REPORT FOR
LAKE CARRIERS' ASSOCIATION

EFFECT OF THE COMPLETION OF THE
ST. LAWRENCE SEAWAY

December 31, 1954

ROBERT HELLER & ASSOCIATES
INCORPORATED
CLEVELAND

[GREAT LAKES]. [ROBERT HELLER & ASSOCIATES, INC., CLEVELAND, OHIO]. **REPORT FOR LAKE CARRIERS' ASSOCIATION. EFFECT OF THE COMPLETION OF THE ST. LAWRENCE SEAWAY. DECEMBER 31, 1954.** Cleveland: Privately printed, 1954. 11 1/2" x 9" stiff binder housing a copy of an 82-page typed, double-spaced report given only to each member of the Board of Directors and to each member company not represented on the Board. At the end of the report are 24 Exhibits followed by 4 Annexes, most fold-outs. "The Lake Carriers' Association represents U.S.-flag vessel operators on the Great Lakes. The Association's 13 member companies operate 49 U.S.-flag self-propelled vessels and tug/barge units ranging in length from 494 to 1,013.5 feet. These vessels can carry more than 100 million tons of cargo in a year. Iron ore, limestone and coal are the primary commodities carried by 'LCA' members. Other cargoes include cement, salt, sand and grain." On September 10, 1954, the Board of Directors of Lake Carriers' Association authorized the Robert Heller & Associates, Inc. to make a factual study and to submit a report of the effects (both advantageous and disadvantageous) of the completion of the St. Lawrence Seaway upon the operation of vessels enrolled in the Association and the resultant effect upon the national economy and the national defense. Text includes the importance of shipping to the Great Lakes Region, international trade, cargo carried by Association vessels, international traffic, forecast of ore flow, Upper Lakes ore traffic, Seaway ore traffic, Coal traffic, Limestone traffic, operating costs, major grain movements, growing international trade, surplus capacity in Upper Lakes fleet, more Labrador ore a possibility, regional and nation-wide impact on the national economy, the effect on the national defense, etc. Exhibits include ore, coal, limestone and grain shipments from 1943 - 1053; the relative importance of ore, coal, limestone and grain cargoes to the Association Bulk Freighters and Self-Loaders; Gross tons of ore required to produce one net ton of Pig Iron; Relationship of projected ore shipments to fleet carrying capacity in a 240-day season with Labrador producing 10,000,000 - 19,000,000 gross tons; projected grain shipments in 1960; production and exports of U.S. wheat; etc. Annexes include the Welland Canal; Operating and Construction Costs of U.S. and Foreign Vessels; Facilities for Handling Bulk Commodities; and Sources and Routing of U.S. Wheat for Export in 1960. Binder covers lightly rubbed at edges and at spine along with what appears to be 2 paint marks to rear cover. Very good. A thorough and interesting report. $250.00

(43084)

LAKE CARRIERS' ASSOCIATION

CENTENNIAL OF GREAT LAKES SHIPPING 1855 1955

Cleveland 13, Ohio

March 11, 1955.

To: MEMBERS OF THE BOARD OF DIRECTORS

Subject: THE HELLER REPORT

On September 10, 1954 the Board of Directors of Lake Carriers' Association authorized the engagement of Robert Heller & Associates, Inc. to make a factual study and to submit a report of the effects (both advantageous and disadvantageous) of the completion of the St. Lawrence Seaway upon the operation of vessels enrolled in the Association and the resultant effect upon the national economy and the national defense. At the same time, the Board of Directors directed that the Association take no further action with respect to a treaty between the United States and Canada relating to the restriction of trade between the two countries unless such action was specifically authorized subsequently to the receipt of such report.

Robert Heller & Associates has now completed its report and a copy is herewith transmitted to each member of the Board of Directors and to each member company not represented on the Board. The Advisory Committee has directed that the Association comment as follows with respect to the report:

(a) The report in its entirety is that of Robert Heller & Associates, submitted in accordance with the resolution of the Board of Directors of September 10, 1954, and is not the report of the Association, its officers, directors or members;

(b) At this time the Association neither approves nor disapproves the report and has no comment with regard to the accuracy or inaccuracy nor the soundness or unsoundness of the facts, data, materials, findings and conclusions contained in the report; and

(c) The Association does not advise its members or any of them in their vessel operations as to any action which should be taken or not be taken in the light of the matters contained in the Heller Report.

The Advisory Committee also directed that the Association should take no further action with respect to a treaty between the United States and Canada relating to the restriction of trade on the Great Lakes between ports of the two countries to vessels built in and owned by citizens of either country.

The Advisory Committee further directed the President of the Association to create a special committee which, for convenience, is to be known as the Committee on the Heller Report. The functions of this Committee are single in purpose; namely, the formulation of recommendations to the Association as to whether or not the Association, by reason of the public interest in the maritime industry of the Great Lakes, the national economy and the national defense, should propose a program to the executive and legislative branches of the government of the United States and, if such program be recommended, the details with respect to it.

For your information, the Committee on the Heller Report has been set up with the following membership:

H. S. Taylor, Chairman

D. L. Coy
J. H. Kerr
D. C. Potts
John Sherwin
A. T. Wood

One member (as yet unnamed) from M. A. Hanna Co.

The purpose of the Heller Report being to enable the Association to determine its position with respect to submission of a program to the executive and legislative branches of the government of the United States, the report will not be released beyond distribution to Directors and member companies until after the Association's position has been determined. You are accordingly requested to limit use of the report to your own individual perusal and consideration.

Respectfully submitted,

LAKE CARRIERS' ASSOCIATION

By Lyndon Spencer
President

LS:ep
Encl.

ROBERT HELLER & ASSOCIATES
INCORPORATED
UNION COMMERCE BUILDING
CLEVELAND 14

December 31, 1954

Lake Carriers' Association
Rockefeller Building
Cleveland 13, Ohio

Dear Sirs:

We are pleased to submit our report of the effects of the completion of the St. Lawrence Seaway upon the operation of vessels enrolled in the Lake Carriers' Association and the resultant effect upon the national economy and national defense.

Submission of the report fulfills the assignment outlined in our agreement dated September 10, 1954.

We wish to express our appreciation for the assistance of officers and members of the Association, in particular, and for the cooperation of others in the industry who supplied information which greatly facilitated our work.

Very truly yours

F L Elmendorf

F. L. Elmendorf
Senior Vice President

CONTENTS

CONTENTS

EXHIBITS

CONTENTS

EXHIBITS

ANNEXES

INTRODUCTION

This report has been prepared by Robert Heller & Associates for the Lake Carriers' Association of Cleveland, Ohio.

The assignment, begun September [illegible], 195[illegible], called for a factual study and appraisal [illegible] of the effects, [illegible] of the completion of the St. Lawrence Seaway upon the operation of vessels enrolled in the Association and the resultant effect upon the national economy and national defense.

The Lake Carriers' Association

Members of the Lake Carriers' Association are fleet operators engaged primarily in the transportation of bulk commodities on the Great Lakes. The [illegible] vessels enrolled in the Association [illegible] included most of the bulk cargo ships operating on these waters under United States registry.

There are two principal types of bulk carriers. One is the [illegible] "straight decker," [illegible] to equipment on the docks. The other [illegible] is the self-unloader, which discharges cargo [illegible] installed on board. Bulk freighters in service [illegible] ranged from [illegible] to [illegible] gross tons carrying capacity; self-unloaders from [illegible] to 10,[illegible] gross tons. Neither bulk freighters nor self-unloaders are suited to the transportation of general cargo, such as packaged [illegible] commodities.

Bulk Commodities

The [illegible] carried by Association vessels are [illegible] iron ore, coal, limestone, and grain. [illegible]

INTRODUCTION

This report has been prepared by Robert Heller & Associates for the Lake Carriers' Association of Cleveland, Ohio.

The assignment, begun September 13, 1954, called for a factual study and submission of a written report of the effects, both advantageous and disadvantageous, of the completion of the St. Lawrence Seaway upon the operation of vessels enrolled in the Association and the resultant effect upon the national economy and national defense.

The Lake Carriers' Association

Members of the Lake Carriers' Association are fleet operators engaged primarily in the transportation of bulk commodities on the Great Lakes. The 321 vessels enrolled in the Association in 1954 included most of the bulk cargo ships operating in these waters under United States registry.

There are two principal types of bulk carriers. One is the bulk freighter, unloaded by equipment on the dock. The other is the self-unloader, which discharges cargo over conveyors installed on board. Bulk freighters in service in 1954 ranged from 5,800 to 24,000 gross tons carrying capacity, self-unloaders from 3,000 to 19,600 gross tons. Neither bulk freighters nor self-unloaders are suited to the transportation of general cargo, such as packaged or crated merchandise.

Bulk Transportation

The dry bulk commodities carried by Association members are primarily iron ore, coal, limestone, and grain. These cargoes dwarf

traffic in other commodities, such as cement, sand, scrap steel, sulphur, and pulpwood, which are also carried on the Great Lakes. It is estimated that final 1954 figures will show lake traffic of about 149 million net tons in the four major commodities, in comparison with an estimated 4 million net tons for all other dry bulk shipments.

For the purposes of this report, the four major commodities - iron ore, coal, limestone, and grain - are considered to constitute bulk transportation on the Great Lakes.

Bulk Cargo Carriers on the Great Lakes

Association vessels represent about 95% of the capacity of the entire United States lake fleet capable of transporting dry bulk commodities. Of the 321 enrolled in 1954, 260 were bulk freighters and 42 were self-unloaders. There were nine ships with deck cranes, carrying cargo such as scrap steel, and the remaining ten were miscellaneous craft, barges, and towing tugs. The 302 bulk freighters and self-unloaders had a combined carrying capacity of abour 3.4 million gross tons per trip.

In addition to the United States fleet on the Great Lakes in 1954, there were 187 Canadian bulk carriers, including both bulk freighters and self-unloaders, mostly limited in size. The total combined per-trip carrying capacity of these ships was about 900,000 gross tons.

A growing number of small ships of foreign registry, other than Canadian, have been entering the Great Lakes. They are restricted

by law to international trade, and confined by size and construction mainly to general cargo. Some have loaded grain for transportation to Europe and have carried an occasional grain cargo between the United States and Canada.

Importance of Shipping to the Great Lakes Region

Shipping is a major element of the economy of the lakes region when viewed in terms of tonnage carried, employment, and investment.

In 1953, about 200 million net tons of iron ore, coal, limestone, and grain were transported on the lakes, more than twice the total tonnage carried through the Panama and Suez Canals. About 172 million net tons were carried in ships of United States registry. During that year, vessels enrolled in the Lake Carriers' Association alone were estimated to have transported about 168.5 million net tons and to have provided the equivalent of full-season employment for approximately 12,000 ship's personnel.

Preliminary figures indicate that in 1954 Association vessels carried about 133.5 million net tons and employed about 9,500 persons.

Based on replacement value at current construction costs, Association vessels represent an investment on the order of $1,060,000,000. Canadian vessels add about $238,000,000.

Port installations owned by railroads, shippers, lake carriers, and users, and employed in handling dry bulk commodities, represent

another billion dollar investment - not less than $840 million for the United States and $240 million for Canada.

In evaluating the effects of the St. Lawrence Seaway upon the operation of Association vessels, it is important to give consideration to all of the foregoing factors. Utilization of ships, manpower, and supporting facilities might all be materially affected.

The Seaway will permit the passage of larger and more competitive vessels to and from the Great Lakes and the sea. It will intensify both Canadian and foreign competition. It will open the door to the entrance of major quantities of competitive ore from Labrador and other foreign sources and may bring about marked changes in the shipment of many other products distributed in the Great Lakes region.

The St. Lawrence Seaway

The St. Lawrence Seaway has been the subject of public discussion by United States and Canadian interests for more than 100 years. Its development has been in negotiation between the two governments since before the turn of the century. The passage of the St. Lawrence Seaway bill by the 83rd Congress of the United States finally made joint action in its construction possible.

As presently forecast, the Seaway will become a reality, open to navigation, in 1959.

The program as adopted calls for improvement in navigation facilities from Lake Erie to Montreal. Among other things, locks

are to be built between Ogdensburg, New York, and Montreal, comparable to those in the Welland Canal which connects Lake Ontario and Lake Erie. These locks are to be 800 feet long, 80 feet wide, and 30 feet deep, supplanting the small locks now in operation. One of the present locks, a bottleneck, is only 270 feet long, about 44 feet wide, and 14 feet deep.

The Welland Canal, at present 25 feet deep, will be deepened to 27 feet. The Seaway also will have a minimum depth of 27 feet. The St. Lawrence River, between Montreal and the Atlantic, has a channel depth of at least 35 feet. Thus, the connecting link provided by the new waterway will permit the largest lake vessels in service and many ocean ships to travel from Lake Erie to the sea.

Cost of the Seaway navigation project is estimated at $300 million, one-third of which is to be borne by the United States. Coincident with the navigation development, a $600 million power project will be constructed jointly by the Power Authority of the State of New York and the Hydro-Electric Power Commission of Ontario.

It has been predicted that cargo tonnage of all types over the series of new waterways constituting the Seaway will eventually reach 45 to 50 million tons a year, according to estimates of various United States and Canadian authorities. Congress has stipulated that the United States investment must be liquidated in 50 years. The United States share of operating costs and interest and amortization charges are to be covered by tolls

levied on users. Toll charges are to be negotiated with the Canadian government.

Beneficial Effects Claimed for the Seaway

Benefits claimed for the Seaway pertain to economic progress and national defense and are related both to the navigation and power aspects of the project.

It has been stated that traffic over the Seaway will greatly expand commerce and industry in the Great Lakes area.

The power project, it has been said, is essential to provide low-cost energy for the growing industrial areas of southern Ontario, New York, and neighboring states.

A most obvious benefit, from the Canadian point of view, will be the opening of a large market for Labrador ore. It is pointed out that it will be possible to transport this ore over the Seaway to certain ports on the Great Lakes at a cost which will permit it to compete with United States ores and thus to share in the growth of the United States and Canadian steel industries.

From a long-term United States viewpoint, the use of Labrador ore would help conserve domestic deposits which are becoming less plentiful and more costly to use.

It is maintained that access to Labrador ore would strengthen the national defense, since in case of war the ore could be transported to the Great Lakes in the comparative safety of inland waters.

Another possibility is that construction of all but the largest ships needed in war could be undertaken on the Great Lakes.

It has been said further that the Seaway would relieve wartime pressure on United States and Canadian railroads and coastal ports.

In total, the purported advantages of the St. Lawrence Seaway are numerous, and many communities and industrial concerns have started planning for its opening.

International Trade

Of the 172 million net tons of major commodities transported in 1953 by vessels of the United States fleet, only about 6.8 million tons were in international trade between the United States and Canada. Vessels enrolled in the Lake Carriers' Association carried all but about 100,000 tons of this total. Canadians, much more active in international trade, transported on the order of 16 million tons in 1953. While total international volume for 1954 was probably lower than that of 1953, there is no reason to believe that the relationship between United States and Canadian tonnage has materially changed.

United States vessels are excluded by law from operating between Canadian ports. Likewise, Canadian ships are not permitted to operate between United States ports. The vessels of both nations, however, as well as those with foreign flags, may ply between ports of the two countries, and between any port on the Great Lakes and those of nations overseas. The St. Lawrence

Seaway, because of traffic patterns which will undoubtedly develop, should become an important highway for international trade.

The initial use of the Seaway for international traffic will probably be most marked by shipments of Labrador ore destined for United States ports, United States coal for Canadian ports, and Canadian and United States grain destined for European ports. If proponents of the Seaway are correct in their predictions, however, millions of tons of general cargo and petroleum will eventually move through it. It follows that determined foreign flag competition will be generated.

At present, foreign flag operators can employ only small and relatively inefficient ships in the Great Lakes trade because of navigation limitations. As a class they tend now to conduct a haphazard business, carrying whatever cargo is available and suited to their ships. As previously mentioned, they have participated, in a small way, in the grain business.

With the opening of the Seaway, foreign flag operators will be able to use large and more economical vessels. With their tremendous financial resources, they may even construct special ships for the Great Lakes trade capable of handling both general and bulk cargoes. Favorable construction and operating costs may permit them increasingly to penetrate the bulk trade between the United States and Canada on an organized and profitable basis.

Operators of United States ocean-going fleets also may find Great Lakes volume attractive and attempt to share in at least the overseas portion of it.

Canadian operators will make a vigorous effort to capture the United States-Canada bulk traffic, as will be shown later.

In passing, it should be observed that advocates of greater freedom in exchange of goods in the Free World may gain strength in the years ahead. Strong political and economic forces conceivably could make "Trade Not Aid" a more meaningful part of United States policy. Such a policy could bring about accelerated activity in Great Lakes international trade and further add to potential competition for United States-Canada bulk traffic.

After completion of the Seaway it seems apparent that vessels enrolled in the Lake Carriers' Association will be progressively exposed to new forms of competition. These circumstances will undoubtedly compel members to bid more aggressively for international traffic in bulk commodities in order to utilize ships and manpower.

Realignment of Sources of Ore

An evaluation of the effect of the Seaway upon Association vessels would be incomplete unless it were conducted against the background of all current activities with respect to realignment of sources of ore. Deposits outside the Great Lakes region are assuming increasing importance. Domestic ores will be supplemented

and to some extent displaced not only by Labrador ore but also by ore from Canadian deposits in the Superior area and from Venezuela.

Ore traffic on the St. Lawrence Seaway will contribute significantly to the foregoing realignment. Canadian deposits on Lake Superior will also, in time, yield increasing tonnage, adding to the international aspects of the Great Lakes ore trade.

The impact of these developments, occurring before and concurrent with the opening of the Seaway, may alter the character of the Great Lakes ore trade materially. While not entirely attributable to construction of the new waterway, such changes affect evaluation of the problems that will face Association members.

In the following sections of the report, all principal forces which may influence transportation of major bulk commodities on the Great Lakes in both domestic and international commerce are given attention in order to view the effect of the Seaway in proper perspective.

THE LAKE CARRIERS TODAY

The bulk cargo fleet operating under the United States flag on the Great Lakes is first and foremost an ore fleet. Even as steel mills of the region have come to depend on these vessels for economical, low-cost transportation of iron ore, so the fleet depends on ore traffic for the major part of its revenue.

The relative importance of iron ore and other major commodities carried by ships of the United States, Canada, and other nations on the Great Lakes is shown by Exhibit 1. It is based on volume for 1953, the last full year for which complete figures are available. Iron ore, ordinarily measured in gross tons, is expressed in net tons on the chart for purposes of comparison. Exhibits 2, 3, 4, and 5 show total shipments of iron ore, coal, limestone, and grain for the years 1943 through 1953 and the portion of these shipments which was domestic traffic between United States ports.

Current information on the part played in this movement by different classes of vessels in the Association was considered essential to an appraisal of the effect of the St. Lawrence Seaway. A knowledge of the operating costs of these vessels was deemed equally necessary. None of this information was available from published sources. As far as is known, it had never been compiled.

With the cooperation of Association members, data covering 1953 operations were assembled and consolidated by Robert Heller & Associates on a confidential basis. The resulting analysis of cargo

carried covers the greater part of the bulk commodity movement in United States ships. Wage and other operating cost figures are believed representative of all United States lake shipping.

Cargo Carried by Association Vessels

Of the 302 bulk freighters and self-unloaders enrolled in the Lake Carriers' Association in 1954, statistics were obtained on 279, of which 243 were bulk freighters and 36 were self-unloaders. Information on utilization of bulk freighters, summarized in Exhibit 6, shows that iron ore was more than 97% of the cargo of vessels in excess of 16,000 tons capacity. It was more than 86% for those from 13,000 to 16,000 tons, and 73% for those from 10,000 to 13,000 tons. It made up a smaller portion of the cargo of ships under 10,000 tons.

Self-unloaders, as shown in Exhibit 7, do not ordinarily carry iron ore or grain. Stone was the principal cargo of the larger ships, coal of the smaller ones.

Exhibits 6 and 7 use the data reported by Association members to show the importance of various commodities to different classes of vessels. Exhibit 8 regroups the same data to show the importance of vessels, by significant broad categories, in the transportation of each commodity. On the exhibit, Association data are superimposed on the tonnage carried in all United States ships, as compiled by the U.S. Army Corps of Engineers, to show the extent of statistical coverage.

Iron ore was moved primarily in the larger bulk freighters. Ships carrying over 10,000 tons which were covered by reported data accounted for 70% of total tonnage.

Coal cargo carried by those vessels on which data were reported was about equally divided between bulk freighters and self-unloaders. Ships carrying less than 13,000 tons accounted for most of the volume. A substantial part of the unreported tonnage was probably transported in bulk freighters.

Limestone was transported primarily in self-unloaders, most of it in medium-sized vessels carrying 7,500 to 16,000 tons.

Grain moved mostly in the smaller bulk freighters. Vessels with less than 10,000 tons capacity on which reports were received accounted for 50.8% of the total grain moving in United States bottoms. A substantial part of the unreported tonnage is believed to have been carried in similar ships.

Revenue and Operating Results of Association Vessels

Rates covering the movement of bulk commodities on the Great Lakes are not regulated by the Government. They are negotiated by the carrier and the shipper, in some instances covering an entire season, in others a single voyage. Season rates are relatively stable, whereas single voyage rates fluctuate widely with the availability of shipping space.

In the absence of established schedules, the rates used for the transportation of the four principal commodities in connection

with this report are average contract rates for 1954, obtained from cargo brokers, shippers, and individual vessel operators.

A ship's revenue from each voyage depends on its carrying capacity as well as rates in effect for the cargo. Operating results for a season are further affected by utilization of the vessel, with profits dependent on making as many trips as possible and keeping idle time at a minimum.

It was noted, in connection with Exhibit 6, that virtually the entire cargo of the largest bulk freighters was iron ore. Vessels with carrying capacity of 10,000 tons or more could cover round-trip operating costs with revenue from a one-way cargo of ore, at average contract rates in effect in 1954. These ships sometimes carried return cargo, but frequently ran empty on the return voyage. Vessels with less carrying capacity did not have proportionately lower operating costs. To cover expenses, they required return cargo, which usually was coal.

All ships need to make as many trips as possible with pay load to spread the expense of fitting out at the start of a season and laying up for the winter. These expenses and depreciation are relatively fixed regardless of the length of a season. A reduction in the number of voyages increases the share of fixed expense to be covered by the revenue from each voyage and reduces the chance of covering costs. This is particularly true for the smaller ships which are, at best, marginal.

International Traffic

Less than 1% of the iron ore and only 2.8% of the limestone carried in Association vessels in 1953 moved in international trade. A larger percentage of the coal moved between United States and Canadian ports, as did a substantial part of the grain. This is shown in Exhibit 9.

The larger ships have not been subject to competition from ships of other nations because they have been engaged primarily in transporting ore and limestone between domestic ports. The smaller vessels, being more dependent on coal and grain, are exposed to a greater degree to Canadian and other competition.

International trade on the lakes is theoretically open to ships of any nation. In effect, it has been restricted to vessels of the United States and Canada because limitations imposed by existing St. Lawrence canals prevent all but the smallest foreign ships from entering the lakes to compete. Completion of the St. Lawrence Seaway will remove the limitation and throw this traffic open to foreign competition.

As indicated earlier, the opening of the Seaway and concurrent events will bring about noteworthy changes in the character of Great Lakes traffic generally. Probable consequences with respect to vessels enrolled in the Lake Carriers' Association, as well as on the national economy and national defense, can best be determined by examining the movement of each of the major bulk commodities.

FUTURE TRAFFIC PATTERN - IRON ORE

Iron ore's dominant position among cargoes on the Great Lakes makes it evident that any major shift in sources of supply will have an important effect on the pattern of traffic handled by bulk carriers on the Great Lakes.

Of significance is the fact that the steel industry has been developing new sources for many years. Development has been spurred by rising ore production costs and less plentiful high-grade United States reserves in the Lake Superior region. At the same time, the industry has sought and found better ways to use lower grade ores.

Notable among new supplies by any measurement, and foremost in potential impact on the Great Lakes fleet, are the deposits in the Quebec-Labrador region of Canada. Canadian deposits on Lake Superior, heretofore relatively undeveloped, also are being further exploited. South America, which like Labrador is a source of ore comparable in quality to the best Lake Superior ores, is assuming increasing importance. Continuing exploration promises to yield still more ore from abroad.

Transportation of ore to the steel mills of the United States, until recently an almost purely domestic enterprise, more and more takes on an international character. This change is already under way. The St. Lawrence Seaway will accelerate it.

Basic Assumptions

To bring into focus the impact of the changing traffic pattern on the Great Lakes fleet, probable iron ore flow after the Seaway opens has been developed. In preparing a forecast, the following basic assumptions have been made:

1. A relationship exists between pig iron production and the growth of the national economy as measured by gross national product.
2. A relationship exists between the natural iron content of an ore and the amount of pig iron it will yield.
3. A relationship exists between ownership of blast furnaces and ore reserves from which they will be supplied.

Relationship Between Pig Iron Production and Gross National Product

Projection of future iron ore shipments is complicated by variations in iron content of ores. If low-grade ores are used, more ore must be processed to make a given quantity of iron or steel than if high-grade ores are available.

Most iron ore passes through a blast furnace and is made into pig iron on the way to becoming iron or steel. According to the American Iron and Steel Institute Annual Statistical Report, slightly over 137 million net tons of ore were consumed by the steel industry in 1953. Approximately 112 million tons went into blast furnaces and 8 million directly into steel-producing furnaces.

Some 17 million tons were used in sintering plants, which aggregate finely powdered ore, but most of the sinter was in turn used in blast furnaces to make pig iron. For simplicity of analysis, iron ore consumption other than in blast furnaces has been disregarded, and pig iron production taken as an index of probable ore demand.

Gross national product is generally accepted as an index of growth of the national economy. For the past 20 years, pig iron production has increased at a lesser rate than gross national product. Leading economists expect this trend to continue, as evidenced by forecasts extending as far ahead as 1975. Estimates of gross national product and pig iron production which represent the consensus of several authoritative forecasts are charted in Exhibit 10.

The pig iron forecast shown in the exhibit may be considered by some to be too conservative, although it has been generally confirmed by industry authorities. It obviously does not take into account many imponderables which may cause production to deviate from the forecast. Economic prophecy is outside the scope of this report, as is any attempt to gauge year-to-year fluctuations in the business cycle. National emergencies, which would greatly increase military demand for iron and steel, are, of course, unpredictable.

For the purposes of this report it has been assumed that by 1960, the year after the Seaway is scheduled to be opened, annual

pig iron production will be at the level of 76 million net tons indicated by the exhibit. This is approximately 11 million tons greater than average production in the years 1952 through 1954.

The projected production of 76 million tons is less than existing blast furnace capacity. In dealing with consumption of iron ore for the future, therefore, no consideration has been given to increased capacity. Possible relocation of existing capacity has also been disregarded as a major shift in markets, greater than any expected within the period under analysis, would be required to justify the cost.

Relationship Between Iron Content of Ore and Pig Iron Yield

The quantity of ore required to produce a ton of pig iron varies with many factors. Among them are the type of blast furnace, the skill of the operator, and other variables which affect the yield from any one installation. Assuming, however, that these will average out over a large group of furnaces, the principal factor which determines the amount of ore required to make pig iron is the iron content of the ore.

Exhibit 11 shows the relationship between pig iron yield and the natural iron content of ores from major sources which will be used in the future. These factors, in conjunction with projected pig iron production, are used later in this report to forecast probable demand for ore.

Relationship Between Ownership of
Blast Furnaces and Ore Reserves

The flow of ore to furnaces owned by steel companies with interests in specific ore sources was the subject of conferences with officials of several major producers during the assignment. The confidential information thus obtained was used in conjunction with published data to view blast furnaces in terms of probable future sources and routes of supply, as set forth later.

Comparisons of the cost of mining operations and overland transportation to loading docks in South America, Canada, and United States upper lake ports are not available. Without them, the future competitive position of various ores in the open market cannot be appraised. Production cost appears relatively unimportant, however, as a factor in forecasting shipments in 1960.

Companies developing ore reserves in Labrador and South America will probably consume most of the initial output. The impetus to locate new sources and much of the capital invested came from companies seeking to become more self-sufficient in ore reserves. These companies may be expected to sell only limited quantities of ore to others until their own requirements are met.

In addition, the surest way for companies to secure a return on the investment they have made in ore reserves and production facilities is to use their own ore. Investment in Labrador has been reported to be on the order of $250 million. It has been indicated that $500 million or more will have been spent on beneficiation

plants to concentrate low-grade Lake Superior ores by the time the installations are completed. Investment in South American developments, particularly in Venezuela, is unknown but is undoubtedly substantial. In view of these investments, it appears reasonable to assume that as far as possible steel companies will consume ore from sources in which they have an interest.

For purposes of this report, it has been assumed that available supplies of Labrador and South American ore will be consumed principally in the furnaces of companies developing the deposits.

In establishing probable quantities of ore to be taken from new sources, two factors have been considered. The first is expected maximum output. The second is ability of interested companies to absorb this output. The amount of ore to be imported from South America is reasonably clear. Labrador's probable production is less well-defined.

Two levels of Labrador production have been projected in connection with this report. The first is an annual shipment of 10 million gross tons, the goal for 1956 and generally regarded as the minimum to be expected in 1960. A second level of 20 million gross tons has been visualized, based on information that Labrador mines are capable of an output of this amount. Twenty million tons, however, is slightly more than the probable yearly requirements of companies with an interest in the Labrador project. Annual output

of 19.1 million gross tons has been taken as the level to which Labrador production can be expanded and readily absorbed.

Other Assumptions

Two other assumptions have been necessary in forecasting the effect on Great Lakes shipping of changes in ore movement.

The first assumption is that in transportation of ore from Lake Superior business arrangements now existing will continue. Some steel companies own ore freighters and others have long-established relationships with independent fleets. It is assumed that these relationships will, in general, govern the selection of carriers to transport their ore from United States sources in the Lake Superior region.

The second assumption is that in competition for international traffic the carrier offering the lowest rates will be selected in spite of existing relationships.

Forecast of Ore Flow

Exhibit 12 groups 1954 blast furnace capacity by general location in the eastern United States in relation to major sources of ore. Furnace capacity of the group of companies with interests in Labrador is identified. With Labrador output at 10 million tons, the flow of iron ore to these groups of furnaces in 1960 may be expected to develop along the following lines.

Southern Furnaces

In the Southern area there are local ores of relatively low grade which, as shown earlier in Exhibit 11, average 35% natural

iron content. Economics dictate their continued use for some time. In 1960, consumption should be at a rate of about 7.5 million tons per year.

South American ores, principally from Venezuela, should flow through Gulf ports in 1960 at the rate of about 3.5 million tons to supply the rest of the requirements of the area.

Although furnaces owned by companies interested in Labrador are located in the area, they are unlikely to receive any ore from this source.

Atlantic Coast Furnaces

Approximately 1.5 million gross tons of local ores per year are expected to be used in furnaces shown in the Atlantic Coast area. South American mines in Chile and Peru, as well as Venezuela, will probably supply a total of 10.4 million gross tons per year through Atlantic ports by 1960. The remainder of the ore for this area, about 1.9 million tons per year, will no doubt come from Labrador.

In passing, it should be mentioned that British steel mills reportedly will take about one million gross tons of Labrador ore a year. Together, Atlantic Coast requirements and British demand should account for approximately 2.9 million tons. Using a 10-million ton base for Labrador production in 1960, and deducting the 2.9 million tons to be shipped via the Atlantic Ocean, 7.1 million gross tons per year should remain as traffic destined for Great Lakes furnaces via the St. Lawrence Seaway.

Great Lakes Furnaces

Great Lakes furnaces will use local ores, Labrador ore, concentrates, and high-grade upper lakes ores. It is estimated that about 4.75 million tons of local ores per year will be consumed.

A part of the 7.1 million tons of Labrador ore expected to move over the Seaway will go to Canadian consumers. It is estimated that they will take 600,000 tons. Thus, 6.5 million tons will probably reach United States furnaces in the Great Lakes area. Furnaces of the Labrador Group served through Lake Erie ports have ample capacity to consume this ore. Steel mills on Lake Michigan may be expected to continue using upper lakes ore.

Concentrates made from low-grade ores, such as jasper and taconite in the Lake Superior district, will provide another portion of the Great Lakes furnace supply. Production goals for beneficiation plants producing these concentrates indicate that by 1960 at least 13.25 million gross tons will be available annually. Canadian furnaces may take 750,000 tons, leaving about 12.5 million tons for use in Great Lakes furnaces.

As previously set forth, projected 1960 pig iron production of furnaces throughout the United States is 76 million tons. This includes roughly 4.1 million tons of pig iron to be produced by Western furnaces, not shown on Exhibit 12 since it does not affect the pattern of ore flow on the Great Lakes.

The indicated yield of Southern, Atlantic, and Great Lakes furnaces, using all ore and concentrates so far mentioned, should be approximately 33.1 million net tons of pig iron per year. In arriving at this figure, full consideration has been given to the relationship between iron content of ores and the pig iron which they will produce.

Allowing for 4.1 million tons from Western furnaces and 33.1 from others, the pig iron still to be accounted for is 38.8 million tons. It would be produced from high-grade ore from the Lake Superior district, embracing Michigan, Minnesota, Wisconsin, and Canadian deposits. Based on iron content, this would indicate a level of consumption in 1960 of about 62.5 million gross tons of high-grade Lake Superior district ore.

The foregoing projection of 1960 pig iron production and ore consumption is summarized in Exhibit 13.

Effect of Changed Ore Flow on Great Lakes Shipping

The amount of ore to be transported from upper lake ports in the Lake Superior district is of primary concern to members of the Association. Upper lakes ore traffic has been their principal source of revenue in the past. Except for shipments originating in Canada, these cargoes must by law continue to move in United States bottoms. The effect of the changed pattern of ore flow on Great Lakes shipping is considered in two parts - the upper lakes ore traffic and Seaway ore traffic.

Upper Lakes Ore Traffic

The ore to be transported from upper to lower lake ports in 1960 will include both high-grade ore and concentrates, as has been noted. If Labrador production is 10 million gross tons, Lake Superior district potential shipments can be expected to total approximately 75 million gross tons, made up of about 62.5 million tons of high-grade ore and about 12.5 million tons of concentrates.

Should Labrador production attain a level in 1960 as high as 19.1 million tons, previously mentioned as a possibility, Lake Superior shipments could be expected to decline to a level of about 65.4 million tons. This would be composed of 52.9 million tons of high-grade ore and 12.5 million tons of concentrates.

The estimates of shipments from Lake Superior include about 5.9 million tons from Canadian mines. Some of this ore will no doubt be carried in Canadian or foreign ships, reducing the quantity available to United States bulk freighters. At the same time, some 3 million tons of United States upper lakes ore not included in the estimates will go directly to steel-making furnaces.

For simplicity, the additional ore transported for steel furnaces and the blast furnace ore carried in Canadian or foreign ships are considered as offsetting each other and the total of upper lakes ore for pig iron is taken as the cargo available to United States ships.

Calculation of the annual amount of ore that can be carried by a fleet requires some assumption as to length of operating

season. While Association members reported that many vessels operated between 220 and 230 days in 1953, navigation was possible for more than 240 days on the average during the last decade.

Increasing competition may be expected to cause owners to operate for as long a period as possible in efforts to cover costs. A 240-day season has, therefore, been assumed in the comparisons which follow.

Exhibit 14 relates carrying capacity of the entire 1954 United States ore fleet in a 240-day season to the amount of Lake Superior district ore which would be transported in 1960 if Labrador shipments were only 10 million tons. Effect of the assumption that established relationships will give certain fleets priority on a portion of the cargoes is indicated on the exhibit.

If the entire United States ore fleet is considered, vessels operating under established relationships might be expected to have first call on 67,545,000 gross tons. This would leave 7,485,000 tons of a 75,030,000-ton total to be carried in the remaining ships. These ships have an annual carrying capacity of 26,054,000 gross tons, 18,569,000 tons more than would be needed.

The disparity between carrying capacity and the tonnage to be moved indicates that some vessels will be forced out of the upper lakes ore trade. Unless they can find employment elsewhere, the smaller, least profitable bulk freighters will, in general, be the ones most likely to be laid up. The exhibit indicates that carrying

capacity equivalent to all ships of the United States ore fleet of less than 10,000 tons might be surplus. In actuality, some of these small vessels would probably be used under established relationships or for movement of bulk commodities to the few ports which cannot accommodate larger vessels. To the extent that smaller ships continue to carry ore, surplus capacity would be created among larger vessels.

Using only ships of 10,000 tons and over, operators with established relationships would account for 64,493,000 gross tons of cargo. There would be 10,537,000 tons left for others. The remaining ships capable of carrying 10,000 tons or more can transport 12,168,000 tons in a season. Thus, even without the smaller ships, there would still be 1,631,000 tons excess capacity at the lower level of Labrador output.

Exhibit 15 shows the relationship between 1954 capacity and Lake Superior district ore to be transported with Labrador producing 19.1 million gross tons. Lake Superior shipments would decline to 65,390,000 gross tons. It is assumed that vessel operators with established relationships would have first call on 58,598,000 tons. There would remain 6,792,000 tons of ore to be transported, and ships with 35,001,000 tons annual capacity available to handle it. Surplus capacity would amount to 28,209,000 tons.

Even with the fleet reduced to vessels of over 10,000 tons, surplus capacity would be large. Under these conditions, established relationships would cover shipments of 57,766,000 gross tons. The

remaining 7,624,000 tons of ore would fall far short of filling the 18,895,000 tons of capacity available. Surplus capacity in 10,000-ton ships could reach 11,271,000 gross tons.

The implications of the foregoing analysis become clear with consideration of the fact that in 1954 there were 83 vessels of less than 10,000 tons capacity enrolled in the Lake Carriers' Association alone. They had a combined per-trip carrying capacity of 669,000 gross tons or an annual carrying capacity of 16,938,000 tons in the Lake Superior trade in a 240-day season.

Based on actual operations as reported by Association members, ships carrying less than 10,000 tons were stated to have transported 14,930,000 tons of ore in 1953. Revenue from this cargo, at the average 1954 rate of $1.60 per ton, would amount to $23,888,000. These are the vessels which may not be needed in the Lake Superior ore trade if Labrador shipments are only 10 million tons.

If 19.1 million tons are shipped from Labrador, less ore will move from upper lake ports and even fewer ships will be needed in the Lake Superior trade. Surplus capacity, as noted, would amount to about 28,209,000 tons in a season. This represents the capacity of the 83 ships of less than 10,000 tons which would be surplus at the lower level of Labrador production, plus 11 million tons of the capacity of larger vessels.

Seaway Ore Traffic

Some of the vessels withdrawn from the upper lakes ore trade may seek to find a place in the Labrador traffic over the Seaway.

In determining possibilities along these lines, consideration has been given to the outlook for profitable operation at anticipated rates and the competitive forces which will be encountered.

Labrador ore is loaded on ships at Seven Islands, near the mouth of the St. Lawrence River. The run from Seven Islands to Ashtabula, Ohio, an important ore unloading port, serves as an example of a Seaway ore run. At the very best, it will probably take a day and a half longer than a trip from Duluth, Minnesota, to Ashtabula, a typical run in the Lake Superior trade. Mileages are approximately equal but there will be more locks to slow the trip over the Seaway than there are in the upper lakes. Further, it is estimated that 12 hours will be consumed in transit of the Welland Canal in each direction.

There is widespread belief that increased traffic will make the Welland Canal a serious bottleneck and that average time of transit may run well above 12 hours each way. A review of existing and probable future conditions, attached to this report as Annex I, indicates that this contention is not necessarily true.

Seaway Rates

If the average of ore rates negotiated when the Seaway opens were to be the same per ton from Seven Islands as it is from Duluth, a vessel's daily revenue would obviously be lower in the Seven Islands run because of the greater time required for the trip. Based purely on running time, it is estimated that a rate of at least $2.00 per ton from Seven Islands to Ashtabula would be needed to equal a

$1.60 rate from Duluth. In view of other factors which will influence charges for transporting ore over the Seaway, however, it appears probable that the net rate, exclusive of tolls, will be less than $2.00 per ton.

Charges for transporting ore over the Seaway will be a matter of negotiation between shipper and carrier, as on the Great Lakes today. Rates at which contracts will be made will depend on competition.

International commerce is open to ships of any nation. Competition accordingly should prove keener for international ore cargoes originating in Labrador than for domestic shipments from the upper lakes which must by law move in United States ships. In addition to United States owners, Canadian and foreign flag operators with substantial cost advantages will be seeking Seaway business. Moreover, there is a competitive route by which Labrador ore can reach inland United States furnaces, which must be taken into account.

Furnaces on the Atlantic Coast and at Great Lakes ports can be reached by direct water shipment. It is improbable that any routing involving land transportation will be able to match the low cost of all-water movement to these plants. Delivery of either upper lakes ore or Labrador ore to inland furnaces, such as those in the Pittsburgh area, on the other hand, requires transshipment by rail from a lake or ocean port, providing a choice of routes.

Ocean-going ore carriers operating under foreign flags carried Labrador ore to Baltimore and Philadelphia in 1954 for transshipment

by rail to inland mills. Rates over this route and unloading charges apparently varied materially, depending on the ships used. It is impossible at this time to predict what combination of water rates from Seven Islands to Atlantic ports, transshipment costs, and rail rates to inland points will prevail in 1960. Examination of some of the possibilities, nevertheless, gives a rough indication of what shippers may be willing to pay for ore shipments over the Seaway.

In 1954, a fairly representative charge for transportation of Labrador ore from Seven Islands to Pittsburgh by way of ocean ports appears to have been $5.00 per gross ton. This included water transportation to Baltimore or Philadelphia, handling charges from ship to railroad car, and rail transportation to Pittsburgh.

Railroads serving Baltimore and Philadelphia are now seeking to reduce the rate on iron ore to Pittsburgh. Transshipment charges seem likely to be decreased, and ocean rates from Seven Islands may go lower if more carriers with larger ships compete for the traffic. Cost of ocean route shipments to Pittsburgh may go as low as $4.40 per gross ton, based on 1954 levels of wages and other operating costs.

Ore shipped from Labrador over the Seaway could go through any of several lake ports. Ashtabula, Ohio, may be taken as an example. In 1954, it cost approximately $2.40 per gross ton to transfer ore from ship to rail at Ashtabula and transport it to Pittsburgh. Deducting $2.40 from the possible ocean route cost of $4.40 leaves $2.00 to cover shipping charges over the Seaway.

Water transportation charges over the Seaway must cover tolls still to be established. A toll of 50 cents per net ton on iron ore was mentioned in Congressional hearings on Seaway legislation. It seems improbable that the toll will be this high. Assuming a toll of 25 cents a gross ton, the net return to the ship operator from a total charge of $2.00 would be $1.75 per ton. Unless there is a general increase in labor and other costs, it is doubtful that shippers will have to pay more for transportation of ore from Seven Islands to Ashtabula, indicative of the probable pattern to lower lake ports.

Under these circumstances, a United States ship carrying less than 10,000 tons probably will not be able to operate profitably in the Labrador trade. As indicated earlier, it would require a net return of at least $2.00 per ton after tolls on the Seaway to equal $1.60 per ton in the Lake Superior trade. Small ships in the upper lakes ore trade covered costs in 1953 only with return cargo. Any increase in operating costs would put them at a greater disadvantage.

Vessels carrying 10,000 tons or more have been able to cover round-trip costs without return cargo in the upper lakes ore trade. Cost coverage would be almost as good in the Labrador run at $1.75 per ton for ore if a return cargo of coal were carried 40% of the time. As much as 45% return cargo is not unreasonable to expect as will be seen later. With such return cargo, operators of some United States ships may find it possible to carry Labrador ore profitably over the Seaway at rates based on shipping costs through Atlantic ports.

Ore rates on the Seaway will also be influenced by Canadian and foreign competition. Ore traffic from Seven Islands to United States ports and the return movement of coal will be international commerce. As such, both will be open to ships of any nation. Canadian lake fleet operators expect the Seaway to put them in the ore business on a substantial scale for the first time. They are awake to the competitive aspects of the situation and may be expected to react accordingly.

Wage costs of Canadian ship operators in 1954 were about 60% of United States costs. Labor is working to close this gap, but Canadian costs are unlikely to approach those of the United States fleet for some time. With somewhat lower construction costs for ships of equal capacity, liberal depreciation allowances, and a favorable balance between grain moving one way and iron ore the other, as will be explained later, Canadians would have a comfortable profit margin at $1.75 per gross ton, exclusive of tolls. They should be in a position to quote an even lower rate if necessary to insure that ore will move from Labrador to Great Lakes furnaces in their vessels.

Foreign flag operators will have still lower costs than the Canadians. The comparative cost of building and operating United States and foreign flag ships is set forth in Annex II. Based on this comparison, it appears that foreign flag operators would have an even greater margin of profit than Canadian shipowners.

In view of present and probable competition, and resultant rates, it is apparent that operations of United States vessels are not likely to be as profitable carrying Labrador ore as they have been carrying Lake Superior ore. The smaller United States vessels, which have covered costs by a narrow margin under the best conditions, will have great difficulty competing at all for Labrador trade.

Canadian Participation in Seaway Ore Traffic

In order to determine the amount of Labrador ore that may be available to the United States lake fleet as a whole, it is necessary to consider the capacity and probable utilization of the Canadian fleet.

In 1954, excluding self-unloaders, there were over 150 ships in the Canadian lake fleet capable of carrying iron ore. Many were small, designed for the 14-foot St. Lawrence canals, but of the 68 larger ones in the upper lakes fleet, at least 21 had capacity of over 10,000 tons. Some carried over 20,000 tons. The combined per-trip carrying capacity of the 21 vessels was 317,860 gross tons.

The Canadian fleet was built originally to move grain from Lake Superior to eastern cities where it is consumed or loaded for export. It seems probable that Canadian shipowners will continue to give high priority to this traffic in the future. Grain has been their primary source of revenue and, as a matter of policy, seems likely to continue to be the principal Canadian cargo in view of its importance to the national economy.

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Most of the Canadian grain transported on the Great Lakes moves between Canadian ports, rather than internationally. Thus, it will not be available to United States or foreign flag ships. Exclusive access to this grain as a return cargo will give Canadian owners the tremendous competitive advantage of high utilization for many ships in the Labrador ore trade.

Approximately 7% of the capacity of the 1954 Canadian upper lakes fleet would be needed to handle the grain shipments expected to move through Georgian Bay ports. Ships in this run will not be a factor in the Labrador ore trade.

Another 60% of the Canadian fleet could move the remaining grain from the head of the lakes to St. Lawrence River ports, carrying ore from Labrador to Lake Erie on the westbound voyage. The largest and fastest Canadian vessels may operate in this trade. Low costs and high utilization would put the owners in position to meet any competition and quote ore rates low enough to insure them the lion's share of the traffic. They should be able to transport 6 million tons of ore in a season. At a level of Labrador shipments of 10 million tons, 7.1 million tons may move over the Seaway. Canadian ships and those United States vessels affiliated with Labrador interests, which will undoubtedly be put in this service, would have more than enough capacity to carry all of it.

With Labrador production at the 19.1-million ton level, 16 million tons of ore per year may move over the Seaway. Canadian

ships in the combined grain and ore trade would be capable of transporting 6 million tons. United States ships affiliated with Labrador interests seem likely to account for another 4 million tons, leaving 6 million tons as potential cargo for other ships.

As has been noted, 67% of the Canadian upper lakes fleet may be employed carrying grain, 7% operating between Lake Superior and Georgian Bay, and 60% transporting grain as return cargo for Labrador ore. The other 33% would compete with United States and foreign flag shipowners for ore and any return cargo available. Capacity of this segment of the Canadian fleet should approximate 5 million tons of ore in a season.

Coal is potential return cargo for vessels of any nationality in the Seaway ore trade. Canadian operators will have competition from United States lake shipping and perhaps from United States and foreign ocean fleets for the combined ore and coal traffic.

The amount of foreign competition and new Canadian construction will determine to a great extent whether Canadian owners force rates below levels at which United States operators can successfully compete. Unless more competition develops, it is possible they may prefer to let Seaway ore rates seek a level reflecting United States costs and the rates that will be in effect over the alternate route through Atlantic ports. This level might approach $1.75 per ton, as indicated earlier, which would provide a good margin for the large part of the Canadian fleet carrying grain and ore.

Seaway Cargoes Available to United States Vessels

United States shipowners can look for little opportunity in the Seaway ore trade at a 10-million ton level of Labrador shipments. When production reaches the higher levels which appear possible, efficient operators should be able to compete. At a 19.1-million ton level, approximately 6 million tons should be available in addition to ore carried by Canadian grain ships and United States vessels affiliated with Labrador interests, as noted previously.

The most profitable return cargo is likely to be the approximately 4.5 million tons of coal which may move annually from United States lake ports to the Province of Quebec, as is shown in the section of the report devoted to coal and limestone. Fleets affiliated with Labrador interests may carry some of it. Large ore ships generally have not, however, sought coal as a return cargo and may not in the Labrador run. Such ships constitute a substantial part of the ship capacity of the Labrador interests. The smaller Canadian vessels may be expected to make a vigorous drive to obtain the traffic even though they can make a profit without it, since it will represent added revenue at little additional cost.

If all vessels except the grain ships were to compete for coal as a return cargo, 4.5 million tons of coal would be divided between the ships owned by Labrador interests, carrying 4 million tons of ore, and other United States and Canadian vessels competing for 6 million tons of ore. Under these circumstances, coal would be

available as return cargo for an average of 45% of the vessels seeking it. To the extent that larger ships do not participate in this traffic, a greater percentage of smaller ones could find return cargo.

Potential Competition from New Ships

Other interests may seek a share in the Labrador ore trade as the flow increases and the Seaway attracts ocean shipping. Moreover, increasing output by Canadian mines on Lake Superior might play a part in stimulating investment in lake shipping. It is advisable, therefore, to consider the relative incentives for foreign, Canadian, and United States shipowners to build vessels to compete for international ore traffic.

Foreign Flag

Foreign flag operators, to compete effectively with Canadian and United States ore carriers, would need ships of comparable carrying capacity, speed, and ease of loading and unloading. With limitations imposed by the Seaway on draft and beam, such ships would probably not be typical ocean-going vessels. It appears that unless a new design is developed, serious foreign competition could come only from ships built along Great Lakes lines.

Opinion of experienced shipbuilders indicates that the problem of bringing a foreign-built lake carrier across the ocean would not be insurmountable. Once here, it could be serviced by United States or Canadian yards without difficulty. Moreover, it is not inconceivable that foreign ingenuity, backed by large financial resources,

might lead to development of a new type of vessel capable of operating competitively both on the lakes and on the open ocean, and of carrying either general or bulk cargo.

The extent of the incentive to build ships to compete on the Great Lakes and the Seaway can be indicated by a comparison of what may be termed "rate of profit". In this instance, rate of profit is considered to be the margin of revenue over direct operating costs, reduced by 2% of initial cost to allow for depreciation, but disregarding administrative and other overhead. Foreign cost levels are illustrated in Annex II.

A typical foreign-flag, lake-type bulk carrier with 20,000 tons capacity may be taken as an example. Constructed abroad but operating full time in the Labrador ore trade at foreign wage rates, it could earn the same rate of profit at about $1.33 per ton from Seven Islands to Lake Erie which a United States flag carrier could earn at $2.00 per ton. As noted earlier, $2.00 from Labrador is equivalent to a rate of $1.60 from Lake Superior. An ore rate of $1.33 per ton thus would stimulate foreign construction. Anything higher than $1.33, such as the $1.75 mentioned earlier, would offer foreign capital additional incentive to build ships for this trade.

The financial incentive for foreign operators to build ships exclusively for Great Lakes trade appears substantial. In practice, labor problems may prove to be a limitation. It may be difficult to recruit foreign crews at low ocean rates for the comparatively short

Great Lakes season. More significant is the probable effect on labor relations on the lakes which will, in any event, be exposed to many unsettling influences when ocean-going ships begin to appear in lake ports in increasing numbers. Any large-scale attempt to use vessels with foreign crews in direct competition with United States and Canadian seamen would further complicate the problem.

Whether or not foreign operators build lake-type ships to engage in direct competition with United States bulk carriers, foreign ocean fleets may be expected to take advantage of opportunities opened to them by the Seaway. Scandinavian, British, German, Greek, Liberian, and Panamanian flags will be seen in Great Lakes ports. As foreign vessels move in, bringing all types of goods, every international cargo on the lakes will be a source of potential revenue. Ore, coal, and grain may all feel the impact.

Canadian

Under Canadian registry, a 20,000-ton ship would have higher costs than it would under a foreign flag, but would have the advantage of Canadian grain as a return cargo.

Running light from Montreal to Seven Islands, it could carry a load of ore to Ashtabula, run light to Fort William-Port Arthur, and return with grain to Montreal. Vessel utilization would be high since the ship would be empty for a relatively small part of the round trip.

With grain return cargo covering a proportionate share of costs, the ship could show the same rate of profit under Canadian registry

with an ore rate of about $1.34 that it could under a foreign flag carrying ore alone at $1.33 per ton. The rate of profit would be even better if coal were transported on the portion of the voyage from Lake Erie to upper lake ports.

Rather than making grain cover a proportionate share of costs, Canadian shipowners may find it advantageous to carry it at a reduced rate, perhaps as low as six cents a bushel between Fort William-Port Arthur and Montreal. This rate would be desirable from the Canadian point of view for two reasons - it would build good will in Canada and should make it unprofitable for a foreign ocean-going ship to travel as far as the head of the lakes seeking export grain. The foreign carrier would be able to make more money on trans-Atlantic cargo from Montreal.

A combination of a 6-cent grain rate with the $1.75 ore rate, mentioned earlier, would undoubtedly stimulate new Canadian construction. Canadian operators are already talking of building additional large vessels to operate in the grain and ore trade.

United States

United States lake carriers already face the prospect of surplus ship capacity, as has been shown. They will have little incentive to build additional ships, at least until the competitive situation becomes clearer.

Operators of United States ocean fleets cannot afford to overlook the general cargo trade which will develop over the Seaway to and from

foreign ports. There does not appear to be much reason, however, to expect them initially to build ships specially for transportation of bulk cargo on the lakes and the St. Lawrence in the face of Canadian and foreign cost advantages.

Conclusions

The future pattern of iron ore traffic will increasingly become international as the steel industry gets more ore from beyond the Great Lakes region. Many vessels now enrolled in the Lake Carriers' Association will no longer be needed to carry ore from the Superior area.

Displaced vessels are unlikely to find profitable employment carrying ore from Labrador in the face of Canadian and possible foreign competition. Consideration of the outlook for use of these ships in transportation of other bulk commodities follows.

FUTURE TRAFFIC PATTERN - COAL AND LIMESTONE

In tonnage handled by United States bulk carriers on the Great Lakes, coal ranks second to iron ore. As noted earlier, substantial volume moves as return cargo for bulk freighters in the upper lakes ore trade. Most of the remaining tonnage is carried by self-unloaders.

Bulk shipments of limestone are next to coal in tonnage. The complementary nature of the traffic patterns of coal and limestone makes it desirable to consider them together.

Great Lakes Coal Traffic

Total coal tonnage shipped on the Great Lakes from 1943 through 1953 was shown in Exhibit 3 to have a slight downward long-term trend. Marked drops in volume of United States shipments in 1946 and 1949 resulted chiefly from coal strikes in 1946 and 1948 and the 3-day work week temporarily adopted by miners in 1949. The total shipped in 1953, according to the annual report of the Lake Carriers' Association, was approximately 51 million tons.

Major coal movements out of Lake Erie ports in 1953, accounting for about 41 million tons, are shown by Exhibit 16. The other 10 million tons was scattered local traffic of less importance. The major movements formed three broad patterns.

The first pattern was the westbound long-haul movement from Lake Erie to the upper lakes. In 1953 this amounted to about 21.4 million tons, of which 17.7 million tons went to United States ports and

3.7 million to Canadian ports. This coal traffic provided highly desirable return cargo for bulk freighters carrying ore from the Lake Superior district to the lower lakes. It represented added revenue for these ships which otherwise would have returned empty.

In the section dealing with present traffic it was noted that coal made up a substantial portion of the total cargo carried in bulk freighters of less than 13,000 tons capacity. It also represented the difference between profitable and unprofitable operation for typical vessels of less than 10,000 tons capacity.

The second broad pattern was formed by eastbound traffic out of Lake Erie ports. In 1953 it was approximately 6.6 million tons. This coal moved in international trade, going almost entirely to Canadian ports, and was mainly carried in Canadian ships.

The third important coal movement was the relatively short-haul tonnage from Lake Erie to the Detroit area. It totaled about 13 million tons in 1953. Data gathered from members of the Lake Carriers' Association indicate that the major portion of this short-haul coal traffic to Detroit moved in self-unloaders. Coal unloading facilities are limited in the Detroit area, as shown by Annex III.

Great Lakes Limestone Traffic

Most of the limestone moved on the Great Lakes in 1953 was quarried in Upper Michigan. It was used in the manufacture of steel, cement, and other products. There has been a steady increase in tonnage since 1943 as was shown by Exhibit 4. In 1953 there were

approximately 27 million tons carried on the Great Lakes. Almost all of this moved between United States ports, only 663,000 tons going to Canada.

Data gathered from Lake Carriers' Association members indicate that of the 27 million tons of stone moved in 1953, about two-thirds was handled in self-unloaders and one-third in bulk freighters.

Revenues and Operating Costs

Competition for westbound long-haul coal cargoes is intense. As a result, rates for this traffic are too low to make it profitable except as return cargo. In contrast, the short-haul coal trade between Toledo and Detroit, while competitive, moves at rates generally adequate to permit profitable operation carrying coal cargoes only. Return cargo, not usually available at Detroit, is not needed to cover costs. Some self-unloaders operate entirely in this one-way, short-haul coal trade.

Limestone rates closely parallel the rates for iron ore from Upper Michigan, where most of the stone that moves on the lakes is quarried. The largest self-unloaders carry limestone almost exclusively. Revenues are generally too low to permit smaller vessels to cover operating costs without additional cargo. Limestone, however, provides a return cargo for ships moving coal in the opposite direction to points beyond Detroit and gives smaller ships an opportunity to secure high utilization. In the combined limestone and coal trade they can operate profitably.

Probable Future Movement of Coal and Limestone

The President's Materials Policy Commission has estimated that total demand for United States coal will rise in the future, exceeding 800 million tons by 1975. This will undoubtedly be reflected in lake coal shipments to some areas, but does not necessarily mean an over-all increase in volume on the Great Lakes because of changes taking place in the character of the demand.

Exhibit 17 shows the trend of bituminous coal consumption in four major markets, constituting approximately 75% of the national total. In 1952, the latest year for which figures are available, bituminous coal represented about 90% of national coal production. There has been a marked decline in use by consumers supplied through retail dealers, and by railroads. There has been an increase in use by electric utilities and by the steel and coke industry which ranks high among industrial users. This increase seems likely to continue.

Short-haul Traffic

In Detroit and the adjacent industrial area, coal is the fuel chiefly used for generating electricity, the demand for which has been increasing. There is also a substantial industrial demand. Short-haul shipments to the Detroit area from Lake Erie have more than doubled in the past 20 years. In 1953, the total was about 13 million tons, of which 1.6 million went to Canadian ports.

During the time that coal traffic to Detroit has been growing, limestone traffic has also increased. This trend is expected to

continue as the steel industry draws more on Michigan quarries to replace costlier local supplies. Thus, in the field of short-haul transportation between Lake Erie and Lake Huron, increasing traffic both ways is indicated. With this growing volume, largely immune to foreign competition, the outlook is promising for the self-unloaders, which handle most of it.

Long-haul Traffic

Coal shipments to upper lake ports have declined in recent years due to losses in retail and railroad markets. Ore beneficiation plants in the Lake Superior region should use increasing amounts of coal, their ultimate requirements being estimated at 1.5 million tons a year. This would not be sufficient to offset the decline in other uses which has taken place in recent years, and there is no reason to expect a reversal of the declining trend in retail and railroad use.

In the projection of Lake Superior ore traffic in the preceding section of this report it was indicated that the carrying capacity represented by bulk freighters under 10,000 tons probably would not be required for transportation of ore after 1960. These smaller vessels could not operate at a profit in the long-haul coal trade exclusively. Ore vessels of 10,000 to 13,000 tons have adequate capacity to absorb westbound coal now carried in smaller ships but facilities in some ports will need improvement as shown in Annex III.

Seaway Traffic

A significant change will probably occur in the eastward movement of coal from Lake Erie to Canada. This will result from the opening of the Seaway and shifts in Canadian coal requirements.

Historically, a major portion of Canada's coal has been supplied by imports from the United States. Exhibit 18 shows United States exports to Canada as related to total Canadian coal requirements for the years 1943 to 1953.

United States coal goes almost entirely to the Provinces of Ontario and Quebec. Exhibit 19 shows shipments by both water and rail to these two provinces from 1943 through 1952, the last year for which figures were available. Exports to Ontario have been principally by water, those to Quebec primarily by rail.

Total Canadian coal requirements for the three years ending with 1953 are shown by Exhibit 18 to have declined perceptibly. This is attributed in part to mild winters. Changes in the character of demand have been less marked in Canada than in the United States.

The Dominion Coal Board has estimated total Canadian demand for 1965 at 45 million net tons as compared with 38 million net tons in 1953. By 1960, exports from the United States should be on the order of 4.5 million tons to Quebec and 21 million tons to Ontario.

The Coal Board forecast takes into consideration population growth, increased energy requirements, and potential expansion of

the Canadian economy. It also allows for dieselization of railroads, increased use of oil and gas for home and industry, and hydro-electric energy from the St. Lawrence power project.

Much of the 21 million tons of coal to be exported to Ontario will go to the Toronto-Hamilton area and hence will not move over the Seaway. On the other hand, the 4.5 million tons destined for Quebec will be potential Seaway traffic. Volume to be moved by this route will depend upon the cost advantage the rail-water combination offers over all-rail transportation.

Limited quantities of coal have moved to Quebec through the 14-foot St. Lawrence canals in Canadian vessels of less than 3,000 tons capacity. Coal has had to compete for space with grain going in the same direction, and grain alone has taxed the capacity of these small ships. As a result, rates for coal have been high, approximating $2.60 per ton from Lake Erie ports to Montreal. Even so, the rail-water cost has been somewhat lower than the cost of all-rail movement.

When coal can move as return cargo for Labrador ore, it is conceivable that rates charged may be comparable to the average contract rate of 70 cents per ton to upper lake ports. Allowing for estimated Seaway tolls, the rail-water route for bituminous coal could offer an advantage of as much as $2.00 per ton over rail movement at 1954 rates. All-rail transportation for anthracite in 1954 was less costly than for bituminous and, therefore, the saving offered by the

new route would not be as great, but could be on the order of $1.00 per ton.

Low-cost water transport and ample ship capacity should cause most United States coal exports to Quebec to move over the Seaway, although railroads might retain some of the traffic by offering lower rates.

United States exports of coal to northern Europe from Middle Atlantic ports were about 25 million tons in 1952. Indications are that volume will decline, although forecasting future European demand is difficult. Analysis of rail and water rates indicates a potential cost advantage in shipping through lake ports rather than Atlantic ports, whether the coal is loaded into ocean-going vessels at lake ports or transshipped at Montreal.

If the Seaway is used for export, Lake Erie ports will handle more coal than at present. Facilities at these ports are adequate to load all the coal now being exported from Atlantic ports. Transshipment facilities on the lower St. Lawrence would have to be provided, however, as indicated in Annex III, before export volume carried in lake vessels could reach substantial levels.

It should be recognized that by the time the Seaway comes into use there may be changes in basic transportation rate structures. Moreover, coal prices may fluctuate as producers in various areas compete for the export market. All these factors will play a part in determining which mines will supply export coal and how cargoes

will be routed. Some export coal will undoubtedly move over the Seaway.

Conclusions

Short-haul coal may be expected to move in greater volume in the future. Since limestone shipments also are increasing, the combined traffic presents a favorable outlook, particularly for self-unloaders. The large volume moving between United States ports will not be exposed to competition which may come in over the Seaway.

Long-haul westbound coal presents a less favorable outlook. It is already unprofitable except as return cargo for ore carriers, and does not appear to offer lucrative employment for ships idled by the change in flow of iron ore. With the largest ore ships not carrying coal and many small ones withdrawn from the trade, those retained in service may find more round-trip cargoes available.

Long-haul eastbound coal traffic is expected to increase in volume. It will be international commerce and will be sought aggressively as return cargo for ships carrying Labrador ore. Rates in general will undoubtedly be too low to permit profitable operation independent of the ore trade. Only the most efficient United States ships will be in line to get much of this business in the face of Canadian and foreign competition.

FUTURE TRAFFIC PATTERN - GRAIN

Grain ranks behind iron ore, coal, and limestone in tonnage transported on the Great Lakes. Annual shipments from 1943 through 1953 are charted in Exhibit 5. In 1953, more than 14 million net tons were shipped. Wheat, corn, oats, barley, rye, flax, and soy beans were included. Most of the 1953 tonnage moved in Canadian ships and less than one-fourth in United States bulk freighters.

United States participation in the grain movement was limited by the fact that over 8.5 million tons of the 14-million ton total was Canadian domestic commerce for which ships of other nations could not compete.

The average United States grain ship on the lakes in 1953, as indicated by data obtained from Association members, was a relatively small one, capable of carrying about 330,000 bushels, or 10,000 net tons, of wheat.

Several factors tend to limit the size of ships in the United States grain trade. One is shallow channels at many elevators, illustrated in Annex III. Problems encountered unloading ships which have too much height above water, and difficulty assembling a full cargo for the largest vessels, are other factors cited by some cargo brokers. In addition, United States operators with contracts to transport iron ore have, in general, used large freighters for ore as much as possible to keep costs down.

The foregoing factors do not materially restrict Canadian grain movement. Canadian docks and harbors at Fort William-Port Arthur, the principal loading port, and at Port Colborne and Georgian Bay ports, which are major transfer points, generally will accommodate large ships. Iron ore tonnage open to Canadians has been too small to compete strongly for ship capacity. The Canadian fleet has been primarily a grain fleet, with ships up to 20,000 tons operating in the grain trade.

Exhibit 20 indicates the 1953 pattern of grain movement between United States and Canadian ports and tonnage moved in vessels of the two countries. This exhibit shows that 2,635,000 tons were international shipments, and that 430,000 tons of United States grain and 7,670,000 tons of Canadian grain were destined for eventual export. These shipments were in 1953 in effect confined to United States and Canadian vessels. The only foreign ships which could participate were small ones able to pass through the 14-foot St. Lawrence canals.

With the opening of the Seaway, large foreign vessels will be able to enter the lakes and compete for these cargoes, which amounted to 10,735,000 tons of the total carried in 1953.

Major Grain Movements

Grain movements are subject to many influences which have caused volume to fluctuate widely in the past. The world market is affected by global economic conditions, commercial policies of different governments, and world-wide crop yield.

The amount of United States grain available for export is affected by the Nation's foreign policy, acreage control and price support policies, and domestic crop yield.

Unpredictable factors influencing production and markets make precise forecasting of grain movement impossible. The probable effect of grain movement over the Seaway on vessels enrolled in the Association may be viewed, however, in its broader aspects. Only grain movements of significant volume need be considered. These are:

1. United States wheat.
2. United States corn.
3. Canadian barley, oats, and wheat shipped to the United States.
4. Canadian grain shipped overseas.

United States Wheat

Total United States wheat production averaged more than one billion bushels per year from 1944 through 1953. This was roughly 35% higher than the average production for the 10 prior years. Production has increased faster than demand due in part to price supports. In spite of the Nation's foreign economic programs which have stimulated exports, total stocks of wheat in the United States have been built up to about one billion bushels, or the equivalent of a year's production.

United States wheat exports averaged approximately 350 million bushels per year from 1944 through 1953, chiefly through ocean ports.

This was some 7-1/2 times as much as the average for the 10 prior years. The substantial increase was due partly to a higher level of world-wide demand but more to United States foreign aid programs. Export price subsidies have sustained the flow even though the domestic price of United States wheat has been too high for it to be competitive in the world market. Exhibit 21 shows exports of wheat by type in 1953.

Informed opinion is that wheat production in 1960 should be about 850 million bushels, or roughly 150 million bushels below the 1944-1953 average. Two different groups of industry and Government experts have arrived at this estimate although their basic premises are diametrically opposed.

One group assumes that Government controls will continue and that imposition of minimum acreage allotments of 55 million acres in 1960 will keep production down.

The other group assumes that Government controls will be virtually eliminated and that the law of supply and demand in a free market will cause production to be adjusted downward.

Although in agreement on the forecast level of production, the two groups differ on United States wheat exports for 1960. The two schools of thought are presented in Exhibit 22. In the absence of general agreement, a reasonable assumption might be that exports will fall between the two extremes shown by the exhibit. For purposes of this report, it is assumed that exports in 1960 will be on the order of 167 million bushels.

It is probable that only a small portion of the 167 million bushels will move over the Great Lakes and the Seaway. Much will continue to move through ocean ports. A review of the sources and routing of the various types of wheat, attached as Annex IV, aids in estimating the volume which should be available to lake shipping in 1960.

United States wheat exports through Great Lakes ports in 1960 are estimated at 25 million bushels, or approximately 750,000 net tons. While this represents a noteworthy increase over 1953 export volume, it is still a small portion of the grain movement on the lakes, which totaled more than 14 million tons in 1953.

No substantial changes in consumption and distribution are foreseen which will affect domestic movements of wheat on the Great Lakes. It is assumed that shipment of wheat to the eastern United States for domestic use in 1960 will be approximately the same as it was in 1953, or 54,300,000 bushels (1,630,000 tons).

United States Corn

Total United States corn production averaged more than 3 billion bushels per year from 1944 through 1953. Only about one-fourth of the crop entered commercial channels. Most of the rest was used as feed on the farms producing it.

The North Central States normally provide about 85% of the corn going into commercial channels. Illinois, Iowa, Nebraska, and Minnesota are the principal growing areas. Informed opinion places

corn production in 1960 at approximately the 1953 level of 3 billion bushels.

Historically, corn has not been a major export crop. Exports, generally averaging less than 3% of total United States production, have varied widely, ranging in recent years from a low of approximately 5 million bushels in 1943 to over 133 million bushels in 1949. Exhibit 23 shows the export movement in 1953 which totaled 131,177,360 bushels.

According to unofficial estimates of the United States Department of Agriculture, corn exports are expected to drop from their 1953 level to somewhere in the neighborhood of 60 million bushels by 1960. This will be due primarily to strong export competition of South Texas sorghum grains and Argentine feed grains.

Most of the corn exports will probably originate in Illinois and Iowa, the major states producing a surplus. A good portion of the 60 million bushels will be exported out of Lake Michigan ports. Most of the balance will be exported out of New Orleans. The exact pattern of distribution will depend on rail, barge, lake, and ocean shipping rates. It is estimated that about 20 million bushels (570,000 net tons) per year will move over the Great Lakes, mostly out of Chicago. Of this, Canada may receive about 7 million bushels (205,000 net tons), the balance going overseas.

There is no reason to expect major changes which will affect the domestic movement of United States corn. Traffic on the lakes

in 1960 will probably approximate the 1953 level of 17 million bushels (475,000 net tons).

Canadian Grains Shipped to the United States

The principal Canadian grains shipped to the United States are barley, oats, and wheat.

Canadian barley is used in the United States by the brewing industry and also as a feed grain. Imports from Canada reached a high in 1953 when almost 32 million bushels were shipped from Fort William-Port Arthur. The average in the previous five crop years was approximately 14 million bushels. As a result of the large 1953 movement, an import quota was imposed by the United States. It is assumed that barley imports in 1960 will be at the quota level of 27,500,000 bushels (660,000 net tons).

Canadian oats are used in the United States chiefly as feed grain. Imports from Canada reached a high in 1953 when approximately 57 million bushels were shipped from Fort William-Port Arthur. The average in the previous five crop years was just under 37 million bushels. As in the case of barley, the United States has imposed an import quota. It is, therefore, assumed that imports in 1960 will be at the established ceiling of 40 million bushels (640,000 net tons).

Canadian wheat coming to the United States is largely frost-damaged grain for feed purposes. Some Canadian surplus wheat is also imported for feed. Volume fluctuates widely from year to year.

For example, lake shipments in 1952 were over four times the shipments in 1953. According to the Dominion Bureau of Statistics Shipping Report, 7,600,000 bushels of Canadian wheat were shipped to United States ports in 1953. For the purposes of this report, the 1960 estimate has been arbitrarily set at the 1953 level, equal to 230,000 net tons.

Canadian Grain Shipped Overseas

Canada is a major factor in the world wheat trade because of the quality and price of its wheat. Roughly 90% of the grain shipped in recent years between Canadian Great Lakes ports was destined for ultimate export. With no reason to foresee any change, it is assumed that the quantity of Canadian grain moved on the Great Lakes for eventual export will be virtually the same in 1960 as it was in 1953.

In 1954 it was less costly, by about 3-1/2 cents per bushel, to ship grain from Fort William-Port Arthur all the way to Montreal by water than to ship it to Georgian Bay ports for subsequent rail movement to Montreal. Notwithstanding, almost one-third of the Canadian grain took the shorter route through Georgian Bay. Limited storage capacity at Fort William-Port Arthur requires ships to make as many trips as possible during the peak season. In addition, excellent facilities and substantial grain storage capacity have been established at Georgian Bay ports. Grain stored there can be transported by rail to Atlantic coastal ports for winter export when the St. Lawrence River is closed.

Shipments of grain through Georgian Bay ultimately may decrease after the Seaway is opened if storage capacity on the lower St. Lawrence is increased and handling facilities improved. It is estimated, however, that 25% to 30% of Canadian grain will still move through Georgian Bay in 1960 for reasons stated above.

The only foreign vessels likely to seek grain at Fort William-Port Arthur, even after the opening of the Seaway, will be those with inbound cargoes which bring them to the upper lakes. Most trans-Atlantic grain ships may be expected to load at Montreal and other lower St. Lawrence ports. As pointed out earlier, a grain rate too low to attract ocean-going competition will probably be established between Fort William-Port Arthur and Montreal by Canadian operators engaged in this trade in combination with the Labrador ore trade.

Conclusions

A summary of probable grain traffic on the Great Lakes in 1960 is set forth in Exhibit 24. The projected total of 14,825,000 net tons represents only a relatively slight increase over the 14,385,000 tons transported in 1953. Indications are that, with the competition to be expected, grain will offer little opportunity for profitable employment of surplus ore ships.

Domestic Movement

As shown in Exhibit 24, the grain movement from United States ports for domestic use in 1960 may amount to 2,800,000 net tons. This cargo will be available only to United States vessels. More

important to members of the Lake Carriers' Association than the tonnage available, however, is the competitive situation expected to prevail.

Rates in the grain trade have been influenced by the volume of iron ore to be moved from the Lake Superior region. Grain moves in the same direction as this ore and is carried in the same type ships. Since ore is the primary cargo, grain shippers have to bid for shipping space. When ore volume has been low and shipping space readily available, grain rates have been low, as was the case throughout most of the 1954 season. When ore volume has been high and shipping space scarce, grain rates have been high. The probable reduction in movement of ore and the increased competition among United States ships which will result may be expected to hold grain rates at a level where only the most efficient operators can make a profit.

International Movement

The projected international movement of United States grain on the Great Lakes in 1960, as indicated in Exhibit 24, includes 260,000 tons to Canada and 1,275,000 tons for export overseas. The corresponding figures in Exhibit 20, in which 1953 shipments were tabulated, were 260,000 tons to Canada and 430,000 tons for export. The 1960 exports of 1,275,000 tons are classified as potential international cargo for reasons which have been indicated. Some of this tonnage may, of course, continue to be transshipped at United States ports as was the 430,000 tons in 1953.

The increase in lake shipments for eventual export indicated by these figures could act to relieve somewhat the predicted competitive pressure of excess shipping in the domestic trade, but probably will not since Canadian and foreign vessels will be able to compete for the international trade. Canadian fleet operators will seek cargoes destined for St. Lawrence ports, and foreign flag vessels will be able to handle overseas cargo.

EFFECT ON VESSELS ENROLLED IN LAKE CARRIERS' ASSOCIATION

Vessels enrolled in the Lake Carriers' Association represent approximately 95% of the dry bulk cargo capacity of United States shipping on the Great Lakes. Total 1954 enrollment of 321 included 260 bulk freighters, 42 self-unloaders, 9 ships with deck cranes, and 10 miscellaneous craft, such as barges and tugs.

Bulk freighters are primarily ore carriers, many large ones operating almost exclusively in the ore trade. Smaller bulk freighters move grain as well as ore from the upper lakes and many carry coal as a return cargo. Self-unloaders are principally carriers of coal and limestone.

High utilization is important to all lake vessels. Adequate return on investment is impossible if they are empty for much of the navigation season. Owners of large ships can depend on carrying capacity and speed to move large quantities of cargo. Round-trip costs can be covered even though a pay load is carried only one way. Owners of smaller ships seek to have them make as many trips as possible and to secure cargo both ways. Even under the most favorable conditions, many smaller vessels barely cover costs and are in a marginal position.

Growing International Trade

International trade has so far been only a small part of total lake commerce. Iron ore and limestone have been almost entirely domestic traffic, restricted by law to United States

ships. In 1953, about 6 million gross tons of ore and 660,000 net tons of limestone were transported between United States and Canadian ports. Roughly 15 million net tons of coal were shipped from the United States to Canada, chiefly in Canadian carriers. Grain tonnage on the lakes has been preponderantly domestic commerce, about 2.5 million net tons moving internationally. Canadian and a few small foreign flag vessels have been competitors of United States bulk freighters for this international traffic.

After opening of the Seaway, international commerce will be more important, especially in the case of iron ore. Canadian consumption of United States ore, which approximated 4 million tons in 1953, may decline, but imports of Canadian ore will increase. In addition to roughly 6 million tons expected to come from Canadian Lake Superior mines, from 7 to 16 million tons may move over the Seaway from Labrador.

International traffic in other bulk commodities is expected to change less. Coal shipments to Canada may increase from roughly 15 million net tons in 1953 to about 18 million in 1960. Limestone volume for Canadian consumption will probably continue to be small, and international grain shipments are expected to be about 2 million net tons. In total, international traffic in bulk commodities on the lakes may show an increase of 50% to 100%, depending on the volume of Labrador ore.

The Seaway will have its greatest impact on vessels enrolled in the Lake Carriers' Association through its effect on iron ore

transportation, leading to idle ships, less profitable operations, and reduced employment.

Canadian shipping may well dominate competition for the growing international traffic exemplified by the Labrador run. Construction and operating costs of Canadian vessels are lower than those of comparable ships under United States registry. Utilization of Canadian vessels on the Seaway should be high, as grain which can move only in these ships will be available going one way and iron ore the other. Coal shipments to the Province of Quebec will be potential return cargo for ore carriers which do not secure grain.

Foreign flag vessels will be active competitors. They will have even lower costs but could conceivably have difficulty attaining satisfactory utilization.

Surplus Capacity in Upper Lakes Fleet

Imported ores initially will supplement domestic supplies. Ultimately they may displace them to a growing degree. All imports will affect the demand for domestic ore, but the amount entering the Great Lakes over the Seaway will bear most directly on shipments from the Lake Superior region. At indicated levels, there will be surplus capacity in the Great Lakes ore fleet.

The minimum amount of ore likely to flow over the Seaway when it opens is some 7 million gross tons per year. With domestic ore being displaced by imports, the top level for upper lakes shipments of high-grade ore and concentrates may be 75 million gross tons in

a normal year. Season carrying capacity of bulk freighters in the United States lake fleet in 1954 was 18.5 million tons greater than would be needed at this level.

More than twice the minimum 7 million tons can come through the Seaway without exceeding the probable needs of Canadian users and United States companies exploiting Labrador reserves. If shipments approach the 16 million tons which these companies should be able to use in their Great Lakes furnaces, upper lakes shipments may fall to around 65 million tons annually. The 1954 bulk freighter capacity was 28 million tons greater than would be needed at this level.

Outlook for Idle Ore Ships in Other Trade

Shipments of Labrador ore and coal over the Seaway, and domestic traffic in coal, limestone, and grain offer potential cargo for some surplus capacity in the upper lakes ore fleet.

Canadian shipping interests appear determined to dominate Seaway transportation of ore, and should be in a position to do so. It nevertheless appears probable that Canadian operators can fill most of their ships without forcing rates too low for some United States competition.

The rate could be on the order of $1.75 per ton plus Seaway tolls if the determining influences prove to be United States costs and the competition of alternate routes through Atlantic ports. At this rate, United States ships in the 10,000-to-13,000-ton class should be able to cover costs carrying Labrador ore if operators are

alert in seeking coal cargo for the return trip. Smaller vessels, marginal in the upper lakes ore trade, are unlikely to find profitable employment in the Seaway trade.

Coal and limestone movement between United States ports offers limited opportunity for the employment of surplus ore ships. Long-haul coal to the upper lakes is carried as return cargo for ships in the ore trade. Rates, as a consequence, are too low to permit profitable operation carrying coal alone. Short-haul coal and limestone traffic on Lake Erie and Lake Huron offers opportunities for high utilization, but self-unloaders have an advantage over bulk freighters in this trade.

Domestic grain historically has supplemented iron ore as cargo for the smaller bulk freighters. Grain volume is limited, however, and competition for available tonnage may be expected to increase when fewer ships are needed to carry ore. Rates, as a result, will probably be too low to cover costs for any but the most efficient operators.

Empty Vessels, Limited Opportunity, and Fewer Jobs

At the lowest level of Labrador ore shipments to be expected, bulk freighters with a carrying capacity of over 18 million tons of ore in a season would be left without domestic ore cargo. If Labrador shipments attain higher levels, surplus ore-carrying capacity could reach 28 million tons or more.

The 18-million ton figure is equivalent to a full season's ore cargo for all 83 bulk freighters of less than 10,000 tons capacity

enrolled in the Association, plus approximately 1 million tons capacity of larger vessels. The 28-million ton figure is a season's cargo for all those of less than 10,000 tons, plus 11 million tons for larger ships.

Not all the small ships would be empty. Some would continue to serve ore docks which cannot accommodate larger vessels. Less than 5% of lower lakes ore unloading facilities, however, require these small ships. A limited number might be needed to carry coal to upper lake ports with restricted harbors. Only the most efficient would be able to operate profitably in the highly competitive domestic grain trade or find a place in the even more intense rivalry for international commerce on the Seaway.

In general, smaller marginal vessels, particularly in fleets without affiliations in the steel industry, will be hardest hit.

With 16 million gross tons of ore annually entering the Great Lakes over the Seaway, 25% of the vessels enrolled in the Association in 1954 could be idle.

For many ships which continued to operate, profit possibilities would be diminished.

At least 2,300 men serving aboard the existing fleet would lose employment, with additional jobs lost ashore.

More Labrador Ore a Possibility

Some authorities believe Labrador production can reach 40 million gross tons per year. At lower levels considered thus far,

Labrador ore can be expected to sell at prices comparable to upper lakes ore. At levels above 20 million tons per year, this may not be true.

There is good reason to believe that ore from Labrador will be less costly to produce than ore from older mines, once production is well under way. Efforts may be made further to bring down unit costs by increasing production. This could lead to an aggressive campaign to capture a larger share of the market, and price concessions might be used to attract buyers. Under any circumstances, it seems probable that there will be increased attention to all elements entering into the delivered cost of iron ore at lower lake ports. Transportation rates may come under pressure along with other costs and be forced down, further aggravating the problems of Association members.

As ore imported through the Seaway gained from lower production and transportation costs, the flow of domestic ore would shrink even more. Independent shipowners would be most affected, and with fewer cargoes at lower rates might find it difficult to stay in ore transportation at all. Carrying capacity would be increasingly concentrated in fleets affiliated with the steel industry.

The pattern of investment in Great Lakes shipping can be radically altered. The form it may eventually assume cannot be clearly foreseen, but it seems certain that fewer and larger vessels will carry bulk commodities in the future.

EFFECT ON THE NATIONAL ECONOMY

Conclusions which have been reached as to the effects of the Seaway on lake shipping were based on analysis and interpretation of factual information. By comparison, measurement of the resultant effect on the national economy, included in the assignment, is not subject to such precise treatment. Appraisal of eventual consequences necessarily rests more on judgment and perception. In what follows, Robert Heller & Associates has considered and independently evaluated opinions and forecasts of many of the most informed authorities.

Completion of the Seaway will open a 2,200-mile, deep-water route to the heart of the North American continent. A region that contains the world's foremost mass production industries and one of its richest breadbaskets will be linked with trade centers of the globe.

Many persons foresee a period of rapid growth for the economy of the lake states when the new waterway opens. Others see the boom extending to the entire midwestern United States. Most of this thinking emphasizes trade in general merchandise rather than bulk commodities and, particularly, exports of goods manufactured by Great Lakes industry.

Benefits to the nation as a whole are less concrete and the net effect is subject to great difference of opinion. That the Seaway can help to increase total trade with other countries and facilitate the carrying of some domestic manufactures and agricultural products

is generally accepted. At the same time, it seems likely that disturbances will result, of extent and duration which cannot be gauged. As the Midwest gains, other sections of the country may lose commerce and manufacturing.

Since the Great Lakes region and the Nation as a whole will be affected in different ways, they are given separate consideration.

Regional Impact

When the Seaway opens, lake cities will become ports of call for ocean-going freighters. Millions of tons of cargo now moving through ocean ports may be diverted to harbors on the lakes. On this expectation of increasing international trade is based the prediction of a Seaway boom for the Midwest.

Manufacturers may move into the Great Lakes region, lured by the prospect of lower transportation costs to foreign markets or for raw materials. For instance, with wool from abroad shipped as easily to a lake as to an ocean port, makers of rugs, carpets, and other woolens might locate new factories in cities that bring them closer to a large segment of their customers. Other companies which use foreign supplies might be similarly attracted.

Customs brokers and freight forwarders can be expected to establish new offices in lake cities. Stevedoring concerns undoubtedly will move some of their operations to the lakes.

Much activity will result on the waterfronts of inland ports. New capital will be poured in. Illustrative is a plan for a Port

of Indiana costing $35 million. Existing harbors, rivers, and channels will require improvement. Docks, warehouses, and other facilities will be needed.

Competitive relationships of lake cities themselves will be altered. Depending on their location, dock facilities, rail connections, and other factors, some of the smaller port cities may experience more rapid growth than larger communities. Civic groups and municipal governments from Buffalo to Chicago and Duluth are already making plans to secure a larger share of future commerce.

As effects of port expansion and relocation of factories spread, inland cities will feel the stimulus. The present pattern of highway and rail transportation may see important changes, such as would be brought about by transfer of coal traffic from Atlantic ports to the Seaway. Businesses that serve the transportation industry may benefit.

Public discussions have emphasized what the boom will mean to states bordering the Great Lakes. Possible detrimental results appear to have received less thought.

Changes in transportation of bulk commodities and the probable retirement of a large number of United States lake ships have been noted. Peril to the Nation in such a weakening of its fleet will be pointed out as one of the effects on national defense. Unfavorable economic consequences will also be considerable.

Loss of employment for lake seamen has been mentioned. Upwards of $25 million a year in payrolls, purchases of supplies, and expenditures in shipyards for fleet maintenance may be diverted from the Great Lakes area to Canadian and foreign ports. Local merchants will feel the impact. Tax losses will compound the effect.

Jobs for miners, spendable income, and state taxes in Michigan, Minnesota, and Wisconsin will be affected by the loss of ore markets. The decrease in revenue from high-grade ore will reduce benefits otherwise resulting from greater production of concentrates.

Great Lakes shipyards may have considerable activity in years just ahead, but the long-range outlook is less satisfactory.

It has been pointed out in this report that because of the competitive situation there is not likely to be much incentive for American capital to build new bulk cargo vessels for the Labrador ore trade. There will, nevertheless, be need for larger and faster vessels to carry Superior ore as costs assume increasing importance under pressure of competition. With the favorable outlook for self-unloaders, new ships of this type undoubtedly will be built for the coal and limestone trade. These domestic ore carriers and self-unloaders promise work for yards on the Great Lakes since present law requires that ships plying between United States ports must be built in this country.

Some repowering of existing vessels can be expected, especially if improved diesels and new gas turbines offer marked economies.

New ships to compete for the expanded international traffic through the Seaway seem unlikely to be built by Great Lakes shipbuilders since they can be constructed abroad or in Canadian yards at less cost.

Nationwide Impact

Two ways in which the Seaway may benefit the peacetime national economy as a whole have been widely publicized. One is that the expansion of the Midwestern economy and broadening of markets for manufactured and agricultural products will ultimately react to the benefit of the rest of the country. The other is that iron ore resources of the United States will be conserved.

There is, however, another side to the coin in that foreign competitors may use the Seaway to take trade away from United States industry.

Loss of Canadian markets is one possibility. Steel offers an example. Mills of this country could lose customers across the lakes when foreign ships are able to load steel in Europe and bring it directly to users in Ontario and Quebec. Any commodity or product for which cost of transportation to the Canadian market is a big factor might feel the effects of similar competition.

Moreover, there is the likelihood of more foreign competition in United States markets. Importing of raw materials for new Midwestern factories has been mentioned. Oil from the Middle East may enter markets in the Midwest as it has on the Atlantic seaboard.

Coffee, chemicals, fertilizers, and sugar can conceivably be shipped direct to Great Lakes cities. It will also be easier for foreign manufacturers to ship finished and semifinished goods.

Through the Seaway into the Midwest may come manufactured consumer products from automobiles to cameras; from sewing machines to watches; large electric generators for power plants and small electric motors for household appliances; wire products from fencing to nails; aluminum shapes and plates; and art goods.

In general, it can be said that any foreign manufacturer now on competitive terms under United States tariff laws can use lower transportation costs of the Seaway to put more goods in our markets. In the case of fragile cargo, such as pottery, bottled beverages, and glass, where reduction of handling during shipping is especially desirable, availability of a water route direct to destination will be a prime factor in bringing more foreign goods to the Midwest.

"Free Trade with the Free World" is gaining acceptance as a concept to replace "giveaway" foreign aid. Competition from abroad would be intensified by any steps the Nation might take toward greater freedom in exchange of goods with other countries.

Widespread economic readjustments inevitably lie ahead for many areas of the country if the effect of the Seaway is as foreseen.

If manufacturers move to sites nearer the inland seaports, they may leave local depressions in their wake, with distressing consequences that might parallel the situation in New England when textile

mills fled to the South. Mines in the East and coal loading ports on the Atlantic may be hit if export coal is shipped from pits closer to loading docks on the lakes.

It can be seen that the Seaway brings problems as well as opportunities. The consensus of authorities is that, on balance, the United States will gain. Every significant change in transportation, from canals and railroads which opened the West to the automobile and airplane, has been attended by controversy, doubt, and painful readjustment. Each came to play an important role in communication, providing easier and faster exchange of goods, bringing agricultural products to cities and manufactured wares to farms, and spreading widely the benefits of trade with other countries.

Now the Seaway, also conceived amid controversy and doubt, is about to bring to the heart of the American continent significant and far-reaching changes in commerce. There is no gainsaying the benefits, in which both the United States and Canada will share. It is only realistic, however, to recognize that there will not be even distribution and that in the period of readjustment some interests will be adversely affected. In the end it may be the booming economy of Canada which will profit most, in some areas at the expense of the United States.

EFFECT ON THE NATIONAL DEFENSE

Consideration of the effect on national defense of changes brought about by the Seaway has to begin with the premise that future wars will at least resemble those we have known. Visualizing the role of Great Lakes shipping, the Seaway, or the entire steel industry in an atomic war is beyond the scope of this report.

In any war in which sustained industrial power is a decisive factor, the new waterway will strengthen the Nation. It will provide a second route through which large tonnages of high-grade ore can be shipped - as against a single waterway in World War II. Production could be expanded rapidly in an emergency, since the new supply is on the surface, recoverable by open-pit mining.

Proponents have cited other ways in which the Seaway could increase the Nation's ability to wage war:

1. Pressure on the railroads would be eased. Munitions could be loaded directly on ships at lake ports and started overseas through the protected waterway.
2. Pressure on Atlantic ports in turn would be relieved.
3. The exposed portion of the ocean route to the British Isles and northern Europe would be shortened through use of the Seaway.
4. Great Lakes shipyards could be used to a greater extent than in World War II to construct war vessels for the Navy.

Without challenging the validity of these claims, it is in order to point out that some of the expected effects of the Seaway on the Great Lakes fleet may reduce the chance of their attainment. A reduction in fleet carrying capacity may have an adverse effect on the Nation's ability to wage war.

If United States shipowners scrap surplus vessels, and the ore fleet is reduced to ships which can be operated profitably in peacetime, a future war could find the country with too few lake ships to transport essential cargoes.

Experience in World War II indicates that ocean-going ore carriers cannot operate in the face of hostile submarine activity. Ships bringing Labrador and South American ore to Atlantic and Gulf ports cannot be diverted to lake ports as they are too large to pass through the Seaway. The full load would fall on the lake fleet, which would be unequal to the task.

The demand for iron ore was 26% higher in the five war years, 1941-1945, than in the years immediately before and after the war. A similar increase over projected peacetime demand in another war could mean annual requirements of 125 million gross tons.

A United States ore fleet geared to transport an average of 65 million tons per season would almost certainly be unable to handle a wartime peak of 125 million tons. It is inconceivable that Canadian ships would not be available, but there is no assurance that foreign ships could be commandeered and pressed into

service. Even if they could be, the capacity of all Canadian and foreign ore carriers plying the Seaway would be hopelessly inadequate for war needs. Steel industry demand for anything approaching 125 million tons of ore per year would overload not only the lake fleet but rail transportation as well.

Increased demand for other bulk commodities would aggravate the situation. Coal, moving in the opposite direction to ore, might not be a problem, although loading and unloading coal slows up an ore ship. Limestone and grain volume might well increase in wartime, however, and further burden an overtaxed fleet.

Unless some provision is made to hold surplus lake freighters in readiness for an emergency, similar to the "mothballing" of ocean-going freighters after World War II, the country could be faced with the need to build a lake fleet after the war started. As many as 50 ships with 20,000 tons capacity might be needed. The cost, in time, money, manpower, and strategic materials, would be staggering. At worst, vitally needed ore and other commodities would be held up by lack of transportation.

As for building ships for the Navy in Great Lakes shipyards, there seems to be danger that the yards, like the fleet, may become unequal to the wartime task. Great Lakes shipbuilders interviewed in the course of this work indicated no concern over their ability to maintain their facilities with income from repair work only. Retention of skills will be a bigger problem.

With work in the yards ebbing over the years, skilled men will find employment in other industry. Experience has shown that once they are established in other jobs it will be difficult to get them back into the shipyards.

Maintaining the reservoir of engineering talent required to build ships in an emergency will also be difficult. Perhaps technical specialists now in the yards can be retained, but it will be impossible to attract and train young replacements without construction work.

Public opinion concerning the peacetime value of the Seaway is divided although, as has been said, most authorities agree that on balance the Nation will benefit. Opinion is more nearly unanimous in the area of national defense.

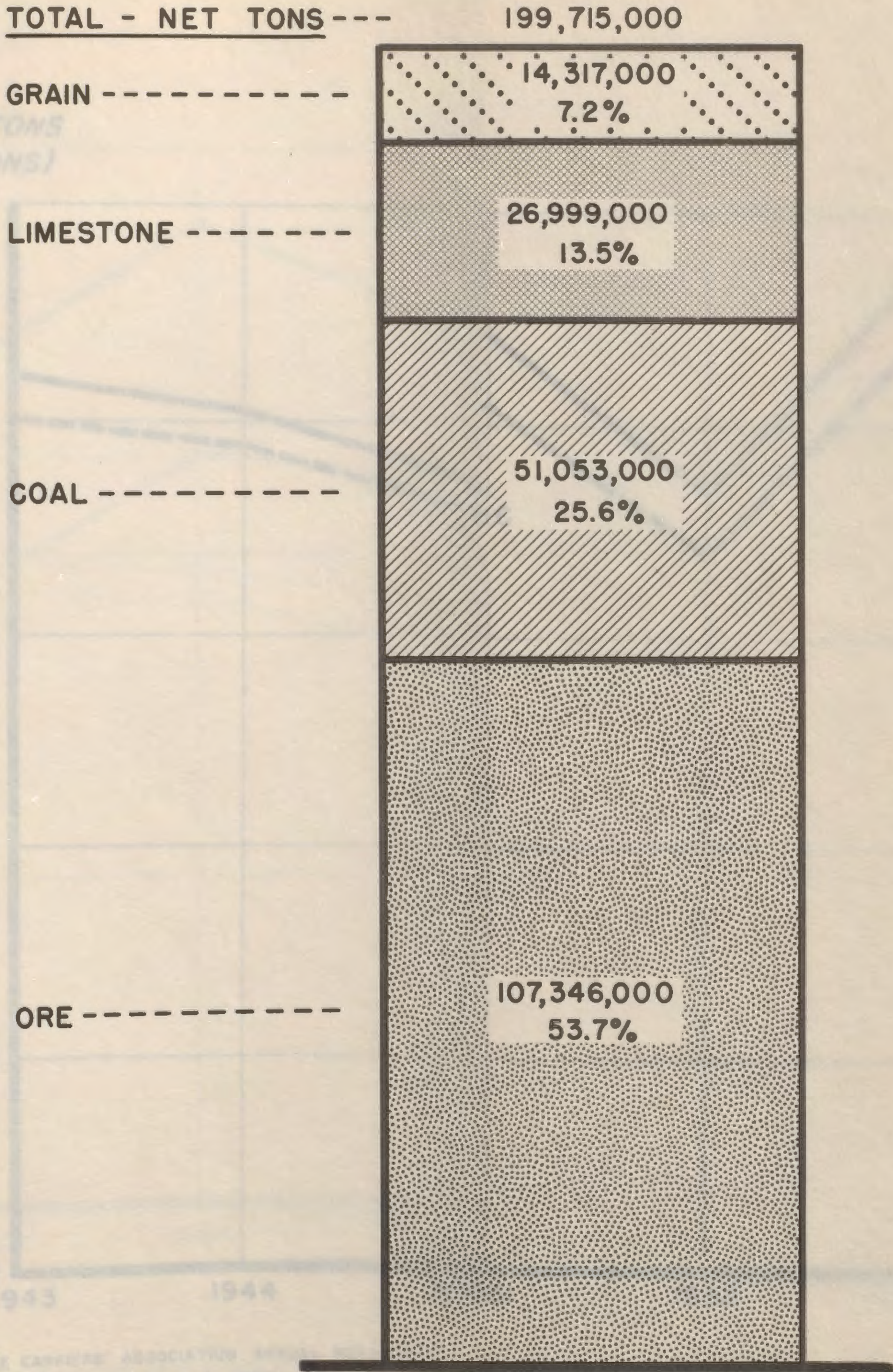
It is the intent of this report only to point out some of the elements of danger in the potential impact of the Seaway on ships and shipbuilding on the Great Lakes, perils against which the country must be alert and watchful.

Even as the beneficial effects of the Seaway profit the Nation, so any weakening after-effect is a matter of national concern. It can be said in this respect that what is bad for the lake carriers may be very bad indeed for the country.

Members of the Association are alert to the needs of the Nation as well as those of their own industry. The two are related.

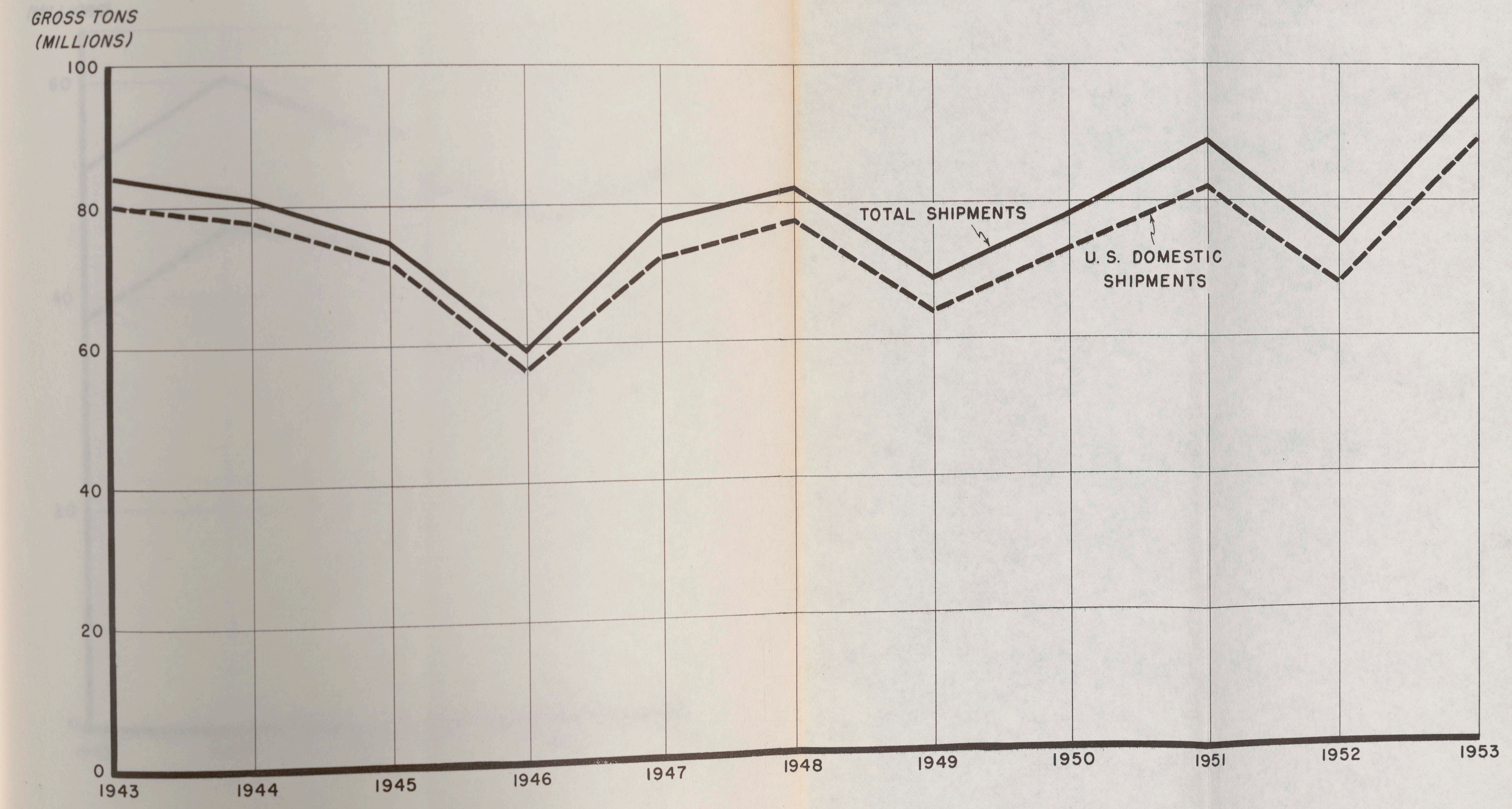
Defense of the Nation depends on a strong and healthy economy to support the fighting forces, and a strong and healthy economy will depend heavily on transportation, in which the lake carriers have a key role.

FOUR PRINCIPAL BULK COMMODITIES CARRIED ON THE GREAT LAKES 1953

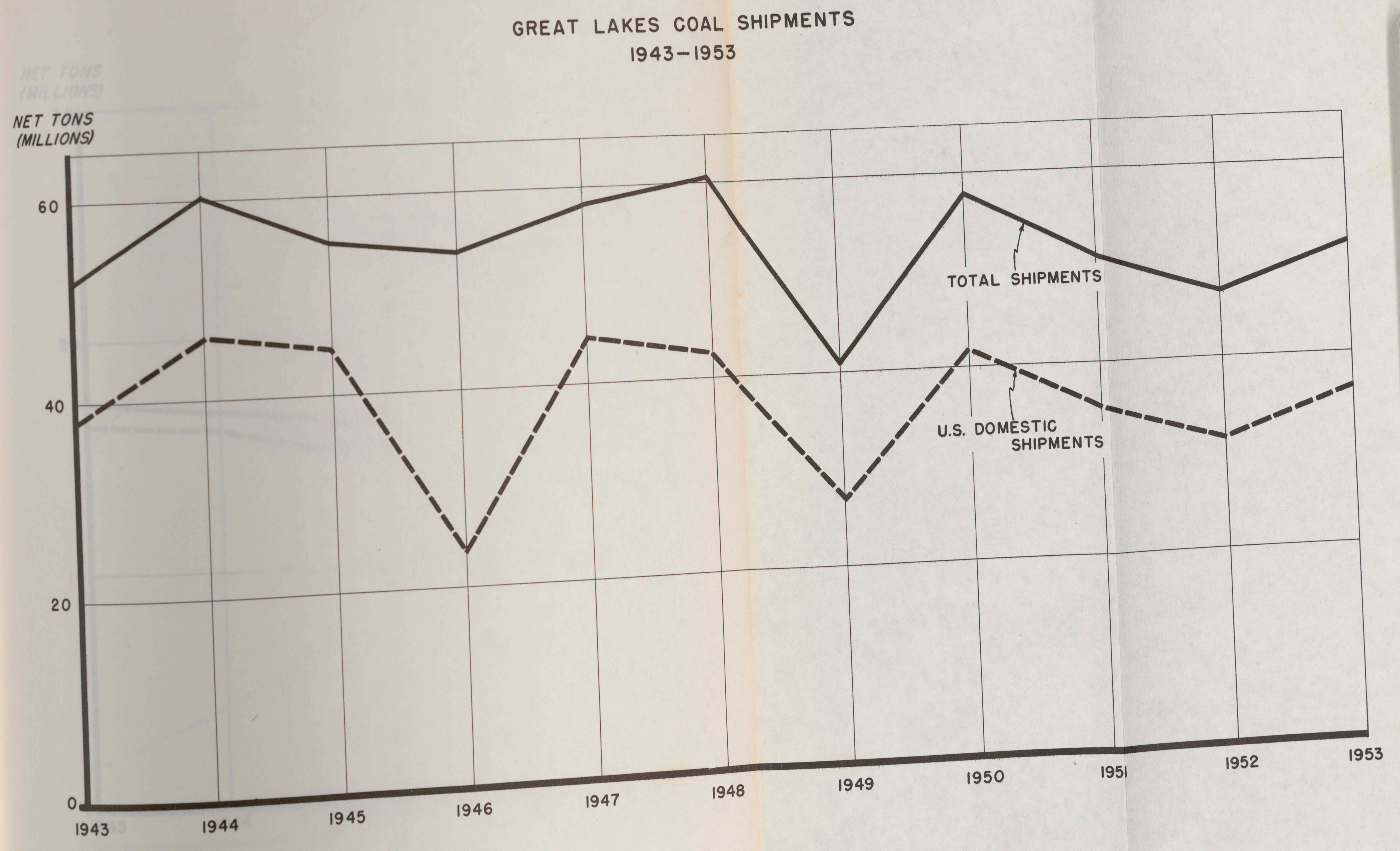


SOURCE: LAKE CARRIERS' ASSOCIATION ANNUAL REPORT, 1953

GREAT LAKES ORE SHIPMENTS
1943—1953

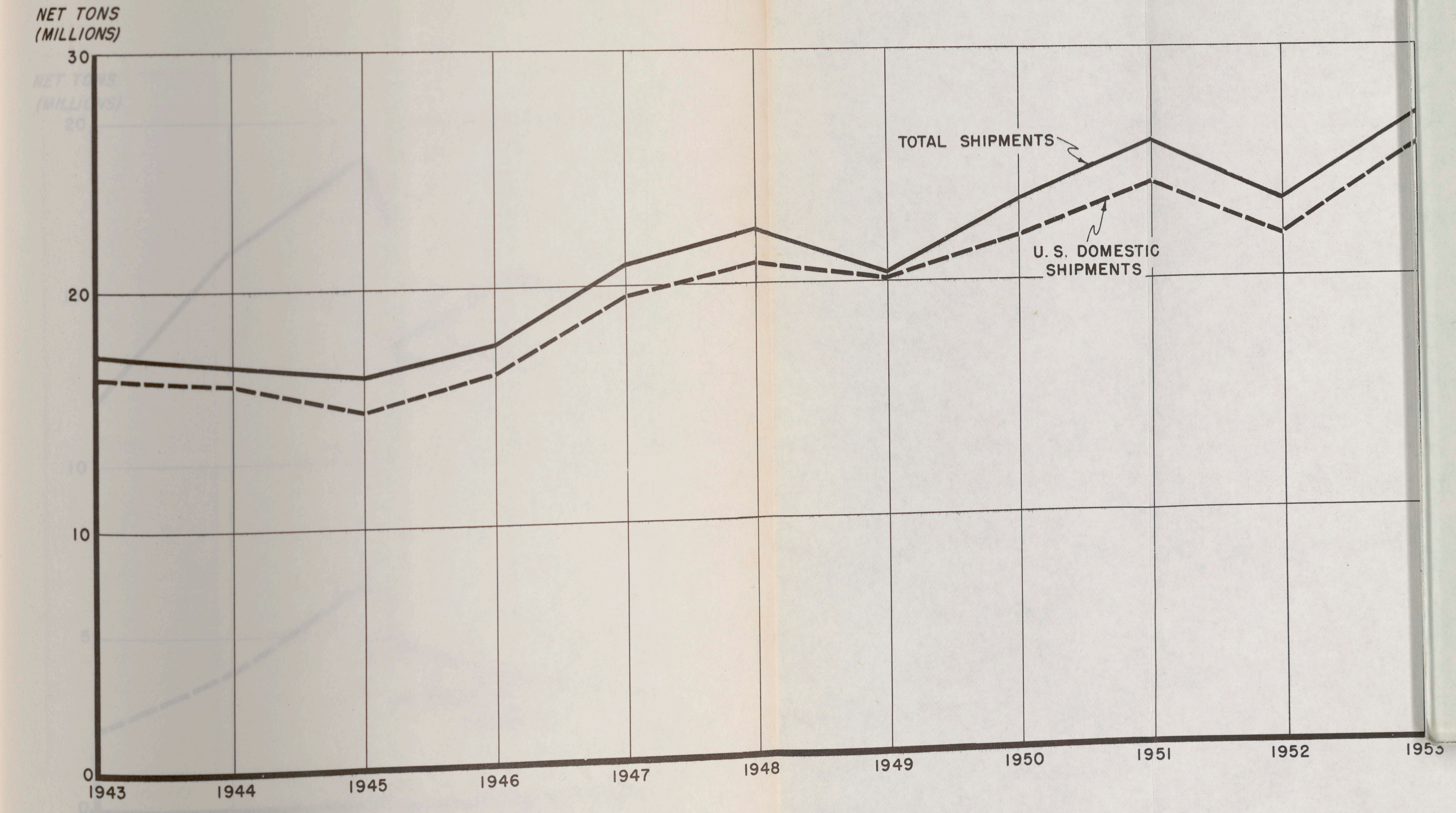


SOURCES: LAKE CARRIERS' ASSOCIATION ANNUAL REPORTS.
CORPS OF ENGINEERS, U. S. ARMY



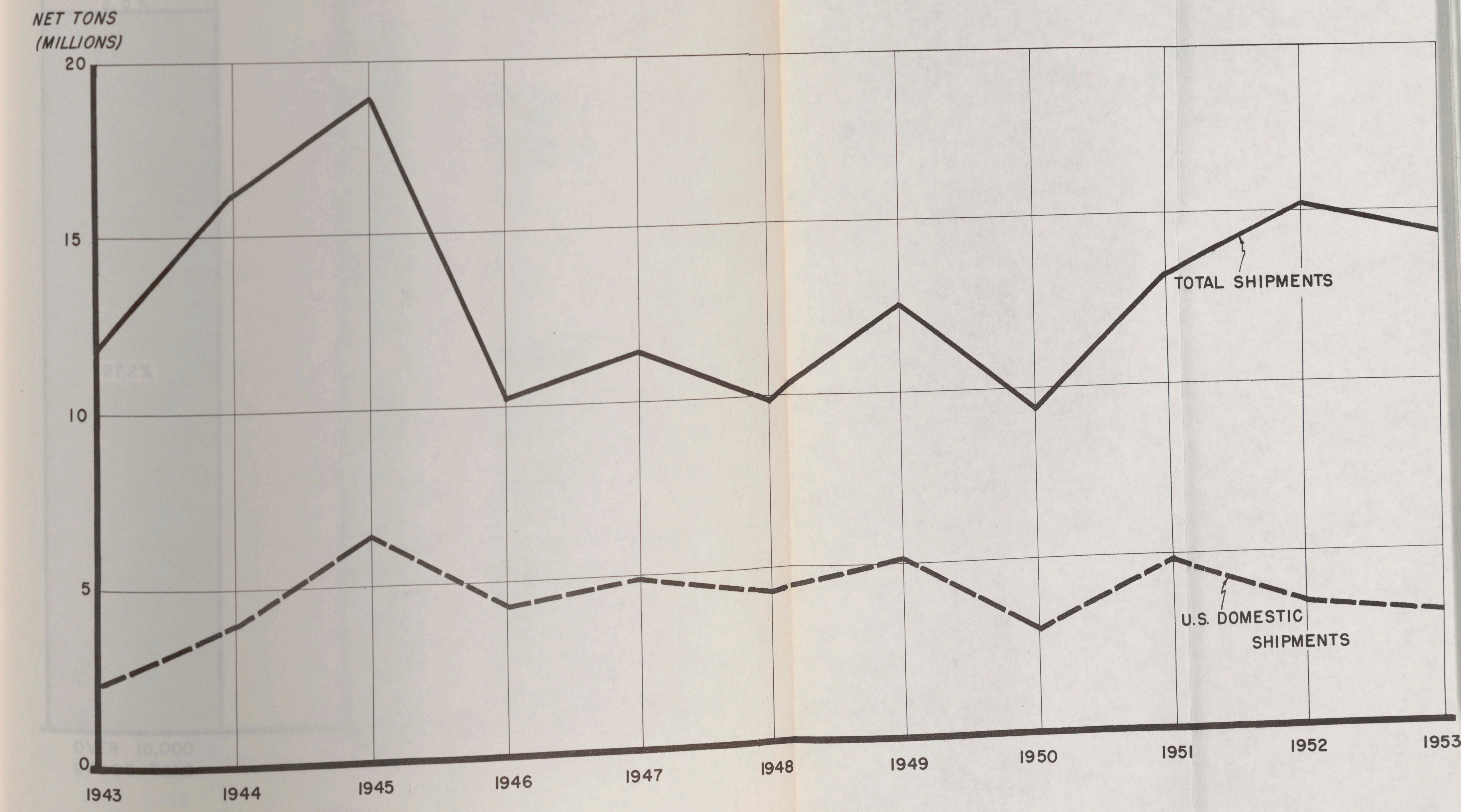
SOURCES: LAKE CARRIERS' ASSOCIATION ANNUAL REPORTS.
CORPS OF ENGINEERS, U. S. ARMY

GREAT LAKES LIMESTONE SHIPMENTS
1943-1953



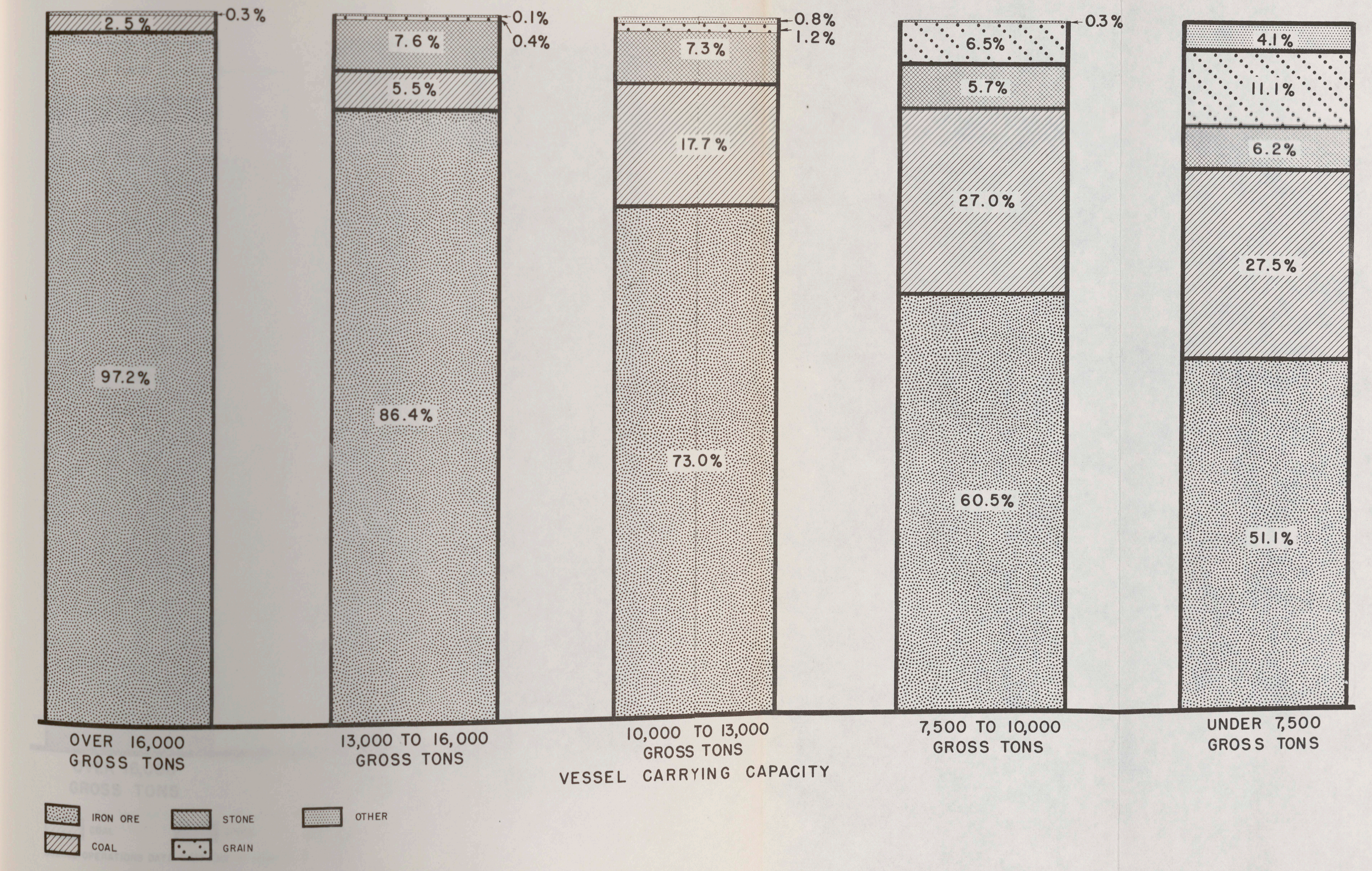
SOURCES: LAKE CARRIERS' ASSOCIATION ANNUAL REPORTS.
CORPS OF ENGINEERS, U. S. ARMY

GREAT LAKES GRAIN SHIPMENTS
1943-1953



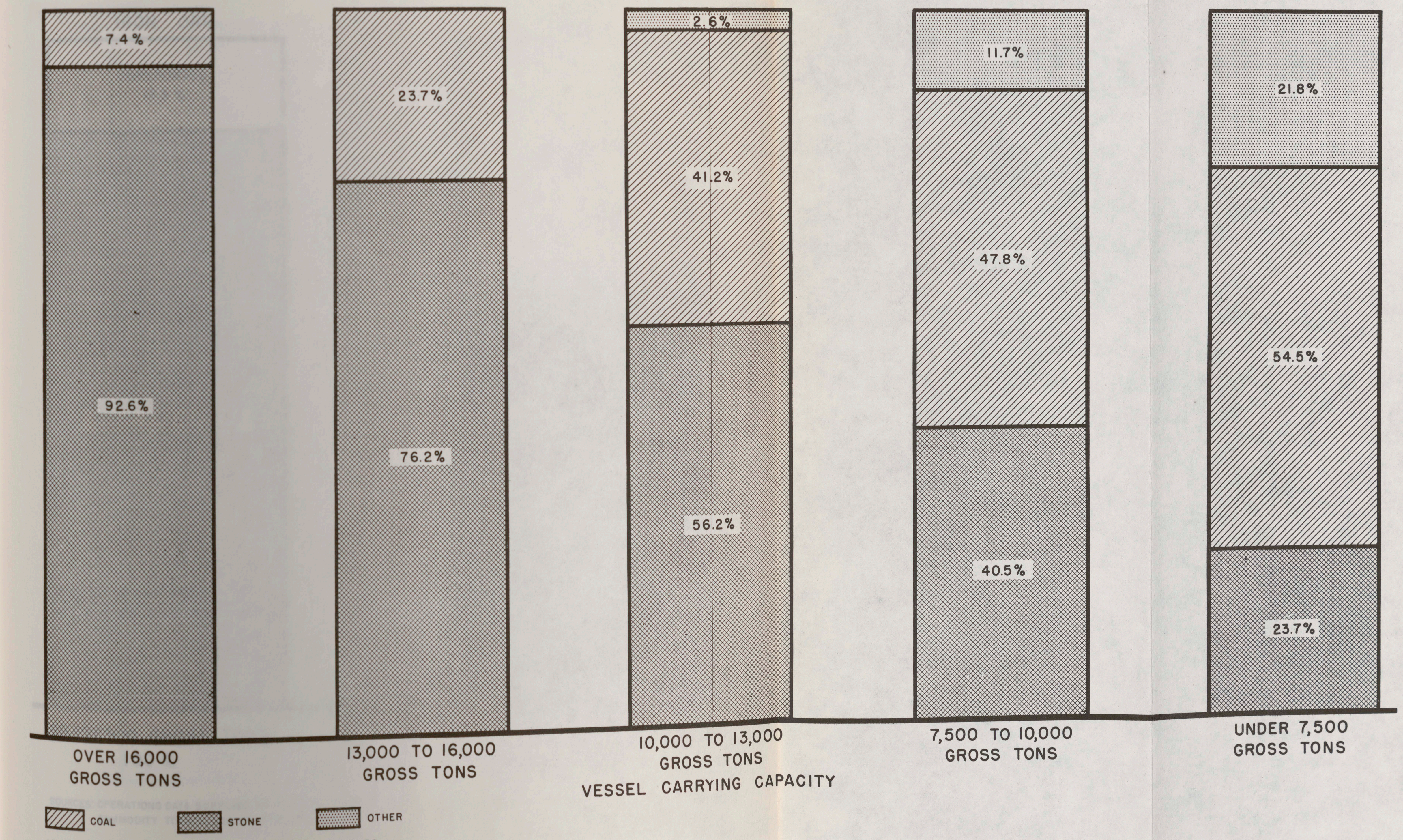
SOURCES: LAKE CARRIERS' ASSOCIATION ANNUAL REPORTS.
CORPS OF ENGINEERS, U. S. ARMY

RELATIVE IMPORTANCE OF ORE, COAL, LIMESTONE, AND GRAIN CARGOES TO 243 ASSOCIATION BULK FREIGHTERS 1953



SOURCE: OPERATIONS DATA SUPPLIED BY ASSOCIATION MEMBERS.

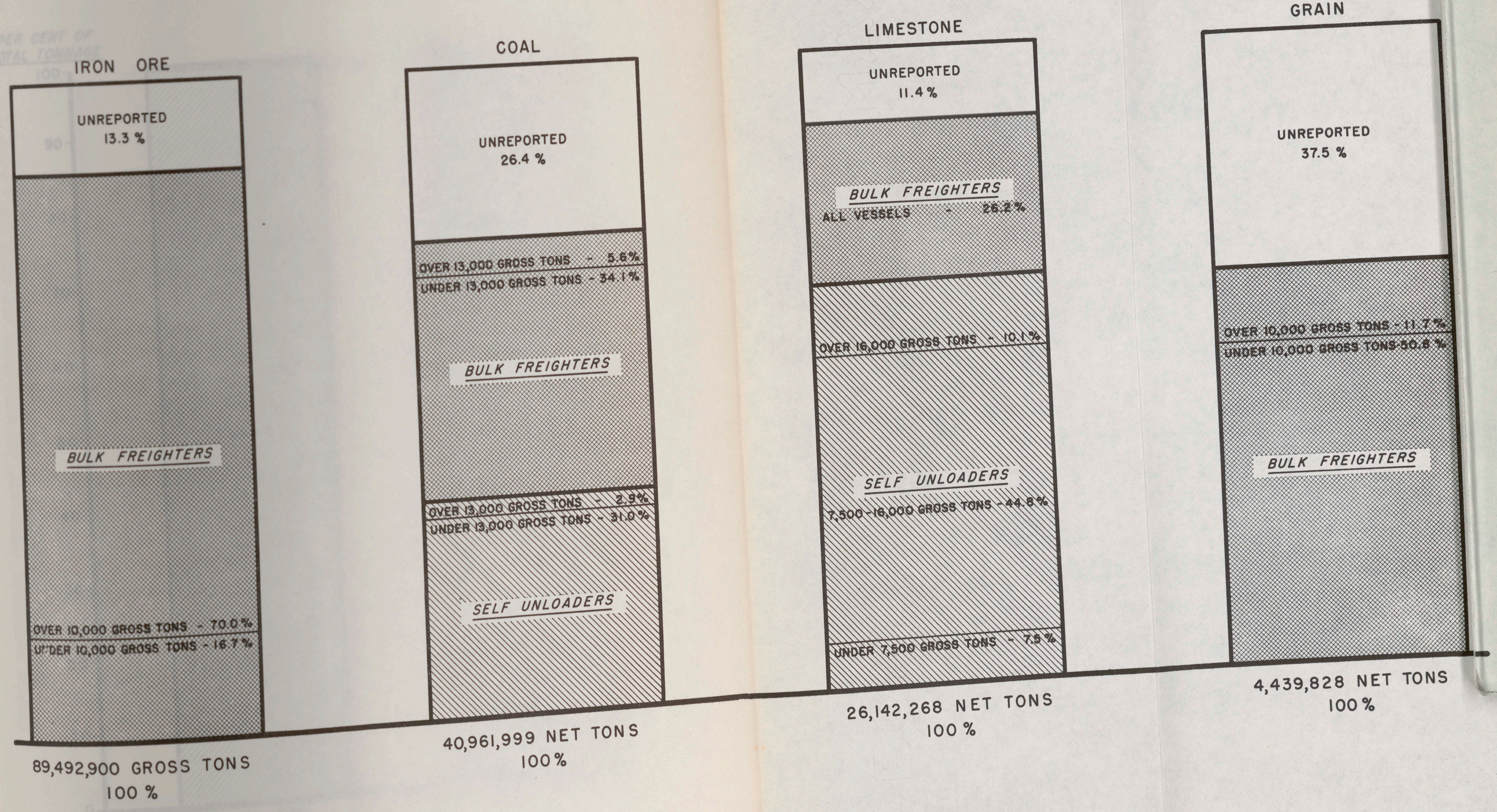
RELATIVE IMPORTANCE OF COAL, LIMESTONE, AND OTHER CARGOES
TO 36 ASSOCIATION SELF UNLOADERS
1953



SOURCE: OPERATIONS DATA SUPPLIED BY ASSOCIATION MEMBERS.

LAKE CARRIERS' ASSOCIATION
EXHIBIT 8

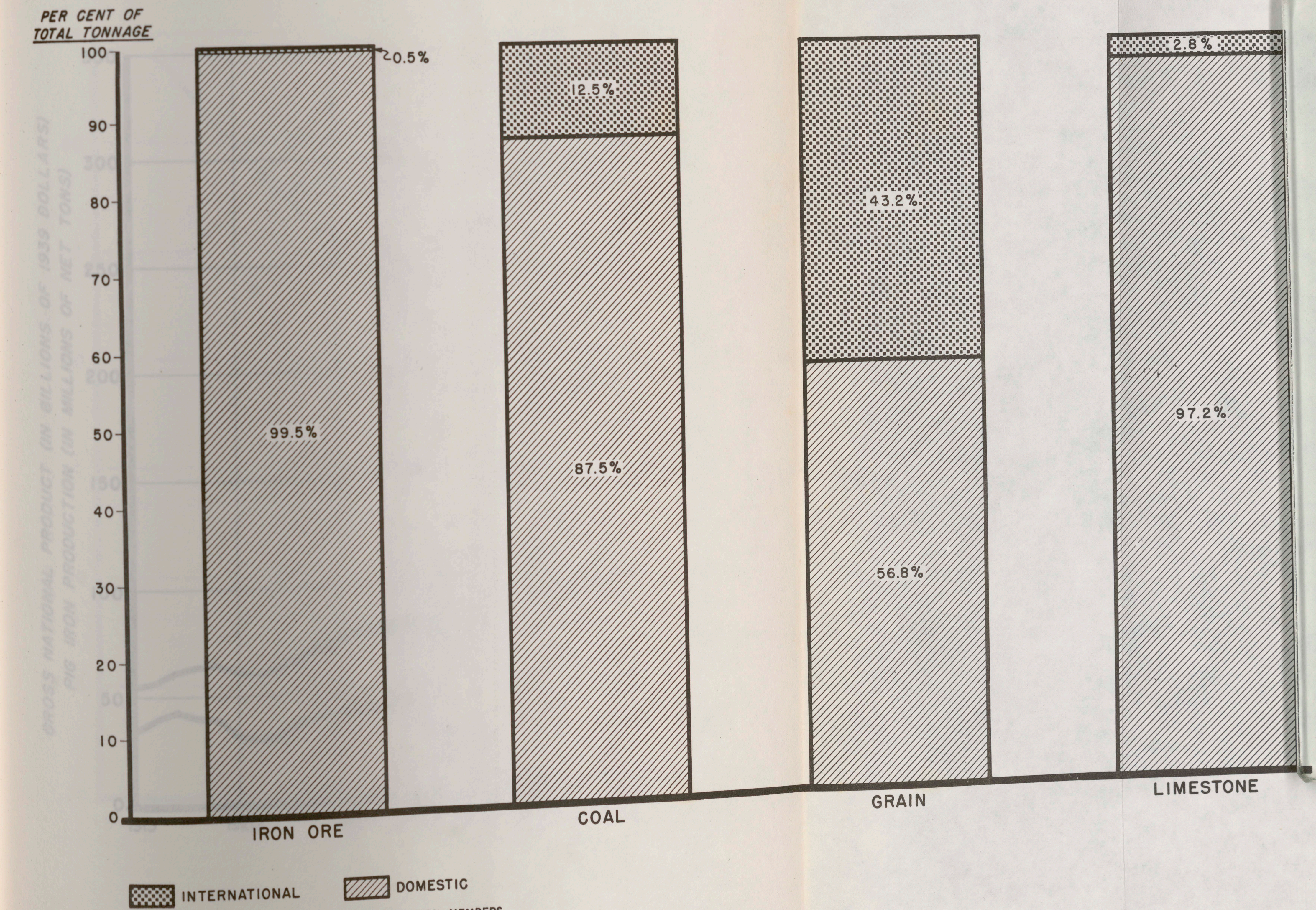
VOLUME OF FOUR MAJOR BULK COMMODITIES CARRIED IN 1953 BY ALL UNITED STATES GREAT LAKES BULK CARRIERS SHOWING DISTRIBUTION OF TONNAGE AMONG VESSELS COVERED BY REPORTS FROM ASSOCIATION MEMBERS



SOURCES: OPERATIONS DATA SUPPLIED BY ASSOCIATION MEMBERS.
COMMODITY TOTALS, AGGREGATING 171,776,155 NET TONS, FROM CORPS OF ENGINEERS, U.S. ARMY.

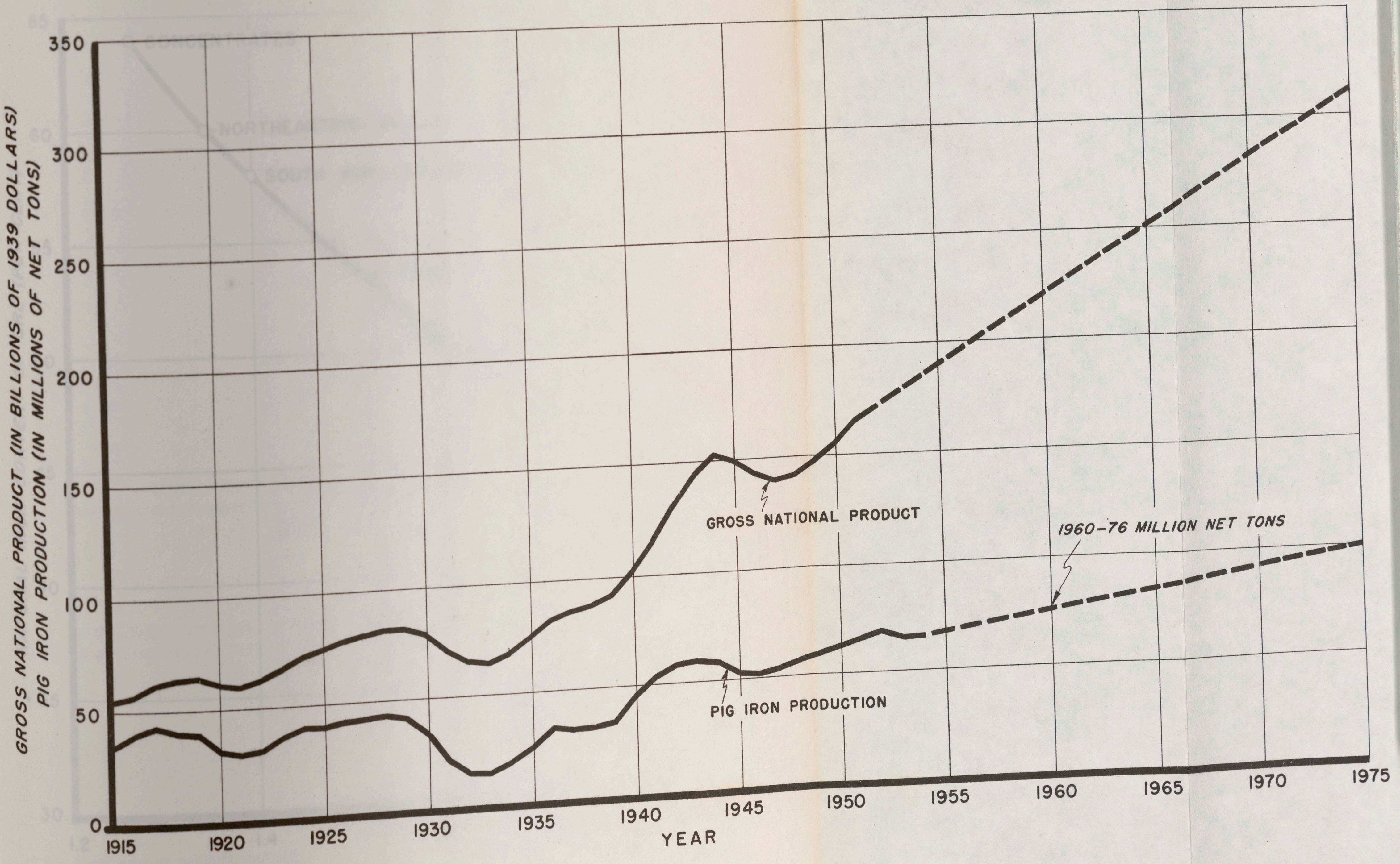
ROBERT HELLER & ASSOCIATES
CLEVELAND

RELATIVE IMPORTANCE OF INTERNATIONAL AND DOMESTIC SHIPMENTS TO 279 ASSOCIATION BULK CARGO VESSELS 1953

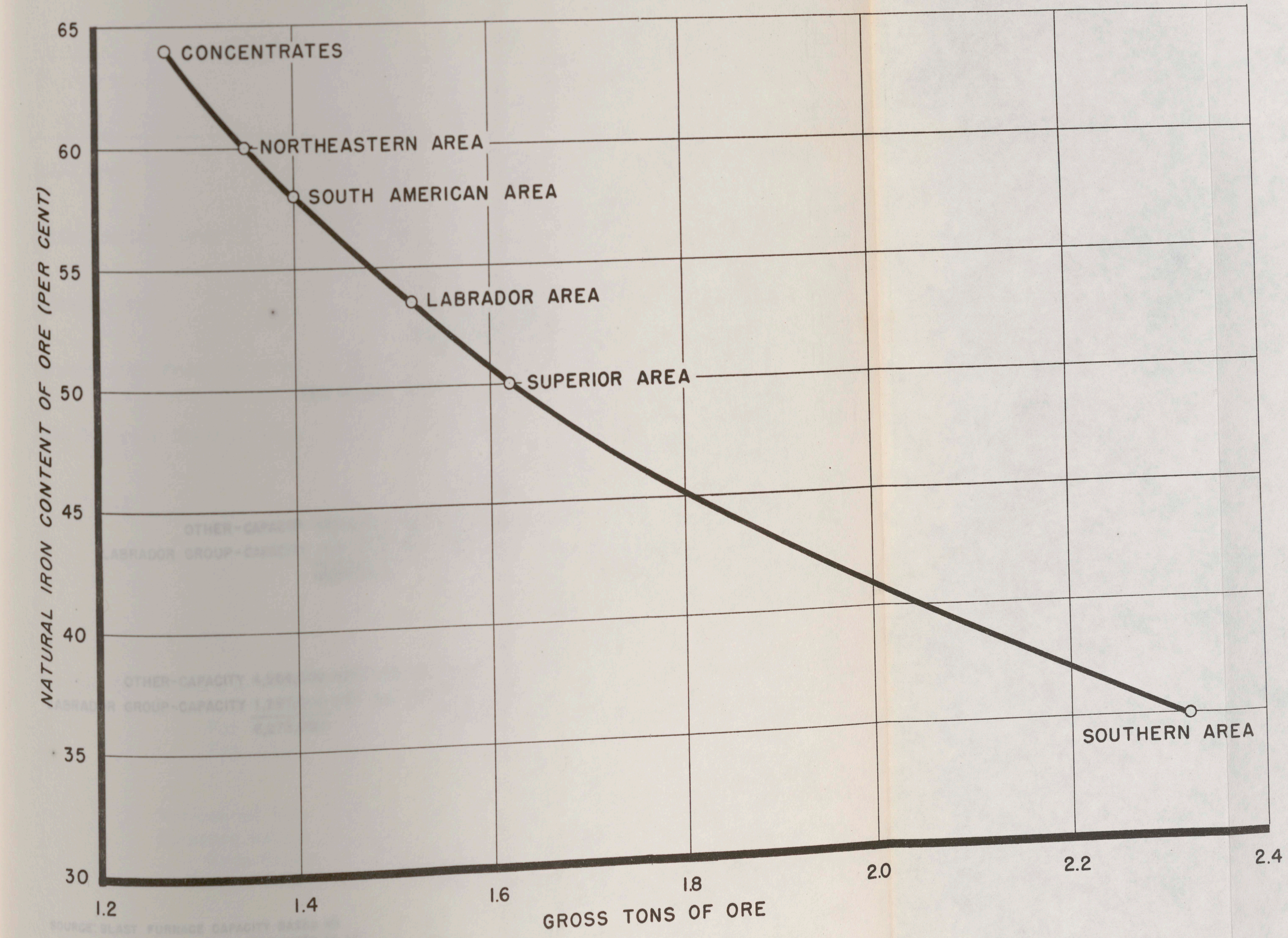


SOURCE: OPERATIONS DATA SUPPLIED BY ASSOCIATION MEMBERS.

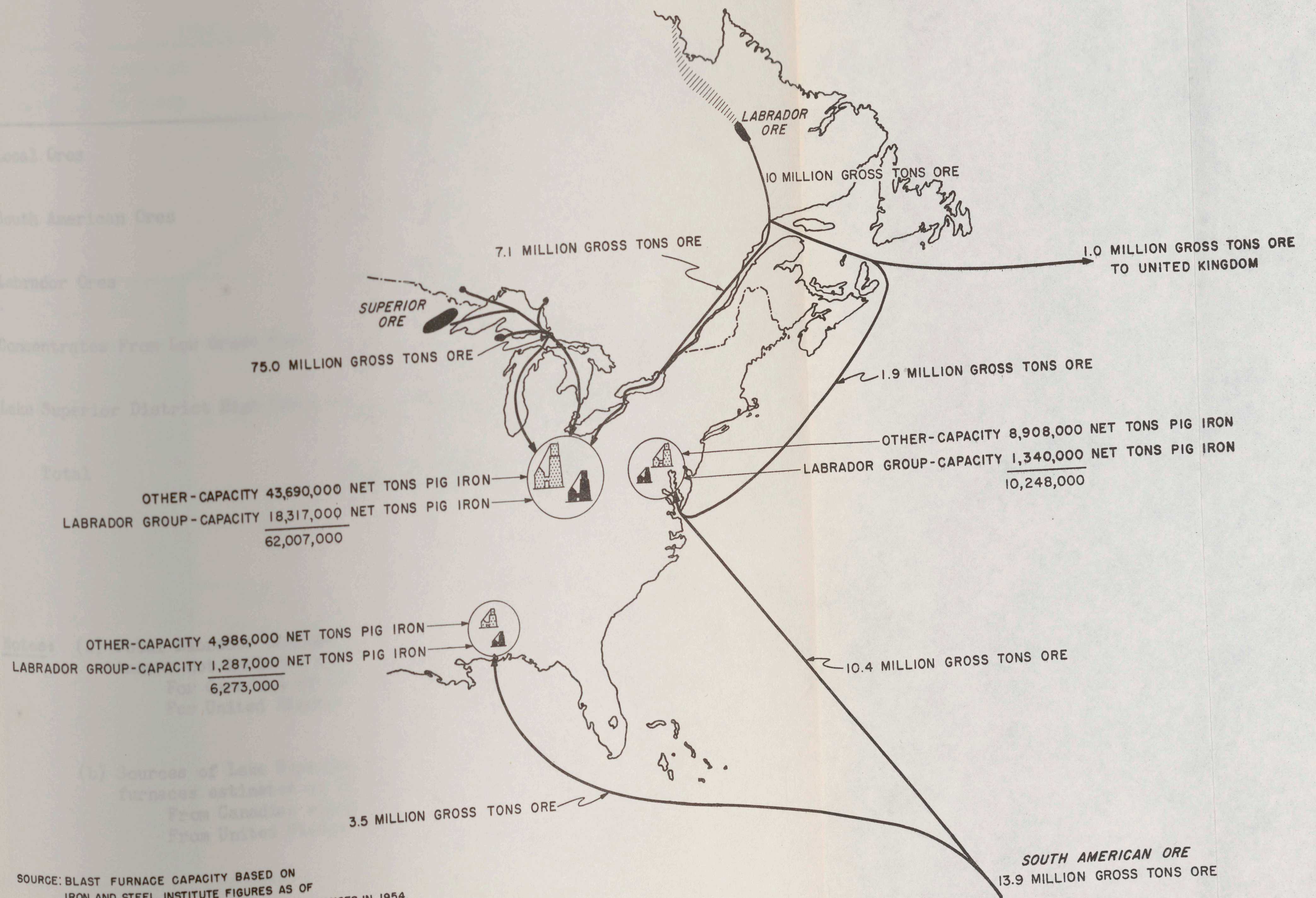
RELATIONSHIP OF PIG IRON PRODUCTION TO GROSS NATIONAL PRODUCT BASED ON THREE-YEAR MOVING AVERAGES PROJECTED TO 1975



GROSS TONS OF ORE REQUIRED TO PRODUCE ONE NET TON OF PIG IRON



BLAST FURNACES GROUPED ACCORDING TO PROBABLE SOURCES OF ORE SUPPLY IN 1960 (LOCAL SOURCES NOT SHOWN)



SOURCE: BLAST FURNACE CAPACITY BASED ON IRON AND STEEL INSTITUTE FIGURES AS OF DECEMBER 31, 1953 ADJUSTED FOR MAJOR CHANGES IN 1954.

PROJECTED 1960 PIG IRON PRODUCTION
IN RELATION TO PROBABLE IRON ORE CONSUMPTION

(Three zeroes omitted from all figures in the table)

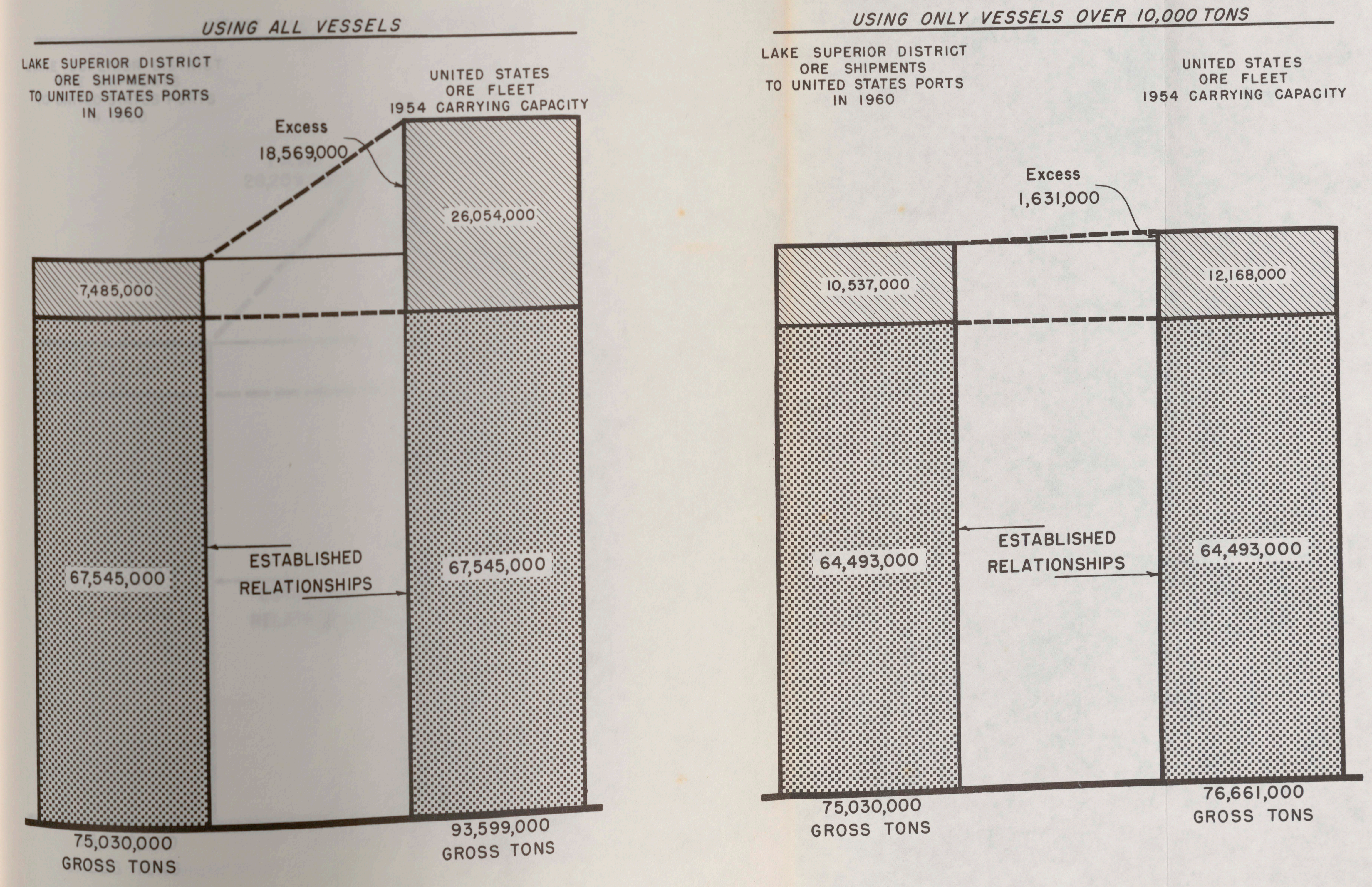
	Total United States		Western United States: Duluth and Western Furnaces		Eastern United States: Southern Furnaces		Eastern United States: Atlantic Furnaces		Great Lakes Furnaces	
	Gross Tons Iron Ore	Net Tons Pig Iron	Gross Tons Iron Ore	Net Tons Pig Iron	Gross Tons Iron Ore	Net Tons Pig Iron	Gross Tons Iron Ore	Net Tons Pig Iron	Gross Tons Iron Ore	Net Tons Pig Iron
Local Ores	19,450	11,370	5,750	3,550	7,500	3,230	1,450	1,075	4,750	3,515
South American Ores	13,900	9,925	-	-	3,500	2,500	10,400	7,425	-	-
Labrador Ores	8,400(a)	5,535	-	-	-	-	1,870	1,240	6,530	4,295
Concentrates From Low Grade Ores	12,500	9,840	-	-	-	-	-	-	12,500	9,840
Lake Superior District High Grade Ores	63,380	39,370	850	530	-	-	-	-	62,530(b)	38,840
Total	117,630	76,040	6,600	4,080	11,000	5,730	13,720	9,740	86,310	56,490

Notes: (a) Total Labrador tonnage considered to be 10 million gross tons.
Amount not included in the table:
For Canadian furnaces - 600,000 gross tons
For United Kingdom furnaces - 1,000,000 gross tons

(b) Sources of Lake Superior District High Grade Ores for Great Lakes furnaces estimated as follows:
From Canadian mines - 5,900,000 gross tons
From United States mines - 56,630,000 gross tons

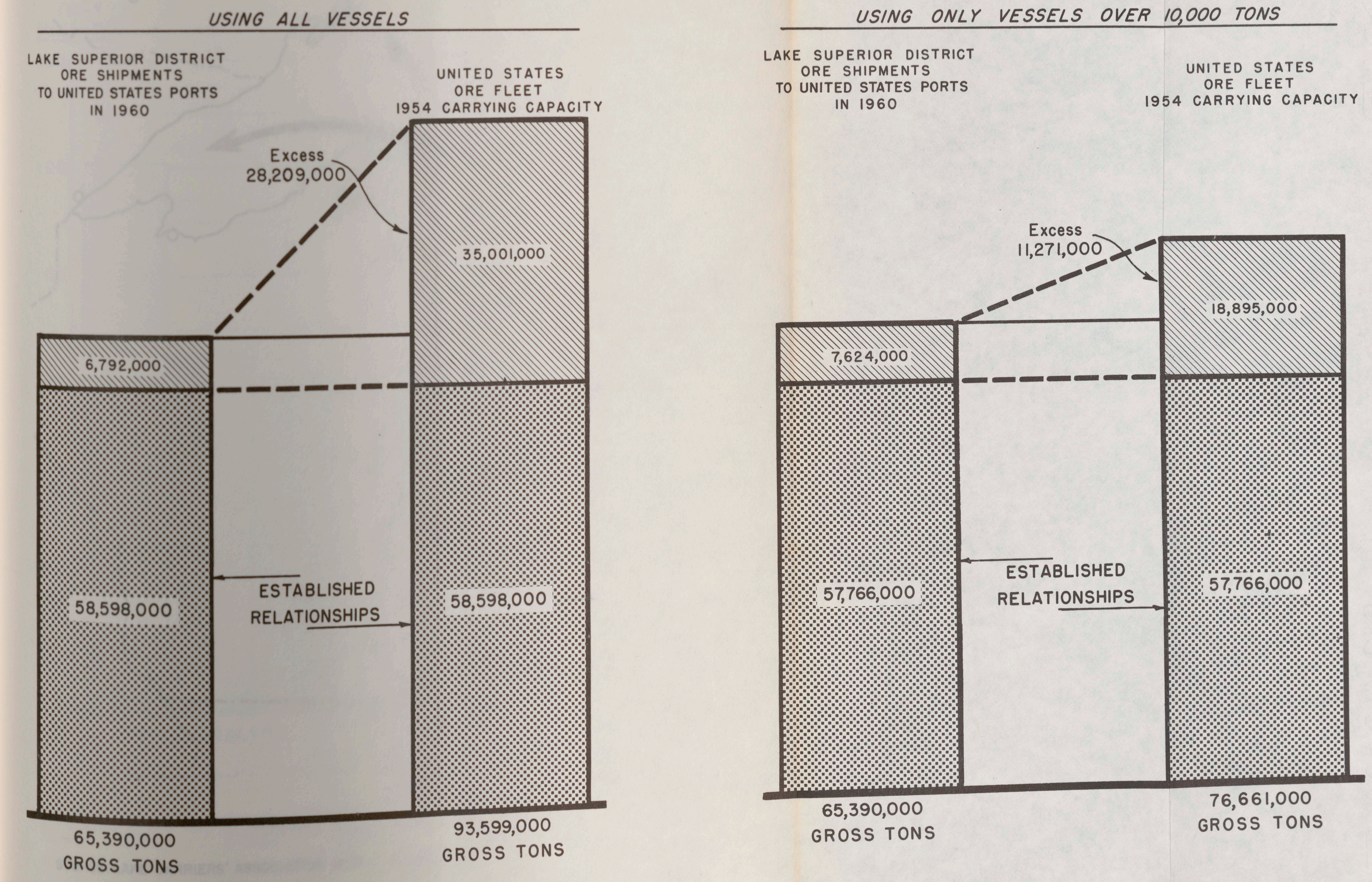
RELATIONSHIP OF PROJECTED IRON ORE SHIPMENTS TO FLEET CARRYING CAPACITY IN A 240-DAY SEASON

(WITH LABRADOR PRODUCING 10,000,000 GROSS TONS)

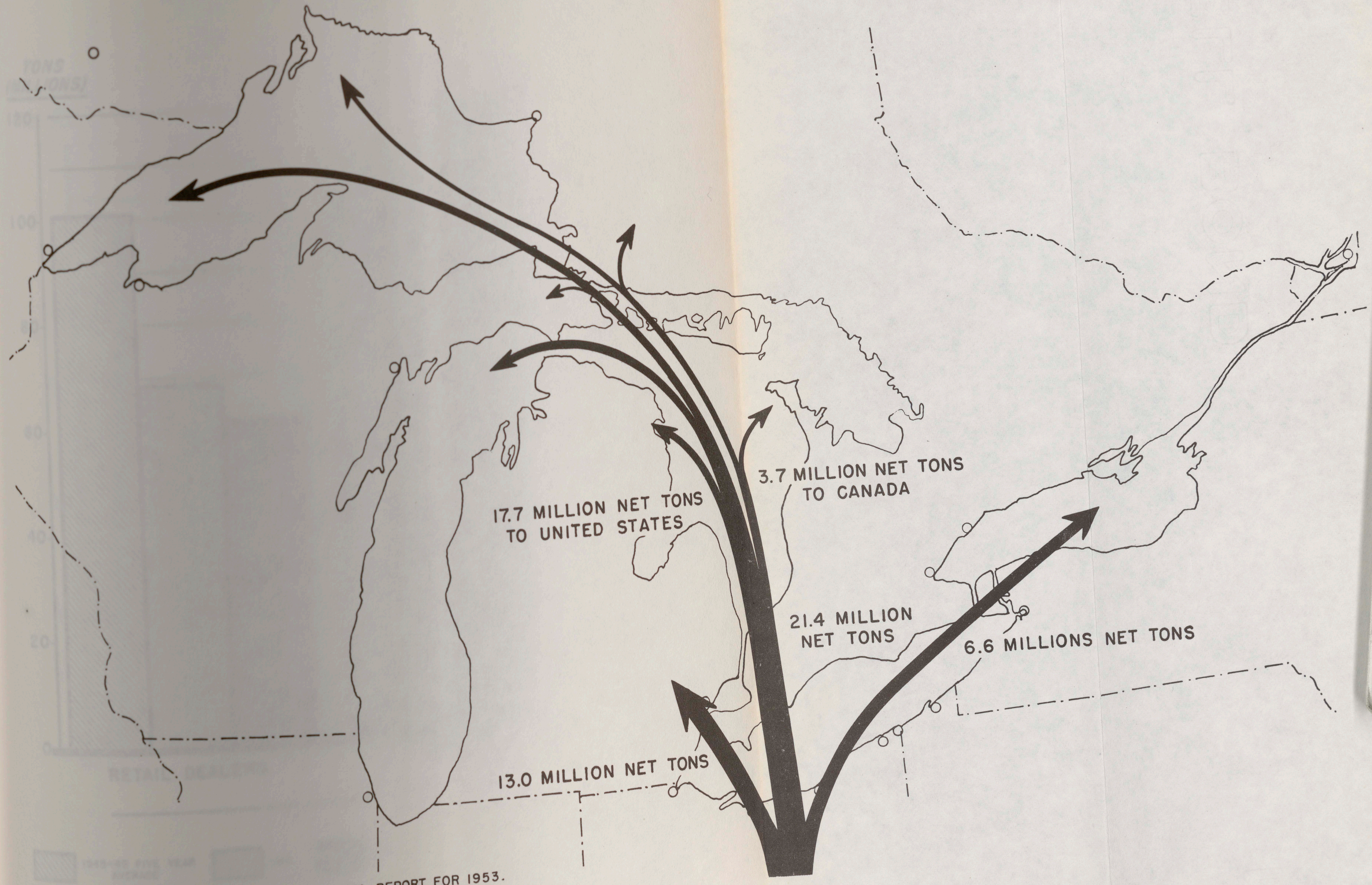


RELATIONSHIP OF PROJECTED IRON ORE SHIPMENTS TO FLEET CARRYING CAPACITY IN A 240-DAY SEASON

(WITH LABRADOR PRODUCING 19,100,000 GROSS TONS)

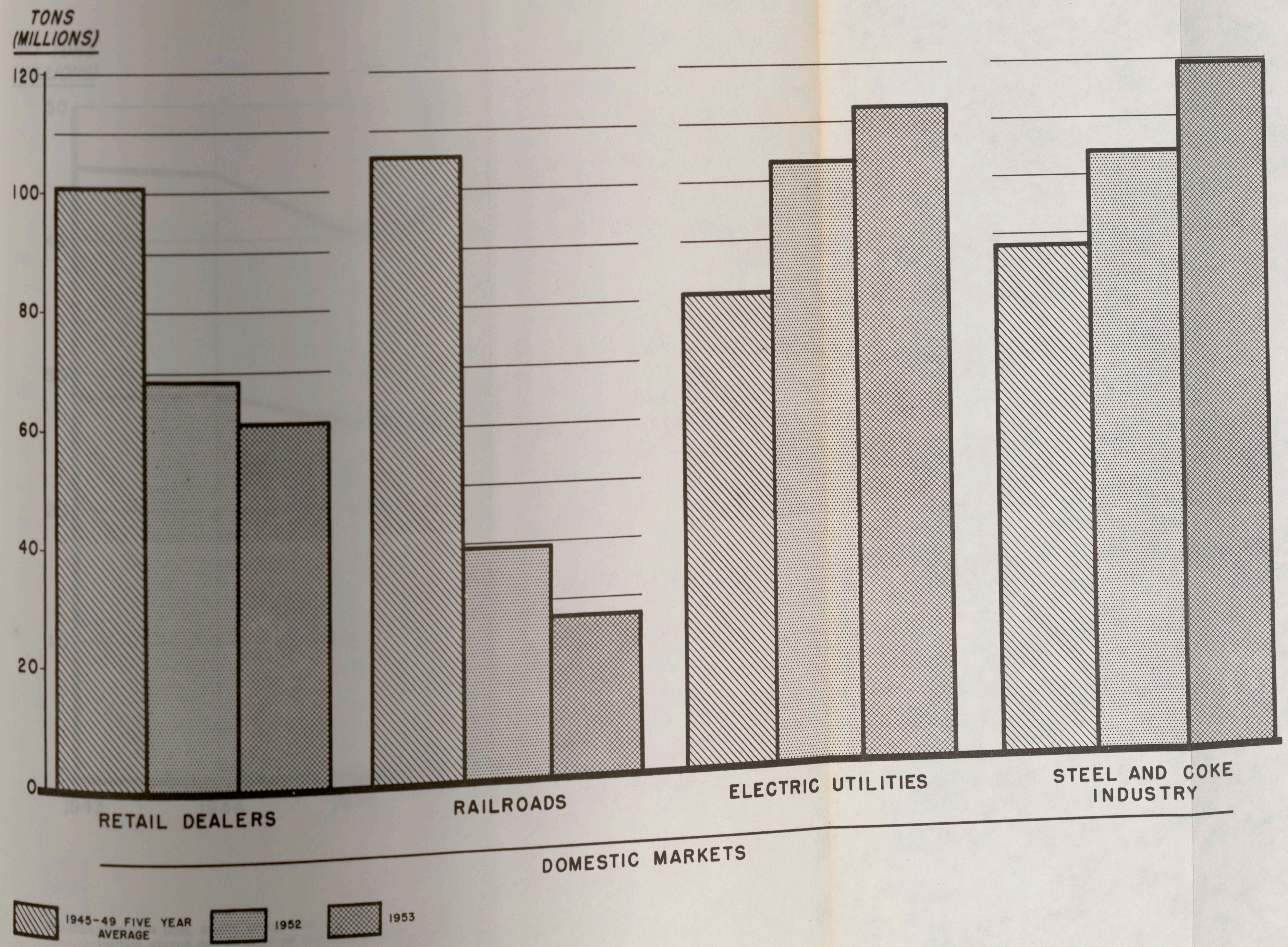


PATTERN OF MAJOR COAL MOVEMENTS FROM LAKE ERIE PORTS
BASED ON 1953 SHIPMENTS



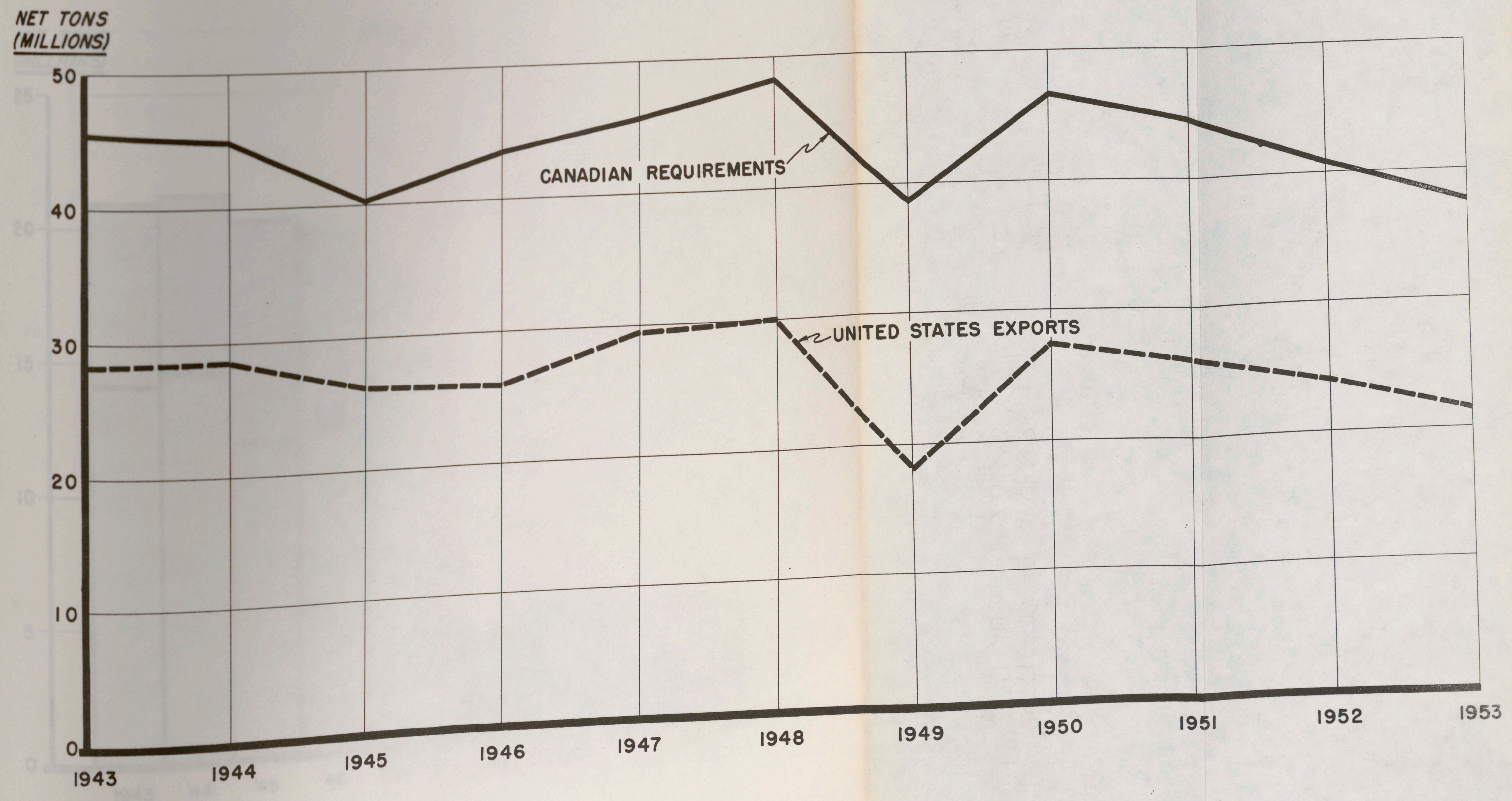
SOURCE: LAKE CARRIERS' ASSOCIATION ANNUAL REPORT FOR 1953.

BITUMINOUS COAL CONSUMPTION BY MAJOR UNITED STATES MARKETS



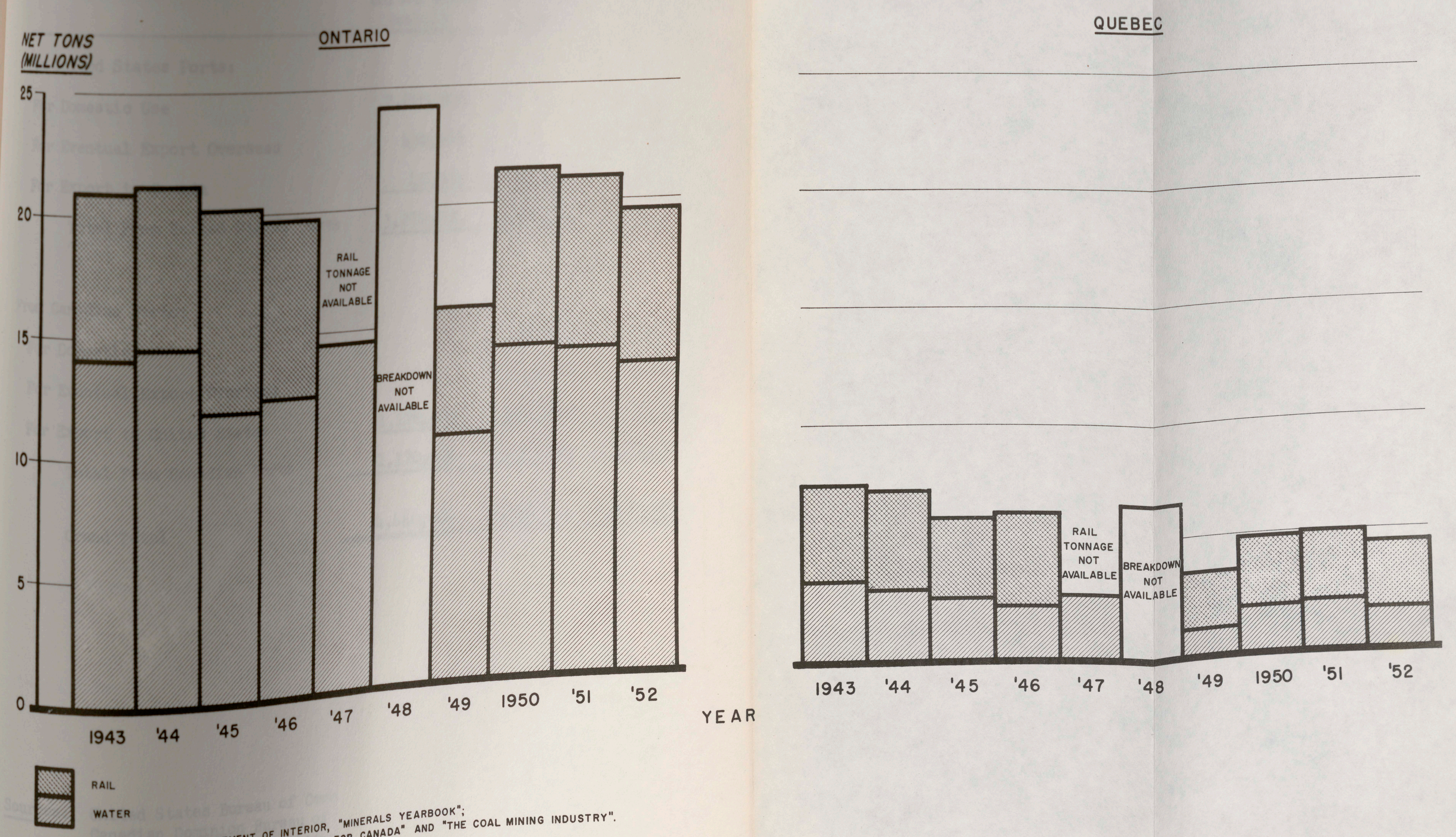
SOURCE: BITUMINOUS COAL INSTITUTE

EXPORTS OF UNITED STATES COAL TO CANADA RELATED TO TOTAL CANADIAN COAL REQUIREMENTS 1943-1953



SOURCES: DOMINION COAL BOARD OF CANADA.
UNITED STATES DEPARTMENT OF THE INTERIOR, "MINERALS YEARBOOK".

UNITED STATES COAL EXPORTS TO PROVINCES OF ONTARIO AND QUEBEC BY WATER AND BY RAIL 1943-1952



SOURCES: UNITED STATES DEPARTMENT OF INTERIOR, "MINERALS YEARBOOK";
DOMINION COAL BOARD, "COAL STATISTICS FOR CANADA" AND "THE COAL MINING INDUSTRY".

SHIPMENTS OF ALL GRAINS ON THE GREAT LAKES IN 1953

	Domestic Shipments (Net Tons)			International Shipments (Net Tons)			Total Shipments (Net Tons)		
	Carried in United States Vessels	Carried in Canadian Vessels	Total	Carried in United States Vessels	Carried in Canadian Vessels	Total	Carried in United States Vessels	Carried in Canadian Vessels	Total
From United States Ports:									
For Domestic Use	2,800,000		2,800,000				2,800,000		2,800,000
For Eventual Export Overseas	430,000		430,000				430,000		430,000
For Export to Canada				40,000	220,000	260,000	40,000	220,000	260,000
Total From United States Ports							3,270,000	220,000	3,490,000
From Canadian Ports:									
For Domestic Use		850,000	850,000					850,000	850,000
For Eventual Export Overseas		7,670,000	7,670,000					7,670,000	7,670,000
For Export to United States				1,170,000	1,205,000	2,375,000	1,170,000	1,205,000	2,375,000
Total From Canadian Ports							1,170,000	9,725,000	10,895,000
Grand Total	3,230,000	8,520,000	11,750,000	1,210,000	1,425,000	2,635,000	4,440,000	9,945,000	14,385,000

Sources: United States Bureau of Census.
Canadian Dominion Bureau of Statistics.
Lake Carriers' Association.

EXPORTS OF UNITED STATES WHEAT IN 1953

Points of Export	Total Bushels	Type, Origin, and Routing: Hard Red Spring	Hard Red Winter	Soft Red Winter	White
Great Lakes Ports	7,000	1,500 bushels from Buffalo to Canada by lake. 5,500 bushels from Duluth to Fort William by lake.	---	---	---
North Atlantic Coast Ports	65,765,000	9,000,000 bushels from North Dakota-Montana area via lake with transhipment at Buffalo.	1,765,000 bushels from Kansas-Oklahoma area by rail to Baltimore and Norfolk.	46,000,000 bushels from Indiana-Ohio-Pennsylvania area by rail to Philadelphia, Baltimore, and Norfolk.	9,000,000 bushels from Michigan-New York area by rail to Boston, Albany, New York, Philadelphia, and Baltimore.
Gulf Coast Ports	87,635,000	1,000,000 bushels from South Dakota area by rail or barge to Galveston and New Orleans.	73,712,000 bushels from Kansas-Oklahoma-Texas area by truck, rail or barge to Galveston and New Orleans.	12,923,000 bushels from So. Illinois, Indiana, Kentucky, and Southeastern States, by rail or barge to New Orleans and Mobile.	---
Pacific Coast Ports	75,270,000	992,000 bushels from Montana by rail to Seattle.	5,278,000 bushels from Eastern Idaho area by rail to Oregon.	---	69,000,000 bushels from Oregon and Washington via rail to Portland and Seattle.
Mexican Border Cities	4,545,000	---	4,245,000 bushels from Southern Texas and Oklahoma by rail to Mexico.	---	300,000 bushels from California by rail to Mexico.
Northern Plains Border Cities	1,000	1,000 bushels from North Dakota and Minnesota by rail to Canada.	---	---	---
Other Points	2,352,000	---	---	152,000 bushels. Routing not available.	2,200,000 bushels. Routing not available.
Total	235,575,000	11,000,000	85,000,000	59,075,000	80,500,000

Sources: United States Department of Commerce.
United States Department of Agriculture.

PRODUCTION AND EXPORTS OF UNITED STATES WHEAT

	Hard Red Spring (Bushels)	Hard Red Winter (Bushels)	Soft Red Winter (Bushels)	White (Bushels)	Durum (Bushels)	Total (Bushels)
1953 Preliminary Figures:						
Production	223,000,000	491,000,000	242,000,000	199,000,000	14,000,000	1,169,000,000
Exports	11,000,000	85,000,000	59,075,000	80,500,000	-	235,575,000
1960 Forecasts:						
Production	190,000,000	375,000,000	160,000,000	115,000,000	10,000,000	850,000,000
Exports:						
Control(a)	30,000,000	125,000,000	30,000,000	40,000,000	-	225,000,000
No Control(b)	-	60,000,000	10,000,000	40,000,000	-	110,000,000
Projected Exports(c)	15,000,000	92,500,000	20,000,000	40,000,000	-	167,500,000

Notes: (a) Forecast made by group foreseeing continuation of government controls.
(b) Forecast made by group foreseeing elimination of government controls.
(c) Figures used in this report as a basis for projecting 1960 grain shipments on the Great Lakes.

Sources: Department of Agriculture.
Industry representatives.

EXPORTS OF UNITED STATES CORN IN 1953

Points of Export	Bushels	Origin and Routing
Great Lakes Ports	7,690,316	Roughly, 40 per cent from Minnesota through Duluth by lake to Canada and 60 per cent from Illinois through Chicago by lake to Canada.
North Atlantic Coast Ports	59,695,109	From Illinois, Indiana, and Ohio by rail, 80 per cent going to Baltimore and Norfolk.
Gulf Coast Ports	52,662,785	From Illinois, Iowa, and Nebraska, mostly by barge, over 90 per cent going to New Orleans.
Pacific Coast Ports	496,962	From Northwestern States by rail to Seattle.
Mexican Border Cities	10,436,930	From Texas, Kansas, Nebraska by rail, about 90 per cent by way of Laredo to Mexico.
Northern Plains Border Cities	193,663	From North Dakota by rail to Canada.
Other Points	1,595	
Total	131,177,360	

Sources: United States Department of Commerce.
United States Department of Agriculture.

PROJECTED GRAIN SHIPMENTS ON THE GREAT LAKES IN 1960

		Total Cargoes (Net Tons)	Cargoes Available Only to United States Vessels (Net Tons)	Cargoes Available Only to Canadian Vessels (Net Tons)	International Traffic Within the Lakes (Net Tons)	Potential International Traffic Overseas (Net Tons)
From United States Ports:						
For Domestic Use						
Wheat	1,630,000					
Corn	475,000					
Other	695,000					
Total		2,800,000	2,800,000			
For Export Overseas						
Wheat	750,000					
Corn	365,000					
Other	160,000					
Total		1,275,000				1,275,000
For Export to Canada						
Corn	205,000					
Other	55,000					
Total		260,000			260,000	
Total From United States Ports		4,335,000				
From Canadian Ports:						
For Domestic Use		850,000		850,000		
For Export Overseas		7,670,000				7,670,000
For Export to United States						
Barley	660,000					
Oats	640,000					
Wheat	230,000					
Other	440,000					
Total		1,970,000			1,970,000	
Total From Canadian Ports		10,490,000				
Grand Total		14,825,000	2,800,000	850,000	2,230,000	8,945,000

Note: Shipments of grains not treated in text are included above at 1953 volume levels.

ANNEX I

WELLAND CANAL

WELLAND CANAL

The Welland Canal connects Port Colborne on Lake Erie and Port Weller on Lake Ontario, bypassing Niagara Falls. Transit of the Canal requires passage through eight locks. Three are double, accommodating traffic in both directions simultaneously. The other five are single locks which can handle traffic in only one direction at a time. Dimensions of the locks and future channel depth will permit passage of any vessels which will be able to use the Seaway.

An evaluation of the practical capacity of the Canal requires consideration of basic factors influencing the flow of cargo, such as:

1. Seasonal distribution and density of traffic at peak periods.
2. The size and type of vessels which use the Canal.
3. Actual loads carried by vessels using the Canal in relation to their maximum capacity.

In addition to large carriers, small craft, such as pleasure cruisers, sailboats, and small freighters, which impede traffic, are accommodated. Even canoes are locked through.

These elements are taken into account in the consideration of Canal utilization which follows.

Canal Traffic

Exhibit A shows a steady increase in both vessels and cargoes going through the Canal for the period 1943 through 1953. The peak

year for Welland Canal traffic was 1953 when 9,372 craft moved in both directions. During this year, freighters of all sizes carried 19,542,000 net tons of cargo.

Ordinarily, the number of vessels using the Canal is about equal in each direction. However, there is a wide disparity in tonnage, as shown in 1953 when 87% of the total cargo moved downbound from Lake Erie to Lake Ontario.

Cargo usually starts moving through the Canal late in March or early April. By May, volume of traffic reaches a level which is maintained through October and thereafter falls off until the closing of navigation, usually early in December. The average of the seasonal pattern by months for the years 1948 through 1953 is shown in Exhibit B.

Practical Capacity of the Welland Canal

In considering the maximum practical capacity of the Welland Canal, three developments expected to affect utilization have been taken into account. They are more balanced traffic, larger ships, and an increase in the number of ships.

Balanced Traffic Flow

Downbound freight tonnage moving through the Canal in the peak year, 1953, amounted to almost 17 million net tons as compared to upbound traffic of 2.6 million tons, as shown in Exhibit A. The number of vessels was about equal in each direction, which means that most of the upbound vessels were empty. With cargo available for these empty upbound vessels, a total of about 34 million tons could have moved through the Canal.

June, 1953, was the peak month in the history of Canal traffic when over 2.7 million net tons of cargo went through. Of this total, almost 2.4 million tons was downbound volume and only 300,000 tons was upbound.

If available upbound capacity had been used, the annual Canal volume would be 35.6 million tons projecting the June, 1953, tonnage to the full season on the pattern shown in Exhibit B.

With the opening of the Seaway, Labrador ore moving upbound through the Canal to Lake Erie ports will create a more equal balance between upbound and downbound traffic. A substantial increase in freight tonnage handled could result simply through use of upbound cargo space now empty. This would mean greater utilization of Canal capacity without any increase in number of vessels and without creating delays in passage.

Larger Ships

The relationship between freight tonnage moved through the Canal and the number of vessels carrying it indicates an average downbound cargo of 3,700 tons in 1953. At the present time, the average size of the ships going through the Canal is influenced by the physical restrictions of the St. Lawrence waterway, although some large ships operate from the upper lakes as far as the head of the river.

When the Seaway is opened, waterway restrictions will no longer exist. A proportionately greater number of large vessels may be

expected to use the Welland Canal, eventually displacing many of the smaller vessels. Any resulting increase in the average cargo can proportionately add to the 35.6 million tons projected above.

With larger ships, utilization of the Canal can be improved with no net increase in number of vessels.

Increased Number of Ships

The number of ocean-going ships using the Canal will undoubtedly increase with the opening of the Seaway. Eventual displacement of smaller ships in the Great Lakes fleet by a fewer number of larger vessels will tend to offset this rise to some extent.

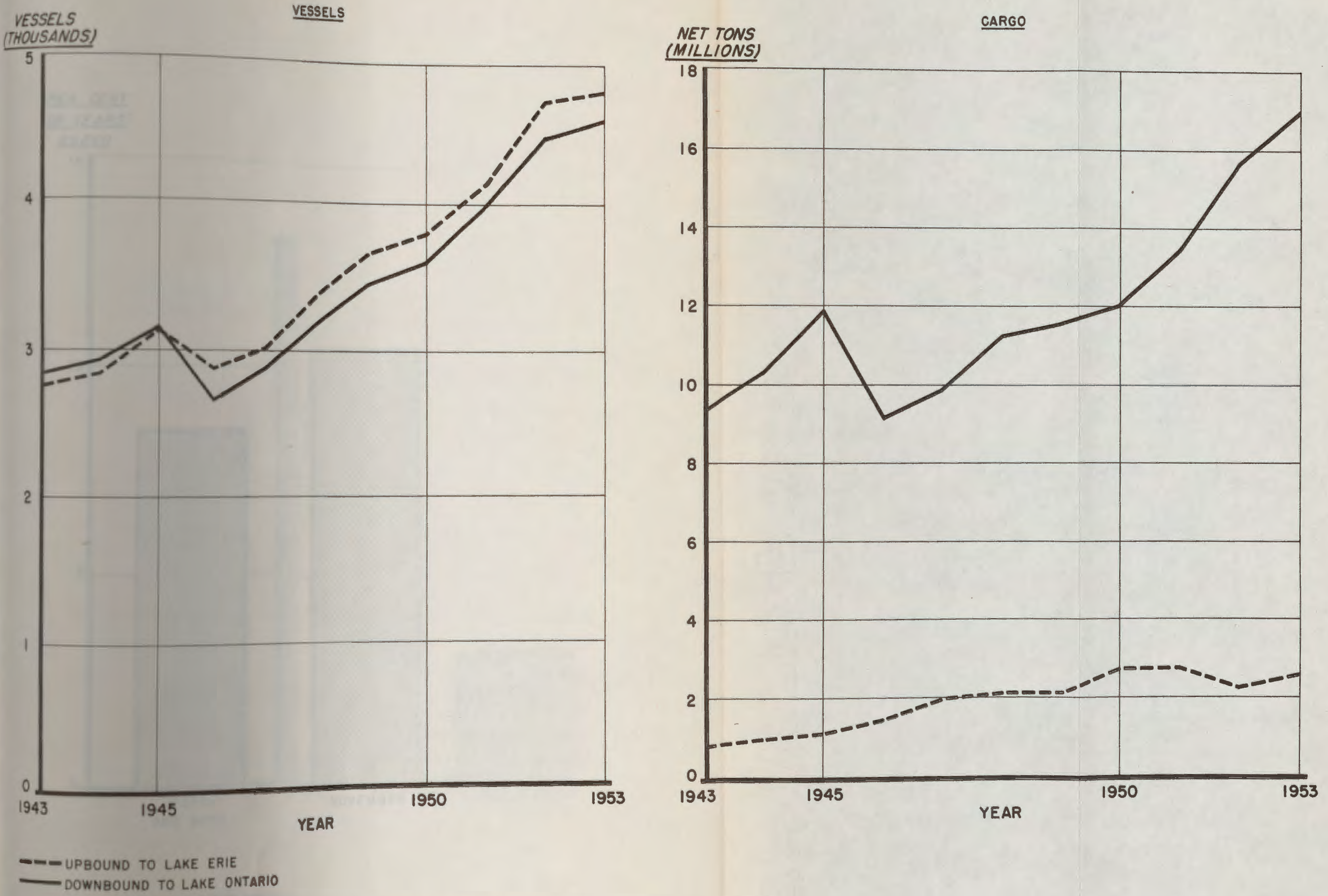
In the week of July 19, 1953, there were 169 lockages in the Canal - an all-time high. Peak tonnage, however, was handled in June, 1953, with a lower average number of lockages per week. No undue delays were encountered either in the month of June or the peak week in July, and indications are that even more vessels could have been handled. Informed opinion is that the high rate could have been maintained over the full season without congestion.

Plans to Increase Canal Capacity

Canadian authorities have indicated that the Welland Canal will not be permitted to become a bottleneck for Seaway traffic. It is estimated that double-locking the five single locks would increase Canal capacity by 30% to 40%. Lock sites have been selected and plans prepared for construction of the additional Canal facilities. It has been stated that work will be undertaken when necessary.

LAKE CARRIERS' ASSOCIATION
ANNEX I
EXHIBIT A

WELLAND CANAL TRAFFIC
1943 THROUGH 1953



SOURCE: "CANAL STATISTICS", PUBLISHED BY DOMINION BUREAU OF STATISTICS, CANADA.

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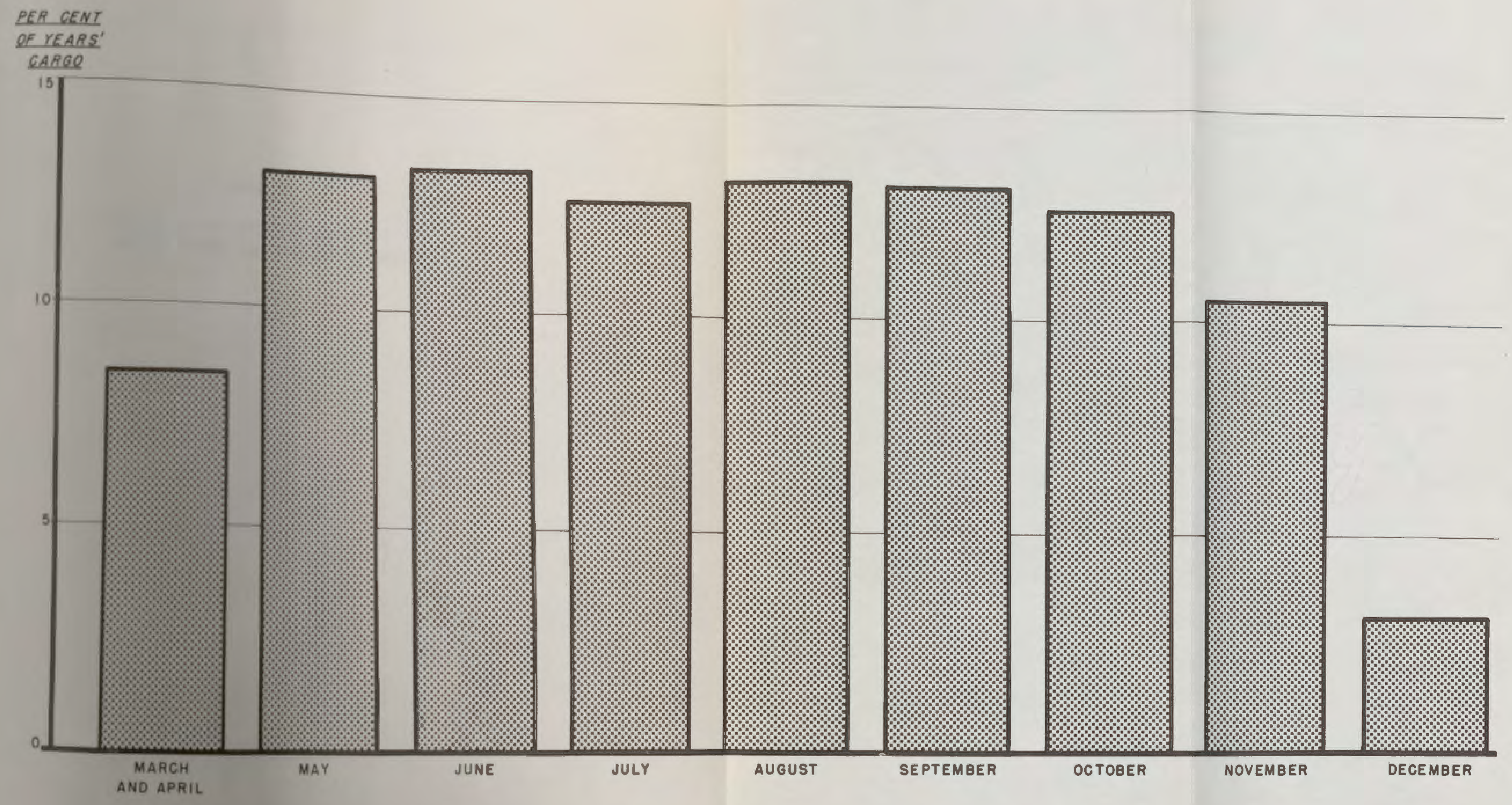
WELLAND CANAL FREIGHT TONNAGE - SEASONAL PATTERN
MONTHLY CARGO AS A PERCENT OF TOTAL YEARS' CARGO
6 YEAR AVERAGE - 1948 THROUGH 1953



SOURCE: "CANAL STATISTICS", PUBLISHED BY DOMINION BUREAU OF STATISTICS, CANADA.

ANNEX II

OPERATING AND CONSTRUCTION COSTS OF
UNITED STATES AND FOREIGN VESSELS

OPERATING AND CONSTRUCTION COSTS OF UNITED STATES AND FOREIGN VESSELS

United States authorities on shipping have no information on foreign flag ships directly comparable to the Great Lakes bulk freighters. An indication of comparative operating and construction costs can be obtained, however, from available data on similar ocean vessels.

Information on costs of United States and foreign ocean shipping was obtained from many different sources, of which the principal ones were:

- Steamship Companies
- United States Maritime Administration
- American Merchant Marine Institute
- American Tramp Shipowners' Association
- Great Lakes Overseas Freight Conferences

Operating Costs

Direct operating costs were gathered for a variety of vessels. The most reliable and recent information for purposes of comparing United States and foreign costs was that obtained for the Liberty Ship class.

Operating costs of Liberty Ships of foreign registry vary principally with regard to wages, related benefits such as pensions and insurance grouped under the general heading of "Social Charges", and subsistence. A comparison of these items for various nationalities is as follows:

	Wages Per Day	Social Charges Per Day	Subsistence Per Day	Total
United States	$800*	$ -	$80	$880
"Average" Foreign	200*	-	56	256
France	159	122	60	341
Norway	163	54	54	271
Italy	137	69	36	242
Great Britain	141	46	53	240
Holland	106	34	33	173

*Includes Social Charges Per Day.

The "average" foreign costs were derived from figures obtained from United States steamship companies which both operate and compete with vessels of foreign registry. Rather than being a true average, these figures represent a rough cross section of all foreign flag Liberty Ships operating to and from the United States Atlantic seaboard.

Although wages, social charges, and subsistence are the significant differences between foreign and United States direct operating costs, there are other differences as well. The following table compares total direct operating costs for a United States and an "average" foreign Liberty Ship in trade to and from the Atlantic seaboard:

	United States	"Average" Foreign	
	Cost Per Day	Cost Per Day	Per Cent of United States
Wages, Including Social Charges	$ 800	$200	25%
Subsistence	80	56	70%
Fuel (Ratio of 6 Days at Sea to 1 Day in Port)	313	313	100%
Other Direct Operating Costs	418	314	75%
Totals	$1,611	$883	55%

It is probable that a foreign flag operator on the Great Lakes will find costs other than wages increased because food, stores, supplies, equipment, repairs, and miscellaneous items will ordinarily cost more in Canada and the United States than overseas. Thus, it can be assumed that both the subsistence and other direct operating costs of a foreign vessel in the Labrador ore trade would closely approximate those of a United States lake vessel of comparable size. Differences would be largely confined to wages.

Construction Costs

Construction costs vary widely in foreign countries but almost all are lower than those in the United States.

A general comparison of average United States and foreign construction costs in early 1954 follows:

	United States Costs	Average Foreign Costs
Ocean-going Bulk Carrier or Tanker	100%	65% to 70%
General Cargo Carrier	100%	60%
Passenger Vessel	100%	55%

Japan and Italy offer the lowest shipbuilding costs in the world. Japanese tanker quotations, for example, have been as low as $120 per deadweight ton, whereas Norwegian and British tanker quotations approximate $180 to $200 per deadweight ton, and United States tankers cost as much as $310.

Construction costs are far from static and it should be recognized that the only accurate estimate is one based on a specific quotation at a particular time. Most of the newer ocean-going foreign bulk carriers operating to and from the United States Atlantic Seaboard were built in Japan, Norway, or Britain. A fair estimate is that a lake-type bulk carrier built in Norway or Britain would cost not more than 60% of a comparable United States vessel.

ANNEX III

FACILITIES FOR HANDLING BULK COMMODITIES

FACILITIES FOR HANDLING BULK COMMODITIES

The principal sources of information on ports and bulk handling facilities included in this annex were:

> Green's Great Lakes Directory, 1954
>
> MacQuown's Directory of Coal Docks on the Great Lakes, 1953-1954 Edition
>
> Lake Superior Iron Ores, Second Edition, 1952, published by Lake Superior Iron Ore Association
>
> U.S. Army Corps of Engineers, Ports of the Great Lakes Series

The handling facilities covered are located in 63 United States and Canadian ports, listed in Exhibit A. All iron ore loading and unloading docks and over 90% of the handling facilities for coal, limestone, and grain are included.

The tabulation is based on conditions existing in 1954. Harbor and channel improvements currently being planned that will probably take place before the Seaway opens have not been taken into account. Similarly, some new construction is not reflected. Examples are the two ports being established on Lake Superior to handle iron ore concentrates and the industrial developments on the Detroit River at Trenton, Michigan, on which capacity figures are not available.

Iron Ore Handling Facilities

Most iron ore shipments originate at upper lake ports and terminate on Lakes Erie and Michigan. Indications are that Labrador shipments of ore to the Great Lakes region will be unloaded with existing facilities. No new construction will be required.

Loading Capacity

The capacity of iron ore loading facilities varies with the mix of ore to be loaded, the efficiency of railroad classification yards, and the speed with which cars can be dumped down designated loading chutes.

No exhibits have been prepared on ore loading capacity as facilities on the upper lakes are more than adequate to handle expected shipments from the Lake Superior district. Labrador facilities are planned to allow for expanding production.

Unloading Capacity

The major ore unloading ports can accommodate all existing bulk freighters, including the largest, capable of carrying 16,000 tons or more. Almost all the ore unloading facilities are located on Lakes Erie and Michigan, as shown in Exhibit B, and only a few are restricted to vessels under 13,000 tons capacity. There are two ore docks where only small ships can be accommodated. Both are on Lake Erie, one in Cleveland and one in Buffalo. Vessels of over 10,000 tons capacity normally handle more than 70% of the ore shipped on the Great Lakes and, except for the two docks mentioned, could handle all of it.

Coal Handling Facilities

Annual capacity of principal United States and Canadian coal loading and unloading facilities on the Great Lakes and St. Lawrence River is shown in Exhibit C. Most coal shipments originate on Lake Erie.

Loading Capacity

All Great Lakes coal loading facilities are in the United States. Those on Lake Erie at Toledo and Sandusky, Ohio, are the most important.

Only a small part of the loading capacity is limited to vessels of less than 10,000 tons. On Lake Erie, there are two small docks at Sandusky and one at Buffalo where the depth of the water prevents loading of larger ships.

Many of the coal loading docks on Lake Erie can accommodate any ocean-going vessels which will be able to pass through the Seaway. If all United States export coal now being shipped through Atlantic ports were diverted to lake ports and the Seaway, these loading docks alone could absorb the additional tonnage. There are no facilities at St. Lawrence River ports, however, capable of transshipping export coal into ocean-going freighters.

Unloading Capacity

At the present time, most of the long-haul westbound coal shipments from Lake Erie to the upper lakes move in small bulk freighters. Unloading facilities on Lake Michigan are almost entirely limited to vessels of less than 10,000 tons capacity.

Some coal unloading docks on Lake Superior are restricted to ships of less than 10,000 tons capacity. A few at Duluth, Minnesota, and a substantial part of the facilities at Superior and Ashland, Wisconsin, are thus limited.

Unloading facilities in the Detroit River area are inadequate to handle short-haul coal coming from Lake Erie. As a result, self-unloaders carry most of the traffic.

Canadian unloading docks on the St. Lawrence River and Lake Ontario are adequate to take care of coal imports from the United States. A few in each area are limited to smaller ships but most of them can accommodate larger ones. Montreal and Quebec can unload vessels of over 16,000 tons capacity.

Limestone Handling Facilities

Limestone is not covered by an exhibit as the use of self-unloaders eliminates the need for special unloading facilities. Stone moving in bulk freighters is generally destined for steel mills where adequate unloading equipment is available.

Grain Handling Facilities

Annual capacity of major United States and Canadian grain loading facilities is shown in Exhibit D. Capacity of unloading facilities is shown in Exhibit E.

Most grain traffic originates at the head of the lakes and terminates at ports on Lake Erie, Georgian Bay, and the St. Lawrence River. Duluth, Minnesota; Superior, Wisconsin; and Fort William-Port Arthur, Ontario, all on Lake Superior, are the major shipping ports.

Loading Capacity

Almost all United States loading elevators on Lake Superior can accommodate vessels up to 16,000 tons capacity. Canadian facilities on Lake Superior can load the largest lake vessels. Lower Lake Michigan ports are mainly limited to vessels of less than 10,000 tons capacity.

Canadian facilities on the St. Lawrence River at Montreal are adequate to load large ocean-going freighters. The major grain ports on the upper St. Lawrence and the lower lakes, while more restricted, will accommodate ocean-going ships of the size expected to use the Seaway.

Unloading Capacity

A little less than half the elevators on Lake Erie are limited by channel depth to ships of less than 13,000 tons. Most of the grain unloading docks to which access is restricted are located in Toledo and Cleveland, Ohio, and Erie, Pennsylvania. Approximately 25% of the elevators at Buffalo, New York, which is by far the major receiving port, are also limited to ships of less than 13,000 tons, but the remainder can accommodate the largest vessels.

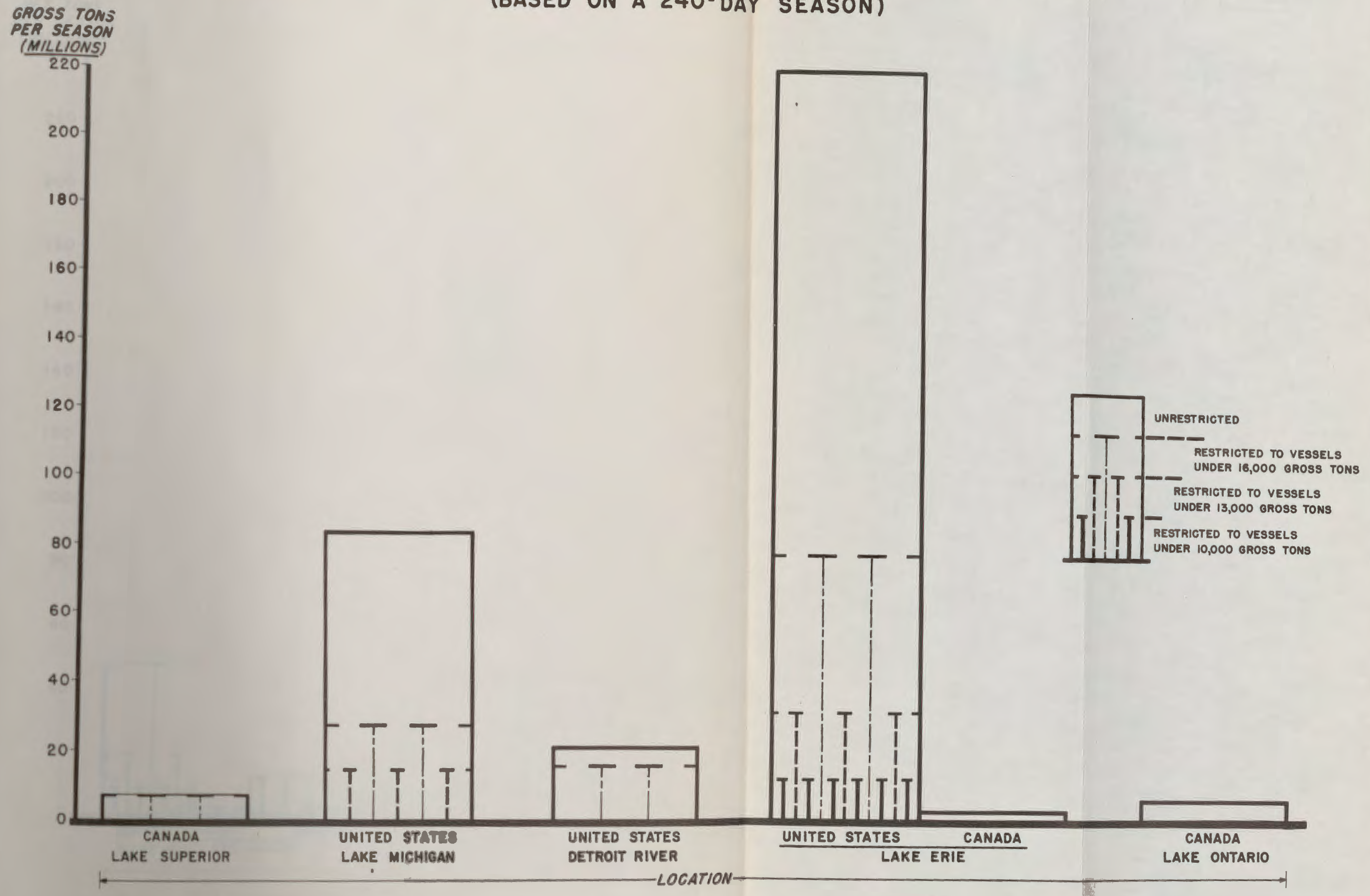
About half the Georgian Bay elevators are limited to ships of less than 16,000 tons capacity. Some of them are limited to ships of less than 13,000 tons.

The principal Canadian unloading ports on the St. Lawrence River are Prescott and Montreal. Elevators at Prescott can handle the largest lake vessels, but unloading facilities at Montreal, due to dock length, are mainly restricted to ships of less than 10,000 tons capacity.

LIST OF 63 GREAT LAKES AND ST. LAWRENCE RIVER PORTS
INCLUDED IN REVIEW OF BULK COMMODITY HANDLING FACILITIES

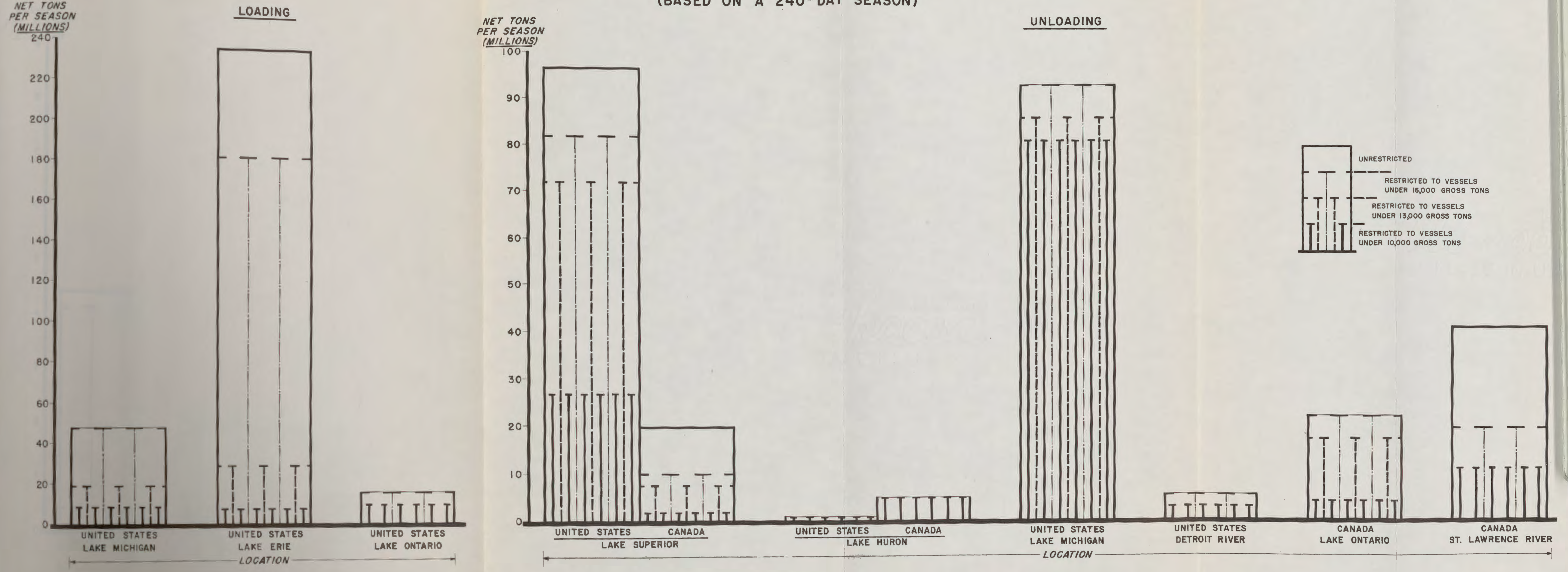
	Lake Superior	Sault Ste. Marie	Lake Huron	Georgian Bay	Lake Michigan	St. Clair and Detroit Rivers	Lake Erie	Lake Ontario	St. Lawrence River
United States Ports	Ashland, Wis. Duluth, Minn. Marquette, Mich. Superior, Wis. Two Harbors, Minn.	Sault Ste. Marie, Mich.	Bay City, Mich. Calcite, Mich. Saginaw, Mich.		Calumet Harbor, Ill. Chicago, Ill. Escanaba, Mich. Gary, Ind. Green Bay, Wis. Indiana Harbor, Ind. Manitowoc, Wis. Milwaukee, Wis. Muskegon, Mich. Port Inland, Mich. South Chicago, Ill.	Dearborn, Mich. Detroit, Mich.	Ashtabula, Ohio Buffalo, N. Y. Cleveland, Ohio Conneaut, Ohio Erie, Pa. Fairport, Ohio Huron, Ohio Lackawanna, N. Y. Lorain, Ohio Marblehead, Ohio Sandusky, Ohio Toledo, Ohio Tonawanda, N. Y.	Charlotte, N. Y. Oswego, N. Y. Sodus Point, N. Y.	Ogdensburg, N. Y.
Canadian Ports	Fort William, Ont. Michipicoten, Ont. Port Arthur, Ont.	Algoma, Ont. Sault Ste. Marie, Ont.	Goderich, Ont.	Britt, Ont. Collingwood, Ont. Midland, Ont. Owen Sound, Ont. Port McNicoll, Ont.		Amherstburg, Ont. Sarnia, Ont. Walkerville, Ont.	Humberstone, Ont. Port Colborne, Ont.	Belleville, Ont. Hamilton, Ont. Kingston, Ont. Toronto, Ont.	Montreal, Que. Prescott, Ont. Quebec, Que. Three Rivers, Que.

CAPACITY OF UNITED STATES AND CANADIAN IRON ORE UNLOADING FACILITIES ON THE GREAT LAKES AND ST. LAWRENCE RIVER (BASED ON A 240-DAY SEASON)



LAKE CARRIERS' ASSOCIATION
ANNEX III
EXHIBIT C

CAPACITY OF PRINCIPAL UNITED STATES AND CANADIAN COAL LOADING AND UNLOADING FACILITIES ON THE GREAT LAKES AND ST. LAWRENCE RIVER (BASED ON A 240-DAY SEASON)



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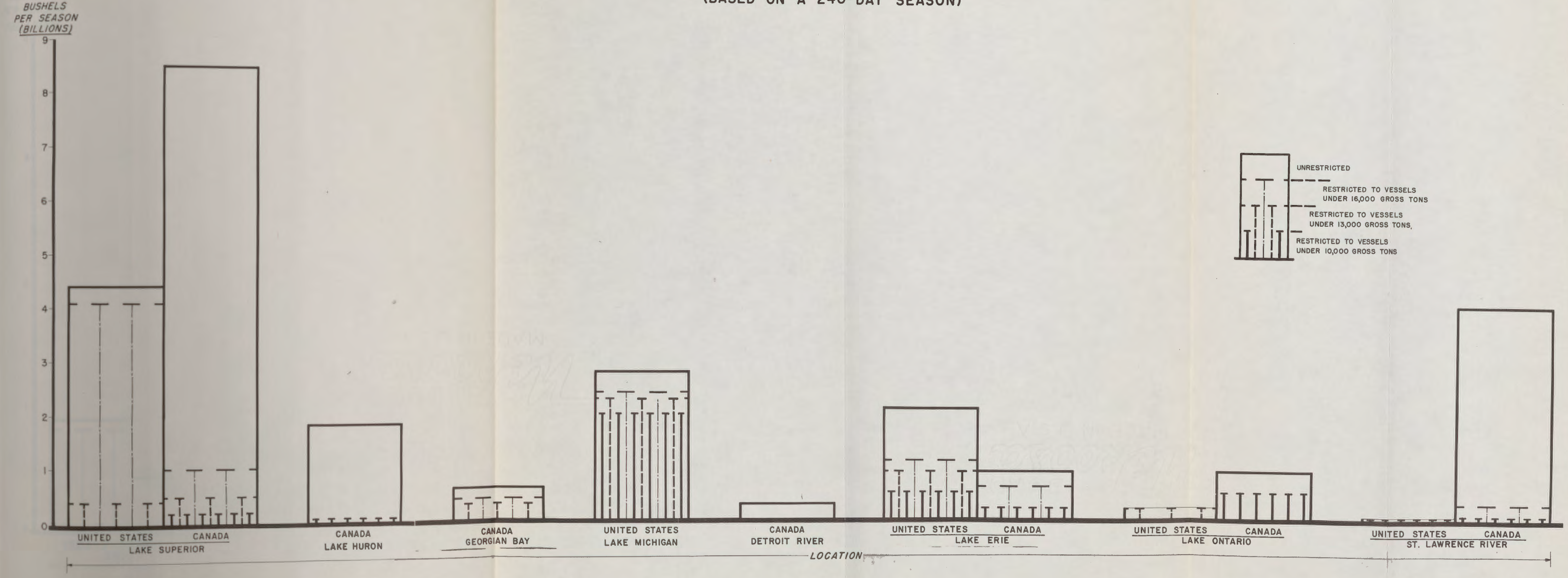
LAKE CARRIERS' ASSOCIATION
ANNEX III
EXHIBIT D

CAPACITY OF PRINCIPAL UNITED STATES AND CANADIAN GRAIN LOADING FACILITIES ON THE GREAT LAKES AND ST. LAWRENCE RIVER (BASED ON A 240-DAY SEASON)



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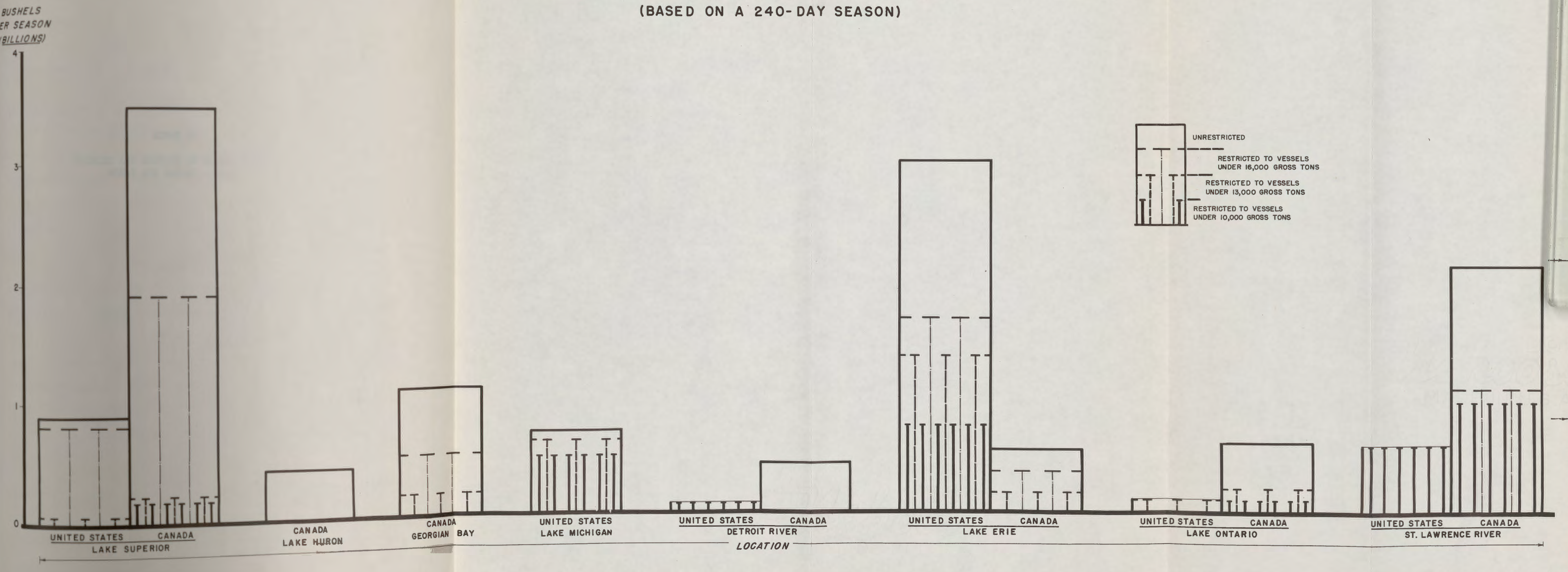
LAKE CARRIERS' ASSOCIATION
ANNEX III
EXHIBIT E

CAPACITY OF PRINCIPAL UNITED STATES AND CANADIAN GRAIN UNLOADING FACILITIES ON THE GREAT LAKES AND ST. LAWRENCE RIVER (BASED ON A 240-DAY SEASON)



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ANNEX IV

SOURCES AND ROUTING OF UNITED STATES WHEAT FOR EXPORT - 1960

SOURCES AND ROUTING OF UNITED STATES WHEAT FOR EXPORT - 1960

It has been assumed that 167 million bushels of wheat of all types would be exported from the United States in 1960. To determine how much may move over the Great Lakes, it is necessary to consider use, growing area, and possible routing for each type.

Hard Red Spring Wheat

Hard red spring wheat is chiefly used to make bread. Most of it is grown in North Dakota and Montana. Proximity to the head of the lakes makes shipment through Duluth natural, whether the wheat is destined for eastern milling and domestic consumption or for export to Europe.

The bulk of hard red spring wheat exports to Europe has moved from Duluth to Buffalo on the lakes and overland by rail or canal to North Atlantic ports. This routing is cheaper by approximately 11 cents per bushel than the all-rail movement to tidewater. There would be additional savings of 9 cents per bushel if it were routed down the present 14-foot waterway to Montreal. The principal reason that this all-water routing has not been used more for United States wheat is that storage and handling facilities at Montreal are congested.

When the Seaway is opened, the 15 million bushels (450,000 net tons) likely to be exported in 1960 may move by two routes in addition to the present one through Buffalo:

1. The wheat might bypass Buffalo and move through the Seaway directly overseas if ocean-going ships are available at the head of the lakes.
2. Lake vessels could carry the wheat from Duluth to Montreal for transshipment if Montreal expands its facilities.

Hard Red Winter Wheat

Hard red winter wheat also is used to make bread. The major surplus producing section is the Nebraska-Kansas-Oklahoma area. The southernmost part of the area is the prime source of export wheat, which moves by truck, rail, or barge to Gulf ports. Terminal facilities at these ports are well developed and a pattern of shipping has long been established.

In the event of a bumper crop and favorable export prices, it is possible that export wheat from Nebraska would be brought into Lake Michigan ports for shipment over the lakes. At the predicted level of 92,500,000 bushels of hard red winter wheat exports in 1960, however, it is probable that all would continue to move through traditional channels to the Gulf.

Soft Red Winter Wheat

Soft red winter wheat is chiefly used in making pastries, cakes, and cookies. The major growing area in which a surplus is ordinarily available for export lies in Indiana, Ohio, and Pennsylvania. Growing of large quantities in recent years has been stimulated by price

supports. A substantial drop in production is forecast, with a consequent reduction in soft red winter wheat exports to a level of approximately 20 million bushels.

Exports have moved mostly by rail to Baltimore, Philadelphia, and Norfolk. It would seem logical that a portion of these exports originating within short trucking haul of Lake Michigan ports or Toledo could be diverted to the lakes. At Toledo, however, the depth of the channel is not adequate to handle grain ships capable of taking much over 200,000 bushels (6,000 net tons). Until the channel is deepened, wheat exports out of Toledo are not expected to be important.

Of the approximately 20 million bushels of soft winter wheat forecast for export, it is estimated that 40%, or 8 million bushels (240,000 tons), could be diverted to the lakes.

White Wheat

White wheat is primarily of the soft variety and is used principally in making pastries, cakes, and cookies. Most exports originate in Oregon and Washington and logically move via Pacific Coast ports.

Some white wheat is also grown in Michigan and New York. Exports move principally by rail to Atlantic ports. From 4 to 5 million bushels may be exported from this area in 1960. Some could be diverted to the Great Lakes. Opinion in the grain trade is that exports over the lakes may amount to 2 million bushels (60,000 tons).

Durum Wheat

Durum wheat is chiefly used for spaghetti, macaroni, and noodles. It is grown primarily in North Dakota. It is highly unlikely that durum wheat will be produced in sufficient quantity for export by 1960 unless a remedy is found for rust damage which limits the crop.

Summary

Possible wheat exports via Great Lakes ports in 1960 may be summarized as follows:

	Bushels
Hard Red Spring Wheat	15,000,000
Soft Red Spring Wheat	8,000,000
White Wheat	2,000,000
Total	25,000,000