THE EFFECTS OF THE ST. LAWRENCE SEAWAY ON THE LOCATION OF ECONOMIC ACTIVITY

by

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ABSTRACT OF THESIS

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By Benjamin H. Stevens

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The location of economic activity is often determined by the need to minimize the transport costs involved in that activity. Therefore, the establishment of more economic transport routes may have significant effects on location. The planned St. Lawrence Seaway is such a route because of the transport economies which it will make possible.

This thesis explores the potential impact of these economies. Transport costs and traffic flows of iron ore, coal, wheat, and general cargo are analysed to determine the Seaway's future effects on the location of the iron and steel, wheat export, coal and cargo transshipment industries.

From these analyses, conclusions are drawn as to the economic future of cities and regions in the United States and Canada. Statistical tables are included to support these conclusions.

Thesis Supervisor: Walter Isard

LETTER OF TRANSMITTAL

August 26, 1954

Professor Frederick J. Adams
Head, Department of City and Regional Planning
School of Architecture and Planning
Massachusetts Institute of Technology
Cambridge, Massachusetts

Dear Sir:

In partial fulfillment of the requirements for the Degree of Master of City Planning from the Massachusetts Institute of Technology, I submit herewith this thesis entitled:

The Effects of the St. Lawrence Seaway on the Location of Economic Activity.

Respectfully,

Benjamin H. Stevens

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INTRODUCTION, PURPOSE, AND SCOPE

Introduction

Predictions as to the economic future of a city and its tributary region are basic to planning for that city and region. Future population in an area and that population's needs and demands will depend largely on the future economic activity of that area.

Without good estimates of future population and industry it is impossible to design effectively and plan economically. Land use schemes, transportation systems, housing programs, and most of the other things for which the planner is responsible are dependent either on population, the economic base which supports that population, or both.

The planner, therefore, must necessarily concern himself with the economic future of the city or region for which he is responsible if his plans are to be valid and useful. Especially he must know if major economic shifts are likely to affect his area.

Such shifts have been anticipated for the areas served by the soon-to-be-built St. Lawrence Seaway. This project, which has been vigorously supported and opposed by opposing interest groups for the last half-century, is now a fait accompli. Passage of the St. Lawrence Seaway bill this spring by the American Congress assures that the United States and Canada will cooperate in the building of this gigantic project.

Reference to the map of the Seaway (see MAP I, Appendix) shows that it will open up the Midwest areas of the United States and Canada to the sea. Instead of just small, inefficient vessels, full-size oceangoing ships and huge barge-like lakes carriers will be able to ply the waterway all the way from the Atlantic to the western tip of Lake Superior. The industrial and agricultural Midwest will thereby be able to trade via an economical all-water route with foreign countries and to tap new sources of raw materials.

From the planner's standpoint, then, it is important to determine what the impact of this new transport route will be, both on the areas served by it and on those whose economic activities depend to a substantial degree on the areas served by it.

Purpose

The purpose of this report, therefore, is to determine what effects the Seaway will have on the location of economic activity in order to be able to make predictions as to the economic future of the cities and regions affected by the Seaway.

Scope

To accomplish this purpose, the writer chose to analyse the effects of the Seaway on the transportation of three major commodities; iron ore, coal, and wheat, and of general cargo. These four categories were chosen because it was felt at the outset that they would account for the great bulk of Seaway traffic and because changes in the transport of these commodities and general cargo would have the most significant effects on the future location of economic activity.

Since iron ore and coal are the two materials basic to the making of iron and steel, the analyses for them were combined in a study of the iron and steel industry in CHAPTER I. CHAPTER II analyses the movement of export wheat. CHAPTER III presents a further study of coal shipments for purposes other than the manufacture of iron and steel. CHAPTER IV analyses trends in the transport of general cargo.

The conclusions reached in each analysis are then summarized in the SUMMARY CONCLUSIONS.

CHAPTER I: EFFECTS ON LOCATION IN THE IRON AND STEEL INDUSTRY

Scope of Analysis

Iron and steel is basically a transport-oriented industry. Although labor, capital, power and other costs are important, they do not vary significantly from region to region. On the other hand, the major costs of transporting raw materials to the production point and finished products to the market vary widely between regions and are the determining factors in economic location of this industry. 1/

The four basic raw materials used in the production of iron and steel are iron ore, coal, limestone, and scrap. Limestone was not included in this analysis because of its relatively ubiquitous nature and because of the small quantity used relative to the other materials. Scrap was also excluded because its availability and price in any given region is subject to such rapid fluctuation.

Raw Material Transport Costs

Transport costs were therefore computed only for iron

1/ Isard and Cumberland, "New England as a Possible Location for an Integrated Iron and Steel Works," Economic Geography, Vol. 26, No. 4, October 1950, pp 245-7.

ore and coal. Ore transport costs were computed from three alternative sources: Labrador (TABLE I), Venezuela (TABLE 2), and Lake Superior (TABLE 3). Coal transport costs were computed only from the Pennsylvania-West Virginia area (TABLE 4) as this is only real competitive source of good coking coal available to the production points chosen.

In each case transport costs were computed to existing and potential production points via traditional routes and via the Seaway. In all cases involving Seaway transport figures were computed for both 15,000-ton and 20,000-ton lakes-type vessels. This was done to take account of possible economies of scale involved in the larger bulk cargo shipments. Although most vessels of this type are presently of the 15,000-ton class, there are ships now being built for lake service of 20,000-ton capacity. These vessels will eventually replace the smaller units since they will be better able to take advantage of the 27-foot depth of the proposed Seaway. Since both sizes will probably be in use for the next few years, both sets of figures were included in the tables.

The costs of assembling the necessary coal and iron ore to produce a gross ton of steel (TABLE 5) was computed for all production points and ore sources. This summary table emphasizes the differences in transport costs to each production point as between the various sources. Since institutional pricing practices might tend to reduce or eliminate differences caused by inequalities in the quantities of the various ores used, a second table (TABLE 6) was constructed. In this table identical quantities of ore and coal per gross ton steel were used in the calculations no matter what the ore source or quality was.

Foreign vs. Lake Superior Ores

The question of the foreign ores from Venezuela and Labrador needs some further elaboration. Venezuela ores are already being employed at Trenton and Baltimore. Labrador ores are not yet in use but are being developed by American companies for use at American production points to supplement the dwindling stock of Lake Superior ores. Much of the argument in this country in favor of helping Canada build the Seaway has been based on the assumption that Labrador Ores would have to be made cheaply available to American steel producers if the economy of the midwest were not to suffer from lack of this vital raw material.

Testimony before congressional committees has indicated that the available reserves of high-grade, open-pit ores in the Lake Superior area amounted to 1.6 billion gross tons in 1951. With a 1951 consumption of 80 million gross tons a year,2/

2/ Earl M. Richards, Vice-President of the Republic Steel Corp., test. before Sen. Sub. on For. Relations, 83rd Cong, 1st Sess, p.125.

reserves were then calculated to be sufficient for 20 years. Although there are reserves of 5 billion tons of taconite ore, this ore is extremely low grade and must be processed before it can be used in blast furnaces. This will add substantially to its cost.

Estimated production of taconite concentrates for 1954 is 2.5 million gross tons.[3/] This clearly will not go far toward solving the iron ore shortage unless substantially more investment is made in Taconite benefication plants. Even if the proposed 1960 production of 13.5 million tons is achieved, foreign ores will still be needed to help make up the deficit unless American steel capacity fails to continue its present rate of increase.[4/]

Forecasts for the Labrador ore development anticipate production of 10 million gross tons annually by 1956 and 20 million by 1965.[5/] Venezualan production is expected to reach 15-20 million gross tons by the late 1960's.[6/] It is apparent that both of these foreign sources will be needed to supply expanded steel capacity at new production points and eventually to replace Lake Superior ores at some existing

3/ Oscar I. Chapman, Secretary of the Interior, testimony before the House Committee on Public Works, 82nd Cong., 1st Sess, p.103.
4/ Oscar I. Chapman, testimony,loc. cit.
5/ Earl M. Richards, testimony, op. cit., p. 129.
6/ Oscar I. Chapman, testimony, op. cit., p. 114.

points. For this reason, rates on Venezuela and Labrador ores were computed to all points even if these ores might not be employed at these points for several years to come.

Actually, foreign ores may be able to compete with Lake Superior ores at interior American production points some little time before the Lake Superior ores give out. The extra costs of going deeper to mine depleted ores, the higher prices of benificiated taconite ores, and the uncertainty of supply may all combine causing a shift towards Labrador and Venezuela ores. It is unlikely, however, that this will occur to any large extent within the next ten years. For this reason, Lake Superior ores were used in the calculations of TABLE 7 for all points presently using them except Toronto which is expected to shift to Labrador Ore when the Seaway is completed. (For further discussion of the choice of Labrador Ore for Toronto, see the notes on Ore Source at the end of TABLE 7).

Finished Product Transport Costs

Transport costs on finished products were computed to each major steel market from all production points which might conceivably serve that market. Rail rates only were used because finished steel seldom moves by water due to the relatively small shipments of any particular steel product and the high handling costs involved. These figures were included in TABLE 7 rather than presented separately because they were directly involved in the total cost computations of that table.

Total Transport Costs

Costs of transporting finished steel to each market from its potential points were added to the costs of assembling ore and coal at those production points to give the total transport costs on finished steel at the market (TABLE 7). These total transport cost figures present a picture of market configuration if we assume that the production point which involves the lowest total transport cost in delivering finished steel to a market will be the supplier of that market. This will be true as long as we ignore basing point pricing systems and other institutional practices in the iron and steel industry.

Basically, then, TABLE 7 gives an indication of a reasonable market pattern on the basis of transport cost differentials. Possible deviations from this pattern and the reasons for these deviations lie beyond the scope of this study.

Market Analysis

Analysis of the market pattern indicated by TABLE 7 shows that the southern New England market falls entirely to Trenton. Providence-Fall River, Hartford, and New Haven are all Trenton's by a fair margin. Worcester and Boston, while also within Trenton's market, show some competition from Montreal and indicate that Montreal might be truly competitive in northern New England if there were no import duties involved.7/

Similarly, New York City is definitely in Trenton's market, but Albany-Troy falls to Trenton by only a small margin under Montreal and Buffalo. This indicates that Montreal might, import duties aside, have the market north of here while Buffalo should have it west of here. As expected, then, we find Buffalo in possession of the western New York State market including Binghamton, Utica, Syracuse, Rochester, and Buffalo. Note that at all these points Toronto is at a decided disadvantage even without import duties. It should be pointed out, however, that Toronto's disadvantage is increased by our choice of Labrador Ore for this production point. Nevertheless, Toronto would still be at a disadvantage with respect to Buffalo even if both

7/ American import duties on finished steel shapes averaged 10% of value in 1950. This rate would be actually more than high enough to keep Montreal from competing at all in American markets. Ref. United States Import Duties 1950, U.S. Tariff Commission, U.S. Government Printing Office, Washington, 1950.

points used Lake Superior Ore.

Continuing west we find that Cleveland has its own market as expected. Toledo, Detroit, Flint, Grand Rapids, and Lansing fall to Detroit. Chicago has Chicago. Note that Pittsburgh loses out in all markets except, of course, its own. Although the historic location of steel industry at Pittsburgh, with its proximity to the coal fields, was logical when large quantities of coal were used per ton of steel, the reduced quantities of coal presently required together with the high cost of transporting ore to this point have seriously damaged Pittsburgh's competitive position in other markets.[8/]

To the north, Montreal and Toronto are closely competitive in the Winnipeg and Nakina markets. Although Detroit and Chicago have cost advantages at these points, heavy import duties would protect the Canadian steel industry from outside competition.[9/] Quebec has a major advantage in its own market but, like 7 islands and Kingston (see notes at the end of

8/ For further elaboration on Pittsburgh's competitive position as a steel producer see Isard and Capron "The Future Locational Pattern of Iron and Steel Production in the United States," _The Journal of Political Economy_, Vol. LVII, No. 2, April 1949, p. 124.

9/ Canadian Import duties on finished steel shapes averaged 10% of value in 1938. There is no reason to believe that this tariff has been reduced. Ref. _Handbook of Canadian Customs Tariff and Excise Duties_, 48th Edition, McMullin Publishers Ltd., Montreal, 1938.

TABLE 7) has an insufficient local market to warrant an integrated works. Montreal, then, will have the Quebec Market as well as its own and Ottawa's markets. Toronto has Toronto.

Apparently no major shifts will take place in the American market picture due to the Seaway. Trenton neither gains nor loses advantage, except perhaps in northern New England and New York where Montreal competition is a potential factor only if import duties are ignored. Buffalo suffers no major losses within the United States but here, and at lake points to the west, losses of Canadian market for American steel will occur if Montreal goes into major production. Otherwise, the lake points of Cleveland, Detroit, and Chicago feel no major changes due to the Seaway. This situation will continue, however, only as long as sufficient reserves of Lake Superior ores remain. The necessity for using foreign ores in future may make the Seaway vital to the survival of interior American production points.

On the Canadian side, Toronto, presently the only major steel producer, will lose its Montreal, Quebec, and Ottawa markets if Montreal goes into major steel production. This loss would probably be compensated for by increased future consumption in the areas tributary to Toronto in which that point has major transport cost advantages and in reduction of imports of American steel.

Montreal, then, qualifies the only potential point of major change. Here transport cost advantages, especially in the transport of coal, will be made possible by the construction of the Seaway. For the first time Montreal will be in a position sufficiently competitive to warrant major steel production.[10/] The question remains whether the Montreal market will be large enough to absorb the output of a minimum efficient integrated iron and steel works.

Montreal Market Analysis

To answer this question, TABLE 8 has been constructed giving the most recent available estimates of steel consumption in the Montreal Market. For the purposes of this table the Montreal Market was defined as the whole province of Quebec plus the metropolitan area of Ottawa in the Province of Ontario since a more complete breakdown of figures was not available. The inaccuracies inherent in this assumption should not be large since by far the major portion of steel-consuming industries in the Province of Quebec are located in the metropolitan areas of Montreal and Quebec. Furthermore,

10/ See CHART 2 for comparison of present ore and coal assembly costs at Montreal with future costs after the Seaway has been completed.

use of figures for only Ottawa in Ontario assumes that the rest of the Ontario market falls to Toronto, when actually the northeastern portion of the province would probably fall to Montreal. The inaccuracies, then, would tend toward underestimation of the true situation.

Referring to TABLE 8, at the bottom of column 5, we find a total steel consumption of about 1.4 million tons. By American standards,[11/] and certainly by Canadian standards, this is enough to warrant an integrated works. There is some question however, whether the consumption of the various finished steel shapes is sufficient to justify the construction of efficient, sized finishing mills to produce them. To answer this question we refer to the totals at the bottom of columns 7, 9, 11, 13, and 15.

The total at the bottom of column 7 shows that the 1951 consumption of bars in the Montreal Market was 197,000 tons. The minimum economic bar mill by U.S. standards would produce 270,000 tons per year. If we assume for the moment that in a less industrialized country such as Canada U.S. standards might not apply, we shall have to determine some sort of Canadian standard for efficient size. In Canada in 1951 there

11/ See Isard and Cumberland, op. cit., for minimum efficient standards of size for American mills.

was a bar and rod mill of 232,000 tons capacity, a second of 172,000 tons capacity and a third of 152,000 tons capacity.[12/] These data suggest that, by Canadian standards, a Montreal bar mill would be justified.

Similarly, a reference to the total of column 9 shows a Montreal market consumption of 315,000 tons of sheet and strip, far short of the American minimum standard of 600,000 tons. We find for Canada in 1951, however, a combined sheet and strip mill for cold-reduced black plate and tin plate of 489,000 tons. If we allow for significant future consumption growth in the Montreal area and adjust the 489,000 ton figure downwards to exclude cold-rolled products and other items which are not usually included in sheet and strip mill size calculations, a sheet and strip mill in the Montreal area might become economically feasible.

The total at the bottom of column 11 shows that 276,000 tons of structural shapes were consumed in the Montreal Market in 1951. The American standard for a minimum efficient structural mill is 300,000 tons capacity. The largest structural shape mill in Canada in 1951 was 154,000 tons capacity. We therefore conclude that a structural shape mill

12/ See <u>Directory of Iron and Steel Works of U.S. and Canada 1951</u>, American Iron and Steel Institute, for Canadian mill sizes and capacities.

in the Montreal Area is feasible.

The total at the bottom of column 13 indicates that 242,000 tons of plate were consumed in the Montreal Market in 1951. By American standards an efficient plate mill has an annual capacity of at least 250,000 tons. In 1951, the largest plate mill in Canada had a capacity of 150,000 tons. We conclude that a Montreal plate mill is justified.

The 1951 wire rod consumption in the Montreal Market shown at the bottom of column 15 was so small that a wire rod mill in the Montreal area does not seem warranted.

In total, then, we would definitely anticipate for Montreal a bar mill of about 200,000 tons, a structural shape mill of about 275,000 tons and a plate mill of about 250,000 tons; 725,000 tons in all. If we were to allow for the host of other products (except sheet and strip) produced by a modern steel works, the capacity of a Montreal plant would fall between the 756,000 ton capacity of the Algoma Works and the 1.186,000 ton capasity of the Hamilton works of the Steel Company of Canada, Ltd.

On this basis, we could conclude that an integrated works without sheet and strip capacity would be feasible at Montreal. If we should accept our own justification of a sheet and strip mill, the basis for an integrated iron and steel works at Montreal would be well established.

Bear in mind, however, that institutional factors and decisions within the Canadian steel industry may work to retard or prevent steel development at Montreal. Certainly Montreal is an attractive location, not only because of the advantages cited, but also because it is presently a scrap surplus point making scrap cheap and reducing the costs of production even more relative to present production points where scrap is in short supply. Still the Canadian industry might, for its own reasons, choose to locate new or expanded steel development at some other point.

Canadian Consumption and Production

Certainly the need for expansion exists. TABLE 9 with CHART I which accompanies it show that Canadian steel production, though it has steadily increased, has not kept pace with increasing Canadian consumption. Therefore, imports have also been increasing to the point where they have averaged 1¼ million tons annually over the last three years. New production at Montreal or elsewhere in Canada, then, would not be competitive with present production but would merely serve to equalize Canadian consumption and production while tending to eliminate imports. Leaders in an industrialized nation often, right or wrong, place a high value on steel self-sufficiency.

Conclusions

It is possible to conclude, therefore, that there will be an increase of $1\frac{1}{4}$ to $1\frac{1}{2}$ million tons in Canada's steel capacity within the next few years. Transport cost advantages involved in the use of the Seaway make it both feasible and logical for this increase to take place in the Montreal area. If economic forces are allowed to operate unhampered by political, governmental, or other institutional influences, there are good grounds for expecting an integrated iron and steel works at Montreal in the not too distant future.

TABLE I ---TRANSPORT COSTS OF LABRADOR ORE PER GROSS TON ORE

PRODUCTION POINT		CHIC	DETR	CLEV	PITT	BUFF	TORO	KING	MONT	QUEB	7ISL	TREN	BALT	
Rail to 7 Islands	(a)	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	
Transshipment	(b)	.33	.33	.33	.33	.33	.33	.33	.33	.33		.33	.33	
Toll on Seaway	(c)	.71	.71	.71	.71	.71	.36#	.36#						
15K-Ton carrier	(d)	3.40	2.24	2.04	4.26*	1.70	1.60	1.30	.96	.75		1.20	1.20	(f)
Total transport costs		7.09	5.93	5.73	7.95	5.39	4.94	4.64	3.94	3.73	2.65	4.18	4.18	
20K-Ton carrier	(e)	2.55	1.68	1.53	3.78*	1.27	1.20	.97	.72	.60				
Total transport costs		6.34	5.37	5.22	7.47	4.96	4.54	4.31	3.70	3.46				

(a) From a table prepared by the Bureau of Mines as an exhibit to the testimony of Oscar I. Chapman, Secretary of Interior, op.cit., P. 563.

(b) Schweitert and Lyon, The Great Lakes-St. Lawrence Seaway, Chicago Association of Commerce and Industry, 1951. P. 37.

(c) From a table presented as an exhibit to the testimony of Senator John Marshall Butler of Maryland before the Senate Subcommittee on Foreign Relations, 83rd Cong., 1st Sess. P. 418. Based on 56¢ per gross ton plus 15¢ per dead weight ton return.

(d) The rate for 15K-ton lakes-type ore carriers is assumed to be 20¢ per gross ton per 100 miles. This figure is based on the testimony of Earl M. Richards, op.cit., P. 129.

TABLE I cont'd.

(e) The rate for 20K-ton lakes-type ore carriers is assumed to be 15¢ per gross ton per 100 miles. See note (b) above.

(f) The rate to Trenton and Baltimore is essentially based on the reference in note (b) above. The rate presented by Schweitert and Lyon, however, is based on the use of 24,000 ton capacity ocean going ore ships, whereas the figure used in the present table is based on the use of ships of 10,000 to 15,000-ton capacity.

* Includes transshipment and rail transport to Pittsburgh.

\# A lower toll rate applies for Toronto and Kingston because transport to these points involves the use of only a portion of the toll-supported Seaway facilities.

See also general notes on TABLES 1 - 4 at the end of TABLE 4.

TABLE 2 --- TRANSPORT COSTS OF VENEZUELA ORE PER GROSS TON ORE

PRODUCTION POINT		CHIC	DETR	CLEV	PITT	BUFF	TORO	KING	MONT	QUEB	7ISL	TREN	BALT
Rail-water to Trinidad	(a)	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
Transshipment	(b)	.33	.33	.33	.33	.33	.33	.33	.33	.33	.33	.33	.33
Ocean vessel to Mont	(c)	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23		
Transshipment	(d)	.45	.45	.45	.45	.45	.45	.45					
Toll on Seaway	(e)	.71	.71	.71	.71	.71	.36#	.36#					
15K-Ton carrier	(f)	2.44	1.28	1.08	3.33*	.74*	.64	.34					
Total transport costs		7.51	6.35	6.15	8.40	5.81	5.36	5.06	3.91	3.91	3.91		
20K-Ton carrier	(g)	1.83	.96	.81	3.07*	.56	.48	.26					
Total transport costs		6.90	6.03	5.88	8.14	5.63	5.20	4.98	3.91	3.91	3.91		
Ocean vessel to Balt	(h)	1.56	1.56	1.56	1.56	1.56						1.56	1.56
Transshipment	(i)	.45	.45	.45	.45	.45							
Rail to Prod. Point	(j)	4.80	4.20	3.48	3.00	3.24							
Total transport costs		8.49	7.89	7.17	6.69	6.93						3.24	3.24

(a) From a table presented as an exhibit to the testimony of Senator John Marshall Butler, loc. cit.

(b) See note (a) above.

TABLE 2 cont'd.

(c) From the testimony of Senator John Marshall Butler, loc. cit. It was assumed that, in accordance with rate structure practices, rates to Montreal, Quebec, and 7 Islands would be identical.

(d) See note (a) above.

(e) See note (a) above.

(f) See note (d), TABLE 1.

(g) See note (e), TABLE 1.

(h) See note (a) above. It was assumed that, in accordance with rate structure practices, rates to Baltimore and Trenton would be identical.

(i) See note (a) above.

(j) The basic rate figures are from a table presented as an exhibit to the testimony of Gregory S. Prince, Assistant General Counsel, Association of American Railroads, before the House Committee on Public Works, 82nd Cong., 1st Sess., P. 726.

The rate to Chicago had to be interpolated from the data since it was not included in the table. All rates had to be increased by 15% because of the increase in rail freight rates since the original data was compiled in 1951.

* Includes transshipment and rail transport to Pittsburgh.

\# See Note #, TABLE I.

See also general notes on TABLES 1 - 4 at the end of TABLE 4.

TABLE 3 ---TRANSPORT COSTS OF SUPERIOR ORE PER GROSS TON ORE

PRODUCTION POINT		CHIC	DETR	CLEV	PITT	BUFF	TORO	KING
Rail to Duluth	(a)	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Transshipment	(b)	.33	.33	.33	.33	.33	.33	.33
Toll on Seaway	(c)						.36	.36
15 K-Ton carrier	(d)	1.60	1.40	1.60	4.10*	1.94	2.04	2.34
Total Transport costs		2.96	2.76	2.96	5.46	3.30	3.40	3.70
20K-Ton carrier	(e)	1.20	1.05	1.20	3.66*	1.45	1.53	1.75
Total transport costs		2.56	2.41	2.56	5.02	2.81	2.89	3.11

(a) From a table presented as an exhibit to the testimony of Earl M. Richards, loc. cit.

(b) See note (b), TABLE I.

(c) See notes (c) and #, TABLE I.

(d) See note (d), TABLE I.

(e) See note (e), TABLE I.

* Includes transshipment and rail transport to Pittsburgh.

Note: Montreal, Quebec, Seven Islands, Trenton and Baltimore have been ommitted from this table for two reasons: They have not used any substantial quantities of Lake Superior ores in the past and they are not likely to do so in the future. For further explanation see the section on Ore Source in the General Notes on TABLE 7 at the end of TABLE 7.

See also General Notes on TABLES 1 - 4 at the end of TABLE 4.

TABLE 4 ---TRANSPORT COSTS OF PENNSYLVANIA-WEST VIRGINIA COAL PER GROSS TON COAL

PRODUCTION POINT		CHIC	DETR	CLEV	PITT	BUFF	TORO	KING	MONT	QUEB	7ISL	TREN	BALT
Rail to Ashtabula	(a)	3.22	3.22			3.22	3.22	3.22	3.22	3.22	3.22		
Transshipment	(b)	.33	.33			.33	.33	.33	.33	.33	.33		
Toll on Seaway	(c)						.25#	.25#	.50	.50	.50		
15K-Ton carrier	(d)	1.36	.20			.34	.90*	.96*	1.08	1.40	2.04		
Total transport costs		4.91	3.75			3.89	4.70	4.76	5.13	5.45	6.09		
20K-Ton carrier	(e)	1.02	.15			.26	.70*	.74*	.81	1.05	1.53		
Total transport costs		4.57	3.70			3.81	4.50	4.54	4.86	5.10	5.58		
Rail direct to Prod Pt	(f)	5.00/	4.32	3.76	1.52	4.17	5.00/					5.03	4.50
Total transport costs		5.00/	4.32	3.76	1.52	4.17	5.00/					5.03	4.50

(a) Based on figures presented in "An Economic Appraisal of the St. Lawrence Seaway Project", Industry Report--Domestic Transportation, U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce, August-November 1947, p. 53. Coal was assumed to originate at Indiana, Pennsylvania, approximate center of the western Pennsylvania coal fields.

The figures presented in the above had to be revised upwards because of the freight rate increases which have occurred since 1947.

(b) Transshipment charges on coal at Ashtabula were assumed to be the same as on ore at lake ports because of the similarities in the handling of the two commodities. See note (b) TABLE I.

TABLE 4 cont'd.

(c) From the testimony of Charles Sawyer, Secretary of Commerce, before the House Committee on Public Works, 82nd cong., 1st sess., p. 7.

The figures presented by Mr. Sawyer were 25¢-35¢ per ton of coal plus 15¢ per deadweight ton return. The higher figure was assumed because increased construction costs would seem to make higher tolls necessary to amortize the Seaway Project.

(d) Water shipment charges on coal in lakes-type vessels was assumed to be the same as on ore because of the similarities of the two commodities. See note (d), TABLE I.

(e) See note (d) above and note (e), TABLE I.

(f) Interpolated from figures included in a table presented as an exhibit to the testimony of Gregory S. Prince, op. cit., P. 725. See also note (a) above.

≠ Direct rail rates to these points are higher than the figures shown. The actual values are not too important, however, since coal would obviously go to these points by the cheaper water transport anyway.

\# See note #, TABLE I.

* Note that the transport costs to Toronto and Kingston are higher than would be expected when compared to the costs to Buffalo, Detroit, and Chicago. This is because it has been assumed that low back-haul rates for ore boats returning to Duluth would apply directly to Detroit and indirectly to Buffalo and Chicago in competition with Detroit. They do not apply to Toronto or Kingston, however, because these points are not assumed to use Lake Superior Ore nor are they in direct competition with American points with respect to this commodity. The reader may wish to make a different assumption but, in any case, the basic conclusions of this report will not be changed.

General Notes on TABLES 1 - 4

Institutional pricing practices are likely to equalize prices between adjacent points. Generally, however, it it impossible to know what the equalization point or

TABLE 4 cont'd.

price will be. Therefore, figures for these tables were computed, except where noted, on the basis of actual transport costs ignoring all institutional considerations such as import duties, price equalization, etc.

Cost figures for certain points were ommitted where it was obvious that a particular mode of transportation could not possibly compete with other transport media or routes to those points.

TABLE 5 ---ORE AND COAL TRANSPORT COSTS PER GROSS TON STEEL COMPUTED FOR ORE AND COAL QUANTITIES REQUIRED BY TYPE OF ORE USED

PRODUCTION POINT	CHIC	DETR	CLEV	PITT	BUFF	TORO	KING	MONT	QUEB	7ISL	TREN	BALT
Labrador Ore via (a)												
15K-Ton carrier	9.64	8.06	7.79	10.82*	7.33	6.72	6.30	5.36	5.07	3.60	5.69#	5.69#
20K-Ton carrier	8.72	7.30	7.10	10.17*	6.75	6.17	5.86	5.03	4.87	3.60		
Venezuela Ore via (b)												
15K-Ton carrier	9.24	7.81	7.56		7.14	6.59	6.22	4.81#	4.81#	4.81#	3.99#	3.99#
20K-Ton carrier	8.49	7.42	7.24		6.93	6.40	6.13					
Rail via Baltimore	10.45	9.71	8.82	8.23	8.52							
Superior Ore via (c)												
15K-Ton carrier	4.20	3.92	4.20	7.75*	4.68	4.83	5.25					
20K-Ton carrier	3.63	3.42	3.63	7.12*	3.99	4.10	4.42					
Coal (L) via (d)												
15K-Ton carrier	6.28	4.80			4.98	6.02	6.09	6.57	6.98	7.80		
20K-Ton carrier	5.85	3.97			4.88	5.76	5.81	6.22	6.53	7.15		
Rail direct to Prod Pt	6.40¢	5.53	4.81	1.95	5.33						6.44	5.76
Coal (V) via (e)												
15K-Ton carrier	5.90	4.50			4.67	5.64	5.76	6.16	6.54	7.31		
20K-Ton carrier	5.42	3.72			4.57	5.40	5.45	5.83	6.12	6.70		
Rail direct to Prod Pt	6.00¢	5.18	4.52	1.82	5.00						6.04	5.40
Coal (S) via (f)												
15K-Ton carrier	6.48	4.95			5.13	6.20	6.28	6.78	7.19	8.04		
20K-Ton carrier	6.03	4.09			5.03	5.94	6.00	6.52	6.73	7.37		
Rail direct to Prod Pt	6.60¢	5.70	4.97	2.01	5.50						6.65	5.94

TABLE 5 cont'd.

(a) Basic figures from TABLE I multiplied by 1.36 gross tons ore per gross ton steel.

(b) Basic figures from Table 2 multiplied by 1.23 gross tons ore per gross ton steel.

(c) Basic figures from TABLE 3 multiplied by 1.42 gross tons ore per gross ton steel.

(d) Basic figures from TABLE 4 multiplied by 1.28 gross tons coal per gross ton steel made from Labrador ore.

(e) Basic figures from TABLE 4 multiplied by 1.20 gross tons coal per gross ton steel made from Venezuela ore.

(f) Basic figures from TABLE 4 multiplied by 1.32 gross tons coal per gross ton steel made from Superior ore.

/ See note /, TABLE 4.

* See note *, TABLE 1.

Via ocean-going vessel of 10,000 to 15,000 tons capacity.

Note: The quantities of ore and coal needed to produce a ton of steel depend on the iron content of the ore used. Ores from Labrador, Venezuela, and Superior vary in iron content. Hence, different quantities of ore, and the coal to be used with that ore, were employed in computing this table according to the ore source. Source for these quantities was Isard and Cumberland "New England as a Possible Location for an Integrated Iron and Steel Works," <u>Economic Geography</u>, October, 1950, P. 248.

TABLE 6 ---ORE AND COAL TRANSPORT COSTS PER GROSS TON STEEL COMPUTED FOR EQUAL QUANTITIES OF ORE AND COAL IRRESPECTIVE OF TYPE OF ORE USED

PRODUCTION POINT	CHIC	DETR	CLEV	PITT	BUFF	TORO	KING	MONT	QUEB	7ISL	TREN	BALT
Labrador Ore via (a)												
15K-Ton carrier	9.64	8.06	7.79	10.82*	7.33	6.72	6.30	5.36	5.07	3.60	5.69#	5.69#
20K-Ton carrier	8.72	7.30	7.10	10.17*	6.75	6.17	5.86	5.03	4.87	3.60		
Venezuela Ore via (b)												
15K-Ton carrier	10.21	8.64	8.36	11.42*	7.90	7.29	6.88	5.32#	5.32#	5.32#	4.41#	4.41#
20K-Ton carrier	9.38	8.20	8.00	11.08*	7.66	7.07	6.77					
Rail via Baltimore	11.55	10.73	9.75	9.09	9.43							
Superior Ore via (c)												
15K-Ton carrier	4.03	3.75	4.03	7.43*	4.49	4.62	5.03					
20K-Ton carrier	3.48	3.28	3.48	6.83*	3.82	3.93	4.23					
Coal via (d)												
15K-Ton carrier	6.28	4.80			4.98	6.02	6.10	6.57	6.98	7.80		
20K-Ton carrier	5.84	3.97			4.88	5.76	5.81	6.22	6.53	7.15		
Rail direct to Prod Pt	6.40/	5.53			5.33						6.44	5.76

(a) Basic figures from TABLE I multiplied by 1.36 gross tons ore per gross ton steel.

(b) Basic figures from TABLE 2 multiplied by 1.36 gross tons ore per gross ton steel.

(c) Basic figures from TABLE 3 multiplied by 1.36 gross tons ore per gross ton steel.

(d) Basic figures from TABLE 4 multiplied by 1.28 gross tons coal per gross ton steel.

/ See note /, TABLE 4.

* See note *, TABLE I.

\# See note #, TABLE 5.

TABLE 7 ---TRANSPORTATION COSTS ON ORE AND COAL AND ON FINISHED PRODUCTS PER GROSS TON STEEL FOR PRODUCTION POINTS SERVING MARKETS INDICATED

PRODUCTION POINT AND MARKET	ORE SOURCE	TRANSPORTATION COSTS ON ORE	COAL	PRODS.	TOTAL COSTS
BOSTON MARKET					
Trenton	V	3.99	6.04	10.60	20.63
Pittsburgh	S	7.12	2.01	18.02	27.15
Buffalo	S	3.99	5.03	13.78	22.80
Montreal	L	5.03	6.22	11.39	22.64
Quebec	L	4.87	6.53	12.47	23.87
PROVIDENCE-FALL RIVER MARKET					
Trenton	V	3.99	6.04	9.28	19.31
Pittsburgh	S	7.12	2.01	15.63	24.76
Buffalo	S	3.99	5.03	15.38	24.40
Montreal	L	5.03	6.22	11.97	24.22
Quebec	L	4.87	6.53	13.52	24.92
WORCESTER MARKET					
Trenton	V	3.99	6.04	9.81	19.84
Pittsburgh	S	7.12	2.01	17.24	24.37
Buffalo	S	3.99	5.03	13.25	22.27
Montreal	L	5.03	6.22	9.81	21.06
Quebec	L	4.87	6.53	15.38	26.78
HARTFORD MARKET					
Trenton	V	3.99	6.04	8.22	18.25
Pittsburgh	S	7.12	2.01	15.63	24.76
Buffalo	S	3.99	5.03	12.72	21.74
Montreal	L	5.03	6.22	9.81	21.06
Quebec	L	4.87	6.53	15.38	26.78

TABLE 7 cont'd.

PRODUCTION POINT AND MARKET	ORE SOURCE	TRANSPORTATION COSTS ON ORE	COAL	PRODS.	TOTAL COSTS
NEW HAVEN MARKET					
Trenton	V	3.99	6.04	6.36	16.39
Pittsburgh	S	7.12	2.01	16.42	25.55
Buffalo	S	3.99	5.03	12.72	21.74
Montreal	L	5.03	6.22	11.55	22.80
Quebec	L	4.87	6.53	15.11	26.51
NEW YORK MARKET					
Trenton	V	3.99	6.04	4.51	14.54
Pittsburgh	S	7.12	2.01	13.25	22.38
Buffalo	S	3.99	5.03	12.19	21.21
Montreal	L	5.03	6.22	11.70	22.95
Quebec	L	4.87	6.53	15.40	26.80
ALBANY-TROY MARKET					
Trenton	V	3.99	6.04	8.22	18.25
Buffalo	S	3.99	5.03	10.08	19.10
Montreal	L	5.03	6.22	8.22	19.47
Quebec	L	4.87	6.53	10.60	22.00
Toronto	L	6.17	5.29	12.00	23.46
BINGHAMTON MARKET					
Trenton	V	3.99	6.04	10.33	20.36
Buffalo	S	3.99	5.03	7.95	16.97
Montreal	L	5.03	6.22	10.33	21.58
Quebec	L	4.87	6.53	12.19	23.59
Toronto	L	6.17	5.29	9.25	20.71

TABLE 7 cont'd.

PRODUCTION POINT AND MARKET	ORE SOURCE	TRANSPORTATION COSTS ON ORE	COAL	PRODS.	TOTAL COSTS
UTICA MARKET					
Trenton	V	3.99	6.04	10.08	20.11
Buffalo	S	3.99	5.03	8.48	17.50
Montreal	L	5.03	6.22	7.95	19.20
Quebec	L	4.87	6.53	10.60	22.00
Toronto	L	6.17	5.29	9.75	21.21
SYRACUSE MARKET					
Trenton	V	3.99	6.04	9.94	19.97
Buffalo	S	3.99	5.03	6.89	15.91
Montreal	L	5.03	6.22	8.75	20.00
Quebec	L	4.87	6.53	11.12	22.52
Toronto	L	6.17	5.29	8.75	20.21
ROCHESTER MARKET					
Trenton	V	3.99	6.04	10.88	20.91
Pittsburgh	S	7.12	2.01		
Buffalo	S	3.99	5.03	4.24	13.26
Montreal	L	5.03	6.22	10.08	21.33
Quebec	L	4.87	6.53	11.92	23.32
Toronto	L	6.17	5.29	5.50	16.96
BUFFALO MARKET					
Trenton	V	3.99	6.04	12.19	22.22
Pittsburgh	S	7.12	2.01	8.08	17.21
Buffalo	S	3.99	5.03		9.02
Montreal	L	5.03	6.22	10.88	22.13
Toronto	L	6.17	5.29	4.25	15.71
Cleveland	S	3.63	4.97	7.16	15.76

TABLE 7 cont'd.

PRODUCTION POINT AND MARKET	ORE SOURCE	TRANSPORTATION COSTS ON ORE	COAL	PRODS.	TOTAL COSTS
CLEVELAND MARKET					
Trenton	V	3.99	6.04	14.83	24.86
Buffalo	S	3.99	5.03	7.16	16.18
Pittsburgh	S	7.12	2.01	5.83	14.96
Detroit	S	3.42	4.09	6.63	14.14
Baltimore	V	3.99	5.40	13.25	22.64
Toronto	L	6.17	5.76	10.33	22.26
Cleveland	S	3.63	4.97		8.60
TOLEDO MARKET					
Buffalo	S	3.99	5.03	9.15	18.17
Pittsburgh	S	7.12	2.01	8.08	17.21
Detroit	S	3.42	4.09	3.44	10.95
Baltimore	V	3.99	5.40	14.83	24.22
Toronto	L	6.17	5.76	8.75	20.68
Cleveland	S	3.63	4.97	5.30	13.90
Chicago	S	3.63	6.03	8.08	17.74
DETROIT MARKET					
Buffalo	S	3.99	5.03	8.08	17.10
Pittsburgh	S	7.12	2.01	8.48	17.61
Detroit	S	3.42	4.09		7.51
Toronto	L	6.17	5.76	9.75	19.88
Cleveland	S	3.63	4.97	6.63	15.23
Chicago	S	3.63	6.03	8.75	18.41
FLINT MARKET					
Buffalo	S	3.99	5.03	8.48	17.50
Detroit	S	3.42	4.09	3.58	11.09
Toronto	L	6.17	5.29		
Cleveland	S	3.63	4.97	6.63	15.23
Chicago	S	3.63	6.03	8.75	18.41

TABLE 7 cont'd.

PRODUCTION POINT AND MARKET	ORE SOURCE	TRANSPORTATION COSTS ON ORE	COAL	PRODS.	TOTAL COSTS
GRAND RAPIDS MARKET					
Buffalo	S	3.99	5.03	11.12	20.14
Detroit	S	3.42	4.09	6.36	13.87
Toronto	L	6.17	5.76	9.94	21.87
Cleveland	S	3.63	4.97	9.02	17.62
Chicago	S	3.63	6.03	7.42	17.08
LANSING MARKET					
Buffalo	S	3.99	5.03	9.81	18.83
Detroit	S	3.42	4.09	4.51	12.02
Cleveland	S	3.63	4.97	7.82	16.42
Chicago	S	3.63	6.03	7.42	17.08
CHICAGO MARKET					
Detroit	S	3.42	4.09	8.75	16.26
Chicago	S	3.63	6.03		9.66
WINNIPEG MARKET					
Buffalo	S	3.99	5.03		
Montreal	L	5.03	6.22	25.70	36.95
Quebec	L	4.87	6.53	24.91	36.31
Toronto	L	6.17	5.76	23.58	35.51
Detroit	S	3.42	4.09	25.71	33.22
Chicago	S	3.63	6.03	22.00	31.66

TABLE 7 cont'd.

PRODUCTION POINT AND MARKET	ORE SOURCE	TRANSPORTATION COSTS ON ORE	COAL	PRODS.	TOTAL COSTS
NAKINA MARKET					
Montreal	L	5.03	6.22	22.52	33.77
Quebec	L	4.87	6.53	22.00	33.40
Toronto	L	6.17	5.76	20.93	32.86
Detroit	S	3.42	4.09	22.79	30.30
Chicago	S	3.63	6.03	23.58	33.24
QUEBEC MARKET					
Trenton	V	3.99	6.04	14.58	24.61
Buffalo	S	3.99	5.03	15.50	24.52
Montreal	L	5.03	6.22	6.89	17.14
Quebec	L	4.87	6.53		11.40
Toronto	L	6.17	5.76	14.83	26.76
MONTREAL MARKET					
Trenton	V	3.99	6.04	10.88	20.91
Buffalo	S	3.99	5.03	13.66	22.68
Montreal	L	5.03	6.22		11.25
Quebec	L	4.87	6.53	6.76	18.17
Toronto	L	6.17	5.76	11.39	23.32
OTTAWA MARKET					
Trenton	V	3.99	6.04	13.52	23.55
Buffalo	S	3.99	5.03	15.11	24.27
Montreal	L	5.03	6.22	5.30	16.55
Quebec	L	4.87	6.53	8.75	20.15
Toronto	L	6.17	5.76	8.22	20.15

TABLE 7 cont'd.

PRODUCTION POINT AND MARKET	ORE SOURCE	TRANSPORTATION COSTS ON ORE	COAL	PRODS.	TOTAL COSTS
TORONTO MARKET					
Trenton	V	3.99	6.04	12.50	22.53
Buffalo	S	3.99	5.03	4.25	13.27
Montreal	L	5.03	6.22	9.54	20.79
Quebec	L	4.87	6.53	11.67	23.07
Toronto	L	6.17	5.76		11.93

Note: V - Venezuela Ore
L - Labrador Ore
S - Lake Superior Ore

GENERAL NOTES

Production Point

Costs were computed only for those points which might reasonably be expected to serve the given market. Some were included because they were past suppliers of the market; others were added because they are potential future suppliers of that market. Points were ommitted if their cost totals were so high that they could not possibly compete in the market.

Note that Seven Island and Kingston were ommitted completely from this table. This was for two reasons: first, in almost every case these two points had transport cost disadvantages in comparison to nearby competing points and second, their local markets were assumed to be too small to allow them to become major production points in the foreseeable future.

Market

The markets included had to fulfill two criteria: first, they had to be major industrial centers and second, they

TABLE 7 cont'd.

had to be past or future consumers of steel produced at the points selected for cost analysis in TABLES 1 - 6.

Note that not all markets which fulfill these criteria have been included. Limitations of space and time allowed the inclusion of only those markets where significant changes in steel supply costs or sources might be expected, or where it seemed desirable to demonstrate the market orientation of steel location at production points themselves.

Ore Source

The ore source designated in each case was chosen on the basis of past experience, institutional factors, and disposition of available reserves. Thus Trenton and Baltimore were assumed to continue using the Venezuela ore for which they were intended. Chicago, Detroit, Cleveland, Pittsburgh, and Buffalo were assumed to continue using Lake Superior ore as in the past, at least as long as sufficient reserves remain. Montreal and Quebec were assumed to begin using native Labrador ore, if and when they begin producing steel in substantial quantities.

Toronto is the only point about which there is some question. Lake Superior ores have been employed here in the past, but it would probably be the first point to lose its supply of the ores when they become scarce in the future. Furthermore, it seemed likely that Toronto producers, with their location in Canada, would rather rely on the substantial reserves of native Labrador ore than remain dependent on an uncertain American supply. For these reasons Labrador ore was designated for Toronto. See also section on foreign vs. Lake Superior ores, P.

Ore Transportation Costs

These figures were taken directly from TABLE 5. The cheapest mode of transportation was selected in every case. We assumed that the more economical 20,000-ton ore carriers would become generally available in the near future. Even if they should not, the conclusions drawn from this table would not be significantly changed since all points except Trenton and Baltimore receive their ore via lakes-type ore carriers. Hence the ore costs to all points except the two above would be proportionately increased by the use of 15,000-ton carriers and market boundaries would not be substantially changed.

Coal Transportation Costs

As above, these figures were taken directly from TABLE 5. Again the cheapest mode of transportation was chosen, based on the assumptions outlined above.

Finished Product Transportation Costs

These figures were based, where possible, on a table included in a recent issue of The Iron Age.1/ The rates in the table were given in cents per 100 lbs. These figures were multiplied by 22.4 (final figures are for gross ton steel) and again by 115% and 103% to take into account the freight rate increase and federal tax respectively. The formula for any rate would be:

(cents/100 lbs.) x (22.4) x (1.15) x (1.03) equals transport cost.

No rates were given in the published table for Canadian points. These rates were determined from a graph drawn for this purpose. Actually two curves were drawn: one for rates from west to east and the other from east to west since west to east rates are apt to be higher.

The curves were constructed by plotting rates vs. distance. Distances were computed by use of the Commercial Atlas and various railroad maps. Rates for known points were determined from the table in Iron Age. Rates for Canadian points were then estimated from the curves.

1/ "Iron and Steel Freight Rates," The Iron Age, January 7, 1954.

TABLE 8 ---CONSUMPTION OF STEEL IN THE PROVINCE OF QUEBEC PLUS THE OTTAWA METROPOLITAN AREA IN THE PROVINCE OF ONTARIO BY INDUSTRY AND TYPE OF FINISHED STEEL SHAPE.

SECTION A INDUSTRY	(1) EMPLOYEES QUEB&OTTA (Q)	(2) EMPLOYEES U.S.A. THOUS.(U)	(3) (Q)/(U)	(4) TOTAL STEEL CONSUMED U.S. NET K-TONS	(5) TOTAL Q & O NET T	(6) BARS U.S.A NET T	(7) BARS Q & O NET T	(8) S & S# U.S.A NET T	(9) S & S# Q & O NET T	(10) STRUC U.S.A NET T	(11) STRUC Q & O NET T	(12) PLATE U.S.A NET T	(13) PLATE Q & O NET T	(14) WIRE ROD U.S.A NET T	(15) WIRE ROD Q & O NET T
	(a)	(b)	(c)	(d)	(e)	(d)	(e)	(d)	(e)	(d)	(e)	(d)	(e)	(d)	(e)
Agri. Impl.	483	94.1	.0051	1278	6520	.630	3220	.391	1995	.064	327	.070	36	.015	76
Boiler Shop	1052	69.0	.0153	2289	35020	..066	1010	.416	6360	.181	2770	1.492	22800	.006	92
Fabric. Struc.	3083	79.7	.0388	3875	152000	.633	24550	.472	18300	2.088	81100	.560	21720	.021	815
Hardware, Tools	2864	125.8	.0228	1244	28400	.479	4770	.103	2350			.005	114	.510	11630
Heating Equip.	2469	110.5	.0224	1119	25080	.043	964	.967	21670	.003	67	.072	1613	.003	67
Household Mach.	4605	101.0	.0419	361	15130	.036	1509	.271	11370			.042	1760		
Machine Shop	2714	1545.3	.0002	6420	1284	1.717	343	2.130	426	.493	99	.977	195	.067	13
Machine Tools	160	70.7	.0002	60	12	.031	6	.004	1	.004	1	.003	1		
Machinery	7693	1545.3	.0005	6420	3210	1.717	858	3.130	1065	.493	246	.977	489	.067	34
Prim. Iron & St.	3017	1157.1	.00026	3764	942	.658	165	.223	56	.052	13	.170	43	2.085	522
Sheet Metal	5452	174.7	.0312	3276	102200	.091	2840	2.612	81400	.007	219	.082	2565	.024	748
Wire	1339	56.8	.0235	912	21450	.032	752	.067	1575	.001	21			.788	18530
Bicycles	261	15.6	.0017	114	80200	.611	19330	.742	23450						
Boats & Ships	5687	149.7	.038	654	1942	.022	374	.077	1310			.001	2	.001	2
Motor Veh. & Parts	1461	653.2	.0022	6344	24850	.037	1407	.072	2737	.102	3880	.447	17000		
Railroad Equip.	17258	91.1	.1894	1786	13960	.770	1695	4.626	10180	.009	20	.145	319	.048	106
Heavy Elec. Mach.	1108	281.6	.0039	1467	338000	.206	39000	.303	57500	.408	77400	.575	109000	.001	338
Radios and Parts	3675	178.6	.0206	97	5720	.173	675	.634	2472	.037	144	.116	453	.164	580
Refrig. & Appliance	2851	173.7	.0164	1040	2000	.005	103	.080	1650						
Other Machinery	4074	128.9	.0316	2534	17050	.033	541	.930	15270	.005	82	.016	273	.007	119
Misc. Manufacture.	11033	801.4	.0138	2149	29700	.287	3960	1.078	14870	.046	635	.161	2220	.170	2345
SUBTOTAL A					1004670		107572		276007		167024		180603		36017

SECTION B INDUSTRY	CONSUMPTION Q AS % OF CANADA		TOTAL STEEL CANADA NET K-TONS	TOTAL Q & O NET T	BARS Q & O NET T	S & S# Q & O NET T	STRUC Q & O NET T	PLATE Q & O NET T	WIRE ROD Q & O NET T
			(j)						
Building Constr.	25.4	(f)	620	157500	26300	10100	40300	27400	
Railway Operating	24.6	(g)	553	136000	43500	10800	62000"	19700	
Mining & Lumber	22.0	(h)	216	47500	13300	3500	4750	10700	
Pub. Works, Utilities, Nat. Defense	31.0	(i)	122	37800	6600	10800	2200	3800	
SUBTOTAL B				378800	89700	55200	109250"	61600	
TOTAL				1383470	197272	311207	276274"	242203	36017

TABLE 8 cont'd.

(a) "Labor Force--- Occupations and Industries," Ninth Census of Canada, 1951, Vol. IV, Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa, 1953.

(b) Census of Manufactures, 1947, Department of Commerce, Bureau of the Census, Washington, 1950.

(c) The ratio of employees in Quebec plus Ottawa to the employees in the United States in the same industry is given in this column. The reason for making this calculation will be found in note (e) below.

(d) "Consumption of Metal Mill Shapes and Forms and Castings by Individual Manufacturing Industries: 1947," Census of Manufactures, op. cit. In many cases, several manufacturing designations in the U.S. Census were added together to approximate the designation in the Canadian Census.

(e) This figures were calculated by multiplying the quantities in the (c) column by the appropriate figures in one of the (d) columns. This method of calculating Canadian consumption was based on the theory that the consumption per employee in Canadian industry was the same as that in American industry.

There are potential fallacies in this assumption. The use of this method was not because it was necessarily the best, but only because it was the only reasonable method available. Unfortunately, the Canadian Census figures are not as comprehensive as their American equivalents. Nevertheless, the writer feels that where this method may fail in accuracy, it succeeds in giving a better overall picture of the consumption in the Montreal Market than any other method presently available.

(f) Based on Value of Construction data, The Canada Yearbook, 1952-53, Department of Trade and Commerce, Dominion Bureau of Statistics.

(g) Roughly based on population data. Ibid.

(h) Roughly based on number of employees in mining, and value of lumber production data, ibid.

(i) Based on population data, ibid.

TABLE 8 cont'd.

(j) Canadian Statistical Review, April, 1951, Department of Trade and Commerce, Dominion Bureau of Statistics.

Sheet and strip

" Includes rails

TABLE 9 --- CANADIAN IRON AND STEEL CONSUMPTION AND PRODUCTION DATA

YEAR	PRODUCTION NET K-TONS	CONSUMPTION NET K-TONS	EXPORTS NET K-TONS	IMPORTS NET K-TONS
1939	1293	1478	214	399
1940	1878	2222	333	677
1941	2260	2670	302	712
1942	2592	3417	175	100
1943	2503	3168	160	825
1944	2513	2880	267	634
1945	2398	2731	321	654
1946	1939	2440	121	622
1947	2455	3101	140	786
1948	2667	3282	203	818
1949	2659	3480	183	1004
1950	2820	3560	182	922
1951	2601	3937	59	1395
1952	2616	3919	68	1371
1953	2697	3717	126	1146

Source: Canadian Statistical Review, Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa.

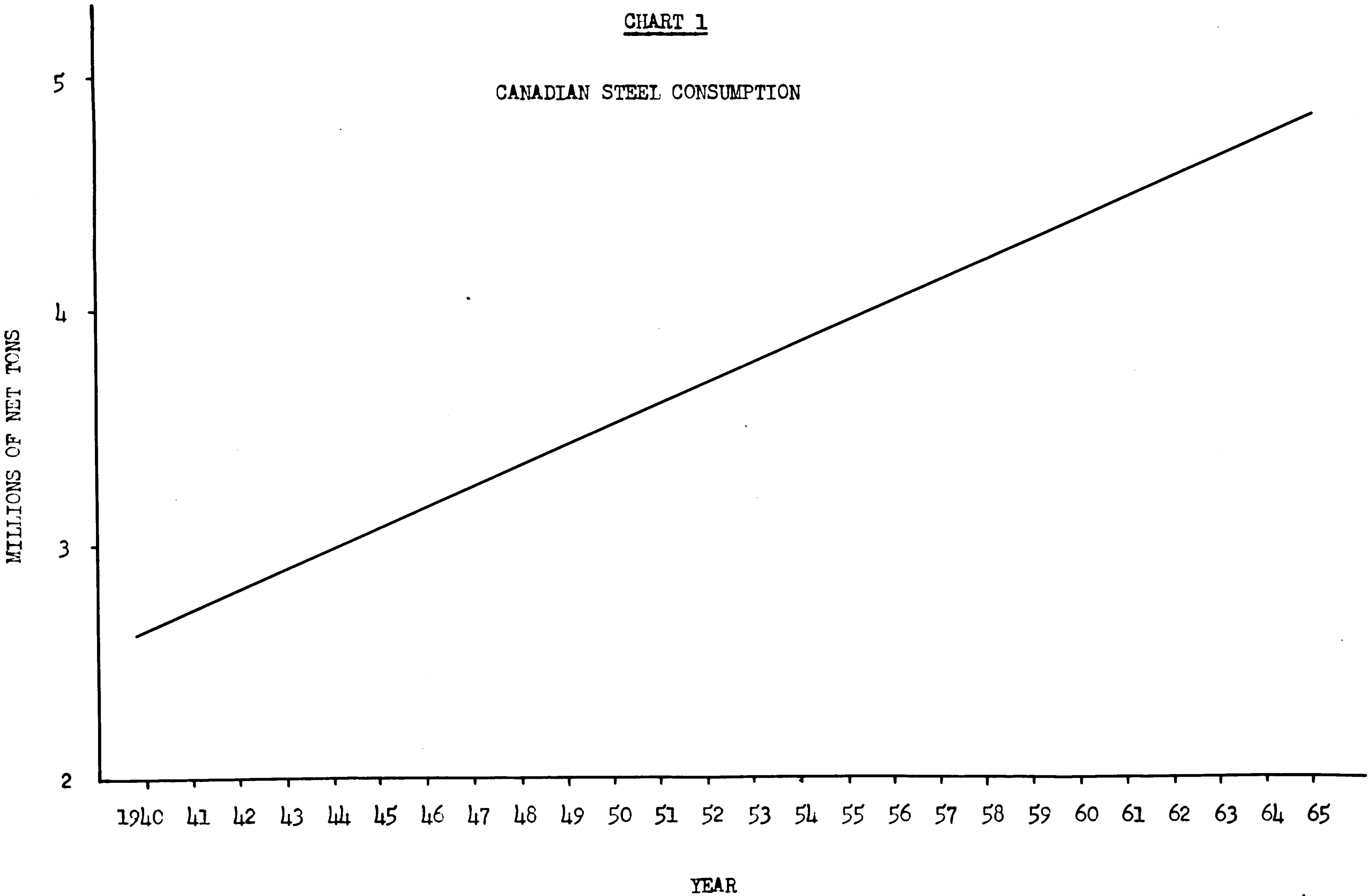
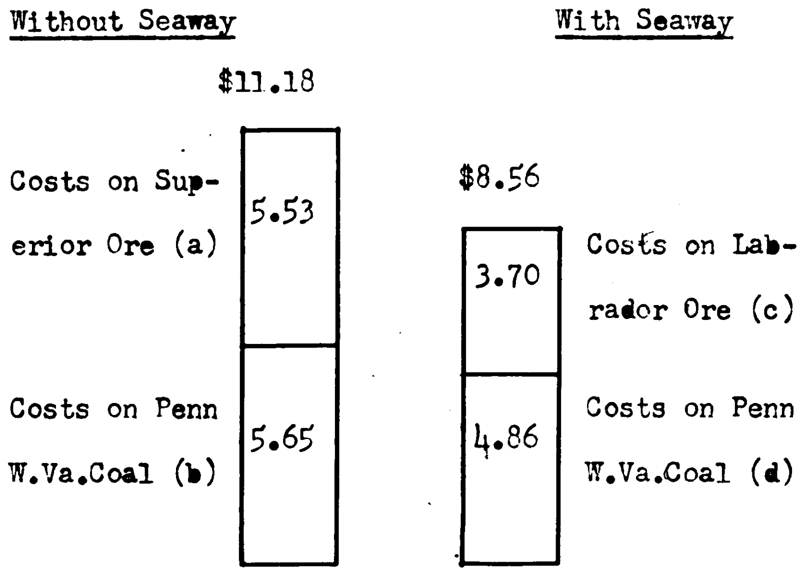


CHART 1
CANADIAN STEEL CONSUMPTION
MILLIONS OF NET TONS
5
4
3
2
1940 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
YEAR

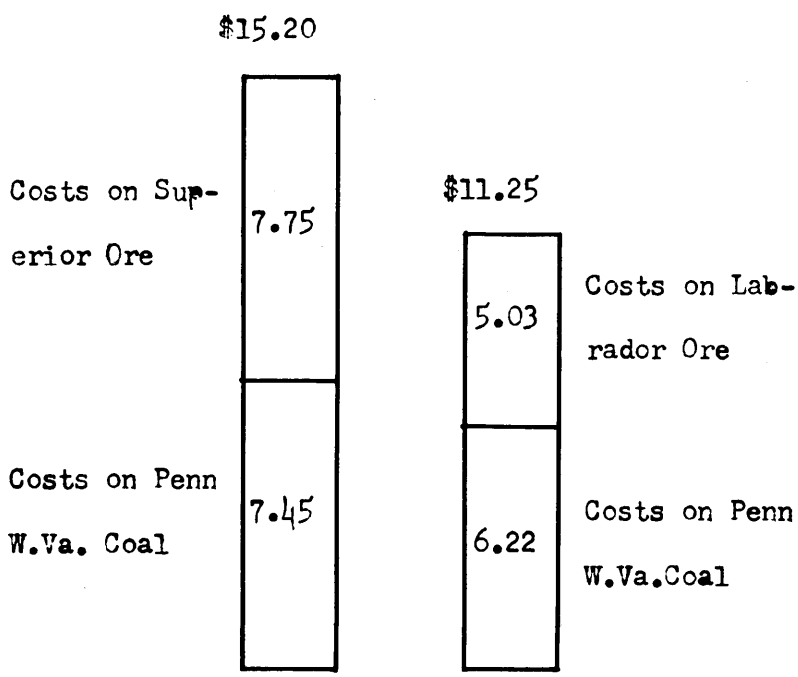
CHART 2

COMPARATIVE COSTS OF DELIVERING ORE AND COAL TO MONT WITH AND WITHOUT THE SEAWAY

Costs per Gross Ton Ore and Coal



Costs Adjusted for Quantities of Ore and Coal Used (e) Per Gross Ton of Steel Produced



(a) $3.70 rate to Kingston plus $.33 transshipment and $1.50 canaller rate.
(b) $3.22 rate to Ashtabula plus $.33 transshipment and $2.10 canaller rate.
(c) TABLE 1
(d) TABLE 4
(e) Costs in upper half of chart multiplied by Ore and Coal quantities per Gross Ton Steel as presented in TABLE 5.

Note: Canaller rates were interpolated from figures given in "An Appraisal of the St. Lawrence Seaway Project," op. cit.

CHAPTER II: EFFECTS ON WHEAT SHIPMENTS

Scope of Analysis

We will concern ourselves here only with the possible effects of the Seaway on the transportation of wheat destined for export. Although much of the wheat produced in the plain states of the United States and Canada is consumed within those two countries, the Seaway will affect the shipment of home-consumed wheat only to points directly served by the Seaway. American and Canadian Lake points, large wheat consumers in themselves can already be served by large bulk-type lake carriers. The Seaway will permit this service to be extended to such points as Toronto and Montreal, but the wheat consumption of these cities is small in comparison with the large amount of North American wheat which moves to the Atlantic coast destined for export. It is only this latter wheat traffic, then, which we will consider in our analysis.

Transport Routes of Export Wheat

It is important to understand the basic flows of export wheat in order to determine the effects of the Seaway upon them. Typically, wheat is shipped by rail from the plain states to elevator storage at Duluth-Superior on the American side or Port-Arthur-Fort William on the Canadian side of

Lake Superior. From these elevators it is loaded into bulk carriers similar to those used for ore shipments.

These vessels traverse the lakes and are unloaded at Buffalo on the American side or Port Colborne on the Canadian side of Lake Erie. After elevation and reloading the wheat travels by barge via the New York State Barge Canal to New York or by rail to Portland, Boston, New York, Philadelphia, or Baltimore. At these points it is again elevated and then loaded into ocean-going vessels for export.1/ Grain elevated at Port Colborne travels by barge via the Welland Canal to Montreal or by rail to Montreal, Quebec, St. John, or Halifax. These latter two points, however, are served mainly by rail shipments from Georgian Bay ports west of Port Colborne during the winter season when the navigation channels to Montreal and Quebec are closed by ice. At all the above points the wheat is elevated before reloading into ocean-going ships.2/

It is important to note that by no means all of the Canadian export wheat moves through Canadian ports. Actually, in the period between 1936 and 1946, about 25% of the

1/ From the tástimony of Walter J. Kelly, Vice-President in charge of traffic, Association of American Railroads, before the Senate Sub-Committee on Foreign Relations, op. cit., p. 472-3.

2/ "An Economic Appraisal of the St. Lawrence Seaway Project," op.cit., p. 27.

Canadian export wheat was shipped through American atlantic coast ports.[3] There are several reasons for this: first, the capacity of the St. Lawrence canal system and the Canadian railroads is not sufficient to carry all the Canadian wheat from Port Colborne and the Georgian bay ports to the Atlantic ports; second, the elevator capacity of the Canadian lake ports is insufficient for peak-season handling of Canadian wheat; third, shipment through Buffalo gives Canadian exporters a wider choice of export point and means of transport to that point.[4]

An increasing quantity of Canadian export wheat has been going west through the port of Vancouver. This movement reached a total of 64 million bushels in 1946 but it should be noted that this was a peak year in postwar Canadian wheat exportation when 343 million bushels were taxing the capacities of all ports.[5] Under more stable conditions it would be expected that wheat destined for Far Eastern points would continue to flow through Vancouver despite transport economies involved in the use of the Seaway.

Similarly, it would be expected that the flow of

3/ Ibid, p. 23.
4/ From the testimony of John L. McDougall, Professor of Commerce, Queen's University, Ontario, before the House Committee on Public Works, op. cit., p. 885.
5/ Canadian Statistical Review, Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa, April, 1951.

American export wheat south via rail and Mississippi barge to the ports of Galveston and New Orleans would continue as long as the wheat was destined for points to the south which could be best served by these ports.

In this analysis, then, we will confine ourselves to the movement of export wheat to Atlantic coast ports and the effects of the Seaway on that movement. Even if wheat were to be diverted from Pacific and Gulf Coast ports, we would assume that it would follow the same trends as the eastward-moving wheat which we are considering.

Transport Cost Analysis

TABLE I shows the cost of transporting a bushel of wheat via various routes to various Atlantic ports. Reference to this table indicates that New York was at a cost disadvantage with respect to Baltimore and Philadelphia in 1951, and, presumably, earlier than that. Yet in 1948, about 10 million bushels of American wheat and 3.3 million bushels of Canadian wheat were exported through New York.[6/] This was apparently due to the low cost of ocean transport from New York. So many liners call at this port that many of them.

6/ From the testimony of Franklin D. Roosevelt, Jr., Member of Congress from the State of New York, before hearings by the Senate Sub-Committee on Foreign Relations, op. cit., P. 683.

are willing to take on wheat at low ballast rates.[7/] Although the exact figures are not available, it appears that savings were and still are sufficient to offset New York's ½¢ a bushel disadvantage.

Note that the water-rail rate to New York via Buffalo was the same as the all-water rate via Buffalo and the New York State Barge Canal. Although it is a well-known fact that water transport, even by inefficient barge-size units, is ordinarily cheaper than rail transport over the same distance, the railroads have managed to keep their rates down in order to remain competitive with barge transportation.

It is unlikely, however, that the Canadian railroads, whose rate per bushel on wheat moving via the Georgian Bay ports was already 2¢ higher than the all-water rate via Port Colborne to Montreal in 1951 can possibly lower their rates enough to compete with the Seaway rate of 9½¢ or 8¢. By the same token, rail transport costs to St. John and Halifax will doubtless remain substantially higher than comparable Seaway rates and these points will remain relegated to off-season wheat traffic. Montreal and Quebec, then will share the major portion of the Canadian

7/ From the testimony of John L. McDougall, Professor of Commerce, Queen's University, Ontario, before hearings by the House Committee on Public Works, op. cit., p. 885.

export trade with Montreal getting the majority because of its proximity to the lower lake ports.

But if the Canadian rail transport is not competitive with the Seaway, neither is any form of transport to American Atlantic ports. Even without the Seaway, Montreal had a cost advantage of 9½¢ over Boston and New York and 9¢ over Baltimore and Philadelphia in 1951. It would seem from this that all the Canadian export wheat, at least, should have moved through Montreal. As has been pointed out above, however, this was not the case. The limited Canadian elevator capacities and the bottlenecks in the St. Lawrence canal system combined with New York's advantageous position with respect to ocean rates and the route-choice advantages of shipping via Buffalo and American ports tended to divert Canadian wheat from the Canadian ports.

The construction of the Seaway, however, will relieve the bottlenecks in the canal system and alleviate the need for extra elevator capacity at the lower lake ports since the bulk carriers will be able to go directly to Montreal and Quebec. More important, it will reduce the cost of transporting wheat to the Atlantic coast via the Seaway to such a low point that it seems unlikely that other forms of transport will be able to compete. TABLE I shows that, as of 1951, the per bushel rate from the head of the lakes to port would have been 16¢ cheaper via the Seaway to Montreal than via any route to New York. If we assume, as we did in CHAPTER I, that the more efficient 20,000-ton carriers will come increasingly into use, the differential would be even larger.

So large is the differential that it seems unlikely that Canadian grain will be exported through American ports once the Seaway is built except during the winter season. This will be true, however, only if the elevator and pier facilities are expanded at Montreal (and at Quebec as a secondary port) sufficiently to handle the increased wheat traffic.

Rather than Canadian wheat moving through American ports, then, it is entirely possible that some American wheat might be diverted to Montreal instead. This would happen, to be sure, only if economic forces were allowed to operate unhampered by institutional considerations. The magnitude or even existence of this potential traffic is so hard to predict, however, that TABLE 2 and CHART I were constructed on the basis of Canadian wheat exports alone.

Potential Grain Traffic

CHART I shows past Canadian wheat exports and a projection for the future. It is assumed, that, despite yearly fluctuations, the general trend of Canadian wheat exportation will continue upward reaching about 300 million bushels in 1960. Bad crop years or shifts in the world political and trade situation could easily modify that total, however.

TABLE 2 shows that exports of Canadian wheat through American east coast ports has remained about 25% of total Canadian exports up to the present. It is assumed that this rate will continue until the opening of the Seaway in 1959. At that juncture, however, it is expected that the traffic through American ports will fall to 5% of total Canadian exports, mostly off-season business. The remaining 20% will be diverted to Seaway transport with transshipment and exportation at Montreal. Other Canadian ports may show slight increases, but the cost advantages of Montreal are so large that the other Canadian ports will probably remain largely off-season exporters.

On the basis of our 300 million bushel projection for 1960, this 20% diversion will mean 60 million bushels of new wheat business for Montreal whose traffic, even without the Seaway, should have reached 75 million bushels by that time. This total of 135 million bushels will flow through Montreal only if port and elevator facilities are substantially increased to handle this traffic, however.

<u>Conclusions</u>

The construction of the Seaway, with its attendant cost advantages for the port of Montreal, will mean a loss of business for the American ports of New York, Philadelphia, and Baltimore. Boston and Portland will also lose but by a lesser amount since only minor Canadian wheat shipments trickle through these ports even under present circumstances. If American export wheat is also diverted to the Seaway, all the American ports stand to lose even more.

Buffalo, however, stands to lose the most. This port, the major wheat transshipment and storage point in the Great Lakes area, will lose almost all of its Canadian wheat traffic. Whereas the loss of export business will be divided among Portland, Boston, New York, Philadelphia, and Baltimore, the loss of wheat transshipment business will be concentrated on Buffalo.

On the Canadian side, only Port Colborne seems destined to lose very much. Elimination of the necessity for transshipment here, as at Buffalo, will cause a substantial reduction in wheat traffic.

Montreal stands to gain by far the most. As the natural gateway to the Atlantic from the Seaway, Montreal will find its wheat traffic greatly increased or even doubled by virtue of the transport economies involved in the use of the Seaway.[8/] This increase will not only bring new income to Montreal, but also will probably stimulate other economic activity.

8/ Other writers have reached the same conclusions. Zeis states, "...there does not appear to be much question that the overwhelming flow of eastward grain will be via Seaway to Montreal, with the United States North Atlantic ports losing all or most of their grain exports during the open season of navigation." Ref. "An Economic Appraisal of the St. Lawrence Seaway Project," op. cit., P. 45.

TABLE I ---COST OF TRANSPORTING A BUSHEL OF WHEAT FROM THE HEAD OF THE LAKES TO SHIPSIDE AT SELECTED PORTS

METHOD OF TRANSPORT	PORT	COST	
All-water via Buffalo	New York	25½¢	(a)
Water-rail " "	New York	25½¢	(a)
Water-rail " "	Boston	25½	(a)
" " " "	Philadelphia	25	(a)
" " " "	Baltimore	25	(a)
All-water " " (Port Colborne)	Montreal	16	(a)
Water-rail " Georgian Bay Ports	Montreal	18	(b)
All-water " Seaway (15K-Ton carrier)	Montreal	9½	(c)
" " " " (20K-Ton carrier)	Montreal	8	(c)

(a) Based on the testimony of John H. Frazier, Director of the Commercial Exchange of Philadelphia, before the Senate Sub-Committee Foreign Relations, op. cit., pp. 671-4.

(b) Based on "An Economic Appraisal of the St. Lawrence Seaway Project", TABLE 14, op. cit., p. 36 with figure corrected to correspond to the 1951 date of the figures covered by note (a).

(c) Based on figures presented in "An Economic Appraisal of the St. Lawrence Seaway Project," op. cit., p. 39, corrected to correspond to the 1951 date of the figures covered by note (a) and to include the Seaway toll of 35¢ per net ton plus 15¢ per deadweight ton return.

General Note:
All of the above figures are for 1951, the latest available. It can be safely assumed that all rates are presently higher, but that their relative values remain the same.

TABLE 2---CANADIAN WHEAT EXPORTS VIA U.S. EAST COAST PORTS (In Millions of Bushels)

	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1951
Total Canadian Exports	173.2	145.8	77.1	129.1	152.7	184.9	161.5	143.3	123.3	238.4	265.7	293.9(a)
Via U.S. East Coast	28.2	23.6	14.2	11.2	59.6	55.6	49.8	64.9	47.3	82.0	67.8	75.0(b)
% U.S. Ports of Total	16.3	16.2	18.4	8.6	39.0	30.1	30.8	45.3	38.4	34.4	25.5	25.5

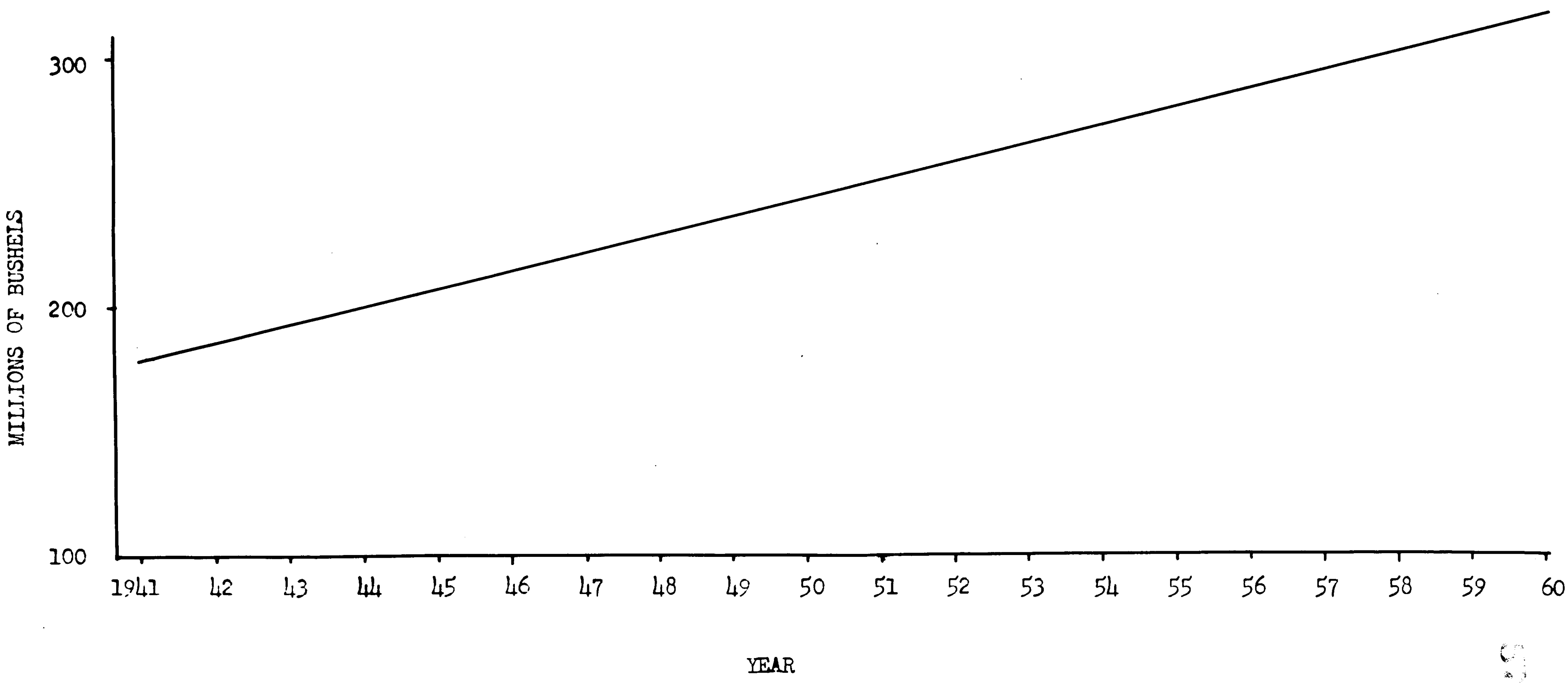
Source: "An Economic Appraisal of the St. Lawrence Seaway Project," op. cit., P.23

(a) Canadian Statistical Review, April 1951 and Dec 1953, Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa.

(b) From the hearings before the Senate Subcommittee on Foreign Relations, op. cit., Pp. 671-4.

CHART 1

EXPORTS OF CANADIAN WHEAT



CHAPTER III: EFFECTS ON COAL TRANSPORT

Scope of Analysis

As we have already seen in CHAPTER I, construction of the Seaway will not affect the cost of coal at American points which can already be served by bulk lakes carrier or directly by rail. It will, however, affect the cost of delivering coal to Canadian points served by the Seaway. Although Toronto is nominally one of these points, the present dimensions of the Welland canal make it possible for bulk-type carriers to enter Lake Ontario and serve Toronto efficiently. Of the other Canadian points included in TABLE 4, CHAPTER I, Kingston has the same present advantages as Toronto, while 7 Islands, without a steel industry, will not consume enough coal to make it a crucial point.

This study, then, will consider only the delivery of coal to the Province of Quebec, mainly through the port of Montreal.

Nova Scotia vs. American Coal

Quebec has no coal resource of any importance. Nearby Nova Scotia, however, has long been one of Canada's major coal-producing provinces-providing 43.7% of Canadian production in 1936. For a variety of reasons, however, this percentage had dropped to 30.6 by 1946.[1/] Difficulties of underwater mining in depleted mines have doubtless had much to do with this. More important, however, has been the decline in productivity of the Nova Scotian miner. This amounted to a drop from 2.54 tons per man-day in 1934 to 1.73 tons per man-day in 1944.

During the same period, the American miner's productivity was increasing from 4.23 tons per man-day to 6.78 tons per man-day. Apparently nothing has happened to reverse either of these trends, although there seems to be no reason why Nova Scotian productivity could not be brought up to its prewar level even if it could not reach the American level.[2/]

In any case, the effect of these productivity shifts has been to lower the F.O.B. mine cost of American coal with respect to Nova Scotia coal. Whereas the F.O.B. mine cost of Nova Scotia coal increased an average of $4.04 a ton, the F.O.B. mine cost of American coal increased only an average of $2.32 during the same period.[3/]

<u>Transport Cost Analysis</u>

Obviously, the increasing advantage in F.O.B. mine cost

1/ "An Economic Appraisal of the St. Lawrence Seaway Project", op. cit., p. 48.
2/ Ibid., p. 52.
3/ Ibid., p. 54

of American coal would tend to offset transport advantages of Nova Scotia coal. This is borne out by the figures. In 1939 the total average cost of Nova Scotian coal at Montreal was 10¢ a ton less than the per-ton cost of Pennsylvania-West Virginia coal at that point. By 1946, however, American coal could be delivered dockside at Montreal for an average of $1.50 per ton less than Nova Scotia coal if transport was by canaler. Nova Scotia coal, however, still had an average of 50¢ advantage over American coal which traveled all-rail from the Pennsylvania-West Virginia fields.

The opening of the Seaway, however, will make the disparity even larger. TABLE 4, CHAPTER I, shows that with the Seaway, transport costs on American coal are $5.13 or $4.86 a ton, depending on the type of carrier used. It is fair to assume that the $1.50 price advantage of American coal dockside at Montreal has been maintained because cost increases in Canada have kept pace with those in the U.S. and Canadian import duties[4/] have not been raised. Since the present transport cost on American coal via rail

4/ Ibid., p. 54. Canadian import duties on American coal were not included in TABLE 4, CHAPTER I, because this table was based strictly on transport costs. Inclusion of the import duties would not have affected the relative competitive position as between Canadian production points in any case. Only the doubtful competitive position of Montreal in the New York and New England Markets would have been affected, but American import duties on Canadian steel would have excluded Montreal from those markets anyway.

and canaller is $5.65[5] a ton, the reduction of this cost by 52¢ or 79¢ in using the Seaway will raise the price advantage of American coal to $2.02 or $2.29 a ton.

This advantage is so large that it seems unlikely that Nova Scotia coal can possibly compete with American coal once the Seaway is built. Even if Nova Scotian productivity improves, the margin seems too great to eliminate in the foreseeable future. Furthermore, there is every reason to believe that American productivity will also improve because the competition of other fuels in the American United States has made the American producers increasingly cost conscious.

Potential Coal Traffic

Recent estimates predict a Quebec market for 5 to 6.5 million tons of coal annually.[6] Add to this the 1.6 million tons which will be needed to supply the predicted iron and steel works and we find a coal traffic of 6.6 to 8.1 million tons entering the province mainly through the part of Montreal. This figure is probably on the conservative side since it does not take into account the coal needs of other new industrial activity and population which will probably be attracted to Montreal by the new steel and wheat industries.

5/ See CHART 2, CHAPTER I.
6/ Ibid., p. 51.

Conclusions

The construction of the Seaway will give American coal producers such a large cost advantage in the Quebec Provincial Market that they will virtually control it. Even if Nova Scotia producers can cut costs and prices to compete with the American producers, they cannot supply more than 1.7 million tons annually without tremendous production increases.[7/] This advantageous position in the expanding Quebec market will help American producers to make up for some of their losses in the American market and thereby benefit the coal-producing regions of Pennsylvania and West Virginia.

On the Canadian side, the decreased cost of coal at Montreal will help make possible an integrated iron and steel works at that point. Furthermore, the lowered cost of coal at Montreal will serve as an added inducement to industries which would like to locate near the steel supply.

The ultimate effect of the Seaway on coal transport, then, will be significant growth in the economic activity of the Montreal area.

7/ Ibid., p. 51.

CHAPTER IV ---EFFECTS ON GENERAL CARGO SHIPMENTS

Scope of Analysis

This chapter will be concerned only with general cargo shipments by ocean-going vessel directly to or from points along the Seaway Great Lakes route. Bulk commodities such as iron ore, coal, and wheat are not included in this analysis; not only are they covered elsewhere in this report, but also they are unlikely to move through the Seaway and the Lakes in ocean-going vessels in any substantial volume.

This analysis, therefore, will cover the importation or exportation of general cargo by interior ports, and the effects of the Seaway on this traffic.

Present General Cargo Traffic

Ports on the Great Lakes and the St. Lawrence Waterway system are already being served directly by ocean-going vessels. These vessels, known as "canallers," are especially designed for passage through the restrictive locks of the present canal system. The typical "canaller" has a length of 254 feet, a width of 43.6 feet, and a loaded draft of 14 feet which just allows it to navigate the Lachine lock at Montreal, smallest of the locks in the present canal system.[1/]

All of the present "canallers" are owned and operated by foreign concerns. The high costs of American labor make it prohibitively expensive for American concerns to compete in this small-vessel trade. Furthermore, the government subsidies which keep the U.S. Merchant Marine in operation apply only on officially designated routes. The Great Lakes-St. Lawrence route is not so designated, nor is it likely to be unless the traffic on it increases manyfold. Even with the subsidy, however, American operators would find it hard to compete with low-cost foreign vessels.[2/]

TABLE I shows the growth of General Cargo Traffic between 1946 and 1951. The imports have consisted mostly of wood pulp, iron and steel fabricated products, clays and earths, and aluminum ores, concentrates, base alloys and scrap, plus lesser amounts of manufactured products. The exports have been mainly petroleum coke, iron and steel products, automobiles and various types of machinery, and foodstuffs.[3/]

The growth of this traffic, even with the inefficiency

1/ Harold M. Mayer, "Great Lakes-Overseas, An Expanding Trade Route," Economic Geography, Volume 30, No. 2, April, 1954, p. 117.
2/ Ibid., p. 142
3/ Ibid., pp. 132-4

of the small-sized vessels and the tortuousness of the present St. Lawrence route, is due to a number of factors. Basically the foreign ship operators, with their low wage scales, have been able to keep their all-water rates competitive with the rail-water rates via East Coast ports. But more than that, Midwest importers and exporters, both in the United States and Canada, have found that direct shipping avoids the losses involved in the extra handling, delays in loading, and possible labor strikes at East Coast ports. Low-weight, high-value products such as liquor and delicate machinery have been moving increasingly by direct shipment to avoid the breakage and pilferage losses encountered at Atlantic transshipment points.[4/]

Actually, the St. Lawrence route to and from Europe is shorter than might be expected since it lies along the great circle route to that continent. Chicago to Antwerp via the St. Lawrence, for example, is only 189 miles longer than the rail-water route via New York. This means that all-water transport is competitive in speed as well as cost with the rail-water transport via the East Coast.

The vessel operators apparently expect their business to grow even without the Seaway. Almost all the present

4/ Ibid., p. 131.

operators have new "canallers" under construction. Many of these new vessels have a capacity of 3500 tons as opposed to the 2000 ton capacity of most of the existing ships.[5/]

Effects of the Seaway

There is every reason to expect, therefore, that direct trade in general cargo between interior and foreign ports will expand once the Seaway is built. The 27-foot proposed depth for the Seaway will accommodate most foreign ocean-going vessels. It will not, however, accommodate much of the American Merchant Marine because the majority of American vessels draw upwards of 30 feet in fresh water when fully loaded.[6/] In any case it is unlikely that American operators, with their high labor costs, could compete in the overseas trade with the use of the Seaway any better than they could without it.

Once the Seaway is built, the ability of larger, more efficient vessels to enter the Great Lakes will probably

5/ Ibid., p. 126.
6/ From the testimony of Brig. Gen. Bernard L. Robinson, Deputy Chief of Engineers, U.S. Army, before the Senate Subcommittee on Foreign Relations, op. cit., p. 48.

General Robinson also pointed out, however, that 75% of the U.S. Merchant Marine could navigate the 27-foot channel if the ships were loaded to no more than an average of 80% of capacity. This would make it almost impossible for American vessels to compete with fully-loaded foreign ships, however.

eliminate the "canallers" from the waterway traffic. This will not affect the operators of these small vessels too adversely, however, since they can return to the "short sea" European trade which is even now their major business during the winter season when St. Lawrence is blocked by ice.[7/]

The most important effects of the Seaway will be on the interior points which it will serve. If the businessmen of the Midwest found it advantageous to trade via the restricted St. Lawrence canal system, it seems logical that they will find it even more advantageous to trade via the Seaway. Transport costs are certain to be reduced by the use of larger, more efficient vessels, while the other advantages of direct shipments will remain.

With a substantial growth in direct trade between foreign lands and Midwest points, these points will prosper increasingly as transshipment centers. Such centers are strategic spots for the location of economic activity. Cargos, once unloaded, can most economically be processed at the unloading point before they are transshiped to another form of transportation.

Profit-seeking enterprise seeks to reduce production

7/ Harold M. Mayer, op. cit., p. 125.
8/ R.U. Ratcliff, Urban Land Economics, 1st Edition, McGraw-Hill, New York, 1949, pp. 34-37.

costs. Transport costs often make up a large proportion of those costs. If an industry can reduce its total transport costs by locating on new and more economical transport routes and by reducing transshipment charges on materials, it will usually try to do so.[9/]

Historically, most of our largest cities have grown up at transshipment points. New York and other East Coast ports are prime examples. Industry has congregated at these places to take advantage of the lower costs involved in processing goods before they are transshipped from water to rail. Similarly, Chicago and other Midwest cities have grown up at railway interchanges. The added advantage of becoming major water-to-rail transfer points should materially help the lake ports to attract more industry.[10/]

In general, the ports farthest from the East Coast will benefit the most by shipping via the Seaway. The high cost of the long rail haul to the East Coast from such points as Chicago and Detroit allows a wide margin for competition from

9/ E.M. Hoover, The Location of Economic Activity, 1st Edition, McGraw-Hill, New York, 1948.

10/ Dean has said, "the likelihood for establishment of commercial agglomerations of first rate importance is especially great where the primary land routes meet the primary water routes.
W.H. Dean, The Theory of the Geographic Location of Economic Activities, Edwards, Ann Arbor, 1938, p. 37.

the all-water route via the Seaway.

Cleveland and Buffalo should gain, too, but not as much. The rail haul from Cleveland and the rail or barge haul from Buffalo are not nearly as long as those from the western ports, and therefore are not as susceptible to Seaway Competition.

Toronto, although it is fairly far east, still should gain substantially from direct vessel service via the Seaway. This is because Toronto is the major center of industrial Canada, and the gateway to the most populous Province of that country. Ports such as Fort William and Port Arthur, although farther west, should not be expected to gain as much as Toronto or interior American points because of their restricted hinterland market and lack of industrial potential.

Obviously, if interior points are to gain by direct shipments of general cargo, East Coast points will suffer by loss of some of their transshipment business and some of the industry which a transshipment point attracts. Montreal, New York, Philadelphia, and Baltimore would be expected to lose the most because they are the major outlets for the products of the midwest. Boston and Quebec would also lose, but by a much smaller amount since only minor shipments of midwest produce move through these ports.

Conclusions

The construction of the Seaway will make possible a considerable expansion of direct overseas trade in general cargo between foreign ports and points served by the Seaway by lowering the costs of getting products to market and materials to industry. This expansion should therefore help to stimulate the economic growth of these interior points. Such expansion will be possible, however, only if the lake and Seaway ports improve their already inadequate general cargo handling facilities.[11/]

On the American side, Chicago and Detroit stand to gain the most. Cleveland and Buffalo will also benefit, but by a less amount. New York, Baltimore, and Philadelphia stand to lose the most; Boston less.

On the Canadian side, Toronto should gain by far the most while Fort William-Port Arthur and other minor lake ports benefit only slightly. Conversely, Montreal should lose by far the most with the adverse effects on Quebec and other St. Lawrence points being only slight.

Note that the adverse effects on certain Atlantic ports may be alleviated somewhat by the general increase in trade stimulated by the use of the Seaway. It would be dangerous to

11/ Harold M. Mayer, op. cit., p. 141.

predict, however, that this increase would be enough to compensate for the losses these points will suffer in their transshipment business and the industries associated with that business.

Bear in mind, also, that unpredictable changes in the foreign trade policy of the United States Government could serve to either strengthen or weaken the effects on American points.

TABLE I ---GROWTH OF DIRECT OVERSEAS GENERAL CARGO TRAFFIC AT AMERICAN GREAT LAKES PORTS IN NET TONS OF CARGO

YEAR	IMPORTS	EXPORTS	TOTAL
1946	10,176	20,148	30,324
1947	23,054	43,720	66,774
1948	46,765	43,406	90,171
1949	63,966	73,618	137,584
1950	127,203	84,874	212,077
1951	107,234	103,667	210,901

Source: Harold M. Mayer, "Great Lakes-Overseas, An Expanding Trade Route," *Economic Geography*, Vol. 30, No. 2, April, 1954, TABLE IV, p. 129. Mr. Mayer's table was compiled from the *Annual Reports* of the U.S. Corps of Engineers.

SUMMARY CONCLUSIONS

American Points

In general, Midwest points will benefit from the transport economies involved in the use of the Seaway while East Coast points will suffer some loss. Chicago and Detroit will benefit especially in their general cargo traffic while New York, Philadelphia, and Baltimore lose somewhat. At least part of this loss should be offset by general increases in foreign trade stimulated by the Seaway. New York, Philadelphia, and Baltimore will also suffer major declines in their Canadian wheat exportations. Boston and Portland will expect similar, but smaller, declines in their general cargo and wheat traffic.

It does not appear that any American points will be strongly affected by shifts in the iron and steel and coal industries. Chicago, Detroit, and Cleveland will probably experience only the relatively minor loss of their iron and steel export market in Canada. The coal-producing areas of Pennsylvania and West Virginia will gain somewhat in increased coal traffic to Montreal.

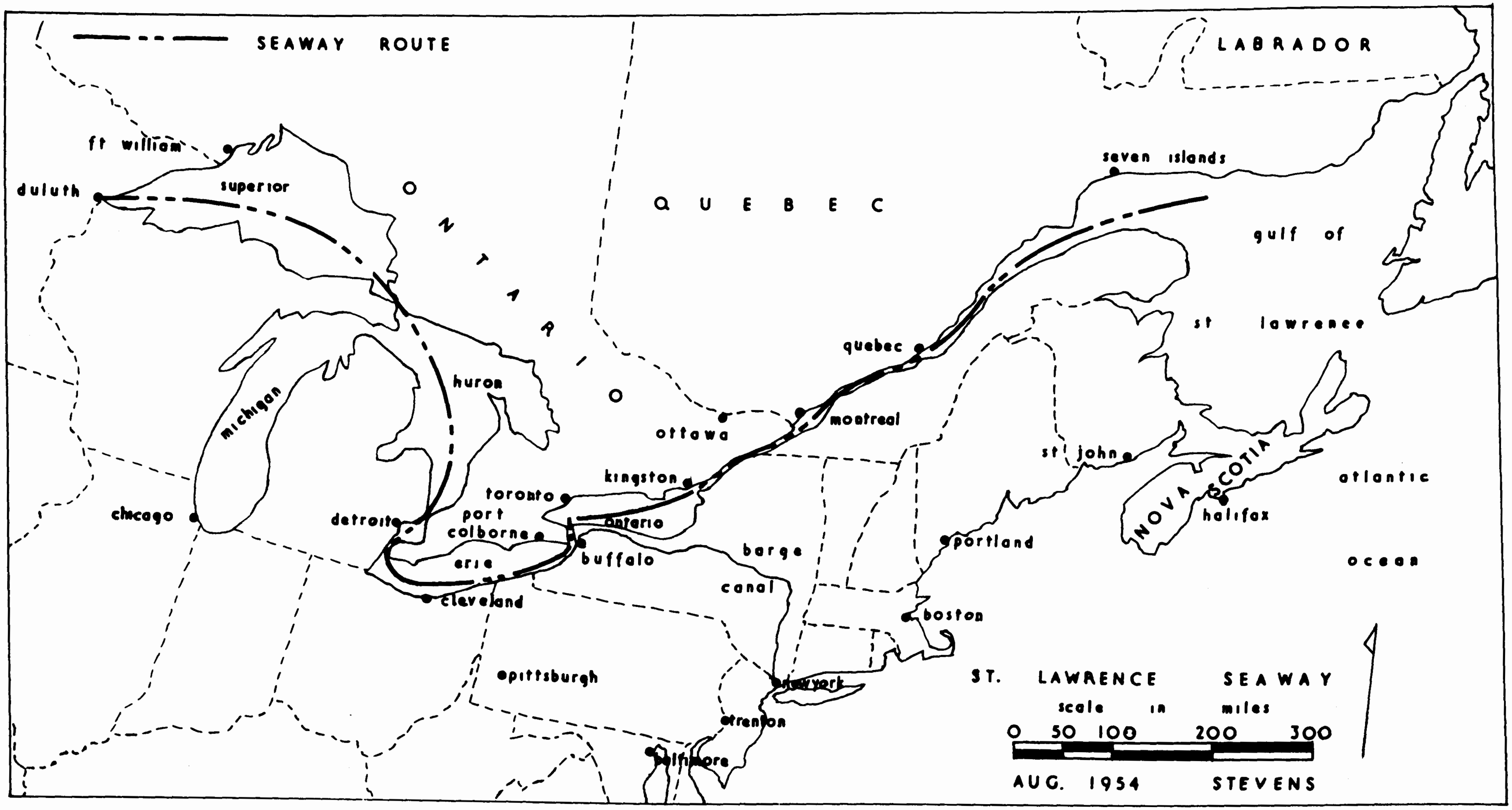
Of all American points, Buffalo will probably suffer the largest losses. This point seems destined to lose the major portion of its presently substantial business in the elevatorage and transshipment of Canadian wheat. Furthermore, Buffalo, the largest American supplier of steel to Canada, will feel the loss of this market.

Canadian Points

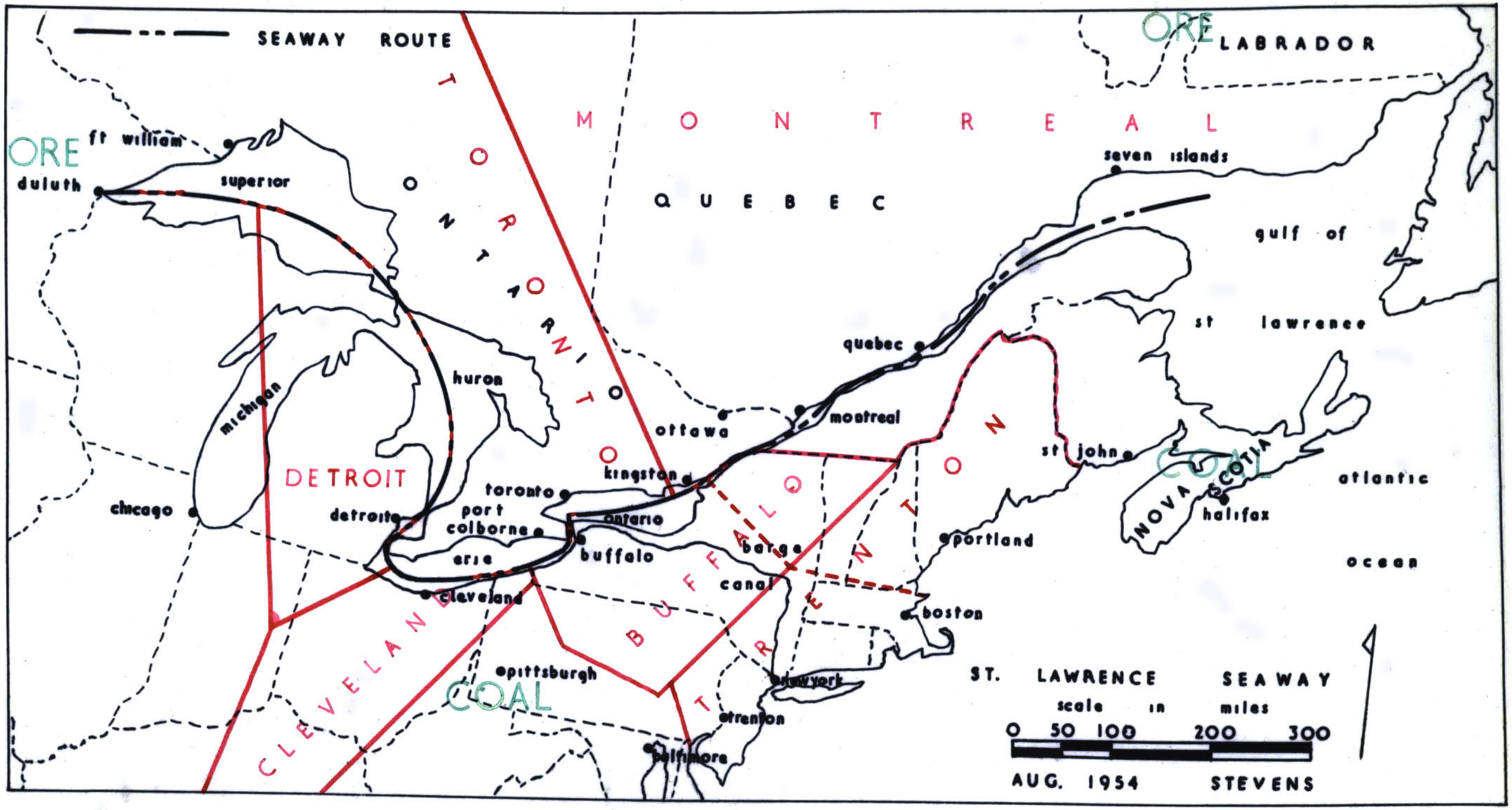
Similarly, Canadian lake ports will undoubtedly benefit from direct shipment of general cargo while the East Coast ports will lose some of their transshipment business. With respect to the commodities, however, the situation here is very different. Although Port Colborne stands to lose much of its fair-sized wheat transshipment business, other Canadian ports show promise of gains much larger than any to be found on the American side.

Montreal especially has a greatly increased future economic potential due to the Seaway. Not only is it possible to predict a vastly expanded wheat traffic through this port and to contemplate the likelihood of an integrated iron and steel works, but it is also possible to conclude that these new activities, together with the lowered cost of coal, will form a powerful stimulus wir future economic development in the Montreal Area.

This future development will not benefit Montreal alone. The growth which the Seaway will make possible in Montreal should serve to stimulate the entire Canadian economy.


SEAWAY ROUTE
LABRADOR
ft william
duluth
superior
ONTARIO
QUEBEC
seven islands
gulf of
st lawrence
quebec
huron
michigan
ottawa
montreal
kingston
toronto
port colborne
chicago
detroit
ontario
erie
buffalo
cleveland
barge canal
st john
NOVA SCOTIA
halifax
atlantic
ocean
portland
boston
pittsburgh
newyork
trenton
baltimore
ST. LAWRENCE SEAWAY
scale in miles
0 50 100 200 300
AUG. 1954 STEVENS

MAP 1



MAP 2

SHOWING MATERIAL SOURCES AND IRON AND STEEL MARKET BOUNDARIES

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Joseph B. Ayers, Jr., Great Lakes Steamship Co., Inc.
Sen. John Marshall Butler of Maryland
Oscar I. Chapman, Secretary of the Interior
William E. Fowler, Youngstown Sheet and Tube Co.
John H. Frazier, The Commercial Exchange of Philadelphia
George M. Humphrey, M.A. Hanna Co.
Walter J. Kelly, Association of American Railroads
Earl M. Richards, Republic Steel Corp.
Brig. Gen. Bernard L. Robinson, U.S. Army Engineers
F.G. Robinson, Galveston Chamber of Commerce
Franklin D. Roosevelt, Jr., Member of Congress, N.Y.

Hearings before the House Committee on Public Works, 82nd Congress, 1st session, including the testimony in part of:

Cleveland M. Bailey, Member of Congress, W. Va.
R.A. Ellison, Cincinnati Chamber of Commerce
Prof. John L. McDougall, Queen's University, Ontario
Maj. Gen. Lewis Pick, U.S. Army Engineers
Gregory S. Prince, Association of American Railroads
Charles Sawyer, Secretary of Commerce

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