25,642.52	$ .0168	$ 4,879.75	$ .1047	$ 30,522.27
TOTAL OPEN PIT OPERATING COSTS (A + B)	$.4518	$131,767.93	$ .4801	$ 139,977.73	$ .9319	$ 271,745.66

UNDERGROUND

C. Operating Costs:	LABOR Per Ton	LABOR Total	SUPPLIES Per Ton	SUPPLIES Total	TOTAL Per Ton	TOTAL Total
1. Mining	$	$	$	$	$	$
2. Timbering						
3. Tramming						
4. Conveyors						
5. Pumping						
6. Hoisting						
7. Repairs						
8. U. G. Supervision						
9. Gen'l U. G. Expense						
10. Gen'l Surface Exp.						
11. Misc. (Detail fully)						
a. ..... $						
b. ..... $						
c. ..... $						
d. ..... $						
TOTAL (C-1 thru C-11)	$	$	$	$	$	$
D. Administration and Miscellaneous Costs: (See note above)						
1. Mine Office—Mine supervision and clerical						
2. Range Office—Mine supervision and clerical						
3. Duluth or other central office in Minnesota — Mine supervision and clerical						
4. Engineering						
5. Laboratory (Assaying, Sampling, Etc.)						
6. Experimental Expense						
7. Misc. (detail fully)						
a. ..... $						
b. ..... $						
c. ..... $						
d. ..... $						
Total administrative expense	$	$	$	$	$	$
TOTAL UNDERGROUND OPERATING COSTS (C+D)	$	$	$	$	$	$

10. Miscellaneous items of expense not included under items 9-B and D:

	OPEN PIT		UNDERGROUND		TOTAL	
	Average cost per net ton	Total Cost	Average cost per net ton	Total Cost	Average cost per net ton	Total Cost
A.						
1. Insurance on buildings and equipment used in operations	$ .0019	$ 552.93	$	$	$ .0019	$ 552.93
2. Personal injury expense actually paid:						
a. Premiums for compensation and liability insurance $						
b. Medical and hospital expenses $						
c. Settlement of injury or death claims $						
d. Safety or other miscellaneous expenses (give details) $						
Total, a to d	$ .0065	$ 1,904.91	$	$	$ .0065	$ 1,904.91
3. Total personal property taxes (Levied in the year 1951 and payable in 1952) 3a+3b. $						
a. Personal property taxes levied in 1951 on mining equipment and other personal property actually used in or attributable to mining operations:						
Total taxable valuation $						
Total taxes levied						
b. Total stock pile tax:						
1. Total tons						
2. Total tax $						
c. Ore in stockpile May 1, 1951, placed therein subsequent to May 1, 1950. Tons						
d. Proportion of total stockpile taxes levied in 1951 applicable to tonnage under 3-c						
4. Social Security taxes paid in 1951	.0205	5,965.94			.0205	5,965.94
5. Pensions	.0434	12,664.80			.0434	12,664.80
6. Group Insurance	.0106	3,086.54			.0106	3,086.54
Total, Item 10-A	$ .0829	$ 24,175.12	$	$	$ .0829	$ 24,175.12
B.						
1. Administration, offices outside of Minnesota	$	$	$	$	$	$
2. Contributions, donations, entertainment, etc.						
3. Association dues, assessments, advertising, discounts, exchange, etc.						
4. Contingent expenses, such as clubhouse, garden prizes, examinations, etc.						
5. Legal expenses						
6. Maintenance and upkeep of misc. real estate and dwellings						
7. Depletion, interest, charges, etc.						
8. Idle mine expense (mines idle during year 1951)						
9. Costs not included above						
Total, Item 10-B	$	$	$	$	$	$
Total, Misc. Expense, (10-A and B)	$	$	$	$	$	$

	OPEN PIT		UNDERGROUND		TOTAL	
	Average cost per net ton	Total cost	Average cost per net ton	Total cost	Average cost per net ton	Total cost
11. Total Royalty accruing on tonnage mined in 1951	$.5689	$165,909.27	$	$	$.5689	$165,909.27
SUBDIVIDE ABOVE TOTAL ROYALTY INTO:						
A. Portion represented by advance royalty credits, applied on 1951 tonnage $						
B. Portion represented by liquidated royalties applied on 1951 tonnage $						
C. Balance (Item 11 — A + B) currently paid or accrued upon ore produced during year 1951 $						
12. Total Amount of Realty Taxes, exclusive of Special Assessments, levied in 1951 (payable in 1952), upon the legal descriptions shown on page 2 $6601.12						
Amount of Ad Valorem Taxes levied in 1951 applicable to the tonnage mined in 1951	$.0143	$4,158.71	$	$	$.0143	$4,158.71
13. Mine Plant and Equipment (Exclusive of Beneficiating Plants)						
A. Standard Mine Plant and Equipment — Additions and betterments in 1951. $27,715.21						
1. Gross capital investment Dec. 31, 1951 $36,201.39*	$.0577	$16,834.05	$	$	$.0577	$16,834.05
2. Depreciation for 1951						
3. Total charged off at close of 1951 $						
B. Motorized Equipment — Additions and betterments in 1951. $						
1. Gross capital investment Dec. 31, 1951 $						
2. Depreciation for 1951	$	$	$	$	$	$
3. Total charged off at close of 1951 $						

\# Represents plant erection costs depreciated on basis of life of mine

STOCKPILE LOADING, BENEFICIATION, TRANSPORTATION AND MARKETING EXPENSE

14. Stockpile Loading:						
A. Shipments from stockpile, 1951						
1. Tons Shipped						
2. Cost of Loading $						
3. Cost per ton $						
B. Tonnage Stockpiled in 1951						
1. Total Tons Stockpiled 9,949						
2. Cost per ton (A-3) $.15						
3. Cost Applicable to tons Stockpiled, B-1 × B-2	$.0051	$1,492.35	$	$	$.0051	$1,492.35
15. Beneficiation (Detail on Page 10) Tons conc. produced						
A. Washing						
B. Drying						
C. Crushing & Screening						
D. Sintering						
E. Jigging						
F. Heavy medium 291,617	.6492	189,326.28			.6492	189,326.28
G. Pelletizing						
H. Flotation						
Total cost of beneficiation	$.6492	$189,326.28	$	$	$.6492	$189,326.28

16. Transportation.	OPEN PIT Average cost per net ton	OPEN PIT Total cost	UNDERGROUND Average cost per net ton	UNDERGROUND Total cost	TOTAL Average cost per net ton	TOTAL Total cost
A. Rail freight (Based on rates in effect year 1951)						
Before 8-28-51 224,771 tons @ $2.7725 per ton						
..... tons $ ..... per ton						
..... tons $ ..... per ton	$2.7725	$623,177.69	$	$	$2.7725	$623,177.69
B. Vessel freight (Based on rates in effect year 1951)						
After 3-28-51 66,846 tons @ $2.84969 per ton						
..... tons $ ..... per ton	2.8497	190,490.13			2.8497	190,490.13
..... tons $ ..... per ton						
C. Vessel unloading (Based on rates in effect year 1951)						
D. Federal Transportation tax						
Total Transportation Expense	$2.7902	$813,667.82	$	$	$2.7902	$813,667.82
17. Other costs incidental to transportation and marketing						
A. Marine Insurance	$	$	$	$	$	$
B. Marketing expense $.0497 5	$.0498	$14,507.93	$	$	$.0498	$14,507.93
C. Cargo analysis expense $						
D. Miscellaneous items not expressly enumerated. (Detail fully under remarks) $						
Total Item 17	$.0498	$14,507.93	$	$	$.0498	$14,507.93
Total Cost of Transportation and Marketing (Items 16 & 17)	$2.8400	$828,175.75	$	$	$2.8400	$828,175.75
GRAND TOTAL COSTS, YEAR 1951 (Items 8 to 17)	$6.2700	$1,828,427.87	$	$	$6.2700	$1,828,427.87

DETAILED INFORMATION WITH REFERENCE TO BENEFICIATING ORES MINED FROM THE ..... MINE, DURING THE CALENDAR YEAR 1951

	Washing Plants	Drying Plants	Sintering Plants	Crushing and Screening Plants
1. Government description of tract upon which plant is located	SW-SE 36-59-18			
2. Plant and Equipment:	Represents addition of heavy density section			
A. Additions and betterments in 1951	$ 148,273.16	$	$	$
(Detail of these items must accompany report.)				
3. Gross capital investment for depreciation as shown by your books at close of year 1951	186,418.39			
4. Amount charged off to depreciation year 1951	20,769.94			
5. Total amount charged off to depreciation at close of year 1951	29,114.20			
6. Net investment outstanding in plant and equipment at close of year 1951	$ 157,304.19	$	$	$
DETAILED COSTS OF BENEFICIATION AS SUMMARIZED UNDER ITEM 15, PAGE 9:				
7. A. Transportation expense, mine to plant	$	$	$	$
B. Labor:				
1. Beneficiation	48,885.67			
2. Maintenance				
3. Superintendence and clerical at plant	2,200.00			
4. Miscellaneous (Detail fully under remarks.)				
Total Labor	$ 51,085.67	$	$	$
C. Supplies				
1. Plant	$ 32,636.53	$	$	$
2 Maintenance	36,764.90			
3. Electric power	25,812.60			
4. Miscellaneous (Detail fully under remarks.)				
Total Supplies	$ 95,214.03	$	$	$

	Washing Plants	Drying Plants	Sintering Plants	Crushing and Screening Plants
D. Miscellaneous other than labor and supplies:				
1. Workmen's compensation (Actual costs only, no reserve funds.)	$ 1,239.89	$	$	$
2. Fire and other insurance necessary to plant	670.33			
3. Other items, Social Sec., etc. (Detail under remarks.)	2,298.84			
E. Taxes:				
1. Levied in the year 1951 (payable in 1952) on real estate connected with plant				
2. Levied in the year 1951 (payable in 1952) on personal property connected with plant	6,862.48			
F. Depreciation as per item 4, page 10	20,769.94			
G. Interest on beneficiating plant investment	11,185.10			
GRAND TOTAL COST	$ 189,326.28	$	$	$

SUMMARY OF OCCUPATION TAX TOTALS

Item		Cost Per Ton	Total	Total
4.	Gross Tons 291,617 L. E. Value Ton	$ 7.27756		$ 2,122,258.66
	Non-Statutory Deductions:			
16.	Transportation	$ 2.7902	$ 813,667.82	
17.	Other Transportation Items	.0498	14,507.93	
15.	Beneficiation	.6492	189,326.28	
14.	Loading Stockpile Ore	.0051	1,492.35	
	Total Non-Statutory Deductions	3.4943		$ 1,018,994.38
	Value of Ore at Mouth of Mine			$ 1,103,264.28
	Statutory Deductions:			
8.	Development	$ 1.1200	$ 326,610.68	
9-A&C	Labor & Supplies	.8272	241,223.39	
9-B&D	Administration	.1047	30,522.27	
10-A.	Miscellaneous	.0829	24,175.12	
11.	Royalty	.5689	165,909.27	
12.	Taxes on Ore Mined	.0143	4,158.71	
13.	Depreciation of Plant & Equipment	.0577	16,834.05	
	Total Statutory Deductions	2.7757		$ 809,435.49
	Taxable Value	1.00756		$ 293,830.79

REMARKS The amount under item 13 is only the cost of erection of the plant which value is lost upon being forced to move the plant. For this reason the cost of erection has been prorated over the life of the property.

State of .....
County of ..... } ss.

I, ... do solemnly swear that I am the .....
(Official title)

of .....; that the foregoing report was made by me, or under my supervision, and that the matters therein set forth have been transcribed from the records of this Company and are true and correct to the best of my knowledge and belief.
(Operating company)

Subscribed and sworn to before me this ..... day of ..... 1952.

Notary public .....

My commission expires .....

STATE OF MINNESOTA
DEPARTMENT OF TAXATION

APPENDIX A TO 1951 OCCUPATION TAX REPORT: _____ MINE

For the purpose of arriving at the allowable credits against occupation taxes, resulting from the application of the labor credit provisions as found in Minnesota Statutes 1949, Chapter 298, as amended, the following items of labor costs shall be considered in computing said credits as they relate to mining operations in the calendar year 1951, to-wit:

Nature of Labor	Reference Occupation Tax Report	Wages Paid	Total labor subject to credit
1. Development:	Item 1-C-3		
a. Direct payroll		$61,470.49	
b. Contract labor		$	
Total			$ 61,470.49
2. Mining:	Item 9-A		
a. Direct payroll		$ 106,125.41	
b. Contract labor		$	
Total			$ 106,125.41
3. Beneficiation:	Item 15		
a. Direct payroll		$ 51,085.67	
b. Contract labor		$	
Total			$ 51,085.67
4. New construction and installation of machinery pertaining wholly to mining or beneficiating operations:	Item 13-A		
a. Direct payroll		$ 16,797.18	
b. Contract labor		$	
Total			$ 16,797.18
5. Engineering and clerical personnel at Mine Office immediately adjacent to the mine, the duties of whom are devoted wholly to mining or beneficiating operations:	Item		$
6. Engineering and clerical personnel at a District Office on the Iron Ranges, the duties of whom are devoted wholly to mining or beneficiating operations, and are in all respects comparable to the duties performed by employees included under Item 5:	Item 9-B		$ 25,642.52
7.	Item		
Pension 10-A-5		$ 12,664.80	
Group Insurance 10-A-6		$ 3,086.54	
Total			$ 15,751.34
8. Costs of social security, unemployment and compensation insurance applying to the foregoing items:	Item 10-A		$ 16,851.58
GRAND TOTAL LABOR (Items 1 through 8)			$ 293,724.19
Total marketable production, tons			291,617
Average labor cost per ton: A. In excess of 50c and not more than 65c			$ .15
B. In excess of 65c per ton			$ .15
C. In excess of 80¢ per ton			.207

(NOTE. None of the items enumerated above should include the salaries of general superintendents, their assistants, or mine superintendents.)

Type of Ore	TONS 1 Direct	2 To be Concentrated	3 Total Crude* (1-2)	4 Concentrates (From 2)	5 Total Merch* (1-4)	Cost of Beneficiation 6 This should check with Item 15 of Report
Direct						
Crushing and Screening						
Washing						
Jigging						
Heavy Media						
Roasting						
Drying by artificial heat						
Sintering						
Magnetic separation						
Flotation						
Agglomeration						
Other process requiring fine grinding						
Total						

*The law states: "the expression, 'crude ore produced,' as used herein, means ores produced for shipment or for beneficiation and shipment, not including materials rejected by sorting or dry screening while loading; the expression 'merchantable ore produced' as used herein means ores which as mined or as mined and beneficiated, are ready for shipment as a merchantable product."

State of.....
County of..... } ss.

I, ..., do solemly swear that I am ..... of .....; that this report was made by me, or under my supervision, and that matters therein set forth are true and correct to the best of my knowledge and belief.

Subscribed and sworn to before me this..... day of ....., 1952

.....

Notary Public .....

My commission expires .....

_____

DEPARTMENT OF TAXATION

STATE OF MINNESOTA

TENTATIVE DETERMINATION UNDER MINNESOTA STATUTES 1949, SECTION 298, AS AMENDED, OF THE AMOUNT OF OCCUPATION TAX DUE FROM _____ ON MINING OPERATIONS OF _____ MINE, DURING THE CALENDAR YEAR 1951.

1.	Character of operation: Open Pit X Underground					
2.	Total tonnage mined during the calendar year 1951	523,946 tons.				
3.	Loss by beneficiation	232,329 tons.				
4.	Net marketable tonnage mined	291,617 tons.				
5.	Market value of net tonnage mined		Per Ton $ 7.317	Total Value		$ 2,133,765.71
	NON STATUTORY DEDUCTIONS: COSTS BEYOND MOUTH OF MINE					
6.	Cost of loading ore from stockpile, ore mined in 1951	tons	Per Ton $	Total Cost	$ 1,492.35	
7.	Cost of beneficiation		Per Ton $	Total Cost	$ 179,929.24	
8.	Transportation cost		Per Ton $	Total Cost	$ 813,667.82	
9.	Marketing Expense		Per Ton $	Total Cost	$ 14,507.93	
10.	Misc. (See detail on reverse side)		Per Ton $	Total Cost	$	
	Total - Items 6 to 10		Per Ton $	Total Cost		$ 1,009,597.34
	Value of Ore At Mouth of Mine		Per Ton $	Total Value		$ 1,124,168.37
	STATUTORY DEDUCTIONS					
11.	Cost of Development		Per Ton $	Total Cost	$ 245,275.65	
12.	Cost of Mining					
	a. Labor		Per Ton $	Total Cost	$ 106,125.41	
	b. Supplies		Per Ton $	Total Cost	$ 135,097.98	
	c. Administrative Expense—Mine and District Offices		Per Ton $	Total Cost	$ 16,023.91	
	d. Administrative Expense—Duluth or other central office in Minnesota		Per Ton $	Total Cost	$	
	e. Deprec. of Mine Plant & Equipm't		Per Ton $	Total Cost	$ 9,050.35	
	f. Misc. (See detail on reverse side)		Per Ton $	Total Cost	$ 38,673.48	
13.	Royalty (Paid to State		Per Ton $	Total Cost	$ 165,909.27	
14.	Ad valorem taxes on ore mined	%	Per Ton $	Total Cost	$ 5,574.02	
	Total - Items 11 to 14		Per Ton $	Total Cost		$ 721,730.07
15.	Value of ore for purpose of tax					$ 402,438.30
16.	Gross Tax upon such value at 11%					$ 44,268.21
17.	Special Tax for Veterans Adjusted Compensation (Sec. 298.011) (1% of No. 15)					$ 4,024.38
18.	Total Gross Tax (16+17)					$ 48,292.59
19.	Credit for Labor as per Sec. 298.02					$ 20,004.90
20.	Net Amount of Tax Due and Payable (18-19)					$ 28,287.69

Item 7. Cost of Beneficiation

Transportation			$
Labor			51,085.67
Supplies			95,214.03
Miscellaneous			4,209.06
Taxes			6,862.48
Depreciation* (See detail below)			20,769.94
Interest** (See detail below)			1,788.06
Total			$179,929.24
*1. Plant Investment—12/31/50			$ 38,145.23
2. Additions—Year 1951	$ 148,273.16		
3. Retirements—Year 1951			
4. Net Additions			148,273.16
5. Amount to Depreciate at 12/31/51			186,418.39
6. Depreciation allowed to 12/31/50	$ 8,344.26		
7. Less Depreciation retired in 1951			
8. Net Depreciation Allowance			
9. Depreciation on Item 5 (9 yr. life)	20,769.94		
10. Total Depreciation to 12/31/51			29,114.20
11. Undepreciated Balance—12/31/51			157,304.19
Depreciation Allowance for 1951			
Depreciation as above—Item 9			
Add Loss—Deduct profit on equipment and rentals			
Depreciation Allowance for 1951			
**Undepreciated Balance as at 12/31/50			$ 29,800.97
Interest @ 6% on 12/31/50 Undepreciated Balance			1,788.06

Item 10. Miscellaneous

Marine Insurance	$
Cargo Analysis	
Other Items	
Total	$

Item 12f. Cost of Mining — Miscellaneous

Engineering	$ 9,046.12
Laboratory	5,452.24
Item 10-A	24,175.12
Item	
Total	$ 38,673.48

Item 12e. Depreciation

	Standard Plant		Motorized Equipment	
1. Investment — 12/31/50		$ 8,486.18		$
2. Additions — Year 1951	$ 27,715.21		$	
3. Retirements — Year 1951				
4. Net Additions		27,715.21		
5. Amount to Depreciate at 12/31/51		36,201.39		
6. Depreciation allowed to 12/31/50	$ 6,081.13		$	
7. Less Depreciation retired in 1951				
8. Net Depreciation Allowance	$		$	
9. Depreciation on Item 5 (25%)	9,050.35	(4 yr. life)		
10. Total Depreciation to 12/31/51		15,131.48		
11. Undepreciated Balance—12/31/51		21,069.91		
Depreciation Allowance for 1951				
Depreciation as above — Item 9		$		$
Add Loss—Deduct profit on equipt. sold and rentals				
Depreciation Allowance for 1951		9,050.35		

SUPPLEMENTAL WORKSHEET

Property_____

ITEM 5. Lake Erie Value

Grade of Ore	Tons	Nat Fe		Phos	Silica	Thru 40M	Value/ton	Total
Bessemer	80,819	52.22		.032	13.82		8.4438	682,418.97
		(8.5682)		(.1430)	(.2674)			1,426,868.82
Non-Bessemer	210,798	46.838		.062	15.01			
		(7.1196)			(= .3507)			
Buyer's Account								
Before 8-28	224,771						.10300	23,151.39
After 8-28	66,846						.18025	12,048.97
Total	291,617							
					Gross value			2,144,488.15
					Less ½% shrinkage			10,722.44
					Lake Erie value		7.3170	2,133,765.71

ITEM 8. Transportation

	Tons		Cost/ton	Total
Before 8-28	224,771		2,772,503	623,177.69
After 8-28	66,846		2,849,691	190,490.13
			2,7902	813,662,82

ITEM 14. Ad Valorem Tax Allowance

Description	District	SD	Reserve (tons)	Assessed Value	Mill Rate	Tax (material)
Sw-NE 36-59-18	Nichols TP	21	300,000	46,950	122.13	5,734.00
NW-SE						
SW-SE						
	Production 291,617 = 97.21%				Total tax Allow 97.21 %	5,574.02
	Reserve 300,000					

ITEM 19. Credit For Labor

Total labor cost	293,724.19			
Tons produced	291,617			
Labor cost per ton		1.0072		
Excess of 50¢ & not more than 65¢		.1500	x .10	.0150
Excess of 65¢		.3572	x .15	.0536
Labor credit earned	291.617 tons x		.0686	20,004.90
Excess of 80¢			x .10	
Labor credit earned	tons x			
Total labor credit earned				20,004.90
Maximum credit allowable 60 % x gross tax @ 11% 44,268.21				26,560.93
Credit not used under limitation				

DEPARTMENT OF TAXATION
STATE OF MINNESOTA

FINAL DETERMINATION UNDER MINNESOTA STATUTES 1949, SECTION 298, AS AMENDED, OF THE AMOUNT OF OCCUPATION TAX DUE FROM _____ ON MINING OPERATIONS OF _____ MINE, DURING THE CALENDAR YEAR 1951.

1. Character of operation: Open Pit X Underground _____
2. Total tonnage mined during the calendar year 1951 _____ tons.
3. Loss by beneficiation 291,617 tons.
4. Net marketable tonnage mined _____ tons.
5. Market value of net tonnage mined _____ Per Ton $ _____ Total Value $ _____

NON STATUTORY DEDUCTIONS: COSTS BEYOND MOUTH OF MINE

6. Cost of loading ore from stockpile, ore mined in 1951 _____ tons Per Ton $ _____ Total Cost $ _____
7. Cost of beneficiation _____ Per Ton $ _____ Total Cost $ _____
8. Transportation cost _____ Per Ton $ _____ Total Cost $ _____
9. Marketing Expense _____ Per Ton $ _____ Total Cost $ _____
10. Misc. (See detail on reverse side) _____ Per Ton $ _____ Total Cost $ _____

Total - Items 6 to 10 _____ Per Ton $ _____ Total Cost $ _____

Value of Ore At Mouth of Mine _____ Per Ton $ _____ Total Value $ _____

STATUTORY DEDUCTIONS

11. Cost of Development _____ Per Ton $ _____ Total Cost $ _____
12. Cost of Mining
    a. Labor _____ Per Ton $ _____ Total Cost $ _____
    b. Supplies _____ Per Ton $ _____ Total Cost $ _____
    c. Administrative Expense—Mine and District Offices _____ Per Ton $ _____ Total Cost $ _____
    d. Administrative Expense—Duluth or other central office in Minnesota _____ Per Ton $ _____ Total Cost $ _____
    e. Deprec. of Mine Plant & Equipm't _____ Per Ton $ _____ Total Cost $ _____
    f. Misc. (See detail on reverse side) _____ Per Ton $ _____ Total Cost $ _____
13. Royalty _____ Per Ton $ _____ Total Cost $ _____
14. Ad valorem taxes on ore mined _____ % Per Ton $ _____ Total Cost $ _____

Total - Items 11 to 14 _____ Per Ton $ _____ Total Cost $ _____

15. Value of ore for purpose of tax $ 402,438.30
16. Gross Tax upon such value at 11% $ 44,268.21
17. Special Tax for Veterans Adjusted Compensation (Sec. 298.011) (1% of No. 15) $ 4,024.38
18. Total Gross Tax (16+17) $ 48,292.59
19. Credit for Labor as per Sec. 298.02 $ 20,004.90
20. Net Amount of Tax Due and Payable (18-19) $ 28,287.69

IRON ORE TAXATION — ROYALTY TAX

ADMINISTRATION

The computation and administration of the royalty tax is very simple. "Royalty" is the amount in money or value of property received by any person having any right, title or interest in or to any tract of land in this state for permission to mine and remove ore therefrom. (Minnesota Statutes 1949, Section 299.02). Assume that "A" owns some land containing iron ore and he leases it to "B" for the purpose of mining the ore; "B" to pay to "A" fifty cents a ton royalty for each ton removed, and assume that 100,000 tons of ore is removed during the calendar year.

"A" would then receive from "B" the sum of $50,000 in royalty upon which "A" would pay a tax of 12% or $6,000.

The law requires each recipient of royalty to file a report with the Commissioner of Taxation on or before February 1st of each year showing the amount of royalty received during the preceding calendar year.

The Commissioner of Taxation determines from the report the amount of the royalty tax due and certifies the amount to the State Treasurer and State Auditor on or before May 1st of each year.

As a practical matter the mining companies usually pay the royalty taxes, regardless of who receives the royalty. This is done to prevent any liens for failure to pay the tax.

The Royalty Tax is 12%. The proceeds of the tax of 11% is credited to the State General Revenue Fund and the proceeds of the tax of 1% goes to the Veterans' Compensation Fund.

IRON ORE TAXATION — TACONITE TAX

ADMINISTRATION

The tax on taconite concentrate that is actually produced is as follows: Five cents per gross ton, plus one tenth of one cent per ton for each one percent that the iron content of such product exceeds 55 percent dried iron.

The collection and payment of this part of the tax is handled as follows: A report form is sent to the companies producing taconite concentrate. In this report is contained the data needed by the Commissioner to determine the amount of tax. After the tentative determination of the tax, and after hearings provided under the statute, he makes the final determination of the amount of the tax, and certifies this amount to the State Auditor, who draws a warrant to the Treasurer to be paid.

The tax collected under Section 298.26, on **unmined** taconite or iron sulphides, is handled by the local officials in their districts, the limit of the tax being $1.00 per acre.

Distribution of the tax collected under Section 298.24, as ex-

plained in the section entitled "Digest of Minnesota Laws Affecting Iron Ore Taxation," is as follows:

one-fourth to the city, village or town;
one-fourth to the school district;
one-fourth to the county; and
one-fourth to the state.

TAXES IN OTHER STATES

ALABAMA

Alabama imposes a tax on mined iron ore of 3c per gross ton. Real estate and personal property is assessed at 60% of its **fair market value** and iron ore in the ground is assessed on this basis. Alabama does not use any particular formula for assessing unmined iron ore and investigation at Birmingham disclosed the fact that the iron ore reserves of U. S. Steel and Republic Steel were valued at about $2500.00 per acre **fair market value,** and assessed at 60% or about $1500.00 per acre. The constitution limits the millage on the ad valorem tax for the state and local purposes.

Alabama has a corporate income tax of 3% of net income and also a corporate capital stock tax. Domestic corporations pay $2.00 per thousand on paid up capital stock and foreign corporations pay $2.00 per thousand on all capital employed in the state.

CALIFORNIA

California assesses real and tangible personal property at 50% of its **full cash value.** There is no severance tax on mined ore and unmined iron ore is taxed on the basis of **present worth of estimated future profits** under the Hoskold formula the same as Minnesota and this tax is for local purposes only. California imposes a corporate income tax of 4% of net income on all corporations.

MICHIGAN

Michigan has no special tax on iron ore. Real and tangible personal property is assessed at its **true cash value.** Michigan has an appraiser of mines who computes the true cash value of unmined iron ore and certifies the valuation to the state and local taxing districts. In arriving at the true cash value, the appraiser of mines uses the "Finlay" method, based on the present worth of estimated future profits. Michigan has no corporate income tax, but has a nominal corporation tax of 2½ mills on the value of capital stock, which as applied to mining companies, yields the equivalent of about ¾c per ton on iron ore produced. Sec. 7.24, M. S. A. provides that metallic ore newly discovered or proved in the ground and not part of the property of an operating mine shall be exempt from the general property tax for 10 years, or until such time as it becomes part of the property of an operating mine or in itself becomes an operating mine.

NEW JERSEY

New Jersey has no special taxes on iron ore and has no income tax. Iron ore, whether mined or unmined, is taxed the same as other property for state and local purposes.

PENNSYLVANIA

Pennsylvania has no special taxes on iron ore. Iron ore is taxed on the same basis as other property. There is a corporate income tax of 5% of the net income. The ad valorem tax is for local purposes only.

NEW YORK

There are no special taxes in New York on iron ore. Real estate and personal property is taxed on the basis of **full value** for state and local purposes. The mine assessments are determined by local assessors and there is no uniformity. We have been advised by the State Board of Equalization and Assessment that New York is considering the use of the Hoskold formula. New York has a corporate income tax of 5½% of net income.

TEXAS

Texas has no special taxes on iron ore. Real and personal property are taxed on their **full cash value** for local purposes only. Texas has a severance tax on oil, natural gas and sulphur.

UTAH

In Utah, for state and local purposes, metalliferous mines are valued at $5.00 per acre, plus value of machinery and real estate, plus twice the average of net annual proceeds for preceding 3 years. There is a corporate income tax of 3% of net income and a tax of 1% of the gross amount received for metalliferous ore sold.

WISCONSIN

Wisconsin has no special taxes on iron ore. Real and personal property is taxed on the **full value at private sale** for state and local purposes. The value of iron ore is determined by the State Geologist and his computations are certified to the state and local taxing districts. The State Geologist uses the Hoskold formula to fix the value of iron ore. Wisconsin has a graduated corporate income tax starting with 2% on the first $1000.00 of net taxable income and ending with 6% on net taxable income over $7000.00.

WYOMING

Wyoming assesses real and personal property at its **true value in money at private sale** for state and local purposes (32-506). The

gross product of operating mines, including oil and gas is taxed in lieu of taxation of the land, but in addition to the surface improvements, an annual return is made to the State Board of Equalization which assesses the gross value at the mouth of the mine and returns the valuations to the several counties for taxation. (32-1001-1006). Wyoming has no income tax.

TAXES IN CANADA AND PROVINCES

CANADA

The Dominion government does not impose any royalty or ad valorem tax. There is a corporate income tax (Laws 1948, C. 52) of 10% on first $10,000.00 of taxable net income and 30% on excess over $10,000.00. It is 12% and 35% when consolidated returns are filed. Mining companies are exempt from the income tax for 36 months if production is commenced during the years 1946 to 1949 inclusive (L 1948, C. 52, Sec. 74).

QUEBEC

There is no provincial ad valorem tax, but real and personal property is assessed at its **real value** by the local taxing districts. The Quebec Mining Act. R. S. 1941, Chapt. 196, Sec. 226, exempts Mining companies from Municipal taxation for 5 years. Quebec imposes an income tax but mining companies are exempt, Stat. 1947, Chapt. 33, Sec. 6. Mining companies, however, pay duties on their net profits as follows: $10,000 to $1,000,000 4%; over $1,000,000 to $2,000,000 5%; over $2,000,000 to $3,000,000 6%; and over $3,000,000 7%. The Hollinger North Shore Exploration Company, Ltd. by the provisions of the act 4/17/1946 will pay in addition to the above, $100,000.00 annually.

ONTARIO

The province of Ontario does not levy an ad valorem tax, but the local taxing districts do. (Laws 1948, Chapt. 272). There is a special mine tax of 10c per acre and the mining companies pay on their annual profits as follows:

$10,000 to $1,000,000—6%
1,000,000 to 5,000,000—8%
Over $5,000,000—9%

LABRADOR AND NEWFOUNDLAND

Labrador is now under the jurisdiction of New Foundland and New Foundland is a full fledged Province of Canada. The laws of New Foundland apply to Labrador.

There is no provincial ad valorem tax, but municipalities tax real and personal property for local revenue, on the assessed value, at various rates. Under the Mining Tax Act of June 22, 1951, Iron

Mining companies pay 20% of net income obtained from iron ore recovered in the year or 10c for each ton of iron ore recovered up to 1,500,000 tons and 8c for each additional ton.

We were advised by the Department of Natural Resources, St. Johns, New Foundland, on May 19, 1952, that the Iron Ore Company of Canada, operators of the Labrador field, under special agreement, will pay only 5% of their net profits.

TAXES IN OTHER FOREIGN COUNTRIES

VENEZUELA

In Venezuela the government owns the minerals in all land. The right to explore for and extract minerals **must** be obtained by a grant from the Federal government. Mines in Alluvion deposits pay an annual surface tax of 50 centimos per hectare (about 2½ acres): those of veins and lodes pay a tax of one bolivar (about 30c) per hectare. On iron ore produced there is a tax of 1% of the value of the ore. Iron mining profits are taxed at a basic rate of 2½% and a graduated surtax is also imposed, running from 1½% to 26%. (Source: Martindale-Hubbell Law Directory 1952, Vol. 3).

CHILE

In Chile the title to all mineral deposits is in the government and the right to explore or extract the ore is granted by concessions from the government. Iron mines (operating) pay an annual 50 centavos (about 2c) per hectare (about 2½ acres). Chile also imposes an income tax on iron mining of 19½%. (Source—Martindale-Hubbell Law Directory 1952, Vol. 3).

The language used in these various state statutes, **full and true value** (Minn.); **fair market value** (Ala.); **full cash value** (Cal. & Tex.); **true cash value** (Michigan); **full value** (N. Y.); **full value at private sale,** (Wisc.); **a true value in money at private sale** (Wyo.); all mean **market value.** However, these statues do not set up any standard by which the market value can be determined, hence there is no uniform method by which the market value is ascertained and each state uses its own theory in fixing the valuation.

In Minnesota, the value of the iron ore in the ground is computed by the Commissioner of Taxation and certified to the county auditors. In Michigan, the Appraiser of Mines computes the value and certifies the appraisal to the state and various taxing units. In Wisconsin, the State Geologist computes the value and certifies the appraisal to the state and local taxing districts. In Minnesota, Michigan, Wisconsin and California, the Hoskold or Finlay formula is used, with certain modifications, to fit particular situations. In other states the systems vary in each taxing district.

RESERVES

By "RESERVES" we mean the iron ore in the ground, other than taconite, which can be mined and is either merchantable iron ore in its natural state, or by present methods of beneficiation can be made into merchantable iron ore, suitable for use in the manufacture of pig iron and steel; and mined ore in stockpiles.

On May 1, 1921, the estimated iron ore reserves in Minnesota were 1,311,410,779 gross tons, since then and up to May 1, 1951, 1,258,503,000 gross tons have been shipped. In other words, the shipments almost equalled the estimated reserves, and yet, on May 1, 1951, we still had estimated reserves of 963,762,000 gross tons. These facts have caused many people to believe that the mining companies have been concealing deposits of iron ore, which if disclosed would become taxable. This Commission has conducted hearings and made a thorough investigation of the matter in an effort to determine whether this belief has foundation in fact.

In Minnesota, prior to 1908, the local assessors estimated the tonnage of ore in the ground and made the assessments. Under the local assessor system there was no uniformity of method used to determine the estimated tonnage or the value of iron ore; and because of this, many assessments had to be reviewed by the State Board of Equalization. So, in 1907, after a joint Legislative Commission, appointed to investigate the best methods of taxing iron ore, had reported on this matter, a joint resolution was introduced in which it was stated: "That the ore lands did not bear their just share of taxation and were grossly undervalued for that purpose."[1]

In 1907, the Legislature abolished the State Board of Equalization and transferred all the duties and powers thereof to the Minnesota Tax Commission. The problem of valuing iron ore properties was studied by the Minnesota Tax Commission; and in 1908 it devised a classification rate schedule of values on iron ore for operating (active) mines and prospects. The values were determined by the quantity and quality of the ore in the ground based upon the reports of explorations furnished by the owners, lessees or operators of the property. The Tax Commission thought that these estimates based upon the reports so furnished, should be verified by disinterested and competent engineers before being accepted as substantially correct.

On December 20, 1909, arrangements were made to have these estimates, furnished by the mining companies, checked by the staff of the University School of Mines. Although the Legislature has never enacted a law requiring the use of this system, it has been followed ever since.[2] The system works in the following manner:—

About November 15th each year, the Mining Division of the Department of Taxation makes a preliminary study of active mines, which the Department wants the School of Mines to review. These lists are discussed with the engineers of the School of Mines and

1. Report of Minnesota Tax Commission, 1908, p. 110.

2. Interim Commission on Iron Ore Tax Report, 1941—p. 40-52.

mining companies. After these discussions a list of the mines of each of the major operating companies is submitted to the School of Mines with the request that those properties be reviewed by them as of the next assessment date (May 1st). At the same time a letter is sent to the mining companies requesting that they submit to the School of Mines, their own estimates on the selected mines operated by them, together with all computations, drill records, maps and cross sections. The mining companies are requested to send in this information during the first half year, and as far as we can ascertain, they have always complied with the request as promptly as possible.

It should be noted that the open pit mines do not remove iron ore during the winter months, hence the estimates made in the winter generally reflect the tonnage in the ground when the next operating season begins about May 1st. Allowance is made for any shipments made in early spring prior to May 1st.

Underground mines operate all year, and for this reason the Pioneer, Sibley, Zenith and Soudan underground mines on the Vermilion Range are checked every year.

On inactive mines, or on so-called reserve properties, there is no necessity for checking each year because the estimated tonnage remains the same, unless some additional drilling has been done, in which event the new drill records are checked and the property re-estimated.

The mining companies furnish the School of Mines with cross-sections of the ore bodies based upon the exploratory drilling and such other information which is disclosed by operations, either on the property itself or adjacent properties. These cross-sections are vertical sections through the deposit from the surface down to the bottom of the exploratory drilling, and in some cases beyond, based upon the interpretation of the engineers and geologists as to how the formations lie and how the different layers conform with each other. In these cross sections are placed the drill holes, in most cases with the analyses generally in the ore body itself, at 5 foot intervals. From these analyses the engineers, to the best of their judgment, outline the layers of the different materials constituting the ore formation. These areas are then run, to determine the total area in the section for the different layers. The engineers at the School of Mines sometimes increase the volume of material in the estimate made by the mining companies and these situations are adjusted by conferences between the engineers of the School of Mines and the mining companies.

From these cross-sections the number of cubic feet of ore formation is figured and on the Mesabi and Cuyuna Ranges the total cubic footage is divided by 14 to determine the tonnage. The mining companies, in computing their estimates on the Mesabi and Cuyuna Ranges also use 14 cubic feet per ton. This formula does not apply to the Vermilion Range, for in the Soudan Mine on the Vermilion Range, 10 cubic feet per ton is used; and in the Pioneer, Sibley and Zenith, 11 cubic feet per ton is used. This is due to the difference in specific gravity of these various ores as found by exper-

ience. The estimates are all based on ore "in place" in the ground and undisturbed. Heaviest of all is the Soudan ore, very dense and hard, and high in iron. Next comes the ore at the Ely mines, part of which is hard ore. The last, and by far the largest group, is made up of the Mesabi and Cuyuna ores, which average out about 14 cubic feet per ton.

The gross tonnages computed in the foregoing manner, are then classified as to quantity and quality according to the constituents in the analyses, as to dried iron content, phosphorus, silica, alumina, manganese, moisture and natural iron and then computed as to the tonnages of Bessemer or non-Bessemer ore. Bessemer ore is that containing .045% or less in phosphorous. In case the phosphorus exceeds .045%, the ore is non-Bessemer.

With the limited personnel available to the School of Mines, it is making an inspection of each active mine about every two to four years, except the underground mines which are checked each year.

The present system for estimating reserves is the best that has been devised, and our investigation leads us to conclude that our present Tax Commissioner is placing all known iron ore in Minnesota on the tax rolls.

The fact that reserve estimates do not diminish in the same proportion as the shipments made, can be accounted for by several factors:—No one can accurately determine the amount of iron ore in the ground unless extensive drilling has been done in the ore body to be estimated, and even then an accurate estimate cannot be made because the areas between the drill holes may, when actually mined, show more or less ore than shown by the drilling estimate. New methods of beneficiation have enabled the mining companies to produce merchantable iron ore from ore bearing bodies formerly considered worthless and not classified as reserves in the former estimates. For example, the Mary Ellen Mine at Biwabik was abandoned in 1930, because the ore body remaining could not be processed commercially by any known method at that time. However, because of the development of the heavy media concentration process, it was reopened in 1948, and has been producing 300,000 to 400,000 gross tons per season, and we are informed has a sufficient reserve to last two or three more years. This is just one instance of many on the range where millions of tons of iron ore have been added to the reserves and placed on the tax rolls because of new mining techniques.

It also appears, from our investigation, that after preliminary drilling has been done and years later when the companies prepare to open up the reserve, additional extensive drilling is done to determine more closely the operating limits of the open pit. These additional drillings, in most instances, disclose more tonnages which are added to the reserve estimates. As an example of this situation, we have the estimates of the Auburn-Great Western Mine. For many years prior to and up to May 1, 1949, the estimated tonnage was 8,389,000 tons. In the year 1949 the Oliver Mining Company drilled 33 new holes to an average depth of 200 feet, and from the new drill record the School of Mines increased the tonnage to 11,-

604,000 tons, or an increase in the prior estimates of 3,215,000 tons. This is just another instance of many that have happened on the range. It should be noted that since May 1, 1921, the estimated tonnage on the Cuyuna Range, have, by drilling and new beneficiation processes, increased from 25 million to 42 million tons in spite of shipments made from that range.

These factors; new beneficiation techniques, additional drilling and the reserves on the Cuyuna Range, account, at least in part, for the fact that the reserve estimates do not diminish in the same proportion as the shipments made.

Our investigation discloses that during the past 30 years, because of the new techniques and additional drilling, there have been two tons of ore added to the reserves for each three tons shipped. Professor John W. Gruner, Geologist at the University of Minnesota, claims that this ratio of two tons added to the reserves, for each three tons shipped will not be maintained and that we can expect this ratio to diminish very rapidly, due to the increasing depth of mining, the decline in average grade of ore and in the size of the remaining ore bodies.

It should be noted, however, that the tonnage of concentrates shipped is increasing and the shipments of high grade direct shipping ore is decreasing. The records show that in 1920, only 12% of the iron ore shipments from Minnesota were concentrates, whereas in 1950, they were 30%; while in 1920, the shipments of direct shipping ore were 88%, and in 1950, were 70%.

The reserves of merchantable iron ore in the State of Minnesota, as of May 1, 1951, are shown in the following table prepared by our Commissioner of Taxation.

TABLE NO. 1
CLASSIFICATION OF IRON ORE RESERVES OF MINNESOTA AS OF MAY 1, 1951

Classification	Mesabi Range	Vermilion Range	Cuyuna Range	Total
Direct Ore:				
Open Pit	493,901,000		11,717,000	505,618,000
Underground	236,946,000	11,660,000	20,209,000	268,815,000
Total	730,847,000	11,660,000	31,926,000	774,433,000
Concentrate:				
Open Pit	121,091,000		8,039,000	130,039,000
Underground	43,713,000		1,495,000	45,208,000
Total	164,804,000		9,534,000	175,247,000*
Metal Ore:				
In Ground	895,651,000	11,660,000	41,460,000	949,680,000*
In Stockpile	13,218,000	450,000	410,000	14,082,000**
Total	908,869,000	12,110,000	41,870,000	963,762,000*

Note: The above figures represent the total estimated iron ore reserves in gross tons as of May 1, 1951, together with the tonnage of ore on State lands that were not under lease as of May 1, 1951

* Includes 909,000 tons in Fillmore County District

** Includes 4,000 tons in Fillmore County District

TABLE NO. 2

IRON ORE RESERVES OF MINNESOTA
May 1, 1920 to May 1, 1951, incl.

Year May 1	Estimated Reserve Tonnage (Including Stockpiles) in Gross Tons				
	Mesabi Range	Vermilion Range	Cuyuna Range	Fillmore County	Total
1920	1,305,926,735	10,927,844	24,819,959		1,341,674,538
1930	1,154,434,031	14,250,540	66,542,939		1,235,227,510
1940	1,139,314,272	13,841,272	65,431,104		1,218,586,648
1945	973,129,581	12,715,183	59,787,900		1,045,632,664
1946	935,323,167	11,850,889	59,228,985		1,006,403,041
1947	937,071,161	11,135,293	56,089,288	186,700	1,004,482,442
1948	930,828,130	10,760,141	38,430,351	394,248	980,412,870
1949	909,484,014	12,515,362	37,718,580	547,744	960,265,700
1950	923,769,792	13,183,901	43,415,199	589,000	980,957,892
1951	908,869,000	12,110,000	41,870,000	913,165	963,762,000

Source: Department of Taxation

All of the foregoing reserves refer to the so-called standard merchantable ore and do not include taconite.

TACONITE

The reserves in Minnesota will probably be added to considerably by the development of Taconite. The United States Bureau of Mines in the 1949 yearbook estimates the tonnage of taconite in the Lake Superior District at 61,000,000,000 tons. However, this estimate is not broken down to show what portion of the estimate is magnetic taconite or what is non-magnetic, or what tonnage is in Minnesota. All of the authorities on taconite processing indicate that at the present time only magnetic taconite can be processed into merchantable iron ore.

The only figures we have been able to obtain on the magnetic taconite in Minnesota which the Commission deems fairly accurate are those given to the Commission by Professor John W. Gruner on May 23, 1952.

Professor Gruner states that there are billions of tons of magnetic taconite on the Mesabi Range but due to the geological structure and the chemical combinations in the rock, that from all the drill records and data which have been made available to him, he estimates that 5,100,000,000 tons can be quarried by the so-called open pit method. He advised the Commission that it takes 3 tons of taconite rock to manufacture one ton of taconite pellets and thus he estimates that 1,700,000,000 tons of iron ore can be produced from the taconite tonnage in the ground.

He stated that the magnetic taconite on the Mesabi Range contains about 20% to 27% of iron as magnetite recoverable by magnetic concentration and that the resulting iron ore product contains 63% to 64% natural iron.

He stated that on the basis of standard merchantable ore of 51.5% natural iron that the taconite concentrates running from

63% to 64% natural iron were the equivalent of 1.24 of a ton of ordinary merchantable ore and because of the high iron content of the taconite concentrates, he computes the amount which can be produced from the present taconite reserves as the equivalent of 2,000,000,000 tons of ordinary merchantable iron ore.

He pointed out that estimates of taconite which run into astronomical figures may be fairly accurate as to the tonnage in the ground, but the excess over his estimate can either not be concentrated because the ore body is non-magnetic or because the taconite itself is so deeply imbedded, or because of the chemical combinations in the rock, that the cost of mining would be prohibitive.

This Commission is of the opinion that estimates of iron ore in the ground are highly conjectural. We know that no ore body in the world has undergone more intensive drilling and exploration than our own Mesabi Range and as indicated in the beginning of this report, we have shipped almost as much ore as the estimated reserves as of 1920 and still have approximately a billion tons available in the ground. It is for this reason that we believe the estimates of magnetic taconite made by Professor Gruner are probably very conservative and undoubtedly time will prove that instead of five billion tons there may be a substantially larger tonnage of magnetic taconite which can be mined and processed.

At the present time the Erie Mining Company, the Reserve Mining Company and the Oliver Division of the U. S. Steel Company are investing millions of dollars for taconite manufacturing plants. If these taconite plants can produce annually in the next few years ten to twenty million tons of high grade concentrates and the mining industry will be able to conserve the supply of regular ore, the life of our Minnesota iron ranges can be substantially prolonged.

It should be explained that the rate of iron ore production in Minnesota is not entirely under the control of the mining companies, nor under that of the steel companies. During World War II, it was expected that the demand for Minnesota ore would slacken in the years after the war ended. Instead, reconstruction and defense have resulted in an increasing demand, with no other adequate new source ready to produce substantial tonnages before 1955.

With the thought in mind that this great demand upon the Minnesota reserves would so deplete the amount of iron ore in Minnesota and affect the stability of the industry in Minnesota in the future, your Commission made a study of other known ore reserves in the United States and elsewhere, which they believe could be competitive with Minnesota's iron ore industry. In our investigation of the various reserves throughout the United States and elsewhere, we have found that the following places have large and extensive iron ore reserves, and have shown the extent and quality of each.

ALABAMA

Red ore 1,000,000,000 gross tons running from 31% to 37% dried iron.[1] There is also some low grade brown and grey ore. The bulk of the Alabama ore is located in Jefferson County at or near Birmingham. The mines are all underground and production is about 8 million tons annually. U. S. Steel and Republic Steel are the big producers. The Birmingham area also has large deposits of coking coal and of limestone, the fluxing material used in making iron. This is the reason why the U. S. Steel Co. has a large steel plant at Birmingham where this low grade ore is utilized.[2] It is doubtful whether or not this ore would be usable without these materials being near at hand. At present, the entire output of these mills is used in the southeastern area of this country.

1. State Department of Revenue, Montgomery, Alabama, 9/21/51.
2. Sub-committee inspection, April, 1952.

CALIFORNIA

122,658,000 gross tons running 50% to 60% dried iron.[1] These deposits consist of HEMATITE AND MAGNETITE, in small shallow deposits in about ten different areas in the state. Production is around 500,000 tons annually and most of it goes to the Kaiser Plant at Fontana.

1. Iron Resources of California, Bulletin No. 129, Part N., p. 217, April, 1948, issued by State Division of Mines.

MICHIGAN

This is the second largest iron ore producing district in the United States, with an annual production of about 12 million tons. On January 1, 1952, the iron ore reserve was estimated at 162,221-921 gross tons (running 50% to 60% dried iron).[1] Most of the iron ore in Michigan is deeply imbedded and is mined by underground methods. Michigan also has an abundant supply of iron bearing rock called "Jasper" which is somewhat similar to our Minnesota "Taconite". The Cleveland-Cliffs Company and the Ford Motor Co. jointly are erecting a plant at Humboldt, Michigan, to process "Jasper" from an open pit and expect to be in production by 1953.[2] It is doubtful that Michigan will ever, because of the depth of ore bodies, be able to increase its production to any great extent, beyond the increase due to future concentrates made from Jasper.

1. H. H. Wade Mining Directory, 1952.
2. The Clevelander, Jan. 1952.

NEW YORK, PENNSYLVANIA, NEW JERSEY

1,600,000,000 gross tons of crude low grade ore requiring concentration. Production of these three states averages about 3 mil-

lion tons of concentrates annually,[1] which requires sintering before blast furnace use. The concentrate produced is about one-third of the crude ore mined.[2] Most of the mining is underground, but there are a few open pits. Moderate expansion may be expected.

1. U. S. Bureau of Mines Minerals Year Book, 1949.
2. The Mineral Industries of New York State, 1950, Department of Commerce.

TEXAS

139,000,000 gross tons of crude low grade ore requiring beneficiation.[1] This is a brown ore and the Lone Star Steel Co. in the Daingerfield area, Morris County, is producing from open pits around 500 thousand tons annually. This ore is beneficiated by washing, calcining and sintering.[2] Ore occurs in thin seams, and is of low iron content.

1. U. S. Department of Interior Geological Survey Map 3-212-1947. Iron Ore Deposits of Western United States by Carl E. Denton and Martha D. Carr.
2. U. S. Bureau of Mines Minerals Yearbook, 1949, page 15.

UTAH

150,000,000 to 175,000,000 gross tons direct shipping ore running from 45% to 50% natural iron.[1] Utah produces from open pit mines about 2½ million gross tons annually. This ore is used in iron and steel centers located at Provo and Geneva, Utah; Fontana, California; and Pueblo, Colorado.[2] Some expansion of Utah iron mining is to be expected in future years.

1. Utah Tax Commission 9/21/51.
2. U. S. Bureau of Mines Year Book 1949, p. 15.

WISCONSIN

On January 1, 1952—6,000,000 gross tons direct shipping ore, running 50% to 60% dried iron.[1] This ore is all on the Gogebic Range and can only be mined by underground method.

1. H. H. Wade Mining Directory, 1952.

WYOMING

54,000,000 gross tons running 50% natural iron.[1] This is a direct shipping hematite ore. The Sunrise Mine in Platte County is the principal producer, averaging about 500 thousand tons annually from underground operations.[2] All of this is used at Pueblo, Colorado, Mills of the Colorado Fuel & Iron Company.

1. Same reference as Texas.
2. U. S. Bureau of Mines Minerals Yearbook, 1949.

LABRADOR-QUEBEC, CANADA

In the hemisphere-wide search for areas containing major deposits of good iron ore, mainly within the last ten years, two

such areas have been found. One is in Quebec-Labrador, and the other is in Venezuela. Both contain large tonnages of high-grade ore and both have their advantages and disadvantages as to operation and also as to transportation. The area discussed here is that in Labrador-Quebec.

Quebec Province covers a very large area, bounded on the west by Hudson's Bay, James' Bay, and the Province of Ontario; on the north by Hudson's Strait and Ungava Bay; on the east by Labrador and the northeast arm of St. Lawrence Gulf; and on the south by Lake Ontario, the Northeastern States, New Brunswick and the St. Lawrence Gulf.

Labrador, a part of **Newfoundland,** but separated from it by a narrow strait, is bounded on the west and south by Quebec, and on the east and north by the Atlantic Ocean. For nearly 300 miles, the southern boundary follows the 52nd parallel and then follows a very irregular and winding path defined by the height of land or watershed separating the flowage westward into Hudson's Bay and northward into Ungava Bay, from that going eastward into the Atlantic and southward into St. Lawrence Gulf. Of interest here is the fact that while the mining company has completed the survey of the irregular boundary line through its concession area, their survey has not yet been accepted by the Province of Quebec.

Concession areas. Of the two principal concessions in the area, the one in Labrador covers about 20,000 square miles, held by the Labrador Mining & Exploration Co., Ltd.; and the other covers 3,900 square miles in Quebec and is held by Hollinger North Shore Exploration Co. Ltd. By agreement, the Labrador grant must be confined to 1,000 square miles by 1953 and the Quebec area to 300 square miles by 1962.

Since the exploration in this area has all been done in the past few years, under most rigorous conditions, the portion of the concession areas actually tested is relatively small.* Hence any statement or estimate of reserves means little without some accompanying description of the country itself, the companies interested in the venture, an account of the construction work now under way, and of the plans for future development.

Topography. The Village of Seven Islands is built on a delta of the Moisie River, which flows into the Gulf of St. Lawrence a few miles east of Seven Islands. The Village gets its name from a group of seven small rocky islands lying just outside the harbor.

About eight miles north of Seven Islands, the rugged rocky country begins, with rapid streams and deep canyons. This continues for about 100 miles. At 150 miles north of Seven Islands is the height of land, at an elevation of about 2,050 feet. There is a slight decline in elevation north of mile 150, and from mile 180 to mile 330 the lakes seem to take up more space than the

* To date, every man, every machine, and all supplies have had to be brought in from Seven Islands by air.

land between them. Near mile 330 is the Menihek Dam and power station, now being completed to furnish electric current for mining operations and for the town of Knob Lake, to be built near the lake of the same name. From there northward the land rises and becomes more hilly. The railroad is to end at Burnt Creek, the present site of the office, shop and laboratory buildings. To the north and west of Burnt Creek, the height of land rises to an elevation of about 3000 feet.

Timber. Spruce and some poplars grow in the southern part of the area north of Seven Islands. There is little live timber farther north except in low ground, or near lakes. Hills are thinly covered with dead spruce, said to have been fire-killed some forty years ago.

The foregoing facts were explained to the five members of the Commission and their Engineer, on September 29, 1952, by the mining officials who accompanied the group on their visit to the iron ore area on the last two days of September. They were: Mr. C. E. McManus, Manager of Open Pit Mines, Hollinger-Hanna Company; Mr. Richard Geren, Chief Engineer; and Mr. E. S. Mollard, Assistant to General Manager of Minnesota Mines, The M. A. Hanna Company, of Hibbing, Minnesota.

These men explained to us the following facts concerning the ore dock now under construction at Seven Islands. The dock has an 800 foot section for belt-loading of ore into ships, and a section 1400 feet long for ship mooring for other shipping. This dock is of the most modern design,* and will be equipped with all necessary facilities for ore grading. The loaded ore cars will be sampled at the mines, and the chemical analysis of ore in each car will be known at the Seven Islands yard office before it arrives there. Cars will hold from 90 to 100 tons, as compared to the 75-ton cars in use in Minnesota. Loaded cars taken from the storage yard** will be pushed up an incline to the mechanical dumper. Two loaded cars at a time will be held in heavy clamps, then rotated and dumped into a large bin or hopper, one of which we saw under construction. Under each hopper will be a heavy apron-type manganese steel feeder which will move the ore to a six-foot reversible conveyor belt. In one direction of the conveyor, the ore can be discharged on to a belt system leading to the ship loading dock; or, in the opposite direction, to another belt system leading to stackers for placing the ore in stockpiles when no vessel is available for loading.

The mining season will be limited by weather conditions to between five and six months, but the harbor is open for eight months or more. The ore in stockpiles can be used to extend the season of shipping by ocean (or Seaway, whenever the latter is completed.)

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* Steel for dock facing contains copper for resistance to corrosion.

** The storage yard is nearly a mile long, starting with 16 parallel tracks, to be increased later to 40 tracks.

The ore-loading conveyors can be placed so as to load two widely spaced compartments of the ore vessel at the same time. By shifting the movable loaders, all compartments can be filled evenly without moving the boat itself. Loading of ore will be at the rate of 8,000 tons per hour.

It is our understanding that the Great Lakes St. Lawrence Seaway is to be built by Canada, with or without U. S. participation. If a start is made in 1953, the Seaway might be completed by 1958.

Recent History. In 1937, Dr. J. A. Retty, a Canadian Geologist, visited the area now being developed for mining. In 1942 the Labrador Mining & Exploration Co., Ltd. and the Hollinger North Shore Exploration Co., Ltd. were acquired by the Hollinger Consolidated Gold Mines, Ltd., of Montreal. In the same year, the M. A. Hanna Company of Cleveland was offered an opportunity to participate with Hollinger, and became the operating arm of the Hollinger-Hanna Company.

The Iron Ore Company of Canada was formed in 1949 to get the new iron ore area into production. Other U. S. companies, including Republic Steel, National Steel, Wheeling Steel, Armco (American Rolling Mill Corp.) and Youngstown Sheet & Tube Corporation are all interested in the I. O. Co. of Canada. The remaining interest is held by the Hollinger Company.

Railroad construction. By Oct. 1, 1952, steel had been laid to Mile 64. Two rock tunnels had been completed; the first at Mile 12, 2200 feet long, and the second farther north, 750 feet long. The longest steel bridge on the entire line, over the Moisie River just above the first tunnel, had been completed. Grading had been completed to Mile 164. It was planned to continue grading into November, and track-laying into December. The maximum grade going north is 1.4%; going south 0.4%. Contractors are CMMK-Cartier, McNamara, Mannix and Morrison-Knudson Co. of Canada.

Supply Sources for R. R. Construction. Company policy favors the use of Canadian labor and supplies to the fullest possible extent.

Steel rails from Sydney, Nova Scotia, are figured at a total of some 100,000 tons, including yard tracks and the 22 passing tracks* that are spaced at intervals of from 10 to 20 miles along the railroad line. Structural steel, about 10,000 tons, will come from Sault Ste. Marie. From London, Ontario will come 55 main line Diesel locomotives. Four of these will be used per train load of 10,000 tons. An initial order of 2,000 98-ton ore cars will come from the Pullman Company, to be followed by another 1,000 cars later.

Ships are unloading railroad ties from distant places, Texas among others. Iron Ore Company of Canada owns one ship and

* These passing tracks are each about 5,000 feet long. As planned for radio control, trains of empty cars are to take the siding, permitting free passage of loaded trains. This arrangement makes the railroad practically as effective as a completely double-tracked line, since there is no delay to loaded trains.

has others under charter. Cement comes from many sources, much of it from a plant in Newfoundland. Water transportation rates are said to be fairly low at this time.

Proved Ore Reserves. It was explained to us that within an area of 5-mile radius, with the center at Burnt Creek, over 200,000,000 tons of high-grade open pit ore have been proved by drilling. When the camp was located at Burnt Creek, it was not known that any important ore deposits existed nearby.

Not far from this first area, within an area of 4-mile radius, is a smaller proved tonnage of good open pit ore. Other deposits within the concession bring the total estimated proved tonnage controlled by Iron Ore Co. of Canada to 417 million tons** as of 1950 averaging 55% to 60% dried iron. Within this total is a substantial tonnage of good manganiferous ore.

Ore Properties visited September 30, 1952:

We saw the following rather widely separated ore exposures:

No. 1. An exposure in the Burnt Creek area.

No. 2. Ferriman No. 2.

No. 3. Ruth Lake No. 3.

No. 1 shows a rather yellowish type of ore at the outcrop, but is of merchantable grade.

No. 2 is a large exposure of fine dark bluish hematite ore, resembling the Mahoning (Mesabi Range, Minnesota) high grade ore both in appearance and analysis. This ore body was stated to be 3,300 feet long, with an average width of 250 feet. The ore is of Bessemer grade, high in iron, with low phosphorus and very low silica.

No. 3 shows a high ridge of outcropping iron ore in the form of crystalline limonite, or goethite. A good part of this is hard ore, and should provide some good amounts of lump ore for use in open hearth plants. It is of a type readily broken, and should be minable at low cost.

The planned order of development of the above deposits is just the reverse of the order in which we visited them. Ruth Lake No. 3 is slated as the first producer. Ferriman No. 2 comes second; and the Burnt Creek deposits are planned as the third group to be opened for shipment.

We also saw the location of another ore deposit, known as Ruth Lake No. 1, south of No. 3. No. 1 was described as extending about one mile in a north-south direction. Another deposit, called Ruth Lake Extension, lies still farther to the south.

The three deposits seen on September 30th evidently contain ample tonnage for the first five years' production at the rate of 10 million tons per year.

In addition to the foregoing, there is shown, on one of the

** Average depth of stripping to make this tonnage available, from 5 to 7 feet.

Company's maps, a large area located at some distance southwest of the Burnt Creek area, in which there is said to be a large tonnage of low grade ore which can be successfully treated by crushing and ordinary washing to produce a good grade of concentrate.

At the Burnt Creek engineering office, Mr. Geren and the Commission's Engineer examined some of the operating maps and drill-hole cross-sections prepared by the Company's Engineers in advance of making the final detailed plans for open pit operation. The following details were noted:

Ruth Lake No. 3. Ore, mainly mixed hematite and goethite, with substantial amounts of manganiferous ore near the enclosing rock. Average manganese content of this type of ore, 8% to 9%. Estimated reserve of open pit ore, 17 million tons. Equipment will include a plant for crushing and screening the ore; and a conveyor at 15-degree angle, for carrying the ore up out of the pit.

Some cross-sections indicate a trough type of ore deposit, similar to many of the Mesabi Range ore bodies. Others show a steeply pitching but quite wide ore deposit, resembling such ore bodies as the Armour and the Croft, on the Cuyuna Range. These will doubtless contain a large amount of underground ore in addition to that available by open pit methods.

We also saw the work of examining the ore samples under a microscope, and compared the geologist's description with the results of the chemical analysis. Ore samples are marked and stored in an orderly manner, so as to be readily found at any time.

In the Burnt Creek area, three ore deposits now being tested are expected to show a total reserve of 25,000,000 tons, described as high-grade open pit ore, mainly Bessemer grade. This area, the third in planned order of production, contains the present base camp where the existence of major ore bodies had not at first been suspected.

Water Power. In addition to the Menihek power plant, now under construction, near Mile 330, a second power plant is being built near Clarke City, some 15 miles west of Seven Islands, on the Marguerite River, to generate electric power for the operation of ore loading and stockpiling conveyors at Seven Islands. We did not see this latter plant site, but we passed over the Menihek site, and also were shown a bird's eye view of Grand Falls, some 70 miles east of the line of the railroad. There the Hamilton River plunges down 300 feet, then boils along in white foam until it disappears between high canyon walls. It is estimated that one million kilowatts (over 1,300,000 H. P.) could be developed at Grand Falls. Eaton Canyon, 75 miles northwest of Burnt Creek, has an estimated potential of 500,000 H. P., and this site has been leased by the Company.

Other Ore areas. Along the northerly extension of the broad belt within which lie the ore deposits of the Iron Ore Company

of Canada, other companies are scouting for further iron ore bodies, reportedly with some degree of success. This ore will probably go northward to a port on Ungava Bay. Its impact may not be felt in the near future, but may become important in later years.

The Airlift. With no roads or navigable streams, all travel has been by air, and will so continue until completion of the 360-mile railroad.

Hollinger-Ungava Transport Ltd., like the Quebec North Shore & Labrador Railway, is a subsidiary of the Iron Ore Company of Canada. It is a regularly chartered airline, carrying both freight and men. An important part of the 1952 cargo was 3,000 tons (60,000 bags) of cement for the Menihek power project. The 1951 total air cargo was 16,000 tons. For 1952, according to Supt. Chas. Hoyt, in charge of Air Operations, the estimated total was more than double that for 1951.

The line has five DC-3 planes, a Canso amphibian for cargo, six smaller float planes and one helicopter. On rental is a converted Lancaster bomber and a C-46 Curtiss Commando. These two carry most of the cement, the flights being continuous around the clock, both the Menihek and the Seven Islands airstrips being lighted.

The airlift record for two summer months in 1952, (figures from Mr. Hoyt): August, 3,500 tons of freight and 5,400 persons; September had the same record. Most of the passengers were company personnel.

Costs for freight by air run high. For heavy cargo such as cement, the delivered cost is ten to twelve times the regular cost. The percentage is less for most other commodities and machines, but the whole air transport job is very costly. There was just no other way to get the job done.

Facts to Remember

1. The Hanna Company pioneered open pit electric haulage at its Mesabi Chief Mine on the Mesabi Range many years ago, when electric haulage was installed in the pit, and on the two-mile railway line from the pit to the washing plant. They may apply electric power to their main transportation job—hauling iron ore trains 360 miles to Seven Islands, and hauling empty cars back to the mines, greatly reducing the freight cost.

2. With the completion of the Seaway, Labrador ore will be on an even footing with Minnesota ore, as far as water transport is concerned, since the distance from Seven Islands to Lake Erie is about the same as that from Duluth to Lake Erie.

3. The mine operating arm of the Iron Ore Company of Canada is the Hanna Company, whose production of iron ore from their Minnesota mines has more than tripled in the past ten years; and whose 1951 Minnesota production was second only to that of

the Oliver Company. The approximate figure, from occupation tax reports, is about 11,300,000 tons, **mainly beneficiating plant concentrate**, from 50 different properties comprising some 40 mining units. This expansion was due in part to their acquisition of the Butler and Evergreen mines in the late '40's, and to the continuing abnormal demand for iron ore; but also it was due partly to their resourcefulness in meeting the increasing difficulties of producing ore from properties that are nearing exhaustion. The Company is strong and aggressive, with top operating ability. Their past record and the great potential of the new ore fields indicate their ability, not only to deliver the 10 million tons initially planned, but even to produce from two to three times that amount, if and when the need arises.

The following map shows the distances from the Labrador-Quebec iron ore field to the Central and Eastern consuming districts of the United States.

MICHIPICOTEN, CANADA (Mines of Algoma Ore Properties, Ltd., Ontario, Canada.)[1]

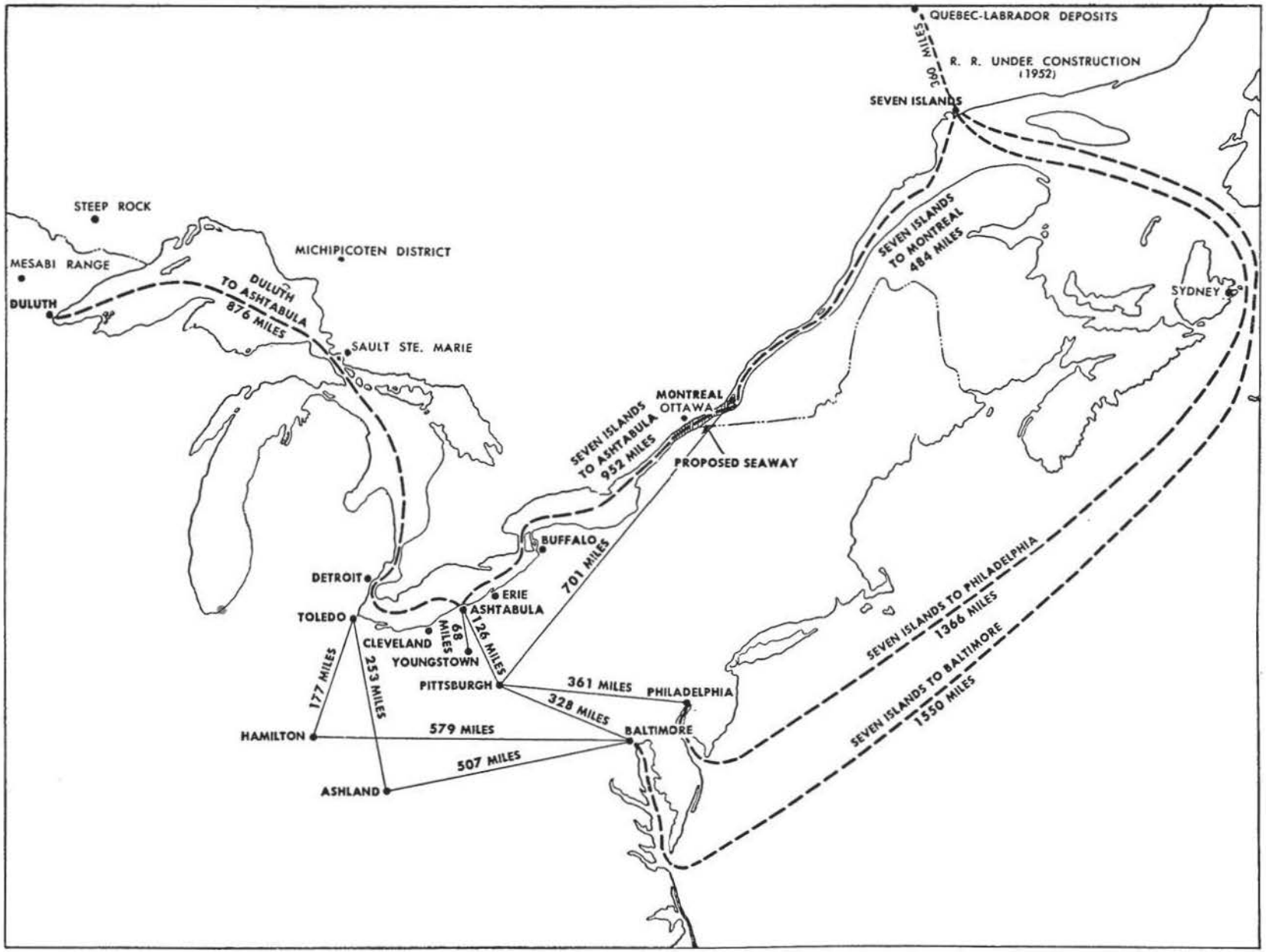
Algoma Ore Properties Ltd. is a Canadian company wholly owned by Algoma Steel Corp. Ltd., formerly using ore from the old Helen Mine. The old Helen Mine, near Michipicoten Harbor, on the north shore of Lake Superior, was a producer of hematite ore, which was mined out by 1918. A large ore deposit had been found by drilling, 14 miles north of the Helen Mine, of a different type of ore, known as siderite, a carbonate of iron. This was called the New Helen Mine. Operations were suspended in 1921, due to inability to compete with Mesabi ore, and the mine was inactive until 1937. In that year the Ontario Government granted a subsidy of 2 cents per iron unit (or $1.00 per ton on ore having 50% iron) to producers of iron ore sinter within the Province of Ontario.

Mining operations were then resumed, and sintering machines were installed 3 miles from the mine, replacing the old revolving tubes formerly used for roasting. Drilling had resulted in finding an ore deposit 200 feet wide and 3000 feet long; and as to depth, the holes extended to 2,000 feet, still in ore. Other important ore deposits in that area have also been found by drilling.

Ore is crushed to 4½ inch size at the mine, and is transported to the sinter plant by aerial tramway at the rate of 120 tons per hour. There the ore and the coke are crushed to ¼ inch size or under, and mixed, the ratio of coke to iron ore depending on the sulphur content of the ore. Since the sulphur is not wanted in the sinter, and will aid in furnishing the heat needed for the sintering operation, its presence in the ore is thus turned to good advantage.

An important feature of this sinter lies in the fact that it is

1. Annual Report of Ontario Department of Mines—Vol. 60, Part II-1951.



MAP NO. 1

NOTE: All land and water distances are in statute miles, and all land distances are via shortest existing rail routes.

Courtesy of M. A. Hanna Company

practically self-fluxing, that is, not requiring the addition of further lime in the form of limestone when charged into the blast furnace. This is shown by the analysis of the sinter, which is as follows:

Iron	52.90%	Alumina	1.86%
Phosphorus	.024%	Lime	3.45%
Silica	7.70%	Magnesia	7.48%
Manganese	2.99%	Sulphur	.04%

This analysis shows a good iron content, low phosphorus, good silica plus alumina, a combined lime-magnesia content of 11%; and neglible sulphur content, nearly all the sulphur being burned out in sintering.

In 1950, the sintering plant was operated at capacity most of the year; treating 4,800 tons of siderite ore per day, and obtaining a daily production of 3,300 tons of good sinter. The objective was 1,000,000 tons for the year 1950, and that figure was slightly exceeded. The 1951 production was nearly 1,200,000 tons. Nearly 700 men are employed at mine, mill and sintering plant. Of the 1950 ore shipment of 1,000,000 tons, 1,000 tons per day went by rail to the Algoma Steel Plant at the Soo and the rest was shipped by boat.

Ore disposal charts indicate that the "Soo" steel plant uses a part of the Helen Mine ore, and a greater amount of Minnesota ore and Michigan ore; and that much of their own ore goes to United States furnaces. This is due to the fact that sinter, being lighter, needs the heavier ore to give the necessary weight to the furnace burden.

Publication 29 of the Minnesota Legislative Research Committee, dated August, 1950, gives the 1948 reserves of iron ore in the Algoma area as follows:

Proved reserves.....33 million tons

Substantial expansion is indicated in this field.

STEEP ROCK, CANADA

This area was visited on June 10, 1952, by a group including several members of the Interim Commission, and a number of engineers and mining men.

The iron ore deposits of this region are 120 miles west of Port Arthur, and 60 miles north of Ely, Minnesota, near the line of the Canadian National Railway, just north of the Village of Atikokan.

Early in the 1900's, prospecting work was done near Steep Rock lake, and iron ore was found by test-pitting. This area was inactive for many years. It was not until 1937 that active exploration and development work started in earnest. Since the major ore deposits were found by winter drilling through the ice on Steep Rock Lake, it was found that the first task was to provide a

diversion channel for the waters of the Seine River, which entered the lake from the northeast, to a parallel watercourse two miles west. Then came the task of pumping out part of Steep Rock Lake, to permit stripping the muck and clay from the Errington (or "B") ore body which had been outlined by drilling.

This part of the drainage was completed by 1943, and removal of lake-bottom mud and clay was carried out in time to permit a shipment of 500,000 tons of ore in 1945.

The pit area was enlarged, and in 1946 the production was increased to 830,000 tons; 1947, 1,200,000 tons; 1948, 680,000 tons; 1949, 1,130,000 tons; 1950, 1,215,000 tons; 1951, 1,325,000 tons; 1952 (as estimated in June) 1,000,000 tons. Production is expected to increase. Reserves have been variously estimated at widely diverse amounts. The figure of 132,000,000 tons, given by the company's engineers in June, 1952, is evidently a conservative estimate of the five known ore bodies in the Steep Rock group. The ore is high grade, direct shipping ore, averaging from 50% to 60% iron. At present this ore goes mainly to U. S. furnaces.

Stripping of the "A" orebody is under way, and another ore area is being explored by drilling. When these two ore bodies begin shipping, it is expected that production will be greatly increased; however, in view of the fact that the "B" orebody, which had, since 1944, produced nearly 7,000,000 tons from the open pit, will shortly be mined by underground methods; and that the other orebodies will follow a similar routine as to ore below a depth of 400 feet below lake level; it does not appear to us that the yearly production rate will greatly exceed 3,000,000 tons.

As drilling progresses on the areas not yet fully explored, the foregoing total of 132,000,000 tons in reserve may be somewhat increased. In this connection it should be noted that the figure of 132,000,000 is made up of both "proved" ore and "probable" ore, thus making substantial allowance for future discovery ore.

CHILE, SOUTH AMERICA

72,000,000 gross tons—60% iron, open pit direct shipping ore.[1] Bethlehem Steel Company have the concession and are producing about 3 million tons annually from the El Tofo Mine located about 20 miles from the port of Coquimbo.[2] About 2½ million tons are being shipped to Sparrows Point, Maryland, where it is used in the Bethlehem Mills.

1. The Iron Age 1/4/51.
2. Legislative Research Publication 29, August, 1950.

LIBERIA, WEST AFRICA

20,000,000 gross tons open pit, open hearth grade iron ore, running 68% to 70% dried iron.[1] The iron ore deposits are located at Bomi Hills about 40 miles from the Seaport of Monrovia. Re-

public Steel Co. have the concession and are shipping the ore to the United States.[2] In addition to the above reserve of high grade ore, there is also a substantial reserve of banded iron formation which may prove to be amenable to concentration.

1. Legislative Research Publication 29, August, 1950.
2. Scientific American, January, 1952, p. 52.

VENEZUELA, SOUTH AMERICA

As of January 1, 1951, the reserves of iron ore in Venezuela were estimated at 360,000,000 gross tons of high grade open pit direct shipping ore of 60% iron.[1] Bethlehem Steel has a large concession at El Pao and the U. S. Steel at Cerro Bolivar. Just recently another iron ore deposit was discovered on the San Isidro Mountain estimated to contain 300 million tons, as rich as those of El Pao and Cerro Bolivar.[2] Venezuela may become one of the major sources of iron ore for United States furnaces supplementing the sources above described in the United States and Canada. In 1951, 635,000 tons were shipped to Sparrows Point, Maryland.

The following map shows the location and distances of foreign sources of iron ore.

When Labrador and Venezuela mines get into steady production, Minnesota will still be called on to produce as heavily as declining open pit ore reserves and increasing difficulties of open pit mining will permit; due to the steadily increasng demand for steel.

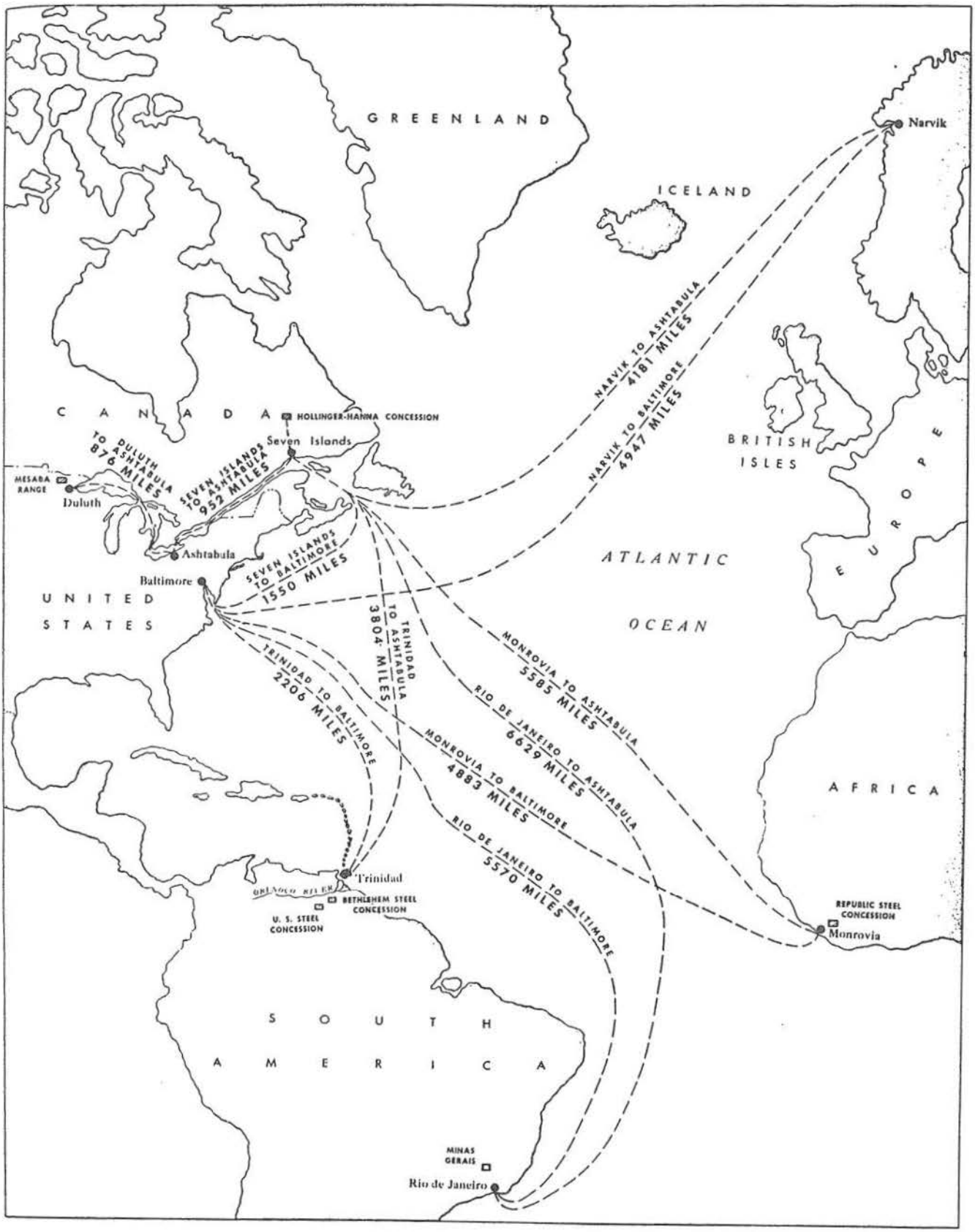
At the present time, due to the heavy demand for iron ore, these foreign ores should be considered as supplemental supply sources which will tend toward conserving some part of our remaining direct and wash ores, and thus, with the taconite concentrate, prolong the life of Minnesota's mining industry.

However, if the demand lessens then these ores may be competitive, provided they can be delivered to the mills at a figure cheaper than the Minnesota ores.

1. The Iron Age 1/4/'1952.
2. American Metal Market—6/5/52.

MAP NO. 2

Locations and Distances of Foreign Sources of Iron Ore



NOTE: All distances in statute miles.

Courtesy of M. A. Hanna Company

TACONITE

No report on the iron ores of Minnesota would be complete without a brief chapter on taconite. Many years of research by the Minnesota Mines Experiment Station, the Battelle Institute and the mining companies are showing good results in the manufacture of high grade concentrate from the iron-bearing rock. Several excellent reports have been written on the geology of the area and on the processes that have been developed for doing in a few hours the work of many centuries by natural forces.[1]

WHAT IS TACONITE? Briefly, it is a fine-grained hard iron-bearing rock; the Mesabi Range formation within which are found the deposits of iron ore.

OCCURRENCE OF THE TWO MAJOR TYPES. There are several different types of taconite. The two most important classes are the magnetic and the non-magnetic taconite.

The taconite of the eastern third of the Mesabi Range is described as being mainly of the magnetic variety. The middle third has areas containing both magnetic and non-magnetic taconite. The western third of the range has little magnetic taconite.

MAIN LAYERS OF IRON FORMATION. As traced from records of drill-holes in both ore and taconite, the iron-bearing rocks occur in four main layers or horizons:

1. Upper slaty formation, high in alumina content;
2. Upper cherty formation, high in silica content;
3. Lower slaty formation; and
4. Lower cherty formation.

MAIN SOURCES OF MAGNETIC TACONITE. On the eastern Mesabi Range, the upper cherty formation is that described by geologists as the main source of magnetic taconite in that area. In the middle area of the Mesabi Range, magnetic taconite is found in the lower cherty formation. It is now considered that the magnetic type of taconite is the one that is commercially important.

ESTIMATED RESERVES. Counting on an average thickness of 100 feet of magnetic taconite over an area where the working depth, disregarding glacial overburden, would not exceed about 230 feet, Gruner estimates some five billion tons of the crude iron-bearing rock, which would yield roughly 1,700,000,000 tons of high-grade concentrate.[2] This estimate appears conservative, in that it includes neither the non-magnetic taconite nor any magnetic taconite that is not readily available for open pit mining. Other estimates, much higher, include both.

BRIEF HISTORY OF EXPERIMENTAL WORK. The Minnesota Mines Experiment Station, in charge of Professor E. W. Davis, has been doing extensive experimental work on the bene-

1. Mineralogy and Geology of the Mesabi Range, by John W. Gruner, 1946, and Beneficiation of Magnetic Taconite, by the Mines Experiment Station, University of Minnesota, October 27, 1950.

ficiation of taconite for many years. Other pilot plants and testing laboratories in Minnesota are as follows:

1. Babbitt Plant of Mesabi Iron Company, built in 1922 near the extreme eastern end of the Mesabi Range. Active in this development were D. C. Jackling, who had developed effective ways of treating low grade copper ores, and W. G. Swart, Manager of the Babbitt plant until its closing in 1924.

2. Testing laboratory of Pickands, Mather & Company, built at Hibbing late in 1942. Results of work done at this plant showed that effective separation of ore and rock particles could be made after extremely fine grinding.

3. Oliver Experimental Laboratory at Duluth, in 1946. Experimental work here included a broad study of beneficiation of low grade ores and of taconite, preparatory for later plants to be built on the Range.

[a]4. Erie Plant near Aurora, Minnesota, 1947. Designed for ultimate production of 200,000 tons of concentrate per year, this plant has served as a pilot plant for a second and larger plant now in the early stages of construction a few miles farther east. Important developments at the Erie Plant include the use of jet piercing of the taconite for blasting, replacing the slow and costly percussion drilling of former years; and increasing success in compacting the fine iron particles recovered from the rock into pellets, and hardening these to withstand the necessary repeated handling between the plant and the blast furnace.

[a]5. Oliver's Extaca Plant at Virginia, Minnesota, 1950. Preliminary work was done on fine ore from the Rouchleau Group Mines, by sintering and nodulizing. It is our understanding that this plant will be used for processing taconite fines from the Mt. Iron crushing plant, and possibly from other sources in that area.

[a]6. Oliver's Taconite Plant near Mt. Iron, 1952. This plant is planned for the production of taconite fines to be agglomerated at the Extaca Plant above described.

[a]7. Reserve Mining Company Plant, at the former location of the early Babbitt Plant. (1952). This plant began production in the fall of 1952, and is to serve as the pilot plant for the larger plant next to be described.

[a]8. Reserve Mining Company Plant near Beaver Bay, on the north shore of Lake Superior. This plant is planned for early construction, and for fairly heavy commercial production of concentrate.

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2. Mineralogy and Geology of the Mesabi Range. John W. Gruner, 1946.

a. We are informed that the investment in these plants will run to five hundred million dollars or more.

PRODUCTION OF TACONITE CONCENTRATE TO DATE

Until 1952, all of the taconite concentrate produced in Minnesota was produced at the Erie Plant near Aurora. The production figures, by years, are as follows:

1949	45,290 tons of fine concentrate; Pellets, none.	Total	45,290
1950	88,737 tons of fine concentrate; Pellets, 40,929	Total	129,666
1951	21,765 tons of fine concentrate; Pellets, 78,212	Total	99,977
1952	Figures not yet available		
Totals	155,792 tons	119,141 tons	274,933

The above figures are of interest, in that they show the increasing percentage of pellets in the total production for 1950 and 1951, as compared to 1949.

ESTIMATED FUTURE PRODUCTION OF TACONITE CONCENTRATE.

Estimates presented to this Commission, showing long range future sources of iron ore for steel plants of the Great Lakes Region show the following figures for taconite concentrate:

1. Gradual increase to 2,900,000 tons per year by 1955.

2. Production of 9,000,000 tons in 1956, followed by a gradual increase to 40,000,000 tons by 1974.

These figures include concentrate from both Minnesota and Michigan iron formation. It is to be assumed that there may be a substantial production of jasper concentrate from Michigan, comparable to that from taconite in Minnesota.

FACTS TO KEEP IN MIND.

1. Taconite is hard, tough, and abrasive. Every steel part that comes in contact with it suffers heavy wear. This applies to the dippers and dipper teeth of power shovels; to the crushers and steel conveyors in the plant; and to the various stages of screening and fine grinding.

2. Three tons of crude taconite are required for every ton of concentrate. As compared to costs of mining direct shipping ore in Minnesota, the following cost items are therefore multiplied by three: mining; hauling from pit to plant; crushing and screening.

3. In addition to costs of mining direct shipping ore, there are the followng items: fine grinding; magnetic separation; large water supply; heavy cost of waste disposal; large cost per ton for plant.

4. The 1941 Legislature, in its enactment of the taconite law, recognized the foregoing handicaps in the processing of taconite.

5. Vital to Minnesota and to this Nation is this vast centrally located source of raw material for steel, more dependable and defensible in time of emergency than imported ores.

6. Taconite beneficiation offers a dependable source of a high-grade manufactured raw material for steel, furnishing employ-

ment for a large number of workers. It could be the means of extending Minnesota's iron ore industry for 100 years or more. While it is known that the costs of processing taconite are very high per ton of concentrate, no dependable cost figures can be known until the industry reaches the stage of substantial tonnage production.

Well-informed men in the industry feel that the development of taconite beneficiation is making good progress, but that its ultimate success will depend greatly upon the ability to stabilize or reduce every item of cost in order to compete with imported high grade ore.

Determination of Tax Base

Since the computation and determination of the ad valorem and occupation taxes is based on value, the law requires that the taxing authorities determine the value of iron ore for tax purposes. Value is a matter of judgment upon which different minds may differ. However, a good measure of value is the market price of the product in question. In construing the Minnesota Statutes for determining the full and true value of iron ore for tax purposes, the Supreme Court has stated that the market value is what a willing buyer will pay a willing seller for the product. For over forty years, the State Department of Taxation has used as a measure of the value of a ton of iron ore the market price, or what a willing buyer will pay a willing seller, and, having determined what that market price is at the beginning of each year, that price or value is used in determining the amount of tax. This market price or value of a ton of iron ore is the price at various Lake Erie ports for the ore delivered to these ports, and since for occupation tax purposes the law requires the value of iron ore to be determined at the surface of the mine, or, as it is commonly called, at the "mouth" of the mine, the State Department of Taxation deducts from the value or market price at the Lake Erie ports, pursuant to the statute, the allowable deductions of freight charges, handling, insurance, etc., to determine the value or market price of a ton of iron ore at the mouth of the mine. This value is then multiplied by the number of gross tons (2,240 pounds) produced during the year by each mine, and from this total are deducted the various items allowable under section 298.02, M.S.A. 1949, as amended by Chapter 664, Laws 1951, and 298.03. Having found this total value, the tax is then computed by multiplying this value by 11% (the present tax rate) to get the occupation tax, and the same total, before deducting the labor credits, is multiplied by 1% to get the amount due the veterans' compensation fund.

OCCUPATION TAX

AD VALOREM TAX

In computing the ad valorem tax on iron ore, which is assessed on the basis of 50% of the full and true value of May 1st of each year, the State Department of Taxation takes, with some exceptions, the average of the value or market price for the four preceding years as a base to arrive at the value of the ore in the ground.

ROYALTY TAX

The royalty tax is computed by multiplying the royalty received by 12%.

The law and method used in computing the ad valorem, occupation and royalty tax is explained fully in this report under the heading "Administration of Tax" and for this reason is not repeated in discussing this subject.

In view of the fact that the tax proceeds due the State of Minnesota from the occupation and ad valorem taxes are based on the value of the iron ore at the mouth of the mine or in the ground, the Commission has investigated thoroughly the market price established at the Lake Erie ports to determine whether or not this market price is the real and actual value, or whether it is a fictitious and artificial price as some people have contended. In other words, the crucial answer underlying our entire tax proceeds from the various taxes on the mining companies originates from the value which is found by using the market price at the Lake Erie ports. Over the years, this market price has become known as the Lake Erie price, and there has been contention that large producers of steel or iron ore have conspired together to set the market price, and thus, in truth and in fact, it is not a competitive price arrived at by a willing buyer and a willing seller.

The Commission heard substantial evidence from numerous owners of mining properties, producers of iron ore, and also invited any evidence from any source which would establish that the market price at the Lake Erie ports, or so-called Lake Erie price, was fictitious or unreal. Those appearing in opposition to the Lake Erie Price produced no evidence disputing the reliability of the market price. Several committees of the United States Congress have held extensive hearings on this matter; notably the O.P.A. in 1942, the National Temporary Economics Commission in 1939; and more recently the sub-committee of the Judiciary Committee of the House of Representatives in December, 1950.

Producers of steel must know a year, or possibly longer, in advance of their production year, where they will get their iron ore; and producers of iron ore, in order to determine their activities for a mining season must be certain to have a market for the ore at a price sufficiently high which they believe will produce a profit for the iron ore producing company.

Accordingly, before each mining season, usually in the winter, the producers of iron ore or the mining companies are seeking a market for the ore during the following shipping season, and thus

these mining companies approach users of iron ore in an endeavor to enter into a contract to supply the steel manufacturer with the needed tonnage of ore. When a mining company or producer of iron ore has reached an agreement with a purchaser or steel manufacturer for the sale during the shipping season of a substantial tonnage of ore and the price therefor has been agreed upon by the seller and the purchaser, this fact is made known and the price is published in various trade journals, and for the year 1951 was published on December 2, 1950.

The price of the ore in this first contract for a substantial tonnage is the price of a gross ton of iron ore containing 51.50% iron natural delivered at lower ports of Lake Erie. (See Table No. 5). The price is adjusted up or down, according to the iron units in the ore, using the market price of 51.50% iron natural. There are also adjustments because of phosphorus, silica and other materials in the ore. The market price so established is then used by all mining companies as the market price or value of iron ore for that season and is the value used by the State Department of Taxation in determining the various taxes on the mining industry in Minnesota.

It appears that for the year 1951 the market price or value was established by contract entered into between the Cleveland-Cliffs Iron Company,* a large producer of ore and a purchaser of ore. The Cleveland-Cliffs Iron Company has established the market price in other years as well, although the testimony indicated that different companies established the market price or value in different years. It appeared from the testimony that all mining companies accept this market price as the price of ore which is produced and sold during the season, and it appears that once the market price has been established, other mining companies recognize that price as one sufficient to produce a profit and thus be an incentive for the production of iron ore for that season.

The Cleveland-Cliffs Iron Company is engaged largely in mining of ores requiring beneficiation, and since the combination of mining and beneficiation is high cost, it appears to the Commission that the price established by the Cleveland-Cliffs Company would be relatively high because of the high cost of their mining, plus beneficiation; and furthermore, since the company mines ore primarily for sale to others, not being manufacturers of steel, it might logically follow that other mining companies could produce and sell ore profitably at that price. Of course, it is an advantage to the State of Minnesota from a tax standpoint to have the market price or value high since it would follow that tax proceeds would be higher.

Owners of some of the numerous small independent mining companies which are producers of iron ore for sale only, and not tied in with any steel manufacturer or processor, appeared before the Commission; and included Mr. Harrison of Pacific Isles Mining Company and Mr. Moore of the W. S. Moore Company. They stated that their great interest was in having the market price of

* An independent seller.

ore as high as possible since they are selling ore, and they unequivocally asserted that in their opinion the price at the Lake Erie ports upon which the value of the ore is based for tax purposes is a real and competitive price and not an artificial or fixed price which resulted from a conspiracy or combination of large steel manufacturers.

It was pointed out that the Oliver Mining Company, a subsidiary of the United States Steel, in 1951, sold nine million tons of ore to competing steel companies. It is obvious that United States Steel, which owns Oliver Mining Company, would be interested in getting as high a price from this ore as possible since, of course, steel manufactured by that company would compete with other steel companies in the sale of steel. In other words, Oliver Mining Company, in such case, would be interested in having a high price, which is also the interest of the State of Minnesota, viewed from a tax standpoint. Cleveland-Cliffs Iron Company, represented by Mr. Bubb, the assistant controller of that company, was also present. He testified as to the technique and procedure used in establishing the market price for the year. He pointed out that Cleveland-Cliffs Iron Company produced and sold approximately 6,500,000 tons of ore yearly at the price established by the first substantial sale made each year. He also pointed out that the sales made to Ford Motor Company had in some years established the market price.

The contracts that are entered into are, in many instances, of a duration running up as high as five or more years, the reason for the length of term being that steel companies must know their source of ore over a substantial period of time. The price of ore in those contracts is agreed to be the price that will be established each year, so that it might be said that even in long-term contracts the price is a negotiable one for each year, the contract simply being an agreement to furnish ore.

The mining companies have consistently objected to the use of the current market price in computing the occupation tax, which would be unnecessary if the price were controlled because in such case it could be depressed. In 1941, they protested vigorously before the State Tax Commissioner and produced testimony that ore could be sold for only $4.05 per ton, whereas the current market price was $4.45 per ton, which was used by the State Tax Commissioner in computing the iron ore taxes.

The Oliver Mining Company claimed that the use of the current market price for that year increased the ore tonnage value in excess of $10,000,000 with a corresponding excess in the ore tax of over a million dollars. The State Tax Commissioner refused their plea and used the ore market price which was established at the beginning of the year in any event, all of which indicates that the market price is not a controlled or fixed price in view of the foregoing.

The foregoing statement covers years in which there was no governmental control in prices. However, we desire to point out that during the years 1942, '43, '44, '45 and '46, the Office of Price

Administration froze the price of iron ore at the then Lake Erie price. During the years 1947, '48, '49 and '50, the price was not regulated by the O. P. A. However, on December 2, 1950, the Office of Price Stabilization again exercised control over the price of iron ore and at the present time the price of iron ore is regulated by the Office of Price Stabilization.

The use of the Lake Erie price does not affect the ad valorem tax with the force that it does the occupation tax.

The following Table No. 3 shows the picture relative to the use of the Lake Erie price in computing the ad valorem tax. You will notice that the ad valorem tax per ton based on the tonnage of ore in the ground in 1941, was $.012 and the Lake Erie price was $4.45, whereas in 1951, the average ad valorem tax per ton was $.017 and the Lake Erie price was $8.30.

Table No. 4 shows the picture on the occupation tax, which is based on the tonnage produced. In 1941, with the Lake Erie price at $4.45, the average tax per ton produced was $.132, whereas in 1951, with the Lake Erie price at $8.30, the average tax per ton produced was $.335. This comparison shows that under the occupation tax law, with its restricted deductible costs, the tax per ton increased even more than did the market value.

TABLE NO. 3
EFFECT OF LAKE ERIE PRICE ON AD VALOREM TAX

Year	L. E. Price Non-Bess	Frgt. Handlg. Ins., Int., Etc.	Value at Surface of Mine	Reserve Tonnage	Assessed Valuation	Ad Valorem Tax	Average Ad valorem Tax per ton Reserves
1941	$4.45	$1.88	$2.57	1,176,031,225	$167,530,603	$14,564,253	$.012
1942	4.45	1.88	2.57	1,149,317,765	160,494,132	13,244,037	.0115
1943	4.45	1.91	2.54	1,121,073,685	152,377,621	13,300,103	.0118
1944	4.45	1.91	2.54	1,095,066,532	141,030,550	12,477,270	.0114
1945	4.55	1.91	2.64	1,045,632,664	129,306,480	12,588,313	.0124
1946	5.05	1.91	3.14	1,006,403,041	120,344,635	12,732,769	.0126
1947	5.55	2.125	3.425	1,004,482,442	117,853,709	13,923,528	.0138
1948	6.20	2.43	3.77	980,412,870	129,310,721	13,257,828	.0134
1949	7.20	2.615	4.585	960,265,700	125,777,567	14,901,587	.0155
1950	7.70	2.625	5.075	980,957,892	149,368,527	16,200,000	.0166
1951	8.30	2.83	5.47	963,762,000	138,701,012	16,460,375	.017

TABLE NO. 4
EFFECT OF LAKE ERIE PRICE ON OCCUPATION TAX

Year	Tonnage Produced	Occupation Tax	Rate Percent	Lake Erie Price Non-Bess	Average Tax Per Ton in Dollars
1941	63,736,347	$ 8,399,387	10.5	$4.45	$.132
1942	70,048,716	8,233,102	10 5	4.45	.118
1943	69,364,022	6,711,683	10.5	4.45	.097
1944	65,073,476	6,301,570	10.5	4.45	.097
1945	62,482,046	6,289,279	10.5	4.55	.101
1946	49,650,356	6,507,835	10.5	5.05	.131
1947	59,967,761	9,700,773	11	5.55	.161
1948	65,013,706	11,762,769	11	6.20	.181
1949	55,187,871	14,355,466	12 *	7.20	.267
1950	64,922,685	18,822,662	12 *	7.70	.289
1951	78,407,263	26,275,375	12 *	8.30	.335

* Includes 1% Veterans Compensation Fund

TABLE NO. 5

ORE PRICES FOR VARYING IRON CONTENT CALCULATION OF LAKE ERIE SELLING VALUES

(According to Formula adopted in 1925, and still in use)

Standard Lake Erie selling values for iron ore, as quoted in trade journals and ore sales contracts, are per gross ton of 2,240 pounds, delivered at rail of vessel at Lower Lake Ports and are based on the following classification and guaranteed base analyses:

Old Range Bessemer	51.50% Iron Natural	.045% Phosphorus
Old Range Non-Bessemer,	51.50% Iron Natural	
Mesabi Bessemer,	51.50% Iron Natural	.045% Phosphorus
Mesabi Non-Bessemer,	51.50% Iron Natural	
High Phosphorus,	51.50% Iron Natural	+.180% Phosphorus

Price Adjustments for Iron Content Above or Below the Guarantee; All Grades:

Selling values of ores of different iron content than the base ores are determined as follows: The base price is divided by 51.50, the number of units in the base ore. The resulting quotient is the base unit value, used to determine additions to or subtractions from the base price, for iron contents above or below the base analysis, as follows:

When less than 51.50% and not less than 50.00% Iron: from the base price deduct, for each unit or fraction of a unit of iron less than 51.50% iron, at the rate of the base unit value.

When less than 50.00% and not less than 49.00% Iron: from the price computed for 50.00% iron deduct, for the unit or fraction of a unit of iron less than 50.00% iron, at the rate of one and one-half times the base unit value.

When less than 49.00% Iron: from the price computed for 49.00% iron deduct, for each unit or fraction of a unit of iron less than 49.00% iron, at the rate of two times the base unit value.

When over 51.50% Iron: to the base price add, for each unit or fraction of a unit of iron more than 51.50% iron, at the rate of the base unit value.

Price Adjustment for Phosphorus:

All ores containing .045% phosphorus, or less, are classed as Bessemer. Phosphorus content lower than .045% commands a premium, determined in accordance with the standard table of phosphorus values. All ores containing more than .045% phosphorus are classed as Non-Bessemer. Ores containing more than .180% phosphorus are classed as High Phosphorus.

Penalties:

In addition to the standard deductions applied for iron contents of less than 50%, which are computed as above, arbitrary penalties are also exacted for high silica and for fine structure.

Premiums for Lump Structure and High Manganese Content:

Hard ores of high iron, low silica contents are often sold as lump grade, generally being priced as Old Range Non-Bessemer plus premiums for lump structure.

Ores containing in excess of 5% natural manganese are recognized as standard manganiferous iron ores and are generally priced as Old Range Non-Bessemer on the combined natural iron and manganese content, plus a premium for the natural manganese in excess of 5%. Ores containing between 2% and 5% of natural manganese are also sometimes marketed as manganiferous at prices which recognize some small value for the manganese content.

Premiums for lump structure and high manganese content vary and are determined by negotiation between buyer and seller.

Source—Minnesota Mining Directory 1952.

What Impact Will the Great Lakes-St. Lawrence Waterway Have on the Iron Ore Industry of Minnesota

We have obtained transcripts of the hearings on the St. Lawrence Waterway held by various Congressional committees and notably the most recent one conducted by the Committee on Public Works, House of Representatives, during February and March, 1951. We have read numerous pamphlets and heard various testimony in favor of, and in opposition to, the project. We have examined quantities of literature on the subject and believe that every phase of this great project has been fully explored. A lengthy narration of the engineering and financial problems involved on this project is unnecessary to determine what impact its completion will have on the iron ore industry of Minnesota.

What we want to know is, if and when the St. Lawrence Waterway is completed, either by Canada alone or jointly by the United States and Canada, what effect will it have on the iron ore industry of Minnesota? For the foregoing reasons we feel that a brief outline of the project will suffice.

The purpose of the St. Lawrence Waterway is to establish navigable channels 27 feet deep from Montreal, Canada to all ports on the Great Lakes and to develop in the International Rapids section of the seaway, hydro-electric power of more than two million horsepower,—this power to be divided equally between the United States and Canada, if the United States joins Canada in the venture.

The present channel has a 35 foot draft from the Atlantic Ocean to Quebec. From Quebec to Montreal the depth is 32.5 feet. This depth permits large ocean vessels to reach Montreal. Between Montreal, Canada and Ogdensburg, New York, a distance of 114 miles, the Lachine, Soulanges and International Rapids are located. At present these rapids are by-passed by means of canals 14 feet deep with 22 locks, 14 feet deep, 43 feet wide and 252 feet long. This particular part of the river is the big job confronting the engineers on the new project, for it is necessary to create a channel 27 feet deep through this section of the river. This requires the construction of numerous dams, canals and locks, and miles of dredging. Between Ogdensburg and Lake Ontario, a distance of 68 miles, the entire distance will have to be dredged. Between Lake Erie and Lake Ontario, a distance of 27.6 miles, the Welland Canal will be deepened from 25 to 27 feet. Between Lake Huron and Lake Erie the channels in the St. Clair River, Lake St. Clair and Detroit River, a distance of 88 miles, will be deepened to 27 feet. Channels in the St. Mary's River and Straits of Mackinac, a distance of 63 miles, will be deepened to 27 feet.

The estimated cost of the project as of December, 1950, is $982,175,000. Of this amount $164,112,000 has already been ex-

pended by Canada and the United States, leaving a balance of $818,063,000 to finish the work. Of this amount Canada will pay $251,269,000 and the United States $566,794,000.

The engineers estimate that it will take at least 4 or 5 years to complete the project if the necessary materials and manpower are available.

The record indicates that the present St. Lawrence 14 foot waterway is being used by vessels of around 2,400 tons capacity, whereas the proposed project would permit the operation of ships with a capacity of 15,000 tons or more.

It is obvious that the present or the proposed new St. Lawrence Waterway can have no adverse effect upon the iron ore industry of Minnesota, until such time as foreign iron ores are available for shipment to the consuming furnaces in this country.

In a few years the iron ore from the new Labrador field in Canada will be in production. Mr. Humphrey, President of the M. A. Hanna Co., one of the companies developing this field, testified on March 5, 1951, before the Committee on Public Works of the U. S. Congress, "that in 1950 drillings had proved at least 400,000,000 tons of high grade open pit direct-shipping ore, and they had only drilled on a small fraction of their concession area." He stated that the Labrador ore was a higher grade ore than the Mesabi; that they were constructing a railroad from Seven Islands to Burnt Creek, a distance of 365 miles, and they planned on shipping 5,000,000 tons during the shipping season of 1955, and would increase the tonnage to 10,000,000 in 1956 or 1957. (These figures were confirmed by a special committee of the Commission on an inspection trip to Labrador.) They propose to move this tonnage, whether or not the new seaway is completed,—he stated that if their production reached 10,000,000 tons, 2 to 4 million tons would move from Seven Islands to the eastern seaboard for use there and in the Pittsburgh area. The balance of 6 to 8 million tons would move over the present St. Lawrence Seaway to the Lake Erie consumption points. He indicated that if the St. Lawrence Waterway was completed, their facilities would be increased to ship 20 to 30 million tons a year. He stated that the Labrador ore would be competitive with the Lake Superior ore, with or without the seaway. "However, the seaway will permit greater tonnages at a reduced cost."**

The Republic Steel Company is now operating in the Bomi Hills district in Liberia, West Africa, and shipping from Monrovia to the United States about 1,000,000 tons a year, with a reserve estimated at over 20,000,000 tons. This is high grade ore running 68 to 70 percent dried iron. The distance, however, from Monrovia to Baltimore is 4,883 miles and to Ashtabula, Ohio, 5,585 miles. It is doubtful if this Liberian ore will ever be transported on the proposed St. Lawrence Waterway to the Lake Erie and Pittsburgh furnaces.

The Bethlehem Steel Company is now using its El Pao Venezu-

** The distance from Duluth to the port of Erie, Pennsylvania, is 941 miles, or 54 miles more than the distance from Seven Islands, Quebec to Erie.

elan ore at their plant located at Sparrows Point, Maryland, and the United States Steel Company is now constructing, at a cost of $400,000,000, a huge plant at Morrisville, Pa., to be known as the "Fairless Works", to utilize the ore coming from its Cerro Bolivar, Venezuela field. The first blast furnace of this works was put in operation in December, 1952. Bethlehem advises us that they can deliver their iron ore from Venezuela and Chile at Sparrows Point, Maryland at a substantially lower cost per **unit** than they can deliver Lake Superior iron ore at Buffalo, New York. (The cost per **unit of iron** is the determining factor, rather than the cost per ton.)

If the steel companies are able to construct new plants to increase production to 120,000,000 tons annually and the present tremendous demand for steel continues, they will be in a position to utilize all the domestic and foreign iron ore that can be delivered with the available facilities. This means that Minnesota iron mines will still be producing at or near the ultimate limit, as they are doing today, and as they have for the past ten years.

At the moment, the problem is to increase the ingot capacity of the steel mills and to produce and deliver enough iron ore and scrap to feed the furnaces. It should be noted that the new St. Lawrence Waterway will not lengthen the shipping season on the Great Lakes—the new waterway, like the present one, will be frozen over and useless for several months each year.

To provide the blast furnaces with the additional tonnage of iron ore requires more boats to transport the ore. To build the boats takes time, a huge quantity of finished steel, and a large capital outlay.

Minnesota's iron ore was the bulwark of our national defense in two world wars and is one of the main ramparts in our present national emergency. An ample domestic supply of iron ore is essential to our national security. As to the comparative defensibility of imports from outside countries, it has been frequently stated that no foreign source of iron ore supply is dependable in a time of war. However, it appears to us that as between Canadian and other foreign sources now being considered, the former could be more readily available in a national emergency. We cannot rely upon foreign ore, with its political implications and transportation perils during critical periods. We believe that this country needs an adequate supply of iron ore available at home and cannot depend upon an ore body in some remote part of the world.

The big steel companies are searching the world over for iron ore and great discoveries have been made in Labrador-Quebec, Venezuela and Chile. They are expending millions of dollars in developing these fields and constructing the transportation facilities. Steel mills are now being constructed on the Eastern seaboards to utilize these foreign ores. If the present unprecedented demand

for iron ore continues and the St. Lawrence Waterway is completed, it will not seriously affect the iron ore industry of Minnesota. However, if this enormous demand for iron ore diminishes, it will make the foreign ores, with cheap transportation, highly competitive with our Minnesota ore and particularly with taconite concentrate. It is true that it will take several years for the proposed new seaway to be completed and that large tonnages of foreign ore will probably not be delivered to the inland and the Great Lakes consuming districts until that time arrives, but anyone can visualize what the impact will be on the Minnesota iron ore industry when it is completed and the foreign ore fields are operating at full scale and the transportation facilities are available to move it into a slackening market.

In order to meet the growing U. S. demand for steel in future years, it now appears that the iron ore requirements of the U. S. will include not only the direct and concentrated ores from every major U. S. producing area, but also imports of high grade ore from Quebec-Labrador, Michipicoten and Steep Rock, Canada; from Venezuela, Chile and possibly Brazil, in South America; from Liberia, West Africa; and possibly from Cuba, in later years. While some of these ores will be utilized at coastal plants, substantial tonnages will continue to go to inland furnaces, by the St. Lawrence Waterway, or by rail from seaports either on the Gulf, on the Atlantic Coast, or later, on the Pacific Coast.

This Commission has made no study and expresses no opinion with reference to the effect the construction of the St. Lawrence Waterway will have upon the general economy of the State of Minnesota.

Impact of National Defense Considerations

It is difficult to make an accurate appraisal of the impact of National Defense on our Minnesota iron ore industry. There are too many imponderables involved,—these include the war in Korea; the possibility of another world war; the possibility of the restoration of peace in Korea and in the world; and a return to normal conditions. (Economists claim that even if peace is restored, the backlog of civilian requirements for steel in construction so long deferred because of National defense, will require maximum production of iron ore for a long time.)

National defense appropriations for the fiscal year ending June 30, 1953, amount to $46,610,938,912. (Public Law 488, C. 630, approved 7-10-52). Of this amount, $21,118,361,770 is allocated to the Air Force; $12,842,459,642 to the Navy; $12,239,500,000 to the Army; $409,800,000 to the Secretary of Defense and $817,500 for miscellaneous. These figures reflect the huge expenditures contemplated for military equipment and personnel during the

present fiscal year. A portion of this money will go into finished steel made from iron ore.

The present world-wide conditions are so unsettled that any estimate on iron ore requirements made today would probably need revising tomorrow. The war in Korea—the cold war and the National emergency have created an unusual demand for iron ore.

Minnesota has supplied the bulk of the iron ore in this country for many years and of necessity will supply most of it during the present emergency because it is the only source of iron ore in this country that can immediately meet the demand.

After many vain attempts to get information on this subject, we concluded that the data could probably be obtained in Washington, D. C. Three members of the Commission went there and with the assistance of Senators Thye and Humphrey, Representative Blatnik and their staffs, the members were able to contact the various departments administering the National Defense program. A vast amount of data on allocations and production was made available and from this information, we have drawn our own conclusions. The following table represents our judgment on the tonnage that will be required to meet the demand of the National Defense program for the years 1952 to 1955 inclusive, the tonnage that will be supplied by the Lake Superior District, the percentage of this tonnage coming from Minnesota, and the percentage of the Minnesota iron ore for National Defense.

TABLE NO. 6

PROJECTED TONNAGE OF IRON ORE USED BY THE UNITED STATES' STEEL MILLS IN MILLIONS OF TONS

	1952	1953	1954	1955
Total Tonnage:	135.6	139.4	143.2	149
Tonnage from Lake Superior Regions:				
Direct Shipping	74.5	71.5	68.5	65
Taconite Concentrate	.5	1.	1.5	2.5
Other Ores	24.7	26.7	28.7	30.2
Total from Lake Superior Region:	99.7*	99.2*	98.7*	97.7*
Percentage of Minnesota Ore used in National Defense	43%	44%	43%	40%

* 82% of Lake Superior Ore comes from Minnesota.

The disagreement in the steel industry which has resulted in a curtailment of the production of steel during the year 1952 will undoubtedly increase the percentage of the steel produced going into National Defense by a considerable amount and will reduce the amount of steel allocated for civilian production.

If the National Defense program lasts for a considerable length of time, it will put a heavy burden on our Minnesota iron ore and

will undoubtedly hasten depletion of our high grade ore. If peace is restored, civilian requirements for iron ore will continue the heavy demand for some time in the future until foreign ores and processed taconite can lessen the burden on our high grade ore.

Cost of Developing and Mining Minnesota Iron Ores and of Competitive Ores In Other Parts of the World

This is one subject upon which there is little available information. We have written to the state departments in the various states that are regular producers of iron ore, including Alabama, California, Michigan, New York, Pennsylvania, Texas, Utah, Wisconsin, and Wyoming, requesting information as to cost of producing iron ore in those states. The responses were all negative except those from Michigan and Utah.[1] It now appears that Minnesota and Michigan are the only states requiring reports from which detailed cost information can be obtained.

We then wrote to the various mining companies operating in the above states, asking if they could furnish the desired cost figures, but the companies refused this information. The result to date is that the only states for which we have fairly complete cost figures are Minnesota and Michigan.

Due to the fact that the iron ore produced in Michigan is nearly all from underground operations, and that only about 6% of Minnesota's iron ore production is mined by underground methods, the comparative costs, beyond the fact that they appear to be fairly well in line as to the underground ore produced, are not very informative.

In the following table are shown the comparative costs of production in these two states for the years 1949-50, on underground mining operations. Note that the figures do not include taxes or royalties. It is seen that there is very little difference in the final result.

1. Utah State Tax Commission, 118 State Capitol, Salt Lake City. Letter by H. H. Higgs, Mine Appraiser-Engineer, gives costs as follows: Mining, Crushing and screening, $1.10 to $1.30 per net ton delivered on railroad cars. This is on open pit operations and compares favorably with the average Minnesota open pit cost of $1.46 per gross ton.

TABLE NO. 7

UNDERGROUND COST OF PRODUCTION

(Excluding Taxes)
(and Royalties)

	1949 Michigan	1950 Michigan
Labor	1.9357	1.9298
Supplies	.8827	.8522
Deferred Costs	.1536	.1810
General Overhead	.2415	.3951
Marketing & Selling	.0532	.0521
	3.2667	3.4102
	Minnesota	Minnesota
Labor	1.896	2.112
Supplies	.846	.668
Development	.047	.048
General Overhead	.380	.726
	3.169	3.554

We also attempted to learn the costs of production in the Steep Rock, Michipicoten and Labrador-Quebec iron ore fields in Canada, but found the same situation existing there,—the information was not available.

Inquiries as to Chilean and Venezuelan iron ore mining costs met with the same reply; however, the Bethlehem Steel Company made the statement that they could deliver iron ore at Sparrow's Point, Maryland, at a substantially lower cost **per unit of iron** than the cost per unit for Minnesota ore delivered at Buffalo, New York.

The only information we could get on the costs of Labrador-Quebec ore is from the testimony of Honorable Oscar Chapman, Secretary of the Interior, who presented an estimate prepared by the United States Bureau of Mines before the Congressional Committee on the Great Lakes St. Lawrence Waterway, as shown by the following table.

Tables No. 9 and 10 show the average production costs of open pit and underground operations in Minnesota and the combined average costs of iron ore produced in Minnesota.

ESTIMATED COST TO DELIVER QUEBEC-LABRADOR ORE TO VARIOUS UNITED STATES CONSUMING CENTERS BY PRESENT FACILITIES AND PROPOSED SEAWAY

TABLE NO. 8

	ESTIMATED COST PER GROSS TON PRESENT FACILITIES					PROPOSED SEAWAY		
	Pittsburgh via Montreal[1]	Pittsburgh via Sparrows Point	Pittsburgh via St. Lawrence[2]	Cleveland via St. Lawrence[2]	Buffalo via St. Lawrence[2]	Pittsburgh	Cleveland	Buffalo
Mining and transportation to crusher	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25
Depreciation and interest	.75	.75	.75	.75	.75	.75	.75	.75
Rail freight to Seven Islands	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65
Water Freight	1.00	2.12	2.75	2.75	2.75	2.00	2.00	2.00
Rail freight to furnace	3.50	2.00	1.89			1.89		
Total gross ton Labrador ore	9.15	8.77	9.29	7.40	7.40	8.54	6.65	6.65
Lake Erie Selling Value	9.59	9.59	9.59	7.70	7.70	9.59	7.70	7.70
Difference	.45	.82	.30	.30	.30	1.05	1.05	1.05

1. All rail, Montreal to Pittsburgh.
2. All water, 3,000 ton barges present facilities.
3. Does not include toll charges.

NOTE: The above costs show that the Quebec-Labrador ores will be competitive to Lake Superior ores with or without the seaway. However, the seaway will permit greater tonnages at a reduced cost.
Source: Congressional Record, No. 82-2, Page 180, February 23, 1951.

TABLE NO. 9—AVERAGE PRODUCTION COSTS OF IRON ORE PRODUCED IN MINNESOTA*

Year	Total Tonnage Mined	Total Cost of Development, Royalty, and Other Costs as Indicated, Except Taxes	Average Cost Per Ton of Development	Average Cost Per Ton of Mining and Beneficiation				Average Cost Per Ton of Royalty Paid	Total Cost Per Ton of All Preceding Items	Approximate Total Cost of Ad Valorem and Other Taxes	Average Cost Per Ton of All Taxes Levied	Per cent of Total Taxes to Total Costs
				Labor	Supplies	Other Items**	Total					
1938	14,728,556	$ 24,197,575	$.186	$.409	$.254	$.407	$1.070	$.387	$1.643	$18,481,639	$1.255	43.3
1939	31,789,650	41,771,509	.215	.241	.168	.258	.667	.432	1.314	22,186,212	.698	34.7
1940	48,304,658	54,780,886	.201	.183	.142	.212	.537	.395	1.133	23,075,470	.478	29.7
1941	63,736,394	72,013,215	.206	.207	.140	.162	.509	.415	1.130	24,787,232	.389	25.6
1942	70,048,716	85,168,023	.190	.234	.161	.240	.635	.390	1.215	23,644,204	.338	21.7
1943	69,004,461	89,147,416	.209	.281	.182	.269	.732	.352	1.293	21,957,593	.318	19.8
1944	65,073,476	86,156,863	.234	.253	.198	.288	.739	.351	1.324	20,667,685	.318	19.3
1945	62,482,046	83,099,814	.208	.251	.201	.324	.776	.347	1.331	20,639,726	.330	19.9
1946	49,650,356	68,658,404	.223	.271	.216	.325	.812	.348	1.383	20,414,120	.411	22.9
1947	59,967,761	89,303,822	.254	.304	.263	.336	.903	.332	1.489	25,093,069	.419	21.9
1948	65,013,706	107,734,083	.298	.308	.284	.405	.997	.362	1.657	26,927,951	.441	20.0
1949	55,187,871	101,501,196	.341	.360	.294	.492	1.146	.352	1.839	31,452,161	.570	23.7
1950	64,793,019	126,736,978	.395	.396	.247	.542	1.185	.376	1.956	36,713,983	.567	22.5

* Tonnage of all ore mined in Minnesota; total costs and costs per ton of development and operation chargeable to mining; and total costs and costs per ton of all mining taxes, as reported for Occupation Tax purposes, for years 1936-1949, inclusive.

** Includes: administration (local and district), depreciation, beneficiation (including crushing and screening) stockpile loading, and miscellaneous costs. Authority: Minnesota Department of Taxation—Biennial Report.

TABLE NO. 10—AVERAGE PRODUCTION COSTS OF OPEN-PIT AND UNDERGROUND ORE PRODUCED IN MINNESOTA*

Year	Total Tonnage Mined	Total Cost of Development, Royalty, and Mining	Average Cost Per Ton of Development	Average Cost per Ton of Mining and Beneficiation					Average Cost Per Ton of Royalty Paid	Average Cost Per Ton of All Preceding Items
				Labor	Supplies	Total Labor and Supplies	Other Items (Including Benef.)	Total		
Open Pit Operations										
1938	11,535,101	$15,967,137	$ .225	$ .238	$.174	$ .412	$.358	$ .770	$.389	$1.384
1939	28,033,250	32,953,986	.238	.141	.125	.266	.231	.497	.440	1.175
1940	44,008,093	44,640,364	.217	.108	.109	.217	.184	.401	.397	1.015
1941	58,771,355	60,547,192	.218	.138	.109	.247	.149	.396	.418	1.032
1942	64,951,827	72,290,635	.202	.154	.131	.285	.232	.517	.394	1.113
1943	63,761,539	75,491,717	.221	.195	.152	.347	.267	.614	.352	1.187
1944	61,177,038	75,309,811	.246	.185	.170	.355	.279	.634	.351	1.231
1945	59,012,981	72,960,183	.217	.183	.175	.358	.320	.678	.341	1.236
1946	47,312,655	61,036,079	.232	.199	.188	.387	.325	.712	.346	1.290
1947	56,648,191	77,761,752	.266	.217	.232	.449	.331	.780	.327	1.373
1948	61,075,597	93,888,374	.313	.219	.251	.470	.405	.875	.349	1.537
1949	51,804,480	88,647,173	.360	.260	.258	.518	.500	1.018	.333	1.711
1950	61,098,092	111,225,426	.416	.292	.221	.513	.531	1.044	.360	1.820
Underground Operations										
1938	3,193,455	8,230,438	.048	1.027	.544	1.571	.585	2.156	.374	2.578
1939	3,756,400	8,817,523	.042	.997	.494	1.491	.466	1.957	.378	2.377
1940	4,296,565	10,140,522	.040	.947	.487	1.434	.507	1.941	.381	2.362
1941	4,964,992	11,466,023	.060	1.033	.501	1.534	.335	1.869	.380	2.309
1942	5,096,889	12,877,388	.054	1.238	.543	1.781	.347	2.128	.344	2.526
1943	5,242,922	13,655,699	.064	1.353	.550	1.903	.293	2.196	.343	2.603
1944	3,896,438	10,847,052	.043	1.321	.628	1.949	.425	2.374	.367	2.784
1945	3,469,065	10,139,631	.050	1.403	.637	2.040	.392	2.432	.441	2.923
1946	2,337,701	7,622,325	.044	1.734	.780	2.514	.324	2.838	.379	3.261
1947	3,319,570	11,542,070	.043	1.787	.797	2.584	.441	3.025	.409	3.477
1948	3,938,109	13,845,709	.055	1.697	.808	2.505	.390	2.895	.566	3.516
1949	3,383,391	12,853,923	.047	1.896	.846	2.742	.380	3.122	.630	3.799
1950	3,694,127	15,511,552	.048	2.112	.668	2.780	.726	3.506	.645	4.199

* Tonnage of all ore mined in Minnesota in years 1938-1950, inclusive; comparison of total costs and costs per ton for development and other costs incurred in mining, as betwen open pit and underground operations.

Authority: Minnesota Department of Taxation—Biennial Report.

Tax Treatment of Low Grade Ore Labor Credit

To encourage the mining of low grade ore, the Legislature, in 1937, passed a law which reduced the assessed value of low grade iron bearing formations (for ad valorem taxes). The law provided that if the tonnage recovery was less than 50% and not less than 49%, the assessed value should be 48½% of the full and true value (regular iron ore is assessed at 50%). If the tonnage recovery was less than 49% and not less than 48% the assessed value was 47% and for each subsequent reduction of 1% in tonnage recovery, the percentage of assessed value to the full and true value shall be reduced an additional 1½% of the full and true value, but in no event should the assessed value be less than 30% of the full and true value. (L. 1937, C. 364, M. S. A. 273.15)

In 1941, to further encourage the production of low grade and high labor cost ores, and to increase employment on the range, the labor credit law was enacted. (M. S. A. 298.02). This law allowed as a credit on the occupation tax an amount equal to 10% of that part of the cost of labor (excluding administrative labor) in excess of 20 cents per ton and limited the credit to two-thirds of the gross tax. (L. 1941, C. 544).

In 1945, by C. 445, the law was amended and the allowance was 10% of the labor cost in excess of 30 cents per ton and not in excess of 40 cents per ton; and 15% on that part of the labor cost in excess of 40 cents per ton and limited to 75% of the gross tax. The law was again amended in 1947, C. 541, and the allowance was 10% of that part of the labor cost in excess of 40 cents per ton and not in excess of 50 cents per ton; and 15% of that part in excess of 50 cents per ton and limited to 75% of the gross tax.

It was again amended in 1949 by C. 639 and the allowance was 10% of the labor cost in excess of 50 cents per ton and not in excess of 65 cents per ton and 15% on the labor cost in excess of 65 cents per ton and the allowance was limited to 75% of the gross tax for underground and taconite operations and 60% for all other operations.

In 1951, by Chapter 664, the law was again amended, so that underground mines and mines in which during the year in question, more than 50% of the crude ore produced had been beneficiated by jigging, heavy media, roasting, drying or by artificial heat, sintering, magnetic separation, flotation, agglomeration, or any process requiring fine grinding, the allowance was 10% of that part of the cost of labor employed by said mine or in the beneficiation of such ore in said calendar year, in excess of 50 cents per ton and not in excess of 65 cents per ton of the merchantable ore produced during that year, and 15% of the labor cost in excess of

65 cents per ton. In the case of other mines 10% of the amount by which the average labor cost exceeds 50 cents but does not exceed 65 cents, plus 15% of the amount by which the average labor cost per ton exceeds 65 cents, multiplied by the number of tons of ore produced at said mine, not exceeding 100,000 tons, and 10% of the amount by which such average cost per ton of such labor exceeds 80 cents, multiplied by the number of tons of ore produced at said mine in excess of 100,000, limited to 75% of the gross tax on underground and taconite operations, and 60% on all other operations.

The amendments to the labor credit law were necessitated in the main by the National inflationary spiral, and partly to prevent low cost mines from receiving the credit. As costs increased, the law had to be amended. Otherwise the low cost mines as well as the high cost mines would have received credit and the credits allowable would have been so large that the gross occupation tax would have been greatly reduced.

Tables were presented to the Commission which illustrate the above statement. The 1951 gross occupation tax was $28,278,289, the labor credit allowed was $2,002,914, and the tax certified was $26,275,375. If the 1949 law had been used to compute the labor credit on the 1951 tonnage, the credit would have been $3,056,352, thus reducing the tax certified by more than $1,000,000.

HAS THE LABOR CREDIT LAW ACCOMPLISHED ITS PURPOSE?

Whether or not the labor credit law has increased employment and the utilization of low grade, underground, and high labor cost ores, is a controversial question.

In the hearings before the Commission, there was much diversity of opinion. Mr. G. Howard Spaeth, Tax Commissioner, stated "that it has not encouraged the employment of labor or the mining of even low grade ores." He attributed the increase of concentrated ore and employment on the range, since the enactment of the labor credit law, to the unusual demand for ore.

Mr. E. Tom Binger, an attorney, representing some 12 small mining companies, stated in substance, that he was certain that the labor credit law had encouraged the mining of low grade ore and that employment had increased because of it; that the labor credit law was an important factor for the small scram operators in determining their costs and whether or not the operation could be conducted at a profit; that the law was doing just what the Legislature intended it to do.

Mr. Francis D. Butler, an attorney representing Butler Bros. Mining Company, expressed his opinion that the labor credit law widens the use of low grade ores and of that type of operation which will require more labor per ton than would be otherwise re-

quired, and that the law reasonably accomplishes what it was intended to do.

Mr. W. K. Montague, an attorney representing large mining interests, stated in substance, that the labor credit law had increased the production of low grade ore and employment, but because of the National economic situation and the great demand for iron ore, no one could determine to what degree the increased production and employment could be attributed to the labor credit law.

Mr. Warren S. Moore, President of W. S. Moore Company, a member of the Legislature and an iron ore producer, stated in substance that he was processing ore from the Prindle Mine which was formerly operated by the Oliver Mining Company and abandoned because they had removed all the merchantable iron ore; that the labor credit allowed on this high cost mine was a great benefit and that the labor credit law was an important factor for the small operators in making their decisions on scram operations.

The following table shows the employment on the range and the tonnage of concentrates produced, before and since the passage of the labor credit law. These figures show that employment and concentrated iron ore production have increased since its enactment, but from our investigation of the subject, we have been unable to determine to what extent these increases can be attributed to the labor credit law.

TABLE NO. 11

Employment on the Range Mines and Ore Shipments Prior to and Since the Enactment of the Labor Credit Law of 1941

EMPLOYMENT:	1940	Low	6820	February
		High	9827	August
	1941	Low	8304	January
		High	12373	August
	1951	Low	15549	January
		High	18275	October

SHIPMENTS IN GROSS TONS:

	Direct	Total Concentrate	Total	Percent of Concentrate
1940	39,741,641	9,207,681	48,949,322	18.8%
1941	49,347,380	14,713,346	64,060,726	23.
1951	56,345,750	22,722,939	79,068,689	28.7

Source: U. S. Bureau of Labor Statistics and Lake Superior Iron Ore Association.

Because of the abnormal economic conditions attending World War II, the war in Korea, the cold war and the National Defense Program creating an unusual demand for iron ore, we cannot determine the degree of influence of the labor credit law on mining of low grade ore or employment.

There is sharp criticism of the labor credit law. Some claim the formula is too complicated. Others claim that mines which were never intended to receive labor credits are given them. The Interim Committee on Tax Research in its 1951 report to the Legislature, suggested that the labor credit against the occupation tax should be computed on a "Percentage Recovery" method. Others have made the same suggestion. None of the advocates of this plan have presented to the Commission any factual background or figures showing its effect on revenue and on the industry.

We know that the present labor credit law is complicated and that simplicity in tax laws is desirable.

It has been suggested, in lieu of labor credit, that after the normal occupation tax based on value of ore at the mouth of the mine has been computed, a percentage credit be allowed based upon the relationship between the actual cost of production and the value of the ore made ready for shipment from the mining area.

WHY HAS A RE-EXAMINATION AND RE-VALUATION OF OUR TAX POLICY BECOME NECESSARY?

Our tax policy has been kicked around as a political football, both in and out of the Legislature, for the past forty years. Both partisan and non-partisan (legislative) candidates have included this subject in political platforms and campaign oratory.

As a result some people and organizations claim that the iron mining companies should pay heavier taxes because they are depleting this great natural resource. The iron mining companies claim the tax burden is too heavy and there are other people and organizations who think the mining companies are paying their just share of the tax burden. Many are confused.

The Commission has listened to testimony supporting these various contentions and claims. Extensive research has been made.

To evaluate the different claims an examination of the past, present and the probable future conditions of the iron ore industry has been our objective. We hope to take this question out of politics and base our tax policy on sound economics.

It is common knowledge that for over forty years, Minnesota has had a virtual monopoly on the production of iron ore in this country. The records show that Minnesota has produced during the period, 80% of the iron ore mined in the Lake Superior district (which includes Michigan, Wisconsin and Canada) and over 60% of the National total. The Federal government in its estimate of iron ore requirements for the next four years expects Minnesota to supply 62% of the tonnage. The heavy demand for Minnesota iron ore due to World War II, the Korean war and the National emergency, has greatly depleted our high grade, direct shipping ore; and a continuation of this prodigious demand will hasten its exhaustion.

In 1940 only 18% of our shipments were concentrates and 82%

direct shipping ore. In 1951, 28.7% of the shipments were concentrates and 71.3% direct shipping ore. For the years 1941 to 1951 inclusive, we shipped 538,095,000 tons of direct shipping ore. On May 1, 1951, our estimated reserve of direct shipping ore was 774,433,000 tons, and of this tonnage 268,815,000 was underground. In 1951 we shipped 56,346,000 tons of this direct shipping ore. At this rate, unless large new reserves are discovered, anyone can calculate how long it will last.

In times of emergency only the open pit mines can rapidly increase production, by using more men and equipment. Underground mines cannot be quickly expanded. Therefore, the burden falls upon the open pit mines. As the ore pits get deeper, more men and equipment are required to produce the same tonnage, resulting in increased costs. Many of our open pits have been mined for years and it frequently happens that lean ore bodies are encountered in these mines which have to be removed to get at the high grade ore. The fact remains that the high grade ore of Minnesota will be exhausted in the not too distant future, unless the low grade concentrates and taconite processing can augment the supply of merchantable iron ore to such an extent that the mining companies can supply the demand with larger percentages of concentrates and processed taconite.

We have in Minnesota billions of tons of magnetic taconite that can be processed into high grade iron ore concentrates containing 60% to 64% natural iron. We have a large tonnage of lean ore that can be beneficiated and made merchantable. Both of these methods are high cost operations. The Legislature has recognized this fact.

In 1937, Chapter 364 was enacted which reduced the assessed value of low grade ore for ad valorem tax purposes. In 1941, Chapter 375, the taconite tax law was enacted; and by Chapter 544 the labor credit against the gross occupation tax was allowed. These laws were intended to encourage the production of low grade ore and taconite and to increase employment on the range.

WHAT TAXES HAVE THE MINING COMPANIES PAID UNDER THE MINNESOTA LAW?

The original iron ore tax law of 1881, up to the time of its repeal in 1897, produced the small sum of $105,600.09. From 1897 to 1921, all iron ore was taxed on the ad valorem basis only. However, in 1921, the occupation tax was enacted, and in 1923 the royalty tax came into being.

From 1897 to 1913, inclusive, the records of the taxes imposed on the mining companies are incomplete. However, beginning in 1914, the Minnesota Tax Commission devised a system for keeping an accurate account of all these taxes paid by the iron ore industry.

The following table shows the taxes paid by the mining companies for the years 1914 to 1951, inclusive, and the tonnage produced and shipped.

TABLE NO. 12
MINNESOTA IRON ORE TAXES, PRODUCTION AND SHIPMENTS, 1914 TO 1951 INCLUSIVE

	IRON ORE TAXES				Total Tonnage of Iron Ore Produced*	Total Tonnage of Iron Ore Shipped
	Ad Valorem 1	Occupation 2	Royalty 3	Total	4	5
1914-1915	$13,935,202	.....	.....	$13,935,202	55,411,561	55,971,013
1916-1920	70,168,134	.....	.....	70,168,134	206,588,420	210,794,738
1921	18,185,156	$ 2,238,328	.....	20,423,484	17,495,578	17,708,789
1922	18,411,500	3,440,597	.....	21,852,097	28,770,120	30,772,162
1923	19,655,268	6,126,443	$1,027,847	26,809,558	44,843,457	45,305,647
1924	18,736,356	2,859,735	895,825	22,491,916	32,425,027	31,589,464
1925	18,570,829	2,316,432	845,072	21,732,333	37,580,850	38,841,968
1926	17,267,679	2,725,312	910,636	20,903,627	41,662,490	41,919,575
1927	17,342,382	2,183,308	916,825	20,442,515	36,474,549	36,504,854
1928	16,844,349	2,466,257	879,520	20,190,126	38,532,003	39,167,842
1929	17,251,700	3,786,352	1,044,696	22,082,748	46,922,911	47,478,167
1930	17,085,645	2,782,361	921,167	20,789,173	36,239,106	34,881,010
1931	16,617,217	1,383,145	649,804	18,650,166	18,370,526	17,309,211
1932	15,857,490	260,604	415,793	16,533,887	5,496,070	2,250,200
1933	16,582,129	958,388	335,600	17,876,117	12,597,805	14,953,168
1934	17,666,132	1,228,626	364,129	19,258,887	16,206,453	15,967,819
1935	17,323,829	1,387,546	459,951	19,171,326	19,954,430	20,532,222
1936	18,012,178	2,637,977	547,048	21,197,203	32,501,729	33,829,341
1937	17,269,567	9,033,930	1,305,385	27,608,882	49,619,930	49,161,064
1938	16,255,212	1,618,439	607,988	18,481,639	14,728,556	14,815,811
1939	16,431,322	4,888,964	865,926	22,186,212	31,789,650	33,022,890
1940	15,579,856	6,387,700	1,107,914	23,075,470	48,304,658	48,949,322
1941	14,564,253	8,399,387	1,823,592	24,787,232	63,736,347	64,060,726
1942	13,244,037	8,233,102	2,167,065	23,644,204	70,048,716	75,299,667
1943	13,300,103	6,711,683	1,945,807	21,957,593	69,364,022	69,971,276
1944	12,477,270	6,301,570	1,888,845	20,667,685	65,073,476	66,586,264
1945	12,588,313	6,289,279	1,762,134	20,639,726	62,482,046	62,830,572
1946	12,732,769	6,507,835	1,358,864	20,599,468	49,650,356	50,010,067
1947	13,923,528	9,700,773	1,654,392	25,278,693	59,967,761	63,517,190
1948	13,257,828	11,762,769	1,907,354	26,927,951	65,013,706	69,108,906
1949	14,901,587	14,355,466**	2,195,108**	31,452,161**	55,187,871	56,825,957
1950	15,994,967	18,822,662**	1,896,474**	36,714,103**	64,793,019	65,331,865
1951	16,460,375	26,275,375**	2,754,461**	45,490,211**	78,407,263	79,068,689
Total Taxes	584,494,162	184,070,345	35,455,222	804,019,729	1,576,240,462	1,604,337,456

* Production 1921 to date, as reported for occupation tax purposes.
** These figures include the additional 1% Veterans' Compensation Fund.
Authority for tax figures: Minnesota Department of Taxation.
Authority for tonnages: Wade's Mining Directory, 1952.

(Explanations of columns numbered 1, 2, 3, 4 & 5 on preceding table)

1. The ad valorem tax goes to the state, counties, townships, school districts and local taxing districts according to the levy of the respective taxing units. For distribution, see Table No. 13.

2. An occupation tax of 11% is distributed as follows:

50% to the State General Revenue Fund;
40% to the Permanent School Fund, and
10% to the Permanent University Fund.
Since 1949 an additional occupation tax of 1% goes to the Veterans' Compensation Fund. Ten percent of the amount going to the State General Revenue Fund is appropriated to the Iron Range Resources and Rehabilitation Commission.

3. The Royalty Tax is 12%. The proceeds of a tax of 11% goes to the State General Revenue Fund and the proceeds of a tax of 1% goes to the Veterans' Compensation Fund.

4. & 5. For years 1914-1951 inclusive, the total production is shown as 1,576,240,000 tons, while the total shipment is given as 1,604,337,456 tons, or about 28,000,000 tons more than that for total production. This apparent discrepancy is explained as follows:

In years 1914-1920, the figures used were those of the United States Bureau of Mines, which excluded all ore with a manganese content of 5% or more. This accounts for the greater part of the 4,766,000 tons, the difference in those years between **tons produced** and **tons shipped.** The remainder is accounted for by an agreement between the State and the Oliver Mining Company, and the City of Virginia, whereby certain tonnages of good ore were mined and placed in what were known as "reserve stockpiles" near the mine, with the understanding that in consideration of the agreement by the company these ore piles would not be shipped out in the near future, but would be left in place for a term of years, they would be assessed at the rate at which that ore would have taken had it remained in the ground.

The first of these so-called "reserve stockpiles" was accumulated from the Alpena Mine in the years between 1912 and 1915, long before the enactment of the occupation tax law. When it was shipped out, many years later, it was recorded in the shipment column; but, having been stocked in the earlier years, and therefore not subject to the occupation tax, it did not appear in the column of "ore produced", being taxed under the ad valorem tax law until the ore was shipped.

In 1942 the shipment figure exceeds the production figure by about 5,250,000 tons. Of this amount 4,000,000 tons came from the large reserve stockpile which had just been shipped out to clear the ground in preparation for stripping the overburden from the Rouchleau Mine, which became active in 1943. This ore, when placed in stockpile, had not been counted as "ore produced", but continued being assessed under the ad valorem tax law. The remainder of

the above difference of 5,250,000 tons in the 1942 figures is accounted for by shipments of lean ore that had been formerly considered as having no value. The same was true in years 1947 and 1948.

While it would be impossible to make an absolute check on these figures at this time, it now appears that the main part of the difference between the production figures and the shipment figures is due to the following causes: 1. Exclusion of ores having 5% or more of manganese in years before 1920 from the figures for "ore produced"; 2. Differences due to ore placed in "reserve stockpiles" prior to 1921; 3. Shipments from lean ore stockpiles which were not considered as being mechantable or usable ore at the time when this material was placed in stockpile.

TABLE NO. 13

MINNESOTA IRON ORE AD VALOREM TAXES, 1914 TO DATE

	Ad Valorem Taxes			
	State	County	Local	Total
1914-1915	$ 2,422,416	$ 2,649,422	$ 8,863,364	$ 13,935,202
1916-1920	7,525,564	11,743,432	50,899,138	70,168,134
1921	1,203,473	3,040,145	13,941,538	18,185,156
1922	1,161,288	2,951,031	14,299,181	18,411,500
1923	2,298,710	3,300,036	14,056,522	19,655,268
1924	1,682,383	3,143,135	13,910,838	18,736,356
1925	2,149,882	2,984,651	13,436,296	18,570,829
1926	1,458,007	2,912,173	12,897,499	17,267,679
1927	1,972,268	3,167,651	12,202,463	17,342,382
1928	1,347,033	3,129,570	12,367,746	16,844,349
1929	1,592,537	3,290,144	12,369,019	17,251,700
1930	1,366,684	3,262,329	12,456,632	17,085,645
1931	1,883,194	3,382,985	11,351,038	16,617,217
1932	1,959,006	3,201,138	10,697,346	15,857,490
1933	2,643,812	3,247,220	10,691,097	16,582,129
1934	2,762,996	4,059,152	10,843,984	17,666,132
1935	3,062,746	3,931,227	10,329,856	17,323,829
1936	2,798,071	4,459,946	10,754,161	18,012,178
1937	2,024,419	4,009,528	11,235,620	17,269,567
1938	2,004,850	4,123,766	10,126,596	16,255,212
1939	1,953,413	4,601,422	9,876,487	16,431,322
1940	1,810,014	4,374,856	9,394,986	15,579,856
1941	1,507,775	3,951,242	9,105,236	14,564,253
1942	1,451,024	3,506,085	8,286,928	13,244,037
1943	893,996	3,677,474	8,728,633	13,300,103
1944	662,625	3,462,913	8,351,732	12,477,270
1945	1,019,654	3,291,772	8,276,887	12,588,313
1946	1,026,087	3,714,909	7,991,773	12,732,769
1947	888,768	5,125,429	7,909,331	13,923,528
1948	914,255	4,823,156	7,520,417	13,257,828
1949	1,141,709	5,195,204	8,564,674	14,901,587
1950	1,319,986	5,908,781	8,766,200	15,994,967
Total	$59,908,645	$127,621,924	$380,503,218	$568,033,787

Authority: Minnesota Department of Taxation.

Notwithstanding these figures, many people have the impression that the mining companies are paying at most a small tax for the privilege of removing a great natural resource. This may be due to the fact that the mining companies pay no state income taxes. However, in addition to ad valorem taxes, they pay an occupation tax on the value at the mouth of the mine on all iron ore produced at a 12% rate, less certain labor credits.

Next to Minnesota, Michigan is the largest producer of iron ore in the United States. The following table shows the average tax per ton of production of iron ore in Minnesota and Michigan.

TABLE NO. 14

COMPARISON OF AVERAGE TAX PER TON OF PRODUCTION MINNESOTA AND MICHIGAN

	MINNESOTA				MICHIGAN		
Year	Ad Valorem	Occupation	Royalty	Total	General Property	Corporation Tax	Total
1940	$ .323	$ .132	$ .023	$ .478	$ .1525	$ .0094	$ .1619
1941	.228	.132	.029	.389	.1296	.0079	.1375
1942	.189	.118	.031	.338	.1134	.0032	.1166
1943	.193	.097	.028	.318	.1197	.0085	.1282
1944	.192	.097	.029	.318	.1520	.0102	.1622
1945	.201	.101	.028	.330	.1527	.0153	.1680
1946	.256	.131	.027	.414	.2135	.0126	.2261
1947	.232	.161	.028	.421	.1546	.0075	.1621
1948	.204	.181	.029	.414	.1491	.0058	.1549
1949	.270	.260	.040	.570	.1868	.0070	.1938
1950	.249	.289	.029	.567	.1818	.0073	.1891
1951	.210	.335	.035	.580	?	?	?

Source: Minnesota Commissioner of Taxation.
Michigan Geological Survey Division.
? Figures Not Available.

Other Informative Data

TABLE NO. 15
CLASSIFICATION OF IRON ORE SHIPMENTS FROM MINNESOTA

Mesabi Range

Year	Direct Ore		Concentrates		Total Shipments Gross Tons
	Open Pit	Underground	Open Pit	Underground	
1892-1900 ...	19,505,000	11,885,000			31,390,000
1901-1910 ...	125,469,000	67,359,000	652,000	16,000	193,496,000
1911-1920 ...	208,521,000	89,256,000	34,178,000	973,000	332,928,000
1921-1930 ...	217,798,000	60,914,000	52,142,000	1,099,000	331,953,000
1931-1940 ...	159,314,000	24,979,000	45,036,000	1,553,000	230,882,000
1941	43,773,000	2,547,000	13,312,000	141,000	59,773,000
1942	51,340,000	2,501,000	16,302,000	137,000	70,280,000
1943	48,614,000	2,542,000	13,600,000	150,000	64,906,000
1944	46,517,000	2,154,000	13,669,000	169,000	62,509,000
1945	42,705,000	1,646,000	13,875,000	143,000	58,369,000
1946	34,830,000	918,000	10,561,000	17,000	46,326,000
1947	42,592,000	1,689,000	14,794,000	4,000	59,079,000
1948	45,899,000	2,168,000	15,965,000	15,000	64,047,000
1949	35,859,000	1,759,000	15,076,000		52,694,000
1950	40,461,000	1,872,000	17,722,000	79,000	60,134,000
1951	51,214,000	1,718,000	20,270,000	113,000	73,315,000
Total 1,214,411,000		275,907,000	297,154,000	4,609,000	1,792,081,000

Vermilion Range

1884-1890 ...	(1)	3,223,000			3,223,000
1891-1900 ...	(1)	11,968,000			11,968,000
1901-1910 ...	(1)	15,138,000			15,138,000
1911-1920 ...	(1)	13,860,000			13,860,000
1921-1930 ...	(1)	14,339,000			14,339,000
1931-1940 ...	28,000	10,051,000	5,000	69,000	10,153,000
1941	27,000	1,726,000	56,000	38,000	1,847,000
1942	25,000	1,853,000	18,000	29,000	1,925,000
1943		1,779,000			1,779,000
1944		1,539,000			1,539,000
1945		1,446,000			1,446,000
1946		1,330,000			1,330,000
1947		1,430,000			1,430,000
1948		1,560,000			1,560,000
1949		1,300,000			1,300,000
1950		1,651,000			1,651,000
1951		1,788,000			1,788,000
Total	80,000	85,981,000	79,000	136,000	86,276,000

1. Data not available on open pit shipments from early operations of Soudan and South Chandler Mines nor from milling operations of Section 30 Mine (1910 to 1923).

TABLE NO. 15 — Continued

CLASSIFICATION OF IRON ORE SHIPMENTS FROM MINNESOTA

Cuyuna Range

Year	Direct Ore		Concentrates		Total Shipments Gross Tons
	Open Pit	Underground	Open Pit	Underground	
1911-1920 ..	4,757,000	8,666,000	392,000	35,000	13,850,000
1921-1930 ..	5,949,000	8,201,000	3,727,000		17,877,000
1931-1940 ..	2,952,000	2,040,000	4,588,000	176,000	9,756,000
1941	1,016,000	259,000	1,085,000	81,000	2,441,000
1942	1,242,000	373,000	1,283,000	138,000	3,036,000
1943	1,081,000	501,000	1,363,000	121,000	3,066,000
1944	968,000	379,000	1,178,000	13,000	2,538,000
1945	1,273,000	301,000	1,406,000	36,000	3,016,000
1946	977,000	176,000	1,178,000	23,000	2,354,000
1947	913,000	189,000	1,756,000	2,000	2,860,000
1948	1,262,000	236,000	1,651,000		3,149,000
1949	925,000	175,000	1,630,000		2,730,000
1950	1,178,000	273,000	1,774,000		3,225,000
1951	1,292,000	334,000	1,875,000	13,000	3,514,000
Total	25,785,000	22,103,000	24,886,000	638,000	73,412,000

Total Minnesota

1884-1890 ..		3,223,000			3,223,000
1891-1900 ..	19,505,000	23,853,000			43,358,000
1901-1910 ..	125,469,000	82,497,000	652,000	16,000	208,634,000
1911-1920 ..	213,278,000	111,782,000	34,570,000	1,008,000	360,638,000
1921-1930 ..	223,747,000	83,454,000	55,869,000	1,099,000	364,169,000
1931-1940 ..	162,294,000	37,070,000	49,629,000	1,798,000	250,791,000
1941	44,816,000	4,532,000	14,453,000	260,000	64,061,000
1942	52,607,000	4,727,000	17,662,000*	304,000	75,300,000*
1943	49,695,000	4,822,000	15,183,000*	271,000	69,971,000*
1944	47,485,000	4,072,000	14,847,000	182,000	66,586,000
1945	43,978,000	3,393,000	15,281,000	179,000	62,831,000
1946	35,807,000	2,424,000	11,739,000	40,000	50,010,000
1947	43,505,000	3,308,000	16,698,000*	6,000	63,517,000*
1948	47,161,000	3,964,000	17,969,000*	15,000	69,109,000*
1949	36,784,000	3,234,000	16,808,000*		56,826,000*
1950	41,639,000	3,796,000	19,818,000*	79,000	65,332,000*
1951	52,506,000	3,840,000	22,597,000*	126,000	79,069,000*
Total 1,240,276,000		383,991,000	323,775,000*	5,383,000	1,953,425,000*

* Includes open pit concentrates from Fillmore County district: 59,000 tons in 1942, 220,000 tons in 1943, 148,000 tons in 1947, 353,000 tons in 1948, 102,000 tons in 1949, 322,000 tons in 1950, and 452,000 tons in 1951.

Ore mined by milling methods is included under "Open Pit."

Authority: Compiled by the Mines Experiment Station.

TABLE NO. 16

SHIPMENTS OF CONCENTRATED IRON ORE FROM MINNESOTA

Year	Washed		Other Than Washed*				
	Gross Tons	% of Total Concentrates	Gross Tons	% of Total Concentrates	Total Concentrates Gross Tons	Total Ore Shipments Gross Tons	% Concentrates of Total Ore Shipments
Prior 1907	0	0.0	0	0.0	0	148,247,423	0.0
1907-1910	668,136	100.0	0	0.0	668,136	106,968,014	0.6
1911	1,978,337	100.0	0	0.0	1,978,337	23,336,127	8.5
1912	2,875,769	93.0	215,585	7.0	3,091,354	34,195,682	9.0
1913	1,967,632	87.5	281,625	12.5	2,249,257	36,339,962	6.2
1914	1,831,504	90.9	182,833	9.1	2,014,337	23,352,360	8.6
1915	2,956,812	99.6	11,805	0.4	2,968,617	32,618,653	9.1
1916	4,072,420	96.2	162,290	3.8	4,234,710	46,189,617	9.2
1917	4,370,234	96.8	143,590	3.2	4,513,824	45,393,882	9.9
1918	4,655,198	94.7	260,290	5.3	4,915,488	44,070,710	11.2
1919	4,570,863	99.8	7,532	0.2	4,578,395	34,791,866	13.2
1920	4,973,497	98.8	59,971	1.2	5,033,468	40,348,663	12.5
1921	3,034,583	99.1	26,298	0.9	3,060,881	17,708,789	17.3
1922	4,683,906	93.4	332,876	6.6	5,016,782	30,772,162	16.3
1923	7,202,894	94.6	409,564	5.4	7,612,458	45,305,647	16.8
1924	4,852,828	91.0	478,456	9.0	5,331,284	31,589,464	16.9
1925	6,177,417	94.1	389,716	5.9	6,567,133	38,841,968	16.9
1926	5,288,071	95.1	269,804	4.9	5,557,875	41,919,575	13.3
1927	4,766,997	94.0	305,688	6.0	5,072,685	36,504,854	13.9
1928	5,296,789	90.7	544,286	9.3	5,841,075	39,167,842	14.9
1929	5,874,028	89.5	692,241	10.5	6,566,269	47,478,167	13.8
1930	4,947,841	78.0	1,391,759	22.0	6,339,600	34,881,010	18.2
1931	3,171,035	85.8	525,154	14.2	3,696,189	17,309,211	21.4
1932	266,282	91.0	26,176	9.0	292,458	2,250,200	13.0
1933	2,331,328	74.4	803,329	25.6	3,134,657	14,953,168	21.0
1934	2,656,315	77.2	783,726	22.8	3,440,041	15,967,819	21.5
1935	3,764,388	73.0	1,389,186	27.0	5,153,574	20,532,222	25.1
1936	6,693,102	86.2	1,071,399	13.8	7,764,501	33,829,341	23.0
1937	7,484,375	77.2	2,207,716	22.8	9,692,091	49,161,064	19.7
1938	2,235,037	79.1	591,407	20.9	2,826,444	14,815,811	19.1
1939	4,609,615	74.1	1,611,748	25.9	6,221,363	33,022,890	18.8
1940	7,230,091	78.5	1,977,590	21.5	9,207,681	48,949,322	18.8
1941	11,859,036	80.6	2,854,310	19.4	14,713,346	64,060,726	23.0
1942	14,268,146	79.4	3,697,070	20.6	17,965,216	75,299,667	23.9
1943	12,606,056	81.6	2,848,054	18.4	15,454,110	69,971,276	22.1
1944	12,332,746	82.1	2,696,074	17.9	15,028,820	66,586,264	22.6
1945	12,222,223	79.1	3,238,620	20.9	15,460,843	62,830,572	24.6
1946	9,710,307	82.4	2,068,771	17.6	11,779,078	50,010,067	23.6
1947	13,421,966	80.4	3,281,568	19.6	16,703,534	63,517,190	26.3
1948	14,466,947	80.4	3,516,420	19.6	17,983,367	69,108,906	26.0
1949	12,597,107	74.9	4,211,995	25.1	16,809,102	56,825,957	29.6
1950	13,056,077	65.6	6,841,058	34.4	19,897,135	65,331,865	30.5
1951	15,000,642	66.0	7,722,297	34.0	22,722,939	79,068,689	28.7
Totals	269,028,577	81.7	60,129,877	18.3	329,158,454	1,953,424,664	16.9

* Includes jigged, hi-density and other gravity concentrates, magnetite concentrates, sinter, sinter-dried ore, dried ore, and taconite magnetic concentrates.
Authority: Compiled by the Mines Experiment Station.

TABLE NO. 17
SHIPMENTS OF CONCENTRATED IRON ORE FROM MINNESOTA BY RANGES IN GROSS TONS

Range	Gravity Concentrates				Sinter	Dried	Taconite Magnetic	Total Concentrates
	Washed	Jigged	Hi-Density	Other*				
1949								
Mesabi	11,673,550	364,372	1,917,010	1,105,934			15,756	15,076,622
Vermilion								
Cuyuna	821,399	35,105	92,500		260,403	420,915		1,630,322
Fillmore County Dist.	102,158							102,158
Minnesota	12,597,107	399,477	2,009,510	1,105,934	260,403	420,915	15,756	16,809,102
1950								
Mesabi	11,923,871	616,319	2,838,322	2,360,402			62,087	17,801,001
Vermilion								
Cuyuna	810,535	66,806	216,844		253,452	426,826		1,774,463
Fillmore County Dist.	321,671							321,671
Minnesota	13,056,077	683,125	3,055,166	2,360,402	253,452	426,826	62,087	19,897,135
1951								
Mesabi	13,700,653	653,115	4,120,361	1,771,881			137,607	20,383,617
Vermilion								
Cuyuna	847,754	68,635	333,736	7,000	194,971	434,991		1,887,087
Fillmore County Dist	452,235							452,235
Minnesota	15,000,642	721,750	4,454,097	1,778,881	194,971	434,991	137,607	22,722,939
1907-1951								
Mesabi	257,225,972	12,532,695	16,339,206	11,984,439	623,494	2,776,212	215,450	301,762,319**
Vermilion	4,743	211,059						215,802
Cuyuna	10,141,387	704,783	1,109,271	7,000	4,564,040	8,575,243		25,523,858**
Fillmore County Dist.	1,656,475							1,656,475
Minnesota	269,028,577	13,448,537	17,448,477	11,991,439	5,187,534	11,351,455	215,450	329,158,454**

* Includes gravity concentrates produced by various methods other than jigging or hi-density that are in addition to the usual washing treatment. This includes the concentrates made from the undersize product of the hi-density plants, abrasive grinding, etc.

** Includes magnetite concentrates from the Mesabi Range and sinter-dried concentrates from the Cuyuna Range.

Authority: Compiled by the Mines Experiment Station.

TABLE NO. 18

SUMMARY

1951 MINE SHIPMENTS OF LAKE SUPERIOR IRON ORE BY RAILROADS TO UPPER LAKE PORTS AND ALL RAIL

(Gross Tons—Railroad Weights)

Range	To Upper Lake Ports	All Rail	Total	Percent of Total
Mesabi	68,050,023	5,265,232	73,315,255	75.58
Vermilion	1,440,334	347,038	1,787,372	1.84
Cuyuna	3,411,250	102,577	3,513,827(1)	3.62
Fillmore County		452,235	452,235	0.47
Total Minnesota	72,901,607	6,167,082	79,068,689(2)	81.51
Gogebic	4,370,182	693,784	5,063,966	5.22
Marquette	5,108,226	539,197	5,647,423	5.82
Menominee	4,572,777	135,154	4,707,931(3)	4.86
Total Michigan & Wisconsin	14,051,185	1,368,135	15,419,320(4)	15.90
Total—U. S. Ranges	86,952,792*	7,535,217	94,488,009(5)	97.41
Canadian Districts				
Michipicoten	802,005	382,205	1,184,210	1.22
Steep Rock	1,325,348	1,376	1,326,724	1.37
Total Canadian Districts	2,127,353*	383,581	2,510,934	2.59
Grand Total— U. S. & Canada	(a) 89,080,145*	(b) (c) 7,918,798	96,998,943	100.00

* The difference between these tonnages to upper lake ports and the tonnages shipped from upper lake ports (Season 1951 statement of December 14, 1951) are accounted for by ore left in docks at beginning and at end of season.

(a) Includes 13,133 tons (U. S. & Canadian) ore left in dock.
(b) Includes 4,167 tons (U. S. & Canadian) ore lost in transit.
(c) Includes 1,454 tons transported via truck.

NOTE: Manganiferous ore, containing 5% or more manganese, included in totals, as follows:

(1) Includes 676,412 tons—Cuyuna
(2) Includes 676,412 tons—Total Minnesota
(3) Includes 62,169 tons—Menominee
(4) Includes 62,169 tons—Total Michigan
(5) Includes 738,581 tons—Total—All U. S. Ranges Stockpile—S. P.)

The Lake Superior Iron Ore Association—1400 Hanna Building, Cleveland 15, Ohio.
March 5, 1952.

TABLE NO. 19
RAIL AND LAKE FREIGHT RATES ON IRON ORE

The following rates include surcharges of 12% on line haul and 15% on handling charges for iron ore under authority of Tariff of Increased Rates and Charges No. X-175-B.

Rail Freight Rates from Lake Superior Mines to Upper Lake Ports
Effective May 2, 1952

From Eastern Marquette Range to Marquette, Mich.	$0.7280
From Western Marquette Range to Marquette, Mich.	0.7952
From Marquette Range to Escanaba, Mich.	0.9968
From Menominee Range to Escanaba, Mich.	0.9968
From Menominee Range to Marquette, Mich.	1.5904
From Gogebic Range to Ashland, Wis.	0.9968
From Gogebic Range to Escanaba, Mich.	1.6016
From Cuyuna and Mesabi Ranges to Duluth, Minn., and Superior, Wis.	1.0304
From Mesabi and Vermilion Ranges to Duluth and Two Harbors, Minn., and Superior, Wis.	1.0304

NOTE—Above rates do not include dock handling charge of $0.1495 per gross ton.

Lake Freight Rates from Upper Lake Ports to Lower Lake Ports
Effective Season 1951

From Escanaba, Mich., to Lower Lake Michigan Ports	$0.87
From Escanaba, Mich., to Lake Erie Ports	1.09
From Marquette, Mich., to Lower Lake Ports	1.305
From Head of Lake Superior to Lower Lake Ports	1.45

NOTE—Above rates do not include unloading charge for lifting ore from hold to rail of vessel $0.23.

Dock Charges on Ore, per Gross Ton

Hold to Rail of Vessel	$0.23
Rail of Vessel to Car	0.1495
Rail of Vessel to Stockpile	0.3565
Dock Stockpile to Car	0.23
Storage Per Month	0.01
Car to Vessel at Upper Lake Docks	0.1495

Rail Freight Rates from Lower Lake Ports to Consuming Districts
Effective May 2, 1952

From Lake Erie Ports to Mahoning and Shenango Valleys, Canton and Massillon	$1.4784
From Lake Erie Ports to Midland, Steubenville, Weirton and Neville Island	1.7248
From Lake Erie Ports to Pittsburgh and Wheeling District	1.9712
From Lake Erie Ports to Monessen	2.0720
From Lake Erie Ports to Johnstown	2.1952
From Lake Erie Ports to Virginia District	3.1920
From Toledo to Jackson and Hamilton	1.6016
From Toledo to Ashland and Portsmouth	2.1168
From Cleveland to Jackson	1.9264
From Cleveland to Ashland, Portsmouth and Hamilton	2.1168
From Ashtabula, Conneaut and Erie to Riddlesburg	2.7776
From Buffalo and Erie to Lehigh and Schuylkill Valleys	3.0352
From Buffalo and Erie to Sparrows Point	3.0352
From Buffalo to Troy	2.2064
From Buffalo to Everett, Mass.	3.1024
From Buffalo to Riddlesburg, Pa.	3.0352
From Chicago to Granite City	2.0496

NOTE—Above rates do not include handling charge from rail of vessel to car of $0.1495 per gross tons.

All-Rail Freight Rates to Consuming Districts

From Cuyuna, Mesabi and Vermilion Ranges to Duluth, Minn.	$1.01
From Negaunee, Mich., to Sault Ste. Marie, Ont.	2.6880
From Marquette Range to Detroit, Mich.	3.6960

From Negaunee, Mich., to Hamilton and Welland, Ont. 6.1376
From Cuyuna, Gogebic, Marquette and Menominee Ranges to Granite City and East St. Louis, Ill. 3.6176
From Fillmore County to Granite City and Chicago District 3.0016
From Marquette, Gogebic and Menominee Ranges to Cleveland, Lorain, Valleys Dist., Canton and Massillon 5.1744
Pittsburgh and Wheeling Dist. 5.7232
Weirton, W. V. 5.4544
Johnstown, Pa. 5.9248
Chicago District 3.3030
From Mesabi and Vermilion Ranges to Cleveland, Lorain, Valleys Dist., Canton & Massillon 5.9360
Pittsburgh and Wheeling Dist. 6.3056
Johnstown, Pa. 6.5072
Chester, Pa. 8.3104
Chicago District 4.2560

All-Rail Freight Rates from Northern New York to Consuming Districts

From Port Henry and Lyon Mountain, N. Y., to Pittsburgh, Pa. 3.7408
From Clifton Mines to Clairton, McKeesport and Pittsburgh 3.7408

Rail Freight Rates from Canadian Mines to Lake Superior Docks and Consuming Districts

From Steep Rock, Ont., to Port Arthur, Ont. $1.45
NOTE—Includes handling charge of $0.14 per gross ton from cars to vessel.
From Jamestown, Ont., to Michipicoten, Ont. 0.575
(Combined rail and dock charge)
From Michipicoten Range to Sault Ste. Marie, Ont. 1.76

Rail Freight Rates on Foreign Iron Ore Arriving at B&O RR Dock Baltimore, Md., to Consuming Districts

From Baltimore, Md., to Donora & Monessen, Pa. $2.6992
to Pittsburgh District 2.8110
to Butler, Pa. 2.9232
to Wheeling District 2.9792
to Cleveland, Lorain, Canton and Massillon 3.2592
to Ashland, Ky., Columbus, Portsmouth and Jackson, Ohio 3.3712
to Cincinnati, Hamilton and Middletown, O. 3.5952
to Detroit, Mich., and Toledo, O. 3.9312

Rates for Discharging Ore in Bulk at B&O Curtis Bay Ore Pier, Baltimore, Md., per Gross Ton
Ramsey, Scarlett & Co., Inc.
Effective October 1, 1951

Full Cargoes	**Col. 1**	**Col. 2**
Collier Type Vessels—		
10,000 to 14,999 tons	$0.61	$0.61
15,000 to 19,999 tons	0.53	0.53
20,000 tons or more	0.45	0.45
Single Deck Vessels	0.87	0.91
Two Deck Vessels—		
Cargo stowed in lower holds	0.87	0.91
Cargo stowed in 'tween decks	1.18	1.25
Three Deck Vessels—		
Cargo stowed in lower holds	0.96	1.03
Cargo stowed in 'tween & shelter decks	1.18	1.25
Part Cargoes		
50% or over dischargeable by cranes	$1.15	
Less than 50% dischargeable by cranes	1.25	
Cargo in hatches, tanks and other compartments not entirely accessible to cranes	1.70	

NOTE—Rates in Column No. 1 apply to crushed Swedish iron ore; in Column No. 2 to all other manganese, chrome and iron ore. Rates are based on straight time work.

*TAX: The Federal Transportation Tax of 3%, effective Dec. 1, 1942, applies to all railroad and lake transportation and dock charges, except for dock handling from vessels to dock stockpiles. This tax does not apply to handling at private docks, nor to any Canadian rail or dock charges.

—Courtesy of Skillings' Mining Review.

TABLE NO. 20
LAKE ERIE BASE PRICES OF IRON ORE* AND VALLEY PRICES OF BESSEMER AND NO. 2 FOUNDRY PIG IRON AT DATE OF ORE BUYING MOVEMENT

Season	Date buying movement	Old Range Bessemer	Old Range Non-Bessemer	Mesabi Bessemer	Mesabi Non-Bessemer	High Phosphorus	Bessemer Pig Iron	No. 2 Foundry Pig Iron
1926	Mar. 17, 1926	$4.55	$4.40	$4.40	$4.25	$4.15	$21.00	$20.50
1927	April 8, 1927	4.55	4.40	4.40	4.25	4.15	19.50	18.50
1928	April 16, 1928	4.55	4.40	4.40	4.25	4.15	17.50	17.25
1929	Mar. 22, 1929	4.80	4.65	4.65	4.50	4.40	18.50	18.00
1930	April 1, 1930	4.80	4.65	4.65	4.50	4.40	19.00	18.50
1931	April 15, 1931	4.80	4.65	4.65	4.50	4.40	17.00	17.00
1932	June 3, 1932	4.80	4.65	4.65	4.50	4.40	14.50	14.50
1933	June 7, 1933	4.80	4.65	4.65	4.50	4.40	16.00	15.50
1934	May 21-26, 1934	4.80	4.65	4.65	4.50	4.40	19.00	18.50
1935	April 23, 1935	4.80	4.65	4.65	4.50	4.40	19.00	18.50
1936	April 1, 1936	4.80	4.65	4.65	4.50	4.40	20.00	19.50
1937	Mar. 8, 1937	5.25	5.10	5.10	4.95	4.85	24.50	24.00
1938	May 23, 1938	5.25	5.10	5.10	4.95	4.85	24.50	24.00
1939	May 3, 1939	5.25	5.10	5.10	4.95	4.85	21.50	21.00
1940	April 16, 1940	4.75	4.60	4.60	4.45	4.35	23.50	23.00
1941	April 17, 1941	4.75	4.60	4.60	4.45	4.35	24.50	24.00
1942‡	April 10, 1942	4.75	4.60	4.60	4.45	4.35	24.50	24.00
1943‡	.....	4.75	4.60	4.60	4.45	4.35	24.50	24.00
1944‡	.....	4.75	4.60	4.60	4.45	4.35	24.50	24.00
1945‡	.....	4.95	4.80	4.70	4.55	4.55	25.50[1]	25.00[1]
1946‡	.....	5.45	5.30	5.20	5.05	5.05	27.00[1]	26.50[1]
1947	Jan. 25, 1947	5.95	5.80	5.70	5.55	5.55	31.00	30.50
1948	Mar. 27, 1948	6.60	6.45	6.35	6.20	6.20	40.00	39.50
1949	Dec. 30, 1948	7.60[2]	7.45[2]	7.35[2]	7.20[2]	7.20[2]	47.00	46.50
1950	Jan. 26, 1950	8.10	7.95	7.85	7.70	7.70	47.00	46.50
1951	Dec. 2, 1950	8.70[3]	8.55[3]	8.45[3]	8.30[3]	8.30[3]	53.00	52.50
1952[4]								

* Based on following analysis: Bessemer 51.50% Fe (Nat.) and 0.045% Phos. (Dry); non-Bessemer 51.50% Fe (Nat.)
‡ Prices controlled by the U. S. Office of Price Administration.
1 Maximum per gross ton, established by U. S. Office of Price Administration.
2 6% increase in dock unloading charge of $0.18, or $0.0108, added to buyers' account, effective January 11, 1949.
3 Prices subject to adjustment by the amount of any increase after December 1, 1950, in ore transportation and handling costs from mines to rail of vessel at Lower Lake ports, including rail, dock and vessel charges and transportation taxes theron.
4 1951 prices on iron ore in effect to 7/26/52, when prices were increased 75 cents per ton. Reg. 169 Office of Price Stabilization dated 9/12/52.
Source: Mining Directory of Minnesota, 1952.

COMMENT AND RECOMMENDATIONS

The preceding chapters contain the facts disclosed by our investigation. It was the desire of the Commission to draw conclusions from this data and make recommendations. However, we have been unable to reach a conclusion as to the proper level for taxing iron ore. There are several reasons why a definite tax policy for taxing iron ore cannot be formulated at this time.

The iron ore industry is in a transition stage. The high grade direct shipping ore is rapidly diminishing and the mining companies are making every effort to process low grade iron ore and taconite to maintain Minnesota's position in the production of merchantable iron ore. These methods of producing merchantable iron ore are high cost and the capital outlay for constructing taconite plants is enormous. A tax policy which would retard the production of low grade iron ore and the development of the embryo taconite industry would be disastrous to the range communities and the mining industry in this state. Another reason why we must be cautious in formulating a tax base for iron ore is the fact that iron ore fields with large deposits of high grade iron ore are now being developed on the American Continent. These new fields will be in production by 1954 and the Labrador-Quebec field has a goal of 20,000,000 tons annually when the transportation facilities including the St. Lawrence Waterway are completed. This ore may be highly competitive with Minnesota ore, especially with the high cost taconite.

Another factor we must consider in approaching a tax policy on iron ore is the recent development of large, rich iron ore bodies in Chile, Venezuela and other foreign countries. These fields have only recently commenced shipping high grade ore to the steel plants on the eastern seaboard.

We feel that within two years time the competitive position of all of these fields with Minnesota's ore market can be more accurately determined by the Commission and the effect of this competition evaluated.

Another matter to consider is the fact that most of the state revenue from iron ore taxes comes from the occupation tax and because of the Constitutional provision only 50% of the tax goes into the General Revenue Fund. In other words, to collect $1.00 for the State General Revenue Fund a tax of $2.00 must be imposed.

Just how long the transition going on in the iron ore industry will continue, no one can foretell at this time.

However, we believe that within two years this Commission will be in a better position to gauge the situation and determine a stable future tax policy on iron ore.

It is our considered judgment that until such time as a definite policy for taxing iron ore is formulated, no change should be made in our present tax on iron ore, except as hereinafter set forth.

If circumstances require more revenue to operate the State

Government during the next biennium (1953-55), iron ore should bear its fair share of any such additional tax burden.

In view of the foregoing we believe that the unexpended balance of the appropriation made to this Commission should be reappropriated for use during the next biennium and that this Commission be continued.

LABOR CREDIT

The Commission has given considerable study to the so-called labor credit allowed in computing the occupation tax. The object of this law was to encourage the production of low grade ore and to increase employment on the range. Whether the Legislative intent has been accomplished by the law is quite controversial.

Several suggestions have been made to this Commission as to needed legislation affecting the so-called labor credit law. In view of the fact that frequent changes have been made in the law to restrict its provisions, we recommend that the law be amended so that it will effectively restrict its operation to underground mines and to mines producing concentrate by methods beyond ordinary washing and crushing: e.g. jigging, heavy media, etc.

NEW PROBLEM

A new problem has recently developed on the range and should be solved at this session of the Legislature. The situation which created the problem is the construction of the new taconite plants. As these plants are being developed, there is an influx of workers and families. These new communities develop rapidly and we are informed that at least three such areas will have a population of about 6000 each. Some of these areas have no schools to accommodate the children and because they are situated on land subject to the taconite tax law which exempts from the ad valorem tax the buildings, equipment, machinery, tools and supplies used in producing the taconite concentrate, there is no way for the local authorites to raise the funds to construct the schools. In the other areas the local schools will need legislative direction and authority to meet the problem.

We have been informed that the mining companies claim that the homes constructed for the workers on the mining property are exempt from taxation. Any ambiguity in the statute should be clarified at this session of the Legislature.

Respectfully submitted,

Legislative Commission on Taxation of Iron Ore

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