

UNITED STATES DEPARTMENT OF COMMERCE

JESSE H. JONES, *Secretary*

The St. Lawrence Survey

PART IV

The Effect of the St. Lawrence Seaway
Upon Existing Harbors



N. R. DANIELIAN, *Director*
ST. LAWRENCE SURVEY

Reports of the St. Lawrence Survey

- PART I. History of the St. Lawrence Project.
- PART II. Shipping Services on the St. Lawrence River.
- PART III. Potential Traffic on the St. Lawrence Seaway.
- PART IV. The Effect of the St. Lawrence Seaway Upon Existing Harbors.
- PART V. The St. Lawrence Seaway and Future Transportation Requirements.
- PART VI. The Economic Effects of the St. Lawrence Power Project.
- PART VII. Summary Report of the St. Lawrence Survey.

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DECEMBER 20, 1940.

THE PRESIDENT,
The White House,
Washington, D. C.

MY DEAR MR. PRESIDENT: I have the honor to transmit to you herewith Part IV of the reports of the St. Lawrence Survey. This part deals with the effects of the proposed St. Lawrence Seaway upon the ports of New York, Boston, and Buffalo.

A summary of facts and conclusions is given in the letter of submittal of Dr. N. R. Danielian, Director of the St. Lawrence Survey.

Very sincerely yours,

WAYNE C. TAYLOR,
Acting Secretary of Commerce.

LETTER OF SUBMITTAL

DECEMBER 16, 1940.

The Hon. SECRETARY OF COMMERCE,
Washington, D. C.

DEAR MR. SECRETARY: I have the honor to submit a report on the effect of the St. Lawrence Seaway upon existing harbors. In the preparation of this report the Survey has had the able assistance of Mr. Edward Cooper, of its own staff. The Survey has also had the advantage of comments and criticisms of staff members of the Board of Engineers for Rivers and Harbors, United States Army.

The analysis of the probable effects of the St. Lawrence Seaway upon existing harbors, was restricted to the ports of New York, Boston, and Buffalo. This procedure avoids needless repetition, cuts down the task to manageable proportions, and gives a basis for evaluating the effects on other ports. For New York as the principal eastern export center of the United States, and Buffalo as the principal transshipment center on the Great Lakes, are generally considered to be the two ports most vitally concerned in the St. Lawrence Seaway. Since other port cities such as Philadelphia, Baltimore, Norfolk, and New Orleans are likely to be affected to a much less degree than New York and Buffalo, the conclusions with regard to these two ports will shed light at least upon the direction in which these other harbors may be influenced. The brief sample study of Boston, utilizing the methods developed in the case of New York Harbor, indicates that this is likely to be the case.

Many studies of the St. Lawrence Survey have necessitated pioneering in the study of future eventualities—pioneering in academic courage, if not always in techniques of analysis. The present study on the probable effects of the St. Lawrence Seaway upon the ports of New York, Boston, and Buffalo is an example of such pioneering. Its virtues are not in that it provides a final and accurate prediction of future events. Its virtue is merely in the fact that an attempt is made for the first time in the history of the St. Lawrence project to analyze the possible future changes in the commercial activity of existing harbors and to base a judgment on the foundations of informed and educated opinion.

These findings are especially important to all persons who are concerned lest the proposed Seaway have adverse local economic consequences by impairing the usefulness of existing harbors, with resultant unemployment, and loss in the value of existing investments. Although the national interest is obviously the paramount considera-

tion in making a decision on a major project such as the St. Lawrence development, the effects upon local interests deserve sympathetic study. This is the viewpoint of the present report.

The study indicates that New York will lose some foreign traffic and that Buffalo will lose some of its grain transfer business. On the other hand, New York Harbor will acquire new water-borne traffic to and from the Great Lakes area. Similarly, Buffalo also will gain new traffic, both domestic and foreign. In each case, the additional traffic will more than offset the losses. The net gain for Boston will be largest of all.

In greater detail, the analysis reveals the following points pertaining to New York Harbor.

1. The foreign water-borne commerce of the port of New York has fluctuated between 15 and 30 million tons a year in the course of the 16 years from 1923 to 1938. The 10-year average, 1928-37, was 21.5 million tons. The total water-borne commerce, including coastwise and internal, intraport and local traffic, has varied between 86 and 138 million tons during the same 16 years, and the average for the 10 years, 1928-37, was 109 million tons.

2. Assuming full utilization of the St. Lawrence Seaway to the ultimate of its capacity, the total diversion of foreign traffic from the port of New York is estimated to be 1.8 million tons. This would constitute about 8.4 percent of the average annual foreign water-borne commerce of New York, but only 1.6 percent of the average total water-borne traffic of 109 million tons during the decade 1928-37. In every year since 1923, the period studied by this Survey, the annual fluctuations of New York Harbor traffic have been greater than the possible diversion.

3. In terms of employment in importing and exporting establishments, and of stevedores, longshoremen, and sailors, the loss in foreign commerce will involve, at a liberal estimate, the loss of 3,000 jobs and pay rolls of somewhat over \$7,000,000 a year. With each job of direct employment there is usually associated another job of indirect employment, in service industries, such as restaurants, hotels, bakeries, etc., in professional services and utilities. Hence, the total loss of jobs incident upon the diversion of foreign commerce from New York Harbor may amount to 6,000. This loss of jobs is one-seventh of one percent of the total number of gainfully employed persons in the New York Industrial Area of 4,582,210 in 1930. The loss in pay rolls is but an infinitesimal portion of total pay rolls of New York Industrial Area in manufacturing, retail, wholesale, insurance, and real-estate establishments, which in 1935 amounted to \$3,239,831,000. This does not include income from utilities, railways, local, State and Federal employment, professional, and personal services.

4. The major portion of existing coastwise and intercoastal water-borne cargo received in New York Harbor consists of a few bulk commodities, such as coal, petroleum products, sand and gravel, iron and steel scrap, copper ore, railroad ties, etc., which are not transshipped to Middle Western points, but are consumed in or near the New York Industrial Area. This traffic would not be lost to New York, when the St. Lawrence Seaway is constructed. This nondivertible traffic accounts for 80 percent of the total coastwise and intercoastal receipts of the port. Similarly, coastwise and intercoastal shipments from New York Harbor consist largely of a few bulk commodities, such as coal and petroleum products, which are reshipped from New York to other American ports. Hence, the major portion of coastwise and intercoastal water-borne traffic of New York would be unaffected by the St. Lawrence Seaway.

5. There are certain products, minor in quantity, in the coastwise and intercoastal receipts of New York Harbor which are likely, in part, to bypass New York by direct shipment into Great Lakes ports when the St. Lawrence Seaway is available. Among these products may be cited lumber and products, fruits and nuts, canned goods, sulfur and fertilizers. Similarly, certain coastwise shipments of products which now originate in the Middle West and are transshipped through New York may be shifted to the direct water route via the St. Lawrence. The total possible diversion of coastwise receipts and shipments together may be but a little over one million tons, or less than 1 percent of the total water-borne traffic of the port, or 3 percent of the coastwise and intercoastal traffic.

6. A study of available inter-regional traffic between the territory surrounding the New York Industrial Area on the one hand, and the Great Lakes tributary area, on the other, shows that there is much available cargo that may move in both directions by water via the St. Lawrence Seaway. Eastward, there would be large quantities of grain and cereal products, dairy products, nonfresh meats, automobiles; and westward, finished and semifinished iron and steel products, sugar, refined copper and zinc, brass and other alloys. A careful analysis of commodity movements shows that new traffic in these and other products will more than compensate for all the loss in coastwise and intercoastal receipts and shipments in New York Harbor on account of the St. Lawrence Seaway.

7. New York Harbor activity is sensitive to the economic welfare of the whole country. This is verified by a comparison of the fluctuations in harbor activity with general industrial indexes. Harbor activity in New York will continue to respond to growth in population

and improved business conditions throughout the country. On the basis of conservative estimates of future developments in population and economic activity, one may confidently expect that water-borne commerce in New York will expand to compensate many times over any possible losses in foreign commerce on account of the St. Lawrence Seaway.

The salient conclusions regarding the effect of the St. Lawrence Seaway upon the port of Boston are:

1. Just as in the case of New York, Boston Harbor is likely to lose but a small portion of its foreign commerce, roughly 250,000 tons. There is not much chance of any loss in coastwise commerce, since Boston does not act as transshipment center for cargo originating and terminating in the Great Lakes area. Receipts and shipments in Boston Harbor are mostly for local consumption or from local sources, such as coal, petroleum, fish, sugar, cotton, wool.

2. With very little danger of diversion of traffic, Boston stands to gain a large volume of new commerce. New England is a heavy importer of raw materials and foodstuffs from the Middle West. New traffic can be expected in cereal products, dairy products, non-fresh meats, automobiles, pig iron, finished and semifinished iron and steel products. New harbor activity can be expected also from the shipment by water to the Great Lakes of New England products, such as machinery, shoe and leather products, canned and cured fish, refined sugar. The conclusion is clear that Boston Harbor will be one of the chief beneficiaries of the Seaway; the fear of diversion is unfounded, and the possibilities of new traffic very promising.

The analysis of the situation in Buffalo reveals that:

1. Buffalo will surely lose some of its grain transshipment traffic. A maximum estimate of this loss is 700,000 tons a season. This is about a fifth of the average annual lakewise grain receipts at Buffalo. In terms of employment, this loss would involve the jobs of 200 workers in grain elevators and other waterfront activities. The loss in employment as a result of this diversion represents 0.054 percent of the 371,374 gainfully occupied persons in the Buffalo Industrial Area in 1930. The loss in revenues to grain elevators is estimated at \$220,000 a year.

2. The losses to Buffalo in grain traffic cannot possibly exceed the liberal estimates of this report, because much of the grain received in Buffalo is for local milling and local distribution. Furthermore, a large portion of Buffalo grain traffic is for end-of-season storage which could not proceed further because of congestion of shipping and closed navigation. Finally, Buffalo has already lost a large portion of its former transshipment business in grain since the opening of the Welland Ship Canal in 1932.

3. The Survey finds that there is no real basis for apprehension that Buffalo will lose its pre-eminent position in flour milling. The milling industry there will certainly not suffer any absolute disadvantage by virtue of being located at a deep-water port. Relative to other milling centers such as Minneapolis, Buffalo will suffer no disadvantage, since water transportation of grain to Buffalo for milling there will still be more advantageous than water shipment of flour direct from upper lake ports. The only possibility of relocation of the milling industry would arise if new mills could be established at the urban centers on the North Atlantic coast. There are many factors limiting such a development. Buffalo is more conveniently accessible to winter sources of grain supplies, stored in its own elevators and at nearby Canadian points. For this grain Buffalo will remain the most economical milling center during the closed navigation season. Buffalo is also better located in relation to a broad market in New England, New York, Pennsylvania and Ohio than seaboard cities. Large mills, particularly those owned by national concerns, would be loath to sacrifice this advantage by a decentralization of the industry into many mills located in different eastern cities, each serving a local market. For all these reasons, relocation of the flour milling industry away from Buffalo at Atlantic ports is a very remote possibility.

4. On the other hand, the St. Lawrence Seaway will provide a cheaper form of transportation in both foreign and intercoastal trade. Flour exports from Buffalo, estimated at an average of 180,000 tons during the open season, would save as much as \$525,000 a year in freight charges. Similarly, Buffalo's principal industry, iron and steel and their products, and machinery, would benefit by the cheaper form of transportation. This industry employed at least 27,000 workers out of 106,000 wage earners in all manufacturing in 1937. At present it is at a disadvantage in the foreign or west coast markets. With the Seaway, Buffalo is likely to acquire its share of these markets. Chemicals, abrasives, aluminum, metal alloys, and other products of Buffalo would also have the advantage of cheap deep-water transportation.

5. New compensating incoming traffic into the port of Buffalo will arise in lumber, sugar, fruits, and canned goods for distribution in the adjacent areas. This traffic, though not as large in weight measures as the possible tonnage of grain traffic, will certainly create more employment, income, and savings in transportation costs.

In arriving at these conclusions, the Survey made every effort to be conservative, which in this case meant making the most pessimistic assumptions from the point of view of the harbors studied. For instance, it was assumed that 10,000,000 tons of new American traffic, over and above the traffic now traveling through the present

14-foot St. Lawrence Canals, would utilize the new Seaway immediately upon completion. This is based upon the utilization of the full 25,000,000-ton capacity of the 27-foot project, of which, eliminating 9,000,000 tons of present traffic, 16,000,000 tons would be new capacity, divided between the United States and Canada on a 10 to 6 ratio. In contrast to this liberal assumption, the known, provable traffic of the major commodities studied in Part III of these reports show an initial *new* tonnage, on the basis generally of 1928-37 trade conditions, nearer 5,000,000. This is not to deny that the ultimate capacity of the Seaway will be utilized. With economic activity at levels higher than the past decade, traffic through the St. Lawrence will surely surpass the limits imposed by the Survey analyses. But under those conditions port activity in all the harbors studied will improve in step with general economic conditions in the country as a whole, and any possible loss from diversion will be lost in the upsurge of prosperity.

Again, the present analysis did not make allowance for the effects of construction outlays spent in New York and for the beneficent results of low cost power upon industry and employment. This is more extensively treated in Part VI. It is sufficient to mention here that full time employment on site of more than 6,400 workers for 5 years with an annual pay roll of \$9,000,000, and additional orders for materials of nearly \$90,000,000, will certainly have a stimulating effect upon New York State industry and traffic. The ultimate expectation that cheap power will create 50,000 new gainfully employed industrial workers, with total dependent population of 125,000 persons, will also materially affect the fortunes of New York State economic activity.

In the light of all these considerations, the conclusion is clear that New York, Boston, and Buffalo stand to gain much and lose but little from the St. Lawrence project.

Very truly yours,

N. R. DANIELIAN, *Director,*
St. Lawrence Survey.

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THE EFFECT OF THE ST. LAWRENCE SEAWAY UPON EXISTING HARBORS

CHAPTER I

THE ST. LAWRENCE SEAWAY AND THE PORT OF NEW YORK

The construction of the St. Lawrence seaway and power project will undoubtedly have significant effects on both industry and transportation in the United States. Through the provision of economical electric energy it will affect the growth and location of industry. By providing a new pathway for water-borne commerce, it will lead to changes in the routing of commodity movements. This chapter is concerned only with the latter aspect as it relates to the port of New York and the adjacent area.

In sections 1 to 3 of this chapter the analysis is given in terms solely of existing industries and methods of transportation; the new traffic brought forth by the Seaway will not be considered. Throughout the entire first part of this chapter, it should be remembered that the direct effects only are under consideration. The volume of transportation demands are assumed to be as of the recent past.

In sections 4 and 5, the probable changes attendant upon the construction of the Seaway will be evaluated in terms of their economic effects upon the New York area, especially in relation to employment gains or losses in the future.

Section 1

THE EFFECT OF THE SEAWAY UPON IMPORT AND EXPORT TRAFFIC OF NEW YORK HARBOR

Before the diversion of water-borne commerce of New York Harbor can be estimated, it is necessary to establish the capacity of the proposed St. Lawrence Seaway and the proportion which will be available to American shipping.

The maximum transportation capacity of the Seaway was estimated by the U. S. War Department as 25 million tons of freight during the open season.¹ In 1937 and 1938, the existing St. Lawrence canals carried over 9 million tons of traffic annually, the tonnage for 1937 being 9,195,439, and for 1938, 9,236,318.² This leaves about 16 million

¹ Sen. Doc. 116, 73d Cong., 2d Sess., p. 76.

² Canada, Dominion Bureau of Statistics, *Canal Statistics*, 1938, pp. 14-15.

tons of capacity available for new shipping. This estimate includes ships in ballast, so that the capacity for revenue freight is even smaller. Of this capacity, it is necessary to estimate the amount available for use by American shipping. This, of course, cannot be done with any great precision at this time. In fact, with the large volume of traffic potentially available there may arise a situation in which the total demand of American and Canadian shippers could not be accommodated. In that case, the proration of the Seaway's capacity might become a matter for negotiation between the two countries. The outcome of such a proceeding is naturally not subject to prediction. However, in the event that allocation becomes a matter of negotiation between the countries, an equal division of the total capacity would be reasonable, inasmuch as the cost of the project is to be shared approximately equally by the two countries. Furthermore, if the density of traffic gives rise to congestion, it is likely that carrying capacity of canals may be increased by deepening them to 30 feet, as provided in the initial project.

Nor does the use hitherto made of the St. Lawrence by the United States and Canada furnish a possible basis for allocation. For a number of reasons, American use of the present shallow canals is much smaller than its use of the proposed waterway can be expected to be.

The chief reason why the present traffic is not a good basis for allocation of future traffic is the present restriction upon draft of vessels using existing channels. In his study of the St. Lawrence, Alfred H. Ritter summarized this situation as follows:

Navigation conditions now limit the draft of vessels entering the Great Lakes to about 13½ feet. The difference between a vessel of this draft and one of 20 feet or more is the difference between economical and costly transportation . . . Vessels of 13 to 16 feet draft are adapted only for use on routes where there is little or no competition, either by rail or by more efficient water carriers . . . They are not suitable for traffic between the Atlantic seaboard and the Great Lakes, and no vessels of the size which can pass the present locks of the St. Lawrence River when fully loaded are suitable for regular lake-ocean traffic.³

Another reason why the United States has not utilized the present St. Lawrence River intensively is that American coastwise commerce for the most part, lies along open seacoasts or is confined to the lakes. Unlike Canada, it has no large ports on the St. Lawrence River east of Lake Ontario. Its coastwise ships, adapted to ocean trade, are too large to utilize the present St. Lawrence canals. Hence Canadian trade has been the chief user of the St. Lawrence canals.

³ Alfred H. Ritter, *Transportation Economics of the Great Lakes-St. Lawrence Ship Channel*, published by the Great Lakes-St. Lawrence Tidewater Association, November, 1925, p. 249.

During 1938, of a total of 8,285,167 tons of through traffic using the St. Lawrence canals, 4,911,160 tons originated in Canada, and 3,374,007 in the United States.⁴

With deeper St. Lawrence canals, the existing proportion between Canadian and American use will change, since deeper draft American coastwise ships will be able to pass through. Therefore, the allocation of the additional capacity has been arbitrarily set as 10 million tons annually for the United States. This is equivalent to 60 percent of the new capacity of 16 millions tons and would result in approximately equal use of the total capacity, new and old, by Canada and the United States. In answer to objections to this admittedly arbitrary method of allocation, it might be pointed out that prediction of this factor is extremely difficult, and that the main concern in the present study is to make a generous allowance so that diversion from other ocean ports be over-, rather than under-stated.

The next step is to allocate the capacity available for American shipping between foreign and domestic commerce. The traffic that can be expected through the St. Lawrence will be new and additional traffic superimposed upon the present pattern of commodity movements within the Lakes and between Lake ports and Montreal. To determine the division of this traffic between foreign and domestic commerce, one cannot take the existing character of traffic in Great Lakes harbors such as Chicago, or Cleveland, or Duluth, and apply it to the prospective St. Lawrence traffic, for the simple reason that traffic on the Great Lakes is of a peculiar nature, due to the preponderance of coastwise traffic on the Great Lakes, based upon the location of natural resources in the Lake Superior region that are utilized at points near the lower Lake ports. This is a type of traffic that would probably continue undisturbed by the St. Lawrence Seaway. Similarly, a large part of the grain movements between United States ports and between Canadian points will continue in their old routes, because of the well-established facilities of transportation and local functionalization such as flour milling in Buffalo.

The additional traffic through the St. Lawrence will be more comparable to the now-existing traffic on the Atlantic and Gulf coasts. In general, the diversified character of production and consumption in the Great Lakes area does not differ greatly from that existing in the North Atlantic ports and the Gulf ports considered together. Indeed, the traffic originating and terminating on Atlantic and Gulf ports is to a large extent derived from industrial and trade activity in the tributary area of the Great Lakes. Hence, it is more reasonable to distribute prospective additional traffic expected on the St. Lawrence Seaway between foreign and domestic commerce

⁴ Canada, Dominion Bureau of Statistics, *Canal Statistics*, 1938, p. 41.

according to the relative proportion of such commerce in the American ports on the Atlantic and Gulf coasts.

The average foreign commerce of the Atlantic and Gulf ports during the period 1928 through 1937, represented 40 percent of the total water-borne commerce, as shown in table 1. This same proportion of the assumed United States traffic through the St. Lawrence, namely 10,000,000 tons, would be 4,000,000 tons. This represents the volume of foreign imports and exports of the United States which may flow through the St. Lawrence Seaway and leaves a canal capacity of 6,000,000 short tons annually which is available for United States domestic commerce.

TABLE 1.—*Water-borne commerce of the Atlantic and Gulf ports*

Year	Foreign commerce (thousands of short tons)	Domestic commerce ¹ (thousands of short tons)	Total commerce (thousands of short tons)	Foreign commerce (percent of total)
1923	76,377	59,148	135,525	56.36
1924	76,590	57,445	134,035	57.14
1925	77,352	71,510	148,862	51.96
1926	94,252	73,219	167,471	56.28
1927	75,130	86,209	161,339	46.57
1928	77,236	82,298	159,534	48.41
1929	84,516	87,404	172,000	49.14
1930	74,141	83,796	157,937	46.94
1931	59,322	82,520	141,842	41.83
1932	47,205	71,229	118,434	39.86
1933	45,061	85,704	130,765	34.46
1934	49,627	91,189	140,816	35.24
1935	53,589	91,440	145,029	36.95
1936	58,808	105,774	164,582	35.73
1937	74,436	118,326	192,762	38.62
1938	67,896	107,156	175,052	38.79
Average, 1928-37	62,394	89,976	152,370	40.95

¹ Local intraport and internal commerce is not included, and domestic commerce is included on an adjusted basis, eliminating duplications.

SOURCE: Data from U. S. Maritime Commission, Division of Research, *Water-borne Foreign and Domestic Commerce of the United States*, Rept. No. 295.

The question arises: What portion of the 4,000,000 tons of prospective foreign commerce of the St. Lawrence Seaway now clears through New York Harbor in the absence of the Seaway? To put it otherwise, what proportion of this foreign traffic would be a diversion from New York Harbor? One method of arriving at an approximation of this volume is to assume that all the ocean ports would be affected in proportion to the volume of foreign commerce they now handle. Then, if New York Harbor accounts for one-third of the foreign commerce of all Atlantic and Gulf ports, under this method of estimation New York would lose one-third of all the foreign commerce which may move by way of the St. Lawrence, or 1,333,000 tons. Applying this method to the facts of the case, it appears that New York Harbor has accounted for 34.51 percent of the foreign commerce of all Atlantic and

Gulf coast ports during the period 1928 through 1937. This is shown in table 2. Since the total foreign commerce of the United States to use the Seaway has been estimated at 4,000,000 tons, New York should contribute about 34.5 percent of this volume, or 1,380,000 tons.

TABLE 2.—*Water-borne foreign commerce, New York Harbor and all Atlantic and Gulf ports, 1923-38*

Year	Port of New York (thousands of short tons)	All Atlantic and Gulf ports (thousands of short tons)	New York as percent of total
1923	25,356	76,377	33.20
1924	24,577	76,590	32.09
1925	26,583	77,352	34.37
1926	26,910	94,252	28.55
1927	27,820	75,130	37.03
1928	29,243	77,236	37.86
1929	30,439	84,516	36.02
1930	25,963	74,141	35.02
1931	20,944	59,322	35.31
1932	16,582	47,205	35.13
1933	15,299	45,061	33.95
1934	17,204	49,627	34.67
1935	17,123	53,589	31.95
1936	19,434	58,808	33.05
1937	23,033	74,436	31.01
1938	18,696	67,896	27.54
Average, 1923-37	21,531	62,394	34.51

SOURCE: Data from U. S. Maritime Commission, Division of Research. *Water-borne Foreign and Domestic Commerce of the United States*, Rept. No. 295.

There may be objections raised to this procedure on the ground that New York will lose a larger proportion of its foreign trade than will some of the other ports, since in foreign commerce New York will be more directly competitive with the waterway. A conservative approach would eliminate from consideration all but the major ports in the North Atlantic, all the Gulf ports except New Orleans, and all Atlantic ports south of Norfolk. It is probable that most of the foreign trade from the Great Lakes area clears from the six major ports listed below, and that the other less important ports gather and distribute their foreign trade commodities only from the immediately surrounding area. For example, it is improbable that foreign imports and exports of the Great Lakes area would go through any Gulf ports except New Orleans. Similarly, foreign trade of the Great Lakes area would go at present to the major North Atlantic ports for transshipment, instead of to the smaller ones.

By this procedure, the full weight of the estimated St. Lawrence diversion is assessed against only six ports instead of all the Atlantic and Gulf ports. This increases the estimated amount of diversion from the foreign trade of each of these major ports, including New

York. The six major ports with their foreign commerce for 1937 are here shown:

Imports and exports, 1937

	<i>Short tons</i>
New York.....	22, 923, 700
Boston.....	3, 151, 200
Philadelphia.....	5, 606, 800
Baltimore.....	8, 189, 000
Hampton Roads (Norfolk and Newport News).....	3, 404, 200
New Orleans.....	6, 216, 800
Total.....	49, 491, 700

Of the foreign trade of the ports listed, New York Harbor accounted for 45.1 percent in 1937; consequently, it may be expected that it will bear that proportion of the estimated St. Lawrence diversion of 4 million tons. This results in a figure of 1,800,000 tons. This would represent the tonnage of existing foreign imports and exports now utilizing New York Harbor which might go by way of the St. Lawrence.

Such a volume of trade is equivalent to about 8 percent of the foreign trade of New York Harbor in 1937. However, the percentage which this represents of total New York Harbor activity is very much smaller, as will be shown later, inasmuch as coastwise, intercoastal, internal, and local water-borne traffic of New York Harbor constitute the major portion of the harbor's tonnage.

Section 2

DIVERSION OF NEW YORK'S COASTWISE COMMERCE ⁵

In the preceding pages, the effects of the Seaway on New York Harbor's foreign trade were discussed. The effects of the Seaway upon New York's coastwise commerce are now to be considered. The discussion will be confined to the diversion of existing coastwise commerce of New York.

Non-divertible Coastwise Receipts.

Some commodities are received in New York from other American ports for local processing or local consumption. Likewise a certain volume of coastwise shipments originates in the vicinity of New York. These commodities would not benefit by transportation through the St. Lawrence and would therefore continue to clear through New York Harbor.

The first task is to isolate such commodities from New York's coastwise trade. Upon an examination of the statistics of coastwise receipts, it is found that three commodities which constitute about 80

⁵ Statistics of domestic water-borne commerce quoted in this section are from Chief of Engineers, United States Army, *Commercial Statistics, Water-borne Commerce of the United States*.

percent of the tonnage seem to fall in this category. These three commodities are bituminous coal, petroleum and products, and sand and gravel.

The case of bituminous coal seems fairly clear. The Great Lakes territory is a coal exporting region rather than an importing one. The major fields of the country lie in Illinois, Ohio, Pennsylvania, as well as in Kentucky and West Virginia. There can be no doubt that the bituminous coal received in New York by water, largely from Norfolk, is not reshipped by rail into the Great Lakes area where coal is mined. It is safe to say, therefore, that all the bituminous coal received in New York is redistributed principally in the area closely surrounding the harbor.

The case is similarly clear for sand and gravel. Its low value compared to the cost of hauling it prohibits long-haul movements. Also, the fact that it is so generally available in the Great Lakes region obviates the necessity of long-haul shipments. For these reasons, it can be stated with assurance that sand and gravel received in New York Harbor is used nearby, and would not be diverted when the St. Lawrence Seaway is built.

Crude petroleum is not transshipped to any great extent into the Great Lakes area from New York. The North Atlantic coast receives its supply of petroleum partly by water from the Gulf ports and partly by pipe line from the western fields directly. Thus, instead of sending petroleum west by land into the Great Lakes area, New York receives it from pipe lines running through that region. Aside from the well-known fact that crude oil flows east in the pipe lines to the Atlantic coast, and not west from tanker vessels unloading in New York, a few simple calculations show that the receipts of crude oil in New York Harbor do not nearly meet the requirements of the refineries in the area around New York Harbor. The U. S. Census of Manufactures for 1937 shows (table 3) that the cost of materials in petroleum refining in New York, New Jersey, and Pennsylvania constituted 20.8 percent of the national total of the oil-refining industry.

TABLE 3.—*Cost of materials, etc., fuel purchased, energy, and contract work in oil refining, 1937*

United States.....	\$2, 064, 306, 627
New Jersey.....	168, 478, 746
New York.....	39, 770, 648
Pennsylvania.....	220, 280, 158
Total.....	428, 529, 552
Percent of United States total.....	20.8

Upon the assumption that this ratio approximates the ratio of crude oil refined in these three States to the total refined in the United States, it is possible to obtain an approximation of the volume of crude oil which was refined in these three States. The United States total in 1937 of crude oil refined was 1,183,440,000 barrels.⁶ Of this figure, 20.8 percent amounts to 246,155,520 barrels, or 37,736,000 tons.

This volume of crude oil requirements can be compared with the net receipts of crude oil in the ports supplying these three States; namely, Philadelphia and New York. The excess of receipts over shipment of crude oil, both foreign and coastwise, in New York for 1937 amounted to almost 11 million tons for New York and 8 million tons for Philadelphia. The total receipts for these two ports of 19 million tons is only about half the crude oil refined in the States of New Jersey, New York, and Pennsylvania. The difference has to be made up by overland transportation into these States.

What about the possibility that crude oil may be diverted from the New York State Barge Canal to the Seaway? Available data show that shipments from New York Harbor up the Hudson River and the Barge Canal are predominantly refined petroleum products. Whatever crude oil is shipped out is not through traffic, for Buffalo receives none via the canal, and Albany only occasional negligible quantities. Therefore this possibility is also ruled out. These facts indicate that far from transshipping oil into the Great Lakes region, the New York area imports overland oil from other parts of the country for local refining. Hence, it is not to be expected that any of the crude oil receipts in New York Harbor will be diverted to the St. Lawrence Seaway. And the traffic in refined petroleum products originating in the New York Industrial Area and destined for northern and western New York State points will certainly not be diverted.

The three products which have been discussed as not divertible from New York Harbor form a preponderant part of the total tonnage received in that harbor in coastwise trade. The average tonnage for the 3 years 1936-38 inclusive are as follows:

	<i>Short tons</i>
Bituminous coal.....	4, 099, 148
Petroleum and products.....	19, 391, 065
Sand and gravel.....	770, 330
	<hr/>
Total.....	24, 260, 543
	<hr/>
Total receipts.....	30, 119, 267
	<hr/>
Total, less above specified groups.....	5, 858, 724

Bituminous coal and petroleum and products, along with sand and gravel, contribute 24 million out of 30 million tons of coast-

⁶ Department of the Interior, Bureau of Mines, *Minerals Yearbook*, 1938.

wise receipts in New York Harbor. But little of these commodities are transshipped from New York Harbor to the Great Lakes area, and hence are not subject to diversion. This leaves an average for the 3 years of less than 6 million tons which might be subject to diversion to the St. Lawrence route.

Of this tonnage, there are several commodities of lesser tonnage than coal and petroleum which also do not seem to be divertible. These commodities include flour and meal, iron and steel scrap, copper ore, railroad ties. Flour and meal do not move from New York into the Great Lakes area because the latter is an exporting rather than importing area for this commodity. Grain moves down the Great Lakes to the mills at Buffalo. From this city, the mill products are sent into New York. The flow is, therefore, eastward to New York from the Great Lakes area. The iron and steel scrap received in New York was probably routed there for consolidation into export shipments or else for movement into steel producing plants in Pennsylvania and New Jersey. Foreign exports in iron and steel scrap were many times greater than these coastwise receipts. In 1937, for example, the exports amounted to 780,000 tons, while coastwise receipts were about 102,000 tons.

Copper ore is received for local refining, and not for transshipment to the Great Lakes area. The Census of Manufactures for 1937 shows that copper refining is located in the far West or on the Atlantic coast. Out of a total of 23 refineries, only two are located in the Great Lakes area, both in Michigan. New Jersey contributes almost one-third of the total value of refined copper products in the United States, with \$231,000,000 out of a total of \$700,000,000 in 1937. In addition, there is a refinery whose production is not reported in New York State. These facts make it probable that the copper ore receipts are processed locally.

It is also clear that railroad ties are not received for transshipment into the Great Lakes area. Railroad ties destined to the Great Lakes area are at present transported up the Mississippi from the South or by rail from the West coast.

The 3-year (1936-38) annual average tons received in New York Harbor of the commodities discussed above are as follows:

	<i>Short tons</i>
Flour and meal.....	119, 625
Iron and steel scrap.....	102, 485
Copper ore.....	188, 797
Railroad ties.....	99, 086
Total.....	509, 993

Previously it was shown that out of an average total of 30 million tons of coastwise receipts in New York Harbor, petroleum, sand and bituminous coal accounted for 24½ million tons. The four commodities

listed above accounted for another one-half million tons. This leaves about five million tons for all other commodities. The exact tonnages are as follows:

	<i>Short tons</i>
Total coastwise receipts.....	30, 119, 267
Coal, sand, and petroleum products.....	24, 260, 543
Flour and meal, scrap, copper ore, ties..	509, 993
	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 24, 770, 536
All other commodity groups.....	5, 348, 731

Thus, out of a total of 30 million tons of receipts in New York Harbor in coastwise trade, almost 25 million tons are composed of seven commodity groups which are usually not transshipped from New York Harbor to the Great Lakes region. Of the remaining 5½ million tons, the tonnage that is consumed locally, and that which is ordinarily sent inland to the Lakes area must be determined. From this an approximation of the divertible tonnage may be obtained. This divertible traffic consists of commodities which have found water-borne coastwise transportation economical. With the Seaway in operation they would probably proceed in a continuous voyage to the Great Lakes port closest to their final destination, thus passing up a stopover of transshipment in New York.

Diversion of Coastwise Receipts.

The data available for the determination of the ultimate destination of divertible commodities are very meagre. It is believed, however, that the method employed here does give highly useful approximations.

In the *Freight Traffic Report* of the Federal Coordinator of Transportation, published in 1935, statistics are given on the movements of various commodity groups between nine freight rate territories into which the United States is divided. These data cover the movements of all carloads for one day only, December 13, 1933. Naturally, this sample is unreliable and the absolute volume of traffic on this one day is not a reliable guide. However, the *proportion* of a commodity group to total traffic which is destined to a particular territory can be used as an approximation. These figures can be applied to the various commodity groups represented in the coastwise receipts whose destination it is desired to estimate. For example, it appears that of all shipments of paper products from Trunk Line territory on the test day, 22 percent was consigned to terminal points in the Great Lakes area. On this basis, the assumption is made that of all paper products received in coastwise trade at New York, 22 percent is destined for reshipment to the Great Lakes area, and would therefore, be divertible to the St. Lawrence Seaway.

The procedure used is by no means precise, but rather overstates the potential diversion to a large degree. One reason for this state-

ment is that New York City traffic probably has a smaller proportion of tonnage originating or terminating in the Great Lakes tributary area than is true of other points in the Trunk Line territory which are closer to the Great Lakes tributary area, such as Pittsburgh. Secondly, and more important, the coastwise water-borne commerce of the port of New York does not generally originate or terminate in the Great Lakes tributary area, because direct rail transportation from the Great Lakes tributary area to the South Atlantic or Gulf territories is utilized. Where rail-water combination coastwise transportation is feasible, proportional rates via Baltimore are lower than through New York. In fact, only intercoastal movements of the domestic commerce of the port of New York are to any degree divertible.

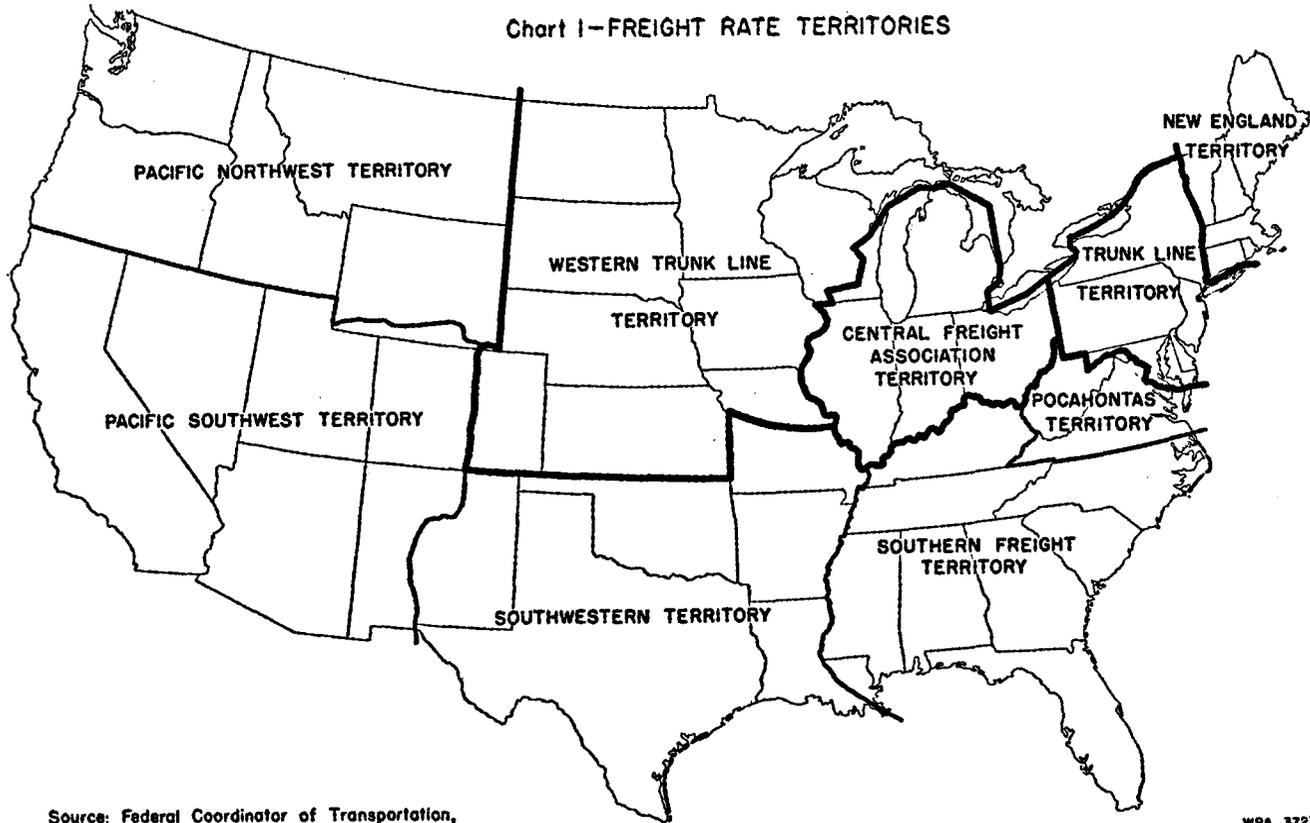
With these limitations in mind, the *Freight Traffic Report* may be analyzed to throw some light on the possibilities of diversion of coastwise commerce via New York Harbor. In using this report, it was found that the Central Freight Association and Western Trunk Line territories give the closest approximation to what may be termed as the tributary area of the Great Lakes-St. Lawrence route. This territory in fact is too large, as it includes the Ohio River Valley, the State of Kansas and a part of Colorado which certainly would not supply the St. Lawrence route any domestic traffic. Therefore inclusion of this large territory will overstate the diversion from the port of New York and thus show the effects of the St. Lawrence upon New York Harbor in the most unfavorable light.

TABLE 4.—Percentage of carloads originating in Trunk Line territory which terminated in Central Freight Association and Western Trunk Line territories, December 13, 1933

Commodity group	Percent	Commodity group	Percent
All commodities.....	12	4. Necessaries.....	12
1. Rough material.....	13	Cereals.....	4
Sand, stone, and gravel.....	13	Miscellaneous farm products.....	30
2. Raw material.....	10	Edible animal products.....	2
Bulk grain and beets.....	10	Oils, vegetable and animal.....	23
Perishables.....	28	Manufactured food.....	15
Live animals.....	5	Textiles and leather.....	7
Coal and coke.....	9	5. Auxiliaries.....	14
Ores.....	17	Petroleum and products.....	11
Sulphur and sulphuric acid.....	11	Building materials.....	10
Forest products.....	21	Chemicals.....	20
3. Semiprocessed material.....	17	Miscellaneous.....	23
Cotton, hay, and tobacco.....	4	6. Accessories.....	17
Paper and products.....	22	Iron and steel.....	17
		Other metals.....	19
		Appliances.....	16
		Glass and tile.....	16

SOURCE: Federal Coordinator of Transportation, *Freight Traffic Report*, Vol. III, p. 92.

Table 4 shows the percentage of each commodity originating in Trunk Line territory on December 13, 1933, which terminated in Central Freight Association and Western Trunk Line territories. The next step consists in dividing the coastwise receipts into a number of



Source: Federal Coordinator of Transportation,
Freight Traffic Report, Vol. III.

WPA 3723

commodity groups, comparable with the classification used in *The Freight Traffic Report*. The average annual tonnage for each of these groups for the years 1936-38 is shown in the second column of table 5. Since the commodity classifications used in table 4 are not identical with the coastwise grouping in table 5, the closest approximations had to be selected.⁷

The result of this procedure is shown in table 5. The estimate of over a million tons of diversion of New York's coastwise receipts is computed on a twelve-month basis of navigation. Since the open season for navigation on the St. Lawrence will extend through 7 months of the year, the estimated diversion must be correspondingly reduced. The net result is an estimate of 623,570 tons.

This estimate is based on the assumption that percentages of inter-regional movements on December 13, 1933, are representative of the conditions during a whole year, including the season of open navigation. This probably is not the case. For instance, construction work in the winter is at a low ebb, and lumber products shipped

TABLE 5.—*Estimate of divertible coastwise receipts of New York Harbor*

Commodity group	Percentages from table 4	Tonnage of coastwise receipts in New York (average, 1936-38) (short tons)	Divertible tonnage, 12-month basis (short tons)
Lumber and products.....	21	897, 246	188, 422
Fruits and nuts.....	30	349, 271	104, 781
Paper products.....	22	378, 326	83, 233
Sulfur.....	11	461, 990	50, 819
Chemicals.....	19	451, 253	85, 738
Miscellaneous.....	20	2, 810, 645	562, 129
Total.....		5, 348, 731	1, 075, 121

during December would be a small factor as compared with summer movements. On the other hand, fruits and nuts sent from the eastern region to the Middle West in December must be biased by the increasing requirements of the holiday season, and the seasonal peaks of shipments of citrus and bananas. In spite of these limitations, these estimates are indications of possibilities which would otherwise have to be estimated without any guidance whatsoever. Unfortunately there are no extensive statistical data on interregional movement of commodities; the coordinator's sample is the only inclusive study available.

Non-divertible Coastwise Shipments.

The method which has been used in analyzing coastwise receipts may now be applied to the study of coastwise shipments from New

⁷ The percentage applied to "lumber and lumber products" in the coastwise tonnage (table 5) is that of forest products in table 4. For "fruit and nuts", the percentage used was for "miscellaneous farm products" in table 4. The other groups have the same titles in both tables.

York Harbor. This movement is much less important than receipts, the average annual tonnage of shipments for the years 1936 to 1938, inclusive, being only about 7½ million tons as compared with over 30 million tons for coastwise receipts.

It is clear from the earlier discussion of bituminous coal and petroleum products, that these coastwise movements of commodities will probably not be affected by the construction of the St. Lawrence Seaway. Anthracite coal, which was not an important element in the receipts of the harbor, constitutes about half the tonnage of all the coal shipped out of New York. Unlike bituminous, which is available throughout the Great Lakes region, anthracite is heavily localized in eastern Pennsylvania, in the Scranton area. As a result, it is received in New York by rail and not by coastwise water transportation like bituminous. For this reason, anthracite coal shows a substantial tonnage only in coastwise shipments, not receipts. Due to this proximity of anthracite mines, New York will undoubtedly continue to ship anthracite in coastwise movements. Anthracite coal, as well as bituminous coal and petroleum products now shipped coastwise, may not be considered divertible tonnage. This procedure eliminates over half the total volume of shipments, as the following average annual shipments during 1936-38 indicate:

Total shipments.....		Short tons 7, 556, 952
Petroleum products.....	3, 268, 944	
Coal.....	742, 457	
	<hr/>	
Nondivertible tonnage.....		4, 011, 401
	<hr/>	
Balance.....		3, 545, 551

Diversion of Coastwise Shipments.

A tonnage of 3,545,551 of potentially divertible traffic remains after eliminating coal and petroleum. The commodities composing this tonnage must be analyzed to see what proportions are divertible. As in the case of coastwise receipts, the *Freight Traffic Report* is utilized to determine what percentage of each commodity terminating in trunk territory originates in the Great Lakes area. Table 6 presents this information. The appropriate percentages are then applied to each major commodity classification of the coastwise shipments. These data are shown in table 7. Again, it should be pointed out that percentages used are not derived from exactly the same commodity groups as those to which they are applied. The inaccuracies of this procedure are compensated for by selecting, in doubtful cases, that percentage which would yield the highest diversion. The basis for selection is given in the footnote to table 7.

TABLE 6.—Percentage of carloads terminating in Trunk Line territory which originated in Central Freight Association and Western Trunk Line territories, December 13, 1933

Commodity group	Percent	Commodity group	Percent
All commodities.....	18.9	4. Necessaries.....	50.5
1. Rough material.....	5.0	Cereals.....	39.6
Sand, stone, and gravel.....	5.0	Miscellaneous farm products.....	20.6
2. Raw material.....	6.5	Edible animal products.....	65.9
Bulk grain and beets.....	29.8	Oils, vegetable and animal.....	11.6
Perishables.....	3.5	Manufactured food.....	30.4
Live animals.....	66.6	Textiles and leather.....	2.6
Coal and coke.....	.6	5. Auxiliaries.....	2.6
Ores.....	27.9	Petroleum and products.....	1.5
Sulphur and sulphuric acid.....	2.1	Building materials.....	15.2
Forest products.....	8.3	Chemicals.....	17.3
3. Semiprocessed material.....	19.2	Miscellaneous.....	20.2
Cotton, hay, and tobacco.....	18.3	6. Accessories.....	27.1
Paper and products.....	19.4	Iron and steel.....	18.0
		Other metals.....	27.5
		Appliances.....	61.7
		Glass and tile.....	30.4

SOURCE: Federal Coordinator of Transportation, *Freight Traffic Report*, appendix I, exhibit 221.

As a result of this procedure, a diversion estimate on a year-round basis of 854,895 tons of coastwise shipments is obtained. Again, correction for seasonal navigation yields a figure of 495,840 tons. As is to be expected, the two largest commodity groups to contribute

TABLE 7.—Estimate of divertible coastwise shipments of New York Harbor

Commodity group	Percentages from table 6 ¹	Tonnage of coastwise shipments from New York (average 1936-38) (short tons)	Divertible tonnage, 12-month basis (short tons)
All animal and vegetable products.....	55.9	381,000	212,979
Textiles.....	2.5	62,809	1,552
Lumber and products.....	8.3	25,724	2,135
Paper products.....	19.4	99,221	19,249
Metal products.....	27.1	375,566	101,778
Machinery and vehicles.....	27.1	47,583	12,895
Chemicals.....	17.3	397,573	68,780
All other.....	20.2	2,156,075	435,527
Total.....		3,545,551	854,895

¹ The percentages in this column were taken from table 6 and refer to the following commodity classifications in that table: 55.9 percent for "Necessaries" (excluding textiles); 8.3 percent for "Forest products"; 27.1 percent for "Accessories"; and 20.2 percent for "Miscellaneous." "Textiles," "Paper products," and "Chemicals," bear the same headings in both tables.

are animal and vegetable products and machinery and vehicles, the Great Lakes area being the center of production for these goods.

A summary of the estimates of diversion of both coastwise receipts and shipments indicates a figure of less than 2 million tons on a 12-month basis. Deduction for the closed season gives a total diversion of 1,119,000 tons on the basis of average coastwise receipts and shipment during 1936-38. This result is summarized below:

New York Harbor	Water-borne commerce	Estimated diversion, 12-month basis	Estimated diversion, 7-month basis	Percent diversion to total
Coastwise receipts.....	30, 119, 287	<i>Short tons</i> 1, 075, 121	623, 570	2. 1
Coastwise shipments.....	7, 556, 952	854, 895	495, 840	6. 6
Total.....	37, 676, 219	1, 930, 016	1, 119, 410	3. 2

It must be remembered that this result represents gross diversion. It makes no allowance for new transportation demands created by the St. Lawrence, either through the stimulation of new production in the St. Lawrence area or through reduced transportation costs.

Also to be noted is the fact that this gross diversion does not represent 3 percent of all harbor activity. If internal, intraport and local harbor activity are brought into the picture, the percentage diversion is only about 1 percent. This aspect will be discussed more fully later on.

Finally, there is a direct offset to this diversion in the form of additional water-borne commerce at the expense of land transportation. It is this aspect, as it affects New York Harbor, which is discussed in the following section.

Section 3

NEW TRAFFIC FOR NEW YORK HARBOR

It is well known that a large quantity of freight is transported by land between the Great Lakes area and the region around New York Harbor. Most of the foodstuffs and raw materials consumed in the New York area comes from the Great Lakes region. In addition, there is a heavy exchange of manufactured products between the two areas. To the extent that this traffic will use the Seaway instead of land transport, the harbor of New York will have additional traffic to handle. This volume will be an offset to the losses of New York Harbor in water-borne commerce, both foreign and domestic, which have just been discussed.

In the following discussion, the effect of this shift in the mode of transportation will be considered. However, freight which now moves directly into and out of the New York Industrial Area will be eliminated from consideration, because a transfer from land to harbor traffic merely means a change in type of transportation activity in New York, but no net gain. The type of movement which results in a net gain for the freight handling activities of New York is the only type to be considered. This consists in freight now moving between the Great Lakes area and the region surrounding, but not in, the New York Industrial Area. To cite a concrete example: At present, rail-

roads carry foodstuffs into eastern Pennsylvania—Scranton, Allentown, Bethlehem—from the Great Lakes tributary area. This traffic does not touch New York. Therefore, it does not contribute any tonnage to the railroad terminals in New York.

Instead of utilizing railroad transportation from Milwaukee, Wis., to Bethlehem, Pa., some foodstuffs and raw materials may travel by Seaway to New York Harbor and from New York to Bethlehem by truck. This will represent a net gain to harbor activity and freight handling in New York. The area which may be designated as the New York tributary area, within a 100-mile radius of New York Harbor is shown in chart 2. It includes four industrial areas as defined by the Census of Manufactures, namely: Philadelphia-Camden, Allentown-Bethlehem, Scranton-Wilkes-Barre, and Bridgeport-New Haven-Waterbury. Counties lying between these industrial areas are also included. Table 8 lists all the counties with their 1940 population.

TABLE 8.—*New York tributary area population, 1940*

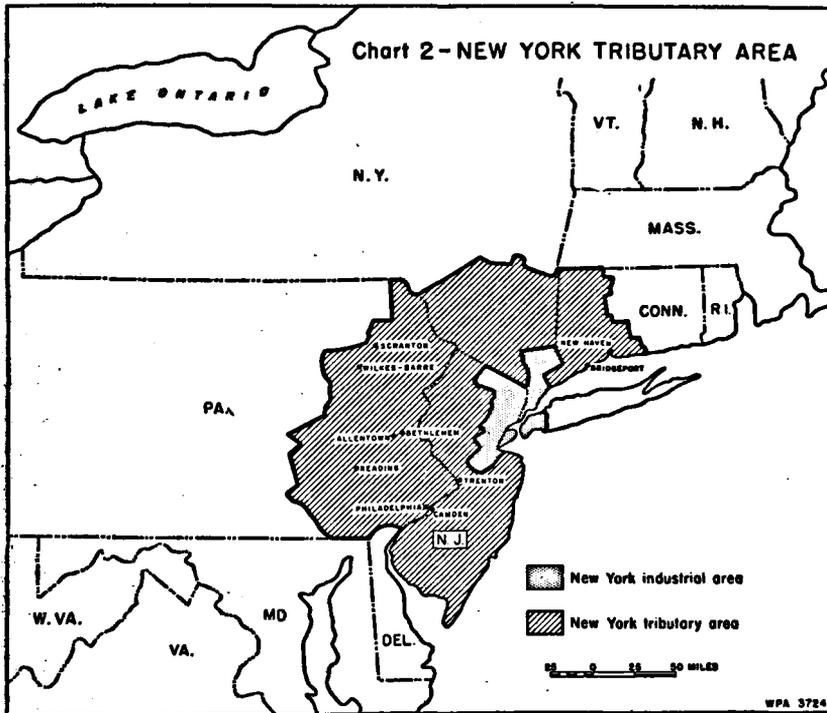
Counties	1940 population	Counties	1940 population
Connecticut:		Pennsylvania—Continued.	
Fairfield.....	422,003	Lebanon.....	72,596
Litchfield.....	86,711	Lancaster.....	212,387
New Haven.....	483,328	Chester.....	135,483
Total in Connecticut.....	992,042	Montgomery.....	288,856
New Jersey:		Bucks.....	107,658
Sussex.....	29,506	Delaware.....	310,172
Warren.....	50,098	Philadelphia.....	1,935,066
Hunterdon.....	36,706	Wayne.....	28,852
Somerset.....	73,941	Lackawanna.....	301,083
Monmouth.....	160,212	Luzerne.....	440,246
Mercer.....	197,124	Pike.....	7,455
Morris.....	125,268	Monroe.....	29,792
Ocean.....	37,401	Carbon.....	61,737
Burlington.....	96,836	Schuylkill.....	228,068
Camden.....	255,867	Total in Pennsylvania.....	4,747,754
Gloucester.....	71,928	New York:	
Salem.....	41,704	Rockland.....	74,076
Atlantic.....	124,079	Orange.....	137,479
Cumberland.....	72,850	Putnam.....	16,475
Cape May.....	28,566	Dutchess.....	118,413
Total in New Jersey.....	1,402,086	Ulster.....	86,764
Pennsylvania:		Sullivan.....	37,685
Northampton.....	169,028	Total New York.....	470,892
Lehigh.....	177,395	Total New York Tributary area.....	7,612,774
Berks.....	241,860		

SOURCE: U. S. Bureau of the Census, *Census of Population, 1940* (Preliminary).

It is necessary to examine the validity of this procedure. It may seem unreasonable, at first glance, to suppose that a seaway voyage plus a land haul up to a hundred miles could be more economical than a direct railway trip. This viewpoint overlooks the fact that even with direct railroad service there often remains a truck haul from the railroad to the point of ultimate consumption. The extent of such secondary physical distribution can be seen from the size of the whole-

sale grocery areas being served from central cities. The importance of this consideration for our problem is that the distribution of commodities from New York Harbor need not imply an additional land haul, but only an extension of the length of trip. Thus, instead of having a central warehouse in Camden, for example, a wholesaler may locate it in New York at the water front. The deliveries to retailers would not imply an additional truck movement, but only a somewhat longer one. For this longer trip of a few miles, the wholesaler is able to take advantage of seaway transportation.

A second point to be remembered is that the tributary area will vary in size for different commodities. The area defined in chart 2



may be far too large for certain commodities. On the other hand, certain other commodities may be distributed over a wider region. The tributary area thus represents only a very rough approximation of possibilities and is not to be considered as a hard and fast boundary for all products and for all time.

Another objection which may be raised concerns the role of Philadelphia. Some shipments to this region will undoubtedly use Philadelphia instead of New York Harbor. However, the more frequent shipping service that would be available through New York, and the

shorter water distance from the St. Lawrence to New York will probably offset in large part the somewhat longer land trip to the final point of consumption.

Finally, it should not be assumed that the structural changes in local distribution systems will take place immediately upon completion of the Seaway. It may be several years before the necessary shipping services and the structure of wholesale and retail distribution respond to the new, cheaper method of transportation. Considerable time will elapse before diversion of coastwise traffic to New York Harbor in substantial amounts takes place: just as time must be allowed for the contrary diversion of traffic from New York Harbor to become effective.

Indeed, the importance of frequent service in this analysis is great. For unless this were possible, the establishment of central warehouses in New York instead of at intermediate points in the New York tributary area would not be feasible. The following analysis is primarily an effort to see whether the volume of trade between the Great Lakes area and the region surrounding New York is of sufficient magnitude to warrant the relocation of secondary distribution centers and the establishment of new channels of trade. It is *not* based upon existing patterns of local trade and distribution.

The method used in estimating the tonnage available for new traffic by the Seaway destined to New York is not a complete study of all commodities, but rather a sample survey. Only several major commodity groups are discussed, based upon information obtainable from various sources.

Foodstuffs Receipts.

The North Atlantic coastal region raises only a small amount of its foodstuffs, and the Great Lakes area supplies most of it. Definite proof of this situation is found in the case of dairy products. The United States Department of Agriculture has gathered statistics on the state of origin of dairy products received in several large markets. Table 9 shows these figures for the Philadelphia market for 1937. The seven midwestern States shown in this table supplied almost all of the dairy products received. This area originated 90.3 percent of the butter, 96.2 percent of the cheese, 45.6 percent of the dressed poultry, and 34.7 percent of eggs, received in the Philadelphia market. Furthermore, the largest part of this supply originated in States which are located on the borders of Lake Michigan and Lake Superior. Thus, Wisconsin alone supplies 22,420,000 pounds, or over 80 percent of the cheese receipts; while three States, Illinois, Minnesota and Wisconsin supply over 47,000,000 pounds, or almost 70 percent of the butter receipts. Figures for 1937 have been used inasmuch as they are fairly representative of average tonnages for the period 1928-37.

TABLE 9.—*Origin of dairy products received in the Philadelphia market in 1937*

State of origin	Butter	Cheese	Dressed poultry	Eggs ¹
	<i>1,000 lbs.</i>	<i>1,000 lbs.</i>	<i>1,000 lbs.</i>	<i>1,000 cases</i>
Illinois.....	7,668	3,684	1,614	87
Iowa.....	8,897	1	3,781	145
Minnesota.....	35,860	127	4,721	151
Nebraska.....	5,365	-----	1,097	20
North Dakota.....	650	-----	747	-----
South Dakota.....	73	-----	300	-----
Wisconsin.....	3,954	22,420	195	21
Total, specified States.....	62,467	26,232	12,455	424
Total, all States at Philadelphia.....	69,213	27,256	27,296	1,221
Percent specified States to Total Receipts.....	Percent 90.3	Percent 96.2	Percent 45.6	Percent 34.7

¹ Gross weight of a case of eggs is given as 56 pounds average.

Source: U. S. Department of Agriculture, *Agricultural Statistics*, 1939.

In the case of meat products and cereal products, such conclusive statistics on shipments are not available. However, statistics on production and consumption by regions in the United States clearly indicate a similar pattern of movement. Table 10 presents the production and consumption of meat by regions. Thus, in the New England and Middle Atlantic States, the population in 1930 constituted 28.0 percent of the total population of the United States. In the matter of meat production, however, this group of States only accounted for 5.7 percent of the United States production of cattle and calves in 1937, only 2.8 percent of the hogs, and 1.9 percent of sheep and lambs. It is clear that this region must obtain a large part of its consumption requirements from other regions.

Table 10 shows that the Great Lakes tributary area, as is to be expected, produced a tremendous surplus of meat over its own consumption requirements. Ohio, Indiana and Michigan, are barely self-sufficient in cattle and sheep, and have a small surplus of hogs. The South Atlantic States, the only other region contiguous to the North Atlantic coastal region, is not self-sufficient in any of the animal types. Therefore, the Great Lakes tributary area is the closest region to the North Atlantic which is available as a source of supply for meat. Its surplus of meat production over consumption requirements in this area is truly remarkable. Containing less than 20 percent of the United States population, this region produces 43 percent of the cattle and calves, and over 50 percent of the hogs. The Mountain States with 3 percent of the United States population produced almost 45 percent of all the sheep and lambs in the United States. This is incontestable evidence that here is the source of supply of meat for the North Atlantic States.⁶

⁶ More exact analysis of the shipments of meat products from the Middle West to the Eastern markets is found in Pt. III, appendix F on Packing House Products.

TABLE 10.—*Net production of cattle, hogs, and sheep, by regions of the United States, 1937*

Region ¹	Population		Cattle and calves		Hogs		Sheep and lambs	
	Number	Per cent of United States total	Thou- sands of pounds	Per- cent of United States total	Thou- sands of pounds	Per- cent of United States total	Thou- sands of pounds	Per- cent of U. S. total
New England and Middle Atlantic States.....	34,427,091	28.0	789,110	5.7	347,845	2.8	37,255	1.9
Ohio, Indiana, Michigan.....	14,727,525	12.0	1,123,075	8.2	2,102,010	17.1	208,499	10.4
Illinois, Wisconsin and West North Central States.....	23,866,575	19.4	5,907,815	43.0	6,462,345	52.7	444,100	22.1
South Atlantic States.....	15,793,589	12.9	647,880	4.8	1,071,650	8.7	65,995	3.3
Mountain States.....	3,701,789	3.0	1,376,710	10.0	217,295	1.8	891,892	44.4
Total, United States.....	122,775,046	-----	13,738,830	-----	12,263,985	-----	2,008,800	-----

¹ States included in each region: New England and Middle Atlantic: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania; West North Central: Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas; South Atlantic: Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida; Mountain: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada.

SOURCE: U. S. Department of Agriculture, *Agricultural Statistics*, 1939.

A similar analysis of wheat production and consumption supplies evidence fully as conclusive that the North Atlantic States obtain their breadstuffs from the Great Lakes tributary area. As shown in table 11, these eastern States, with 28 percent of the population, raise only 3 percent of the nation's wheat. The area adjacent to the head of the Great Lakes produces half of the wheat grown in the country, yet contains barely a fifth of the population; and, as in the case of meat production, there are no regions which are closer to the North Atlantic which have a surplus of wheat to send there. Ohio, Indiana and Michigan are not self-sufficient, while the South Atlantic States must themselves import large quantities from other regions.

It is established that the Atlantic coastal States must receive a large part of their deficiency in food products from the area west of Lake Michigan. It is now necessary to define in greater detail the possible tonnages that may move from this area to the New York tributary area via the St. Lawrence. This traffic would be new to New York Harbor, and hence would counterbalance the loss in coastwise trade.

The estimated tonnage of cereal products that is needed in the New York tributary area and which is generally brought in from the Great Lakes States may be calculated by obtaining an estimate of the net deficiency in the New York tributary area of such products. In table 11 it was shown that the whole of the New England and Middle Atlantic States produced only 3.2 percent of the total national production of wheat, although its population was 28 percent of the country as a whole, on the basis of 1930 Census figures. Assuming that the

per capita consumption of wheat in all this area is more or less equal, then the local production would be sufficient to meet about 11.4 percent of total consumption.⁹ The deficiency of total wheat consumption would, then, be 88.6 percent, which would have to be obtained principally from the Great Lakes region. Where other grain products are concerned, such as soybeans, rye, oats, barley, the New England and Middle Atlantic States probably produce a much lower percentage of their requirements than wheat. Consequently, if we assume that 88.6 percent of all grain and cereal products needed in this area would be imported from the Great Lakes region, our calculations would be biased on the conservative side. The per capita consumption of all cereal products during the period 1920-38 inclusive averaged 215 pounds per year. The population of the New York tributary area is given in table 8 as 7,612,774 on the basis of the 1940 population figures. At an average per capita consumption of cereal products of 215 pounds, total consumption in this tributary area, as of the present, should be about 1,637,000,000 pounds, or 819,000 short tons. Eighty-eight and six-tenths percent of this would be 725,634 tons, and would indicate the deficiency of cereal products that would have to be brought in from the Middle Western area.

TABLE 11.—*Population and wheat production by regions*

Region	Population, 1930		Wheat production average 1927-36	
	Number	Percent of United States total	Thousands of bushels	Percent of United States total
New England and Middle Atlantic.....	34,427,091	28.0	24,210	3.2
Ohio, Indiana, Michigan.....	14,727,525	12.0	78,616	10.4
Illinois, Wisconsin, and West North Central.....	23,866,575	19.4	373,811	49.7
South Atlantic.....	15,793,589	12.9	26,662	3.5
Mountain States.....	3,701,789	3.0	91,606	12.4
United States total.....	122,775,046	100.0	752,891	100.0

SOURCE: U. S. Department of Agriculture, *Agricultural Statistics*, 1939, p. 12.

How much of this deficiency would be brought via the St. Lawrence route and New York Harbor is difficult to calculate accurately. It is conceivable that in the distant future, if there is a complete change in the distributive mechanism of the grain products, if grain elevators, storage warehouse and milling facilities were established in the New York Industrial Area, to take care of a whole year's requirements then all of this tonnage and more might come by water during the open season of navigation. There are, however, many inherent difficulties in the way of such a revolutionary change, and it is unlikely to be realized within a foreseeable future. These difficulties are

⁹ From table 11, we find that New England and Middle Atlantic States constituted 28 percent of U. S. population but produced only 3.2 percent of the U. S. wheat crop. By dividing 3.2 percent by 28 percent a figure of 11.4 percent results which represents the proportion of total consumption which can be supplied locally.

discussed in the next chapter, where the conclusion is reached that in all probability Buffalo would retain its position in flour milling and much of the grain storage and transshipment business. Under these conditions, a highly conservative estimate of possible new traffic for New York Harbor in cereal products would be but a fraction of the deficiency above shown, say, about 100,000 tons.

A study of the potential movement of meat products by the St. Lawrence Seaway has been carried out in another report of this Survey.¹⁰ In order to eliminate any controversy on whether fresh meats might be shipped by water, only non-fresh meat products were considered. Per capita consumption of nonfresh meats was obtained and local production was eliminated as potential traffic. A final correction for the closed navigation season was made. These procedures indicated that the per capita consumption during the open navigation season of nonfresh meats which originates in the Great Lakes was 5.7 pounds. Applying this to the population of the New York tributary area of 7,612,744 in 1940, we obtain an estimate of 21,696 tons.

Another food product which may utilize the St. Lawrence Seaway is lard. On the basis of 10.6 pounds per capita consumption in 1937, there would be, after allowance for local production and seasonality of navigation on the St. Lawrence, a total of 21,070 tons of in-season movement of additional traffic for New York Harbor for transshipment to the New York tributary area, as defined in this report. By the same methods as in the case of lard, a further amount of 13,716 tons of other animal fats and grease are found as potential new traffic. In table 9 above, the actual movements in 1937 of butter, cheese, dressed poultry, and eggs to the Philadelphia area were indicated. By taking 58 percent to indicate the in-season movement, the following tonnages are obtained as possible available traffic that would be new to New York Harbor if moved via the St. Lawrence: Butter, 18,116, cheese, 7,607, dressed poultry, 3,612, and eggs (at 56 pounds per case) 6,886 tons. These latter figures are obviously understatements, since they do not include the shipments to a large part of New Jersey and eastern Pennsylvania. Nor do they include shipments to Bridgeport, Connecticut.

Summarized, facts presented with regard to the food products above considered give us a figure of 192,703 tons for total in-season movement through the St. Lawrence for distribution via New York Harbor to the New York tributary area. This traffic would be new to New York Harbor.

Automobile Receipts.

Besides food products, there will also be a large volume of manufactured goods which will find the St. Lawrence an economical method

¹⁰ Part III, Appendix P.

of shipment to the New York tributary area. Illustrative of this class of products are motor vehicles. In another report of the Survey, it is shown that the savings on transportation costs would justify shipment of automobiles via the St. Lawrence to the Atlantic coast points.¹¹ This saving, however, would apply only in the case of completed cars of manufacturers who do not have assembly plants on the eastern coast. There would be no comparable saving on the shipment of parts and accessories for assembly or for sale to the North Atlantic ports. It is estimated that total tonnage of cars that might move via the St. Lawrence to the New York tributary area would be nearly 72,000 tons. This figure was based upon an average weight per car of 3,300 pounds for passenger cars and 3,400 pounds for commercial vehicles. It does not include, as noted, sales of cars by the two major producers who have assembly plants on the eastern coast.

Shipments of Iron and Steel Products.

There is likely to be a large amount of new traffic which may move from the area adjacent to New York to New York Harbor and thence by water via the St. Lawrence into the Great Lakes. To evaluate the possibilities of this movement is a difficult task because the region around New York produces a wide diversity of manufactured goods. However, a brief outline of the industrial character of the New York region may supply us with a general idea of the nature of the traffic. Then we may see whether such products normally find a market in the Great Lakes States, and whether they are adapted to Seaway transportation.

The New York tributary area is an important producer of semi-finished and finished iron and steel products. To avoid disclosure of the operation of individual companies, data are not presented in the Census for the Allentown-Bethlehem Industrial Area. However, from other sources, it is known that the eastern Pennsylvania-Maryland producing area has 10 percent of the total finished hot-rolling products capacity of the United States and 8 percent of the total finished steel products capacity.¹² It may, therefore, be possible that this industry will be a source of new westward traffic particularly in view of the prevalence of cross-hauling in this industry.

Table 12 shows shipments of plates and shapes from the eastern Pennsylvania, Philadelphia, and Delaware area to Great Lakes States. The eastern Pennsylvania area includes the Bethlehem area, while Delaware includes only one plant just over the Pennsylvania boundary. The data came from the files of the Temporary National Economic Committee which investigated the iron and steel industry. The average amount shipped during the 3 years, 1936 through 1938, was about 87,000 tons of plates and shapes, destined for Ohio, Indiana,

¹¹ See Part III, Appendix A.

¹² U. S. Tariff Commission, *Iron and Steel*, Report No. 126, Second Series. Washington, 1938, p. 312, table 21d.

Illinois, Michigan, Wisconsin, and Minnesota. Furthermore, these shipments were heavily concentrated in the areas situated on the Lakes and not at inland points, for information in the files of the Temporary National Economic Committee indicates that Chicago and Detroit accounted for almost all the shipments of heavy structural shapes from the area to their respective States. In the case of Ohio, shipments to the Ohio River areas totaled only 3 percent of all shipments to Ohio. Therefore, the 87,000 tons of shipments were destined to be used largely in Great Lakes port areas.

TABLE 12.—*Shipment of plates and shapes from eastern Pennsylvania, Philadelphia, and Delaware Producing Area to six States bordering on the Great Lakes*

Year	Total shipments	Destination						Total 6 States
		Ohio	Indiana	Illinois	Michigan	Wisconsin	Minnesota	
PLATES (short tons)¹								
1936.....	259,384	27,179	1,518	12,659	11,776	9,925	521	63,578
1937.....	420,572	44,644	1,151	9,341	8,378	3,064	114	66,692
1938.....	62,655	5,268	90	2,105	625	243		8,331
Average 1936-38.....	280,570	25,697	920	8,035	6,925	4,411	212	46,208
HEAVY SHAPES (short tons)								
1936.....	331,093	13,130	3,634	10,796	9,232	3,410	1,647	41,849
1937.....	419,198	20,185	6,407	13,115	16,202	5,116	2,210	72,325
1938.....	226,073	1,773	637	1,110	3,923	918	237	7,508
Average 1936-38.....	325,625	14,698	3,588	8,340	9,452	3,148	1,365	40,691

¹ These figures cover 64.1 percent of the capacity in this area:

Total capacity in gross tons of the area.....	1,035,000
Capacity reported.....	663,000

SOURCE: Data obtained from files of Temporary National Economic Committee.

Nor did this volume represent the total potential movement, inasmuch as only a part of the capacity is included in the data. For example, the coverage includes only 64.1 percent of the plate capacity of the mills in the eastern Pennsylvania, Philadelphia, and Delaware producing area. If the estimate of shipments were to be increased to a basis of 100-percent coverage, the volume would amount to 135,000 tons. It is, of course, impossible to tell whether the plants not included in the data would ship a greater or smaller percentage of their output to Great Lakes ports. The data presented indicate the approximate magnitudes involved and a round figure of 100,000 tons of plates and shapes is certainly a reasonable estimate for entirely new traffic in these products that may use New York Harbor.

Shipments of Sugar.

Another commodity which probably will move in large quantities from the New York tributary area to the Great Lakes region is sugar.

There is no doubt about the advantages of water transportation for this commodity wherever such low-cost transportation facilities are available. Large quantities of sugar are transported up the Mississippi River, and over the Great Lakes.¹³ Large quantities move via the New York State Barge Canal to Oswego and Buffalo. In 1937 receipts of sugar cargoes over the New York State Barge Canal at Oswego amounted to over 40,000 tons and at Buffalo to over 54,000 tons.¹⁴

New York and Pennsylvania are among the largest sugar refining centers in the United States. The Philadelphia-Camden industrial area alone accounted for over \$62,000,000 worth of refined cane sugar in 1937 out of a total for the country of \$425,000,000.¹⁵ Undoubtedly some part of the Philadelphia-Camden output finds its way into the Middle Western area. As this section is a part of the New York tributary area as defined in this report, the problem here presented is to estimate what may be the amount of such traffic in sugar that may utilize New York Harbor when the St. Lawrence is constructed, instead of the existing overland transportation systems.

There are no available facts showing the amount of refined cane sugar transported from the Philadelphia area to the Middle Western States. It has been necessary to estimate the possible movement of sugar tonnage from this center of sugar refining. The estimate made for the purposes of this report is based upon a computation of per capita consumption of refined cane sugar in certain Middle Western States and the proportion of total sugar imports and local refining from cane in the principal importing areas of the United States. By applying to the total consumption in those States the percentage that Philadelphia cane sugar refining bears to the total United States imports and production of cane sugar, we obtain approximately the amount that may be supplied from Philadelphia. Then a correction for open-season navigation on the Great Lakes is made.

To present the facts in greater detail, table 13 indicates the importation of dutiable and Philippine sugar by stated customs districts, including, in the case of New Orleans, the amount of refined cane sugar produced from local cane, which was 758,000,000¹⁶ pounds in 1937.

The total consumption of cane sugar was estimated for the only year for which specific per capita consumption by States could be found; i.e., 1933. Taking 1933 population in Minnesota, Wisconsin, Illinois, Indiana, Michigan, and Ohio, specific per capita consumption

¹³ Chief of Engineers, United States Army, *Commercial Statistics, Water-borne Commerce of the United States, 1937*, part II, table 47, p. 46.

¹⁴ *Ibid.*, pp. 994-1005.

¹⁵ *Census of Manufactures, 1937*, part I, p. 235.

¹⁶ *U. S. Department of Agriculture, Agricultural Statistics, 1939*, p. 134.

TABLE 13.—Imports of sugar, 1937

Customs district	Millions of pounds	Percent of total	Customs district	Millions of pounds	Percent of total
Massachusetts.....	593	9.6	New Orleans.....	1,991	32.2
New York.....	1,955	31.6	Total.....	6,185	100.0
Philadelphia.....	1,173	19.0			
Maryland.....	473	7.6			

SOURCE: U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, *Foreign Commerce and Navigation of the U. S., 1937*.

figures of sugar, other than domestic beet sugar, were applied. The computations are shown in table 14.

TABLE 14.—Estimated consumption of refined sugar (other than domestic beet sugar) in certain specified States

State	Population 1930	Per capita consumption domestic and imported sugar (excluding beet sugar) 1933	Estimated total consumption 1930 population basis
	<i>Thousands</i>	<i>Pounds</i>	<i>1,000 Pounds</i>
Minnesota.....	2,607	27.6	71,953
Wisconsin.....	2,917	53.4	155,768
Illinois.....	7,756	58.7	455,277
Indiana.....	3,364	66.9	225,052
Michigan.....	4,716	47.6	224,482
Ohio.....	6,691	78.6	525,913
Total.....			1,658,445

SOURCE: Per capita consumption by States from private sources.

The total consumption in these six States in 1933 of imported refined sugar and cane sugar refined in the United States amounted to 1,658,445,000 pounds. Applying 19 percent as the proportion of sugar clearing via Philadelphia refineries in comparison with Massachusetts, New York, Philadelphia, Maryland, and New Orleans, the contribution of Philadelphia would seem to be a total of 315,105,000 pounds. Open season movement, on the basis of 58 percent of this figure, amounts to 182,761,000 pounds, or a little over 91,000 short tons. This, then, is taken as the probable contribution of Philadelphia to the consumption of imported and locally refined sugar in the Middle West in the six States specified above. With cheaper navigation facilities from New York via the St. Lawrence, it is assumed that probably this amount would begin to clear during the open navigation season through New York instead of going direct to the Middle West.

Other Commodities.

A third type of activity in which the New York tributary area is very important is in the processing of nonferrous metals and alloys and their products. The Bridgeport Industrial Area is the largest

brass producing area in the country; the State of New Jersey dominates in copper refining, while the Philadelphia Industrial Area leads in zinc refining. The prominence of these regions in the nonferrous metals industry can be seen from data in the Census of Manufactures and the Minerals Yearbook of the U. S. Bureau of Mines.

In 1937 there was an average of 83,016 wage earners in the United States employed in the group entitled "nonferrous metal alloys; nonferrous metal products except aluminum, n. e. c." Connecticut accounted for 22,210 workers, well over one-quarter of the total. The Bridgeport Industrial Area employed most of these workers, i. e., 19,582.

The average number of wage earners in smelting and refining of copper in 1937 was 14,514. Three refineries in New Jersey employed 4,229 wage earners, or 30 percent of the total. These figures do not show the true preeminence of New Jersey and adjacent points in the New York tributary area in the refining of copper because smelting and refining are combined in these statistics. Actually the smelting of copper is localized in the far west, particularly in Arizona, Montana, Utah, Nevada, and to a lesser degree, Michigan. After being smelted, the copper is transported to the New York tributary area for electrolytic refining. Thus the large majority of the Nation's tonnage of copper passes through the Atlantic seaboard refineries. Then the refined product is shipped to the Connecticut valley, to the Middle West, and to other points throughout the nation for fabrication, alloying, and other processing.

Zinc smelting and refining engaged the efforts of 11,265 wage earners in the United States in 1937. The State of Pennsylvania employed 4,539 wage earners, which was 40 percent of the total. These activities centered largely in the Philadelphia region.

It is not possible to set a numerical estimate of the tonnage of potential movement of these products in domestic commerce via the Seaway. It can be noted that the quantities involved in these commodities are very large. From the Bureau of Mines the production of refined copper in 1937, new and old, from domestic and foreign sources, was 1,481,569 short tons. Distilled and electrolytic zinc, primary and secondary, produced in the United States in 1937 was 608,458 short tons.

The chief domestic industrial uses of copper are in electrical manufactures, automobiles, telephones and telegraphs, light and power lines, other rod and wire, buildings, castings, and radio receiving sets. The four major industrial uses of zinc in the United States in 1937 were: Galvanizing of sheets, tubes, wire and shapes, 41.6 percent; brass-making, 27.8 percent; rolled zinc, 9.6 percent; die castings, 14.5 percent.

Most of the chief industrial users of these products are heavily represented in the Great Lakes tributary area. In view of the large quantities of materials involved, and of the adaptability to water transportation of this type of heavy, standardized raw material, it is logical to expect a substantial volume of Seaway traffic in the non-ferrous metal products.

Another field of manufacturing in which the New York tributary area is important is textiles. A few figures from the Census of Manufactures for 1937 prove this fact. The Philadelphia-Camden Industrial Area ranks with the Boston area in woolen and worsted manufacturing. It accounted for 10.3 percent of the total value added by manufacture in the United States in worsted woven goods, 3.1 percent of woolen woven goods, and 2.1 percent of woolen yarn. The Allentown-Bethlehem and Scranton-Wilkes-Barre Industrial Areas are prominent in silk and rayon textile production. The former contributed 19.2 percent of value added in silk throwing and spinning (commission only), 16.3 percent of silk narrow fabric weaving, 8.0 percent of silk broad woven goods, 6.5 percent of silk yarn and thread made for sale, and 3.1 percent of broad woven goods. The Scranton-Wilkes-Barre area was responsible, in terms of value added by manufacture in the United States, in 1937, for 43.3 percent in rayon throwing and spinning (commission only), 9.4 percent in silk broad woven goods, 41.3 percent in silk throwing and spinning, and 4.6 percent in rayon broad woven goods. Taken together with the textile production in the New York Industrial Area itself, particularly in Paterson, the concentration of output is so great as to provide a firm basis for potential water-borne commerce. Although the tonnage factor would not be large, the savings in transportation costs would be substantial because of the relatively high rates involved per unit weight.¹⁷

Further examination of the chief products of the New York tributary area reveals several other specialties: The Bridgeport area, for example, is a center of hardware manufacture. In the Census classification "hardware, n. e. c." this center accounted for 10 percent of total value added in 1937. Automobile hardware is one constituent of this group and is of obvious interest to the Great Lakes States. Likewise prominent in its list of manufactured commodities are: Electrical machinery, apparatus, and parts with 3.5 percent of the total; clocks, watches, time-recording devices, and materials and parts with 14.6 percent of value added; fur-felt hats with 44.8 percent.

The Philadelphia-Camden Industrial Area, aside from the products already mentioned, has a wide list of diversified products such as specialized machinery, transportation equipment, and electrical sup-

¹⁷ That textiles today move in coastwise water-borne commerce is evident from statistics of the port of Boston. In 1937, its coastwise shipments amounted to almost 40,000 tons.

plies and apparatus. Particularly concentrated there, in addition, is the leather industry, Of the value added in leather, tanned, curried and finished in regular factories, 10.9 percent arose in this area.

Before concluding this brief outline of manufacturing activity in the New York tributary area, we may note that it is the largest producer of one other important commodity. Lehigh County, part of the Allentown-Bethlehem area, is the largest producer of portland cement in the Nation. Furthermore, the State of Pennsylvania has by far the largest surplus of local supply in the country, shipping 16 million barrels to other states in 1937. At the same time Illinois had a 2 million barrel deficiency, while Indiana, Wisconsin, Minnesota, Nebraska, Oklahoma, South Dakota and Arkansas had a one million barrel deficiency.

In cement, as in the steel industry, the basing point system of pricing makes for frequent cross-hauls, often of long distances. Transportation costs come into play strongly in determining the areas to be served by a given mill. Cement is well adapted to water transportation; the water-borne movement in 1937, excluding foreign trade, amounted to 1,800,000 tons, of which about one-third moved on the Great Lakes. For obvious reasons, the bulk of cement shipments corresponds rather closely to the open-season for navigation on the Great Lakes-St. Lawrence route.

From the facts presented above, the proximity of surplus producing areas to the Atlantic, the adaptability of the commodity to low-cost water movement, the cross-hauling and importance of transportation costs, and the location of deficiency areas bordering the Great Lakes, there may well be a movement to, for example, Chicago and Duluth.

Summary of New Traffic.

In summarizing the discussion from the point of view of new traffic for New York Harbor, we do not imply that all the commodities mentioned are certainly going to use the Seaway. A great deal depends on competitive rate-making by competing agencies and numerous other factors. On the other hand, there are many commodities which will certainly use the Seaway which have not been touched upon. For only a few commodities have we been able to attempt even an estimate of potential tonnage.

Estimates of eastward new traffic in certain agricultural products and automobiles resulted in a figure of 264,703 tons. Westward, two commodities, iron and steel, and sugar amounted to 191,000 tons. Together the total was 455,703 tons. As against an estimated diversion of 1,119,000 tons of existing commerce, there is still a possible loss of 663,297 tons of coastwise and intercoastal traffic. On the other hand, many products of the New York tributary area are available

for such movement by water, including nonferrous metals, alloys and products, textiles, hardware, electrical supplies, leather and cement. The quantities of available traffic in such products are very great. If a small proportion of them were to make use of the Seaway, it would compensate for the possible diversion.

In addition to this, there are the manufactures of the Great Lakes area consumed on the Atlantic seaboard which are available for movement via the St. Lawrence. Of them only automobiles were mentioned. Much additional tonnage will be forthcoming from the iron and steel industry, machinery, tires, chemicals, etc. Consequently, it is clear that the total gains in new traffic for New York Harbor of commodities originating and terminating in the New York tributary area, would more than offset the loss in coastwise commerce.

It is obvious, of course, that the change of direction of traffic in and out of Philadelphia towards New York instead of to and from the Middle West directly would not mean a loss of commercial activity in Philadelphia itself; it would only mean a shift of mode and direction of transportation. Hence, there would be no loss to Philadelphia in this respect.

In New York Harbor itself, the gain of traffic would be more than the gain of traffic from the tributary area, since there would be a change for many commodities in the mode and direction of transportation in the New York industrial area itself, from land transport to shipping. Consequently it can be expected that, assuming that the traffic gain from the tributary area will at least offset the diversion caused by the St. Lawrence, then the change in direction of New York area's own traffic will mean a much increased activity in New York Harbor at the expense, of course, of direct land transportation systems. In the case of automobile traffic, which is brought in by haul-away, this would mean a reduction of the congestion of traffic on the highways to the advantage of harbor activity. To the extent that railroads now carry some of this traffic shifted to the harbor, there would be a change in the mode of commercial activity, but no change in total quantity or pay rolls.

The net conclusion, then, is that there would be no loss from diversion of domestic commerce—in fact, there will in all probability be a net gain. In addition to the new traffic of the New York tributary area, there will be the new traffic of the New York Industrial Area itself. If this were to be counted, the increase in harbor activity of New York would be larger. However, the conclusion that coastwise diversion would be more than offset by the new traffic will probably hold true without considering this latter traffic.

Section 4

THE IMPORTANCE OF DIVERSION OF FOREIGN COMMERCE

Since diversion of coastwise traffic away from New York Harbor will be more than compensated by new traffic, the only net diversion that one needs to evaluate is in foreign commerce.

In this part of the report, the economic effects of the diversion of foreign commerce upon New York Harbor will be discussed. The losses in employment caused by it will be estimated, and against them will be weighed the gains to New York City attending the construction of the Seaway. Previously, it was pointed out that a large part of the food supply of the New York area will be transported through the Seaway at lower cost. This in itself represents a direct saving to all the people of New York. Aside from this, there will be compensating advantages of employment in new industries developed by the low-cost power of the St. Lawrence, as well as the direct employment to be utilized in the construction of the Seaway. Furthermore, New York being the industrial and financial center of the United States, improvement in the economic conditions of any part of the country will redound to its benefit. Hence, to the extent that national prosperity is promoted by this project, New York should look forward to sharing in it.

In order to evaluate the diversion loss in foreign commerce, it is first necessary to see it in proper perspective. It was estimated that this loss would amount, on the average, to about 1,800,000 tons of traffic a year. For the port of New York, 1,800,000 tons represent only a small percentage of its activity. Of the average foreign trade traffic of New York Harbor for the period 1928-37, this amount of diversion would constitute about 8.4 percent. Moreover, when the coastwise commerce of the harbor is taken into consideration, the loss in foreign traffic amounts to approximately 3.1 percent of the average annual foreign and coastwise traffic during the ten-year period. This is patent in table 15. Thus, it is clear that the diversion constitutes only a small percentage of the foreign and coastwise commerce of the port of New York.

Even less significant does this divertible tonnage appear when compared to the total harbor activities, including internal, intraport, and local movements.¹⁸ For the ten-year period, 1928 through 1937,

¹⁸These three types of movement are defined as follows by the Chief of Engineers, United States Army, *Commercial Statistics, Water-borne Commerce of the United States*.

Internal: Traffic between a port and a tributary waterway.

Intraport: Traffic between the several arms or channels of a port, as at New York, for each of which a separate report is made, is termed "intraport." The receipts and shipments balance, and one-half of the total represents the net traffic.

Local: Movements of freight within the confines of a port, except car ferry, general ferry, and cargoes in transit, are termed "local."

the total water-borne commerce of the port of New York averaged over 109 million tons annually. This tonnage, by type of movement, was as follows:

	Tons
Foreign.....	21, 531, 000
Coastwise and intercoastal.....	37, 244, 000
Internal, intraport, and local.....	50, 472, 000
Total.....	109, 247, 000

TABLE 15.—*Water-borne commerce of the port of New York, 1923-33*

[Thousands of short tons]

Year	Foreign imports and exports	Coastwise traffic	Internal, intraport and local traffic	Total
1923.....	25, 356	28, 992	74, 163	128, 511
1924.....	24, 577	24, 119	64, 510	113, 206
1925.....	26, 583	38, 344	50, 333	115, 260
1926.....	28, 910	34, 957	65, 920	127, 787
1927.....	27, 820	47, 726	59, 899	135, 445
1928.....	29, 243	39, 907	58, 328	127, 478
1929.....	30, 439	43, 346	64, 071	137, 856
1930.....	25, 963	39, 744	54, 806	120, 513
1931.....	20, 944	36, 993	48, 417	106, 354
1932.....	16, 582	31, 446	39, 606	87, 634
1933.....	15, 299	33, 028	37, 427	85, 754
1934.....	17, 204	36, 341	41, 004	94, 549
1935.....	17, 123	34, 288	46, 219	97, 630
1936.....	19, 434	37, 207	55, 129	111, 770
1937.....	23, 083	40, 125	59, 714	122, 922
1938.....	18, 666	39, 016	54, 698	112, 410
Average, 1928-37.....	21, 531	37, 244	50, 472	109, 247

SOURCE: Data on foreign and coastwise commerce from U. S. Maritime Commission, Division of Research; internal, intraport, and local statistics from Annual Reports of the Chief of Engineers, United States Army, *Commercial Statistics, Water-borne Commerce of the United States, 1939*, p. 251.

It is clear that the internal, intraport, and local commerce represents about one-half the total harbor activity. Although foreign and coastwise commerce is more important to the port than an equal volume of local types of commerce, nevertheless the latter cannot be dismissed from consideration, since it supplies a large volume of employment. In terms of tonnage, the estimated diversion of foreign commerce is 1.6 percent of the average annual traffic of the port for the 10-year period.

A loss of the magnitude of less than 2 percent of harbor activities obviously cannot consign a seaport to the status of a "ghost" city. In view of the many changes which are certain to occur in trade relations and transportation by the time the project is completed, an anticipated change of the magnitude of this diversion cannot be considered of major importance. This is obvious from the experience of New York Harbor over the years, where ordinary fluctuations in traffic from year to year have always been more than 2 million tons.

Let us attempt to estimate the possible loss of employment and pay rolls in New York due to this diversion of traffic. Precision is impossible; all that can be done is to apply the percentage loss of tonnage to whatever employment and pay roll figures are available. These percentages have been estimated as 8.4 percent of foreign commerce and 3.1 percent of both foreign and coastwise commerce.

The Census of Wholesale Distribution for 1935 presents statistics for importers and exporters and their agents in the States of New York and New Jersey. Total pay rolls for the year 1935 amounted to \$54,687,000 (table 16). Applying a percentage loss of 8.4, we find that the loss in pay rolls would amount to \$4,593,708. The total number of employees of importers and exporters in 1935 was 21,687, and a loss of 8.4 percent in employment would amount to 1,821 workers. All these losses are estimated without taking account of the gains that may accrue. These will be discussed later.

The diversion of foreign trade would also be reflected in wage payments to longshoremen. The Maritime Commission has estimated that during 1939 the port of New York's commerce resulted in the employment of 38,000 longshoremen, calculated on a full-time basis. The current wage rates for longshoremen are about \$1 an hour, which amounts to \$40 a week or \$2,000 a year.¹⁹ The pay roll for longshoremen is thus estimated at \$76,000,000 in 1939.

Longshoremen are associated with all types of water-borne movements, foreign, coastwise, and local movements. It is probable that local movements require less of this type of labor per ton because of the nature of the cargo, vessel, and trip. It is not possible to estimate the allocation of longshoremen's labor to the various types of commerce. Therefore, it is proposed to follow an extremely conservative procedure by assuming that no longshoremen are associated with internal, intraport, and local shipments, and that all of the 38,000 full-time longshoremen were working only on foreign and coastwise traffic. On this assumption, the amount of labor will be reduced by

TABLE 16.—*Employment and pay rolls in import and export establishments in New York and New Jersey, 1935*

Area and kind of establishment	Employees	Pay rolls, 1935	Area and kind of establishment	Employees	Pay rolls, 1935
New York State:	<i>Number</i>	<i>\$1,000</i>	New Jersey State:	<i>Number</i>	<i>\$1,000</i>
Exporters.....	3,237	7,260	Importers.....	212	5,176
Importers.....	15,788	35,706	Import agents.....	10	
Export agents.....	1,488	3,827		222	5,421
Import agents.....	952	2,473			
	21,465	49,266	New York total.....	21,465	49,266
			New Jersey total.....	222	5,421
			Total.....	21,687	54,687

SOURCE: *Census of Business, Wholesale Distribution, 1935.*

¹⁹ This is not an actual average figure, but an estimate on the assumption of full time employment.

the percentage which the diversion of tonnage is to foreign and coastwise traffic, a figure which has been estimated at 3.1 percent.

The loss in pay rolls to longshoremen is thus estimated at 3.1 percent of their total wages in 1939 of \$76,000,000, or \$2,356,000. In terms of number of workers, the loss amounts to 3.1 percent of 38,000 full-time longshoremen, or 1,178 workers. Again, this is the gross loss before estimating compensatory changes in the economic activity of the New York area.

The problem of estimating losses in wages to sailors, insofar as it affects New York, is more difficult. It must be remembered that the two million tons of diverted commerce will still be carried into and out of Great Lakes ports. Therefore, the sailors associated with this commerce, or others in their place, will still be employed. The loss to New York consists only of the amount of money which these sailors would have spent in New York, but which they will spend in other ports as a result of the rerouting of their ships.

The total number of sailors on vessels of 1,000 tons or over which engaged in New York deep-sea trade in 1939 was estimated by the Maritime Commission as 20,000. At an average monthly cash wage of \$50 per sailor, or \$600 per year per sailor, the total wages paid to these 20,000 sailors would amount to \$12,000,000 a year. The assumption of \$50 per month per sailor is considered to be very substantial, in view of the fact that a large proportion of the ships coming to New York are of foreign registration, which do not pay such high wages as the American shipowners. What proportion of the \$12,000,000 wage payments to these 20,000 sailors can be assumed to be a loss to New York trade? Assuming that all of these 20,000 sailors are engaged in coastwise and foreign trade, we might be justified in estimating that the same percentage of their wages would be lost to New York as the percentage of the loss of foreign traffic to total coastwise and foreign traffic of New York Harbor. This amounted to 3.1 percent, and hence, the amount of total wages that would be affected would be \$372,000. This, of course, is not the case, since those sailors do not spend all of their income in New York City. Between their visits to New York these sailors stop off at other ports, and many of them have families to support; it would, therefore, be conservative to estimate that New York would be losing not more than half of these expenditures by sailors on shore leave. This would amount to an average of \$186,000 a year. A summary of the losses enumerated, reaches a total of \$7,135,000.

It is to be remembered that the figures are only approximate. For one thing, the data on employment were not for the same year for exporters as for longshoremen, etc. Also, the percentage loss in employment will not correspond exactly to the percentage loss in tonnage. Finally, the total loss indicated does not include all possible direct

and indirect losses. For example, local trucking and warehousing activities will in some degree be affected. Since only pay rolls have been considered, the decrease in profits has not been included. Also, loss on insurance business, ship repairs, coaling and provisioning are not measured, for lack of data. For all these reasons, the estimate can represent only an approximation. On the other hand, the methods used have tended to overstate the losses for the activities listed above.

Wage payments and salaries for the year 1935 in the New York area have been compiled by the U. S. Census of Business. This Census by no means covers all pay rolls. The Bureau of the Census points out its omissions as follows:

. . . It must be borne in mind that certain phases of business and other activities which provide employment are not included in this report because of lack of information on the extent of employment and pay roll by counties for these fields. Most important among these are domestic services, professional services, educational institutions, transportation (except motor bus and trucking), communications (telephone and telegraph), public services (Federal, State, county and municipal), public utilities (central electric light and power stations), commercial fishing, forestry, institutions (prisons, reformatories, hospitals, etc.), religious and charitable organizations, and boarding and lodging houses. Furthermore . . . it does not take into account the income from privately invested capital.

Table 17 shows pay rolls for various types of business by counties in the New York Industrial Area. The total of all such payments in 1935 amounted to \$3,239,831,000. The estimated loss from diversion

TABLE 17.—*Pay roll in industry and business in New York Industrial Area, 1935*

[Thousands of dollars]

County	Total	Manu- factur- ing	Retail	Whole- sale	Insur- ance, real estate, finance	Mines and quar- ries	Serv- ice	Con- struc- tion	Hotels	Mis- cella- neous
NEW YORK										
Bronx.....	90,970	28,225	30,845	9,309	7,262	-----	5,732	3,163	120	6,314
Kings.....	353,762	185,655	74,072	32,217	24,332	-----	13,196	6,150	1,600	16,530
New York.....	1,892,326	544,478	222,023	362,136	309,042	-----	96,045	49,130	30,596	278,876
Queens.....	151,983	73,082	38,058	12,036	8,718	-----	5,288	3,702	276	10,823
Richmond.....	21,066	12,746	4,485	630	1,353	-----	421	252	12	1,167
Westchester.....	79,454	30,123	24,885	5,574	5,590	186	3,417	3,793	304	5,582
NEW JERSEY										
Bergen.....	55,974	36,398	10,163	1,769	2,622	18	995	1,941	10	2,068
Essex.....	231,527	111,958	40,647	17,092	37,304	64	6,154	4,727	630	12,951
Hudson.....	161,129	106,120	18,693	8,177	10,034	-----	3,963	2,931	235	10,976
Passaic.....	85,419	62,266	11,871	3,296	3,194	137	1,256	697	96	2,606
Middlesex.....	50,464	37,196	5,506	2,202	1,536	230	444	383	49	2,918
Union.....	65,767	42,911	11,979	2,027	3,633	-----	1,284	1,301	144	2,488
Total.....	3,239,831	1,271,158	493,217	456,465	414,620	635	138,195	78,170	34,072	353,290

SOURCE: U. S. Bureau of the Census, *Census of Business, Personnel and Pay Roll in Industry and Business and Farm Personnel, by Counties, 1935*.

was approximately set at \$7,000,000. This constitutes one-fifth of one percent of the total pay rolls. If all pay rolls were enumerated by the Census, the percentage loss would be even a smaller fraction.

Another procedure which indicates how small the loss is in terms of New York's total activities is to compare the loss in the number of workers to the total number of workers in the New York Industrial Area. The Census of Occupations for 1930 lists the number of gainful workers in this area as 4,582,210. The number of workers affected by the diversion of foreign trade was estimated as 1,821 for importers and exporters. The loss in employment for longshoremen was estimated at 3.1 percent of the total of 38,000 men. This amounts to 1,178 men. In the case of sailors, it was pointed out that no actual loss of employment was involved, but only a diversion of their expenditures. The total of employees of importers, exporters, and longshoremen who would be affected by the diversion amounts to 3,000. As a percentage of all gainful workers, this loss is $\frac{3}{100}$ of one percent.²⁰

In either case the percentage loss is so small as to be negligible, even allowing for the largest possible error in making the estimate. Even in prosperous times, the month to month fluctuations in employment are many times greater than this. And cyclical movements of employment make this figure appear infinitesimal indeed. Any predictions that the construction of the St. Lawrence Seaway will cause a major loss in employment in New York Harbor is not borne out by these figures.

Section 5

THE IMPORTANCE OF DIVERSION OF TRAFFIC IN RELATION TO THE FUTURE PROSPECTS OF NEW YORK HARBOR

The preceding discussion has been based upon the assumption that the conditions of the present would obtain at the time of the completion of the St. Lawrence Waterway. Obviously, conditions are not going to remain static during any length of time in the future. In outlining the conditions which may be expected to prevail when the Seaway will be put into operation, we shall attempt to obtain an idea of the population growth of New York Area, as well as the growth in employment which may take place.

The most authoritative work on population growth has been done by the National Resources Committee. A number of estimates for the New York district have been prepared by this organization. The one with the least growth indicates that an increase of 3.9 percent

²⁰This percentage loss is smaller than the one computed on the basis of pay-roll figures for 1935. The reason for this is that the gainful workers include all the employees such as domestic and professional workers, whereas the pay roll figures had only a partial coverage of New York trade and industrial activity. For this reason, the percentage of gainfully employed people who would be affected is more accurate.

for the decade 1940 to 1950 may be anticipated. For the following decade an increase of 0.66 percent is given.²¹ When applied to the Census figures for 1940, the results are as follows:

Year	Estimate of percent increase by decades	Population
1940.....		10,608,612
1950.....	3.9	11,106,922
1960.....	6.7	11,184,670

By this procedure, the increase in population for the New York Industrial Area amounts to 416,910 from 1940 to 1950, and 77,748 from 1950 to 1960. In the next 20 years, the estimated increase comes to almost 500,000 persons.

Associated with this estimated increase in population, there will be a larger number of gainful workers. This has been computed to amount to 222,597 additional gainful workers by 1960. This result was obtained by calculating from Census data the proportion of the population gainfully employed in New York City from 1900 to 1930.

TABLE 18.—*Gainful employment and population in New York City, Census years, 1900-1930*

Year	Population	Number in gainful occupations	Percent of population in gainful occupations
1900.....	3,437,202	1,470,008	42.8
1910.....	4,766,883	2,152,443	45.0
1920.....	5,620,048	2,531,412	45.0
1930.....	6,930,446	3,187,459	46.5

Clearly, the proportion of workers has not changed significantly from 1910 to 1930, after a rise from 1900 to 1910. With the rise in the average age of the population, the proportion is likely to rise in the next 20 years. Hence it will not overstate the number of gainful workers to project a rounded percentage 45.0 into the future.²² By applying 45 percent to the above population estimates for the New York Industrial Area, the increase in gainful workers amounts, in the next decade, to 187,610 and in 20 years to 222,597.

²¹ National Resources Committee, *Population Statistics, Part III, Urban Data*, p. 28. The study of the Resources Committee was completed before the census of 1940 was taken. The percentage growth in the lowest estimate presented was somewhat greater than the actual growth shown in the last census for the decade 1930 to 1940. However, the correspondence was close enough to indicate that figures for subsequent decades should be quite accurate. It should be noted that their estimates pertain to a district slightly larger than the New York Industrial Area. The percentage of growth was here applied to the industrial area itself on the assumption that the rate of growth would be similar.

²² Table 18 is computed for New York City proper because the number of persons gainfully occupied was not available for the entire New York Industrial Area prior to 1930. In the Census of that year, the data show that the ratio for the Industrial Area was 45.1 percent. This is further evidence that this is a reasonable figure to project.

TABLE 19.—*Estimates of gainful workers in the New York Industrial Area by 1950 and 1960*

Year	Population estimates	Percent of population in gainful occupations	Estimated number of persons in gainful occupations	Estimated ¹ increase over preceding decade in persons in gainful occupations
1930.....	10, 160, 159	45. 1	4, 582, 210	-----
1940.....	10, 690, 012	45. 0	4, 810, 505	228, 295
1950.....	11, 106, 822	45. 0	4, 998, 115	187, 610
1960.....	11, 184, 670	45. 0	5, 033, 102	34, 987

These figures are not to be considered as definite forecasts for the years 1950 and 1960. If the average gain during each of the decades following these years, as compared with 1940, approximates these figures, the reasoning of the following pages would still be applicable.

Against this figure may be set the estimated loss in employment which may result from the diversion of foreign traffic to Great Lakes ports. This estimate was 3,000 jobs lost in direct employment. Including jobs indirectly affected by this loss, there would be about 6,000 jobs which may be destroyed by diversion of foreign commerce from New York. The normal growth in employment would appear sufficient to absorb this loss 35 times over. There is no major problem of adjustment created by the St. Lawrence Seaway insofar as New York is concerned.

The same conclusion is impressed upon us by the examination of trends in the water-borne commerce of New York. At the present it is rather difficult to predict foreign commerce. The international relations of the whole world are in the process of reformulation, and the extent of future trade awaits the outcome of war and world readjustments yet unforeseen. It is very probable that an intensification of nationalism and the disruption of long-established trade relations may ensue for a long time to come. In that case the foreign commerce of New York would diminish and the diversion through the St. Lawrence would show a proportional drop. Thus if the foreign commerce of New York in 1950 should be only one-half of its present volume, the estimated diversion of 1.8 million tons might well be reduced to approximately 1 million tons. On the other hand, foreign trade of the United States and of New York Harbor may have recovered to such a degree by the time that the St. Lawrence is in operation that the loss incurred through the waterway may be more than offset. In any event, the pursuit of policies that increase the foreign commerce of the United States is much more important to New York Harbor than the diversion via the St. Lawrence, for the latter is but a small fraction of the total, whereas New York Harbor accommodates a quarter to a third of the foreign commerce of the country as a whole.

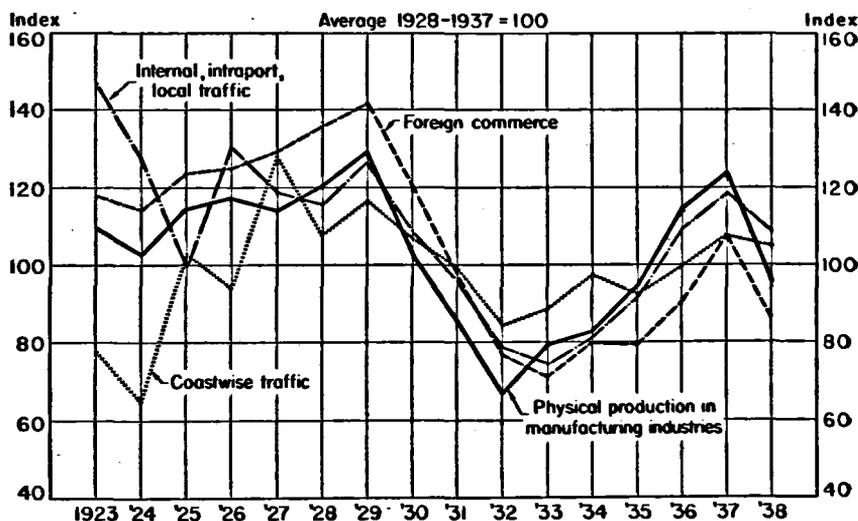
TABLE 20.—Indexes of tonnage of water-borne commerce in New York Harbor and United States physical production in manufacturing industries

[Average: 1928-37=100]

Year	Foreign commerce	Coastwise traffic	Internal, intraport, local traffic	Physical production in manufacturing industries
1923	117.8	77.8	146.9	109.3
1924	114.1	64.8	127.8	102.5
1925	123.6	108.0	99.7	114.3
1926	125.0	93.9	130.6	117.3
1927	129.3	128.1	118.7	114.9
1928	135.8	107.2	115.6	120.6
1929	141.4	116.4	126.9	129.3
1930	120.6	106.7	108.6	102.5
1931	97.3	99.3	95.9	85.9
1932	77.0	84.4	78.5	68.9
1933	71.1	88.7	74.2	79.5
1934	79.9	97.6	81.2	82.6
1935	79.5	92.1	91.6	94.5
1936	90.3	99.9	109.2	114.7
1937	107.2	107.7	118.3	123.7
1938	84.8	104.8	108.4	95.1

SOURCE: Data on water-borne commerce from table 15 supra; United States physical production: census years from Census of Manufactures, 1937; inter-censal years, "Recent Economic Changes," Vol. II, 1935-40 from Federal Reserve Bulletin.

Chart 3 - INDEXES OF TONNAGE OF WATER-BORNE COMMERCE IN NEW YORK HARBOR AND UNITED STATES PHYSICAL PRODUCTION IN MANUFACTURING INDUSTRIES, 1923-1938



Source: Table 20

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What are the prospects for other types of water-borne commerce of New York Harbor? Any attempt to determine the probable course of New York Harbor activity is subject, of course, to grave limitations. The method used here can afford only a rough approximation of what may be expected. Even with a large degree of error, the results will help place the diversion of foreign commerce in its proper perspective. It might be expected that the water-borne commerce of New York Harbor is in large measure dependent upon the productive activities of the Nation as a whole. Table 20 and chart 3, indicate the relation between the volume of manufacturing production in the United States and the various types of commerce in harbor. Although foreign commerce has been slipping in relation to manufacturing production, coastwise tonnage and the local types of commerce show a close relation both in general trend and cyclical movements. There is every reason to believe that the commerce of the port of New York, exclusive of the St. Lawrence diversion, will expand as the Nation's physical volume of production expands. Hence, if some approximation of future trends in manufacturing output can be obtained, the magnitude of water-borne commerce can be estimated.

In another report of this office on future transportation requirements, careful estimates of probable trends in production have been prepared, based upon study of population growth, employment trends, technological changes and worker productivity. For our purposes, the middle of three estimates has been chosen as a basis of comparison. This indicates that in the decade of the 1950's, physical production in manufacturing industries of the Nation would be of the order of magnitude of 50 percent greater than the average for the period 1928-37, inclusive. In the following decade, this growth approaches 100 percent of the 1928-37 levels. If these approximations are applied to the water-borne commerce of the harbor, the procedure can be summarized as in the following tabulation.

Estimates of future physical production in manufacturing industries and New York Harbor activity

	Average, 1928-37	Average, 1950-59	Average, 1960-69
Estimated index of physical production in manufacturing industries.....	100.0	157.2	191.9
New York Harbor traffic:			
Foreign (thousands of tons).....	21,631	33,847	41,219
Coastwise (thousands of tons).....	37,244	53,548	71,285
Internal, intraport, and local (thousands of tons).....	50,472	79,242	96,803

Should these estimates be even approximately valid, there exists no cause for concern over the effects of the St. Lawrence upon the prosperity of New York Harbor. In 1937, coastwise commerce was over 40,000,000 tons. The estimated increase by the 1950's would be

about 18,000,000 tons and by the following decade over 31,000,000 tons. These figures summarized are as follows:

	<i>Coastwise traffic (thousands of tons)</i>	<i>Increase over 1937 (thousands of tons)</i>
1937.....	40, 125	-----
Decade 1950-59.....	58, 584	18, 459
Decade 1960-69.....	71, 285	12, 701

With such increases in future traffic, the estimated diversion of foreign commerce from New York of 1.8 million tons will be compensated for many times over. Assuming even a large degree of error in all estimates, we are safe in saying that the commerce of New York Harbor will not decline but rather continue to increase in spite of the diversion.

A similar analysis of local, internal, and intraport commerce shows similar compensatory growth.

	<i>Internal intraport, and local traffic (thousands of tons)</i>	<i>Increase over 1937 (thousands of tons)</i>
1937.....	59, 714	-----
Decade 1950-59.....	79, 342	19, 628
Decade 1960-69.....	96, 603	36, 889

The figures just shown need not be taken too literally. They are not predictions of the volume of water-borne commerce of the harbor 10 to 20 years hence. They are used to emphasize and illustrate the general conclusion that with the growth of the Nation, the commerce of the harbor will increase to such an extent that the St. Lawrence diversion will scarcely detract from its rate of growth. Even if the extent of national increase in production or the responsiveness of harbor activity to it is overestimated very greatly, the general conclusion is still valid.

A final point to be made is that no account has been taken of any other aspects of the project, except that of transportation, in its relation to the City of New York. The provision of low cost power is full of significance for the State of New York. Part VI is devoted to this phase and estimates that cheap power will mean an increase of 50,000 in employment in New York State. With their dependents, these workers will constitute an addition of 125,000 persons to the population of the State. The construction of the project is bound to stimulate the industries of the State through the expenditure of \$90,000,000 upon materials and the employment of 6,400 workers for 5 years with an annual pay roll of \$9 million. The effects of these developments upon New York City industry and commerce should be considered in evaluating the net gain or loss of the project.

In conclusion, it has been shown that total losses of employment and pay rolls in the New York area due to St. Lawrence diversion

will be of the magnitude of a fraction of a percent, even if there were no offsetting gains arising from the St. Lawrence. But many such gains are bound to arise. A conservative estimate of additional employment for the State of New York of 50,000 due to industrial expansion on the basis of cheaper power has been made in Part VI. This is almost 10 times as large as the employment loss of 6,000 workers. A small fraction of the 50,000 accruing to the New York area itself would therefore be enough to cancel out the diversion loss. This fails to reckon the benefits of lower residential rates and lower transportation costs as factors which will directly increase the real income of the New York City community. Another way of showing the proper relative magnitude of diversion losses was to compare the growth of population and workers which New York may anticipate in the normal course of events. It was found that this was sufficient, in the next two decades to cover such losses over 35 times. Finally, it is clear that the probable growth of traffic requirements will continue to expand the activity of New York Harbor, so that the diversion loss will be absorbed many times over by it too.

If all these compensatory and growth factors be summed up, the largest possible gross losses resulting from St. Lawrence transportation facilities appear as very small compared to the gains.

CHAPTER II

THE ST. LAWRENCE SEAWAY AND THE PORT OF BOSTON

It is clear from the preceding chapter that the net effect of the Seaway upon the economic activity of New York City is likely to be slight; in no way is it certain that the effect will be detrimental. Because of its position as the principal export and import center of the United States, New York Harbor will be affected by the St. Lawrence Seaway to a larger extent than any other port. Hence it follows that cities like Boston have little to fear from the project.

In support of this generalization, and in order to have a type study of a harbor smaller than that of New York, a brief analysis is given here of the foreign and coastwise commerce of the port of Boston and the probable influence of the Seaway upon its activities. The methods here used are similar to those of the preceding chapter. The limitations of those methods were discussed extensively and are applicable to this section as well.

Section 1

FOREIGN COMMERCE OF THE PORT OF BOSTON

A generous estimate of the diversion of foreign commerce to the Seaway from the six major Atlantic and Gulf ports amounted to 4 million tons annually. This was based upon the assumption that the maximum additional capacity of the waterway would be 16 million short tons annually, of which 10 million were allocated for United States traffic, 6 million tons reserved for domestic water-borne commerce, and 4 million for foreign commerce of the United States.

It was then assumed that the diversion would affect the six major Atlantic and Gulf ports in proportion to their foreign trade. The statistics of the foreign commerce imports and exports of these ports in 1937 were as follows:

	<i>Short tons</i>
New York.....	22, 923, 700
Boston.....	3, 151, 200
Philadelphia.....	5, 606, 800
Baltimore.....	8, 189, 000
Hampton Roads (Norfolk and Newport News).....	3, 404, 200
New Orleans.....	6, 216, 800
Total.....	49, 491, 700

Of this total Boxtton constituted only 6.4 percent. Applying this percentage to the assumed total diversion of 4 million tons, one obtains a figure of 256,000 tons as an estimate of Boston's loss of foreign trade. It should be noted that Boston had the smallest proportion of imports and exports of all the ports listed above and the estimated diversion of one-quarter million tons is in line with its total foreign commerce.

Section 2

DIVERSION OF BOSTON'S COASTWISE COMMERCE

Coastwise Receipts.

Using 1937 as the most recent typical year, it is found that coastwise receipts amounted to over 12½ million tons. Coal, petroleum products, and sand and gravel were seen to be unlikely commodities to be diverted. In terms of tons these products constitute an overwhelming proportion of the total:

Coastwise receipts in Boston, 1937

	<i>Short tons</i>
Coal.....	5,402,214
Petroleum and products.....	5,011,372
Sand and gravel.....	328,780
	<hr/>
Total specified.....	10,742,366
Total, all receipts.....	12,613,682
	<hr/> <hr/>
All other products.....	1,871,316

Less than 2 million tons of coastwise receipts out of over 12 million tons were accounted for by commodities other than these three non-divertible groups. Even if these other products were entirely divertible, the loss would not be overwhelming. However, even casual inspection suggests that the other products are in fact largely non-divertible.

A brief glance at the major coastwise receipts of Boston would indicate that they are intended for the consumers and factories of Boston and the New England region. As in the case of foreign trade, commodities destined to the Great Lakes area are transferred to rail principally at the Middle Atlantic ports rather than at Boston.

Thus, receipts of fish undoubtedly were for processing and canning in the Boston area, or for regional consumption. The heavy concentration of textile manufacturing implies, similarly, that cotton and wool receipts are intended for local processing, while sugar refining and oil refining, heavily localized in the Boston area account for

receipts of raw sugar and sulfur. A recapitulation of the 1937 receipts of these products at Boston follows:

	<i>Short tons</i>
Fish.....	162, 669
Sugar, syrup, and molasses.....	115, 551
Cotton and products.....	148, 935
Wool and products.....	71, 743
Sulfur.....	50, 575
	549, 473

This total of 550,000 tons when added to the three other commodities which are not divertible, namely, coal, petroleum, and gravel, amounts to over 11¼ million tons. This leaves about 1½ million tons which must be analyzed as to their divertibility. Of that remainder, wood and paper products and general cargo are the chief constituents.

	<i>Short tons</i>
General cargo.....	451, 080
Wood products, exclusive of furniture.....	225, 047
Pulpboard, wrapping paper, paper-stock.....	138, 502
Fertilizer.....	102, 045
	916, 674

Of these four groups, it is unlikely that general cargo or fertilizer destined to the Great Lakes area would be using Boston rather than middle Atlantic ports. Likewise, the study on movements of wood pulp indicates that shipments are made by rail from Canada and northern New England directly to the Great Lakes tributary area and not by water to Boston and thence by rail.¹ Consequently, this commodity group represents receipts primarily for local processing or consumption. The net result seems to be that the St. Lawrence Seaway will have negligible effect upon the coastwise receipts of Boston.

Coastwise Shipments.

The coastwise shipments of the port of Boston are very small in amount. In 1937, the tonnage was somewhat over 1 million compared to receipts of over 12½ million tons. Coal and petroleum which have been discussed previously as nondivertible make up over one-third of this tonnage. In addition, a few commodity groups constitute the rest of the tonnage, and are products manufactured in the vicinity of Boston, such as boots and shoes, and textiles, which are clearly nondivertible. For example, soap and washing compounds can easily be traced as originating in Cambridge, Massachusetts, potatoes in Maine. A listing of these products shows that they make up the preponderance of coastwise shipments.

¹ See Pt. III, appendix O.

Coastwise shipments, Boston, 1937

	<i>Short tons</i>
Coal.....	12, 204
Coke.....	49, 390
Petroleum and products.....	371, 047
	<hr/> 432, 641 <hr/>
Boots and shoes.....	13, 838
Potatoes.....	47, 725
Paper products.....	41, 057
Textiles.....	39, 556
Soap and washing compounds.....	20, 580
	<hr/> 162, 756 <hr/>
General cargo.....	403, 596
	<hr/> 998, 993 <hr/>
Total specified above.....	998, 993

Thus, these few groups account for about 1 million tons out of total shipments of 1,179,420 tons of coastwise traffic in 1937. The remainder is scattered in small amounts among numerous groups. The conclusion is unavoidable that the diversion of the St. Lawrence upon coastwise shipments can have no appreciable effect.

Section 3

NEW TRAFFIC FOR BOSTON HARBOR

As in the case of New York Harbor, new traffic in Boston Harbor may result from the Seaway. This would arise from the diversion of tonnage now traveling by rail between the Great Lakes area and New England. As in the case of New York, such new traffic which is destined to the Boston Industrial Area will be eliminated from consideration. Although this traffic will actually represent new activity for Boston Harbor, it is excluded because it represents a change in the mode of transportation, rather than a net increase in traffic. However, a part of the traffic which now travels directly to Worcester, for example, from the Great Lakes area, which now does not touch Boston at all, may use the Seaway to Boston and be distributed to Worcester by rail or truck. This does not curtail any terminal activities in the Boston Industrial Area, but does increase the activity of the harbor.

The extent of such potential traffic can be inferred from the heavily populated character of the region surrounding the Boston Industrial Area and its industrial importance. The States of Massachusetts and Rhode Island together had a population of 5,025,678 in 1940, according to preliminary Census figures. Exclusive of the people

residing in the Boston Industrial Area, numbering 2,655,204, the population of the two States was 2,370,474. A great many of the commodities used or processed further in this area are at present shipped in from the States of the Great Lakes region.

Let us take the case of automobiles, for example. In Part III, estimates were made of the volume of shipments into the States on the Atlantic coast based upon average registration figures for the period 1929-38. Excluding those types of automobiles which are assembled in Massachusetts or Rhode Island, and making allowance for the closed navigation season, the study found a potential volume of 58,976 tons of new cars and trucks for Massachusetts and Rhode Island.

Semi-finished and finished iron and steel products move in large quantities from the Great Lakes area into Massachusetts and Rhode Island. The average for the 3 years 1936-38 as shown in Part III, was 42,608 tons for Massachusetts, and 1,463 tons for Rhode Island. For this traffic also, coastwise movement via the St. Lawrence offers opportunity for savings over rail transportation.

In the matter of pig iron, New England consumes more than it produces. It was estimated in the portion of this study referred to above, that the annual average deficit of production for the period 1935-38 amounted to 87,000 tons. Imports of pig iron averaged 30,600 tons. This left an average of 56,400 tons of domestic shipments into New England from the Great Lakes area, particularly Buffalo as well as Bethlehem, Sparrows Point, and even Birmingham. With the Seaway, the Great Lakes producers will have a more favorable position, not only in relation to other domestic producers, but also in competition with foreign manufacturers.

Besides manufactured products like automobiles and iron and steel, New England receives agricultural products and foodstuffs from the Great Lakes States. In 1937, the U. S. Department of Agriculture showed that 66,082 tons of butter, cheese, eggs, and dressed poultry were received in the Boston market from Illinois, Iowa, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin. How much more was received in other Massachusetts' markets, or in Providence, is not known. Neither can it be determined how much of the Boston receipts were destined for redistribution outside the Boston Industrial Area. Hence no exact estimate of new traffic for the harbor can be derived. The figures merely indicate that such movements are likely to be large.

General statistics on the production and consumption of other foodstuffs like cereal products and meat products indicate the heavy dependence of New England upon outside sources. From data used in the study of New York Harbor and from individual commodity studies in another part of this survey, the deficiency of such

commodities for the 2,370,000 persons in Massachusetts and Rhode Island outside of the Boston Industrial Area were roughly estimated as follows for the open navigation season: Cereal products, 131,000 tons; nonfresh meats, 4,030 tons; lard, 7,301 tons. Again, we remind the reader that these quantities are not given as exact prediction of new coastwise traffic for Boston Harbor. They do indicate that large volumes of foodstuffs come into the surrounding area of Boston from the Great Lakes.

These commodities fail to take into account many of the most important commodity groups which New England and the Boston area now ship via land transportation to the Great Lakes area. Such products would include all types of machinery and iron and steel products, textile products, shoes and leather products, manufactured food products, such as processed fish, etc. To estimate the volume of these commodities available for shipment out of Boston through the St. Lawrence Seaway into the interior would constitute a task far beyond the scope of this report. However, it cannot be questioned that the potential traffic would be much larger than the few commodities which have been listed.

Summarizing the few facts presented above, we see first, that the foreign traffic of Boston Harbor is subject to diversion to the Seaway only to a limited degree. This follows logically from the secondary importance of Boston as a transshipment center for the Great Lakes area, the principal ports of this trade being in the Middle Atlantic or Gulf ranges. Secondly, because of this situation, the coastwise commerce of the harbor is practically not subject to diversion. Against the small losses in foreign trade which Boston may sustain, must be set the new traffic which the Seaway may bring to it. Indications are that this factor will be important. Serving in this capacity as a gathering and distributing point for products using the Seaway in domestic commerce, Boston stands to gain in importance as a transportation center.

CHAPTER III

THE ST. LAWRENCE SEAWAY AND THE PORT OF BUFFALO

The construction of the St. Lawrence Seaway will make deep-water ports out of the cities on the Great Lakes shores which are now inland ports. Historical evidence is unmistakable that no location favored with a deep-water outlet to the high seas has ever suffered from such advantage. Yet some economic interests associated with the City of Buffalo have argued that the port of Buffalo would be grievously harmed by the St. Lawrence Seaway. The purpose of this paper is to examine this viewpoint in the light of the available facts and the probable impact of the Seaway.

Section 1

THE ECONOMIC STRUCTURE OF BUFFALO

In order to analyze the potential effects of the St. Lawrence Seaway upon the economic activities of the Buffalo area, it may be well to outline the industrial structure of the area. The Buffalo Industrial Area includes the counties of Erie and Niagara with a population of 911,737 in 1930, and 955,919 in 1940. The latest complete analysis of industrial occupations in the area is found in the Census of 1930 and is given in table 21.

TABLE 21.—*Persons 10 years old and over engaged in gainful occupations, by industry groups, 1930*

Industry	Number	Percent distribution
Agriculture.....	15, 772	4.2
Forestry and fishing and extraction of minerals.....	854	.2
Manufacturing and mechanical industries.....	165, 398	44.6
Transportation (and communication).....	43, 328	11.7
Trade (and finance).....	72, 739	19.6
Public, professional, domestic, and personal service.....	73, 263	19.7
Total.....	371, 374	100.0

SOURCE: *Census of Population*, Vol. III, pt. 2, pp. 306-307.

The outstanding importance of the manufacturing and mechanical industry group is evident, as it comprises 45 percent of the workers.

Trade and the various service industries employ about one-fifth of the total number, while transportation has over one-tenth.

Table 22 gives a break-down of wage earners by the various industries in the manufacturing and mechanical group; it indicates the relative importance of the components. The one fact which stands out from this tabulation is the importance of the iron and steel group. It accounts for over one-fourth of the employees in all manufacturing and mechanical industries. The building industry is the second largest employer of labor among the "manufacturing and mechanical industries."¹ Chemical and allied industries were third in importance, and the automobile industry fourth. All the other industry groups are much smaller, each employing 2 or 3 percent of the workers in the entire category.

TABLE 22.—*Gainful workers in manufacturing and mechanical industries, Buffalo Industrial Area, 1930*

Industry	Number	Percent distribution
Building industry.....	24,197	14.6
Chemical and allied industries.....	12,528	7.6
Clothing industries.....	4,589	2.8
Bakeries.....	3,496	2.1
Slaughter and packing houses.....	1,977	1.2
Other food and allied industries.....	5,281	3.2
Automobile factories and repair shops.....	12,483	7.6
Iron and steel industries.....	44,928	27.2
Metal industries, except iron and steel.....	4,672	2.8
Shoe factories.....	517	.3
Other leather industries.....	564	.8
Lumber and furniture.....	6,081	3.7
Printing, publishing, and engraving.....	5,421	3.3
Paper and allied industries.....	4,532	2.7
Textiles.....	4,616	2.8
Electrical machinery and supply factories.....	3,929	2.4
Independent hand trades.....	2,662	1.6
Other manufacturing.....	22,925	13.9
Total.....	165,398	100.0

SOURCE: *Census of Population*, Vol. III, pt. 2, pp. 306-307.

While the figures presented are the only complete statistics of the importance of various industry groups in the Buffalo Industrial Area, later material can be obtained from the United States Census of Manufactures.²

The pre-eminence of the iron and steel industry among the manufacturing industries of Buffalo was equally pronounced in 1937. As shown in table 23, this industry accounted for 26,697 workers or over 25 percent of all manufacturing employment in that year. If ma-

¹ This classification of the Census of Population differs from that to be found in the Census of Manufactures. The latter does not include such occupations as automobile repair shops and the building industry, among the "manufacturing" group.

² The Census of Manufactures does not give all the individual industries for the Buffalo Industrial Area. Whenever the statistics may disclose the operations of an individual firm, they are not shown separately. On the other hand, often more detailed break-downs are available in the Manufacturing Census than in the 1930 tabulation of gainful workers. Thus, the milling industry is shown individually in the 1937 Census of Manufactures, but is included in the food products group in the 1930 Census of Population.

chinery and motor vehicle production is added, the number of wage earners exceeded 43,000, or over 40 percent of all manufacturing wage earners. The next most important category was in chemicals, n. e. c., which had nearly 7,000 workers. Paper and paper boxes accounted for over 3,500 workers, and finally the flour and milling plants employed nearly 3,000 workers.³

The importance of these industries in the economic life of Buffalo can be shown in another manner, namely by its degree of concentration in the area. In these industries the area has a much greater proportion of the United States production than it has in manufacturing as a whole. Thus, of the value added by all manufacturing in the United States in 1937, the Buffalo area represented 1.72 percent. In chemicals, n. e. c., however, Buffalo accounted for 10.9 percent of the total value added in the United States. Similarly, this percentage was 8.9 for flour and other grain mill products, 4.54 for steel works and rolling mills, 3.88 for motor vehicles and parts, and 1.75 for paper.⁴ It follows that, both from the number of workers and their importance in Buffalo's trade with the rest of the country, they largely determine the prosperity of the area and of the local industries which are dependent upon them.

There remains to be considered a group of workers who will be directly affected by the Seaway. These are the workers associated with the Lake traffic of the harbor, stevedores, longshoremen, grain elevator employees, etc. The statistics concerning them are very meager. The Census of Occupations for 1930 indicated that there were 243 longshoremen and stevedores, and 80 workers in grain elevators. This is by no means a complete figure, since many occupations in connection with grain elevators such as stenographers and electricians, etc., were included as clerical or mechanical workers in general. A better estimate of the number of workers employed in grain elevators can be obtained from an analysis of the operations of a typical elevator.

Information was obtained on the number of workers in elevators of given capacities. Applying this information to the elevators in Buffalo, a rough estimate may be obtained, which, upon a full-time

³ In discussing the economic structure of a community, it is generally helpful to make a distinction between two types of activities. The first may be called primary activities. They are devoted in large part to supplying goods or services for exchange in inter-regional trade. Secondly, there is a group of secondary or local industries in each area. Such, as a rule, are the meat-packing plants, bakeries, newspaper publishing and printing, the building industry, etc. Of course, domestic and professional service, trade, etc., are usually, although not always, of this type. Generally they serve the needs of the community itself, although as is the case with meat-packing in Chicago, they may be primary industries. Their size is usually in proportion to the size of the city. In large part, they are dependent upon the degree of activity in the "exporting" or basic industries. Hence in table 3, meat-packing, baking, newspaper publishing have been left out of account although among them they account for almost 6,000 wage earners.

⁴ Part VI, *The Economic Effects of the St. Lawrence Power Project*.

TABLE 23.—*Wage earners employed in manufacturing industries in the Buffalo Industrial Area, 1937*

Industry	Number	Percent distribution
Steel works and rolling mills.....	14,384	
Metal refining and ore dressing ¹	2,686	
Foundry products (gray-iron and malleable iron).....	2,310	
Forgings.....	413	
Stamped and pressed metal parts.....	1,274	
Structural and ornamental metal work, made in plants not operated in connection with rolling mills.....	690	
Tools, not including edge tools, machine tools, files or saws.....	1,256	
Screw-machine products and hardware specialties ¹	3,361	
Boiler-shop products.....	333	
Total, iron and steel and their products, not including machinery.....	26,697	25.26
Electrical machinery, apparatus, and supplies.....	2,475	
Machinery, n. e. c.....	3,203	
Machine-shop products.....	967	
Machine-tool accessories and machinists' precision tools.....	205	
Engines, pumps, air-compressors, etc. ¹	1,636	
Total, machinery, not including transportation equipment.....	8,486	8.02
Motor-vehicle bodies and motor-vehicle parts.....	8,379	7.93
Chemicals, n. e. c.....	6,949	6.57
Flour and other grain-mill products.....	1,631	
Feeds, prepared for animals, and fowls.....	1,187	
Total.....	2,818	2.67
Paper.....	2,332	
Boxes, paper, n. e. c.....	1,226	
Total.....	3,558	3.37
Heating and cooking apparatus, excluding electric.....	1,708	1.62
Furniture, including store and office fixtures.....	1,563	1.48
Total specified above.....	60,158	56.92
All wage earners in manufacturing industries.....	105,722	100.00

¹ These industries are not reported separately for the Buffalo Industrial Area in the Census of Manufactures, 1937. The data were obtained from the reports of the New York State Department of Labor.

SOURCE: *Census of Manufactures, 1937.*

basis, leads to the estimate that there are from 700 to 850 workers,⁵ in the grain-elevator business in Buffalo.

In 1930 the Census gave the number of longshoremen and stevedores as 243. The total of elevator workers, longshoremen, and stevedores would appear to be about 1,000. Out of a total of 371,000 gainful workers in 1930, in the Buffalo Industrial Area, this represents less than one-third of one percent.

Before concluding this brief outline of the economic structure of

⁵ The estimate was made as follows: In 1935, Buffalo had 21 grain elevators with an aggregate capacity of 45 million bushels. The average elevator therefore was one of 2,136,000 bushels. (United States Army Engineers, *Transportation on the Great Lakes, 1935*).

By 1938, the Annual Report of the Chicago Board of Trade showed that the capacity had risen to over 51 million bushels.

In order to estimate the employment in the average elevator in Buffalo, detailed confidential data were obtained from operators. For a unit of about 3¼ million bushels, the number of workers was approximately 40 to 45 men. It was also ascertained that a unit of a million bushel capacity employed from 20 to 25 men. On straight line interpolation, a figure of 30 to 35 men would result for the average size elevator in Buffalo. Applied to its capacity, this yields an estimate of from 720 to 840 workers.

Although no direct data were available in regard to grain elevator employment in Buffalo, such figures were obtained for Duluth. With elevator capacity of 46,000,000 bushels, that port employs 568 men during peak periods. By comparison, an estimate of 700 men in Buffalo seems quite reasonable.

the Buffalo area, it would be well to present some idea of the volume of pay rolls of workers.

Unfortunately, no complete pay-roll data are available. The figures shown in table 24 omit the wages and receipts of domestic and professional workers, as well as of public employees.

TABLE 24.—*Buffalo Industrial Area (Erie and Niagara counties) pay roll, 1935*

Type of business	Pay rolls (thousands of dollars)			Percent distribution
	Erie	Niagara	Total	
Manufacturing.....	102,087	32,324	134,411	61.3
Retail.....	29,056	4,693	33,749	15.4
Wholesale.....	15,757	1,122	16,879	7.7
Insurance, real estate, finance.....	10,833	1,136	11,969	5.5
Mines and quarries.....	1,101	46	1,147	0.5
Service.....	3,017	219	3,236	1.5
Construction.....	3,608	607	4,215	1.9
Hotels.....	1,241	174	1,415	0.6
Miscellaneous.....	11,317	936	12,253	5.6
Total.....	178,017	41,257	219,274	100.0

SOURCE: *U. S. Census of Business, 1935. Personnel and Pay Roll in Industry and Business, and Farm Personnel, by Counties.*

Although the total is by no means complete, the listed pay rolls amounted to \$219 million in 1935. This tabulation shows that manufacturing pay rolls were by far the largest, constituting over 61 percent of this total; retailing produced over 15 percent and wholesaling almost 8 percent.

Section 2

THE ROLE OF LAKE TRANSPORTATION IN BUFFALO'S ECONOMIC LIFE

The commerce of the Great Lakes as a whole is overwhelmingly dominated by the iron and steel industry. Lake shipping is the means of transporting the raw materials used in the industry and, to a lesser degree, of transporting iron and steel products. Next to iron ore and coal, grain and flour are heavily dependent upon lake transportation. Together with the raw materials of the iron and steel industry, they account for the major portion of the water-borne commerce on the Great Lakes. The figures in table 25 from the report of the Army Engineers make these relations clear.

The dominance of the iron and steel industry in lake shipping is evidenced by its proportion of 88 percent of the total tonnage. If we add grain and its products, over 90 percent of the tonnage is included. This is the general situation at all lake ports combined. Does it apply also to the commerce of the port of Buffalo?

TABLE 25.—*Water-borne commerce of the ports on the Great Lakes, 1937*

Products	Tons	Percent of all commerce
Coal and coke.....	84,581,873	87.5
Iron ore.....	138,078,299	
Sand and gravel, and stone ¹	31,967,164	
Iron and steel, unmanufactured forms of, and rolled.....	4,865,566	
	259,492,902	
Flour and meal.....	1,198,257	2.7
Grain and feed.....	6,678,367	
	7,876,624	
Total specified.....	267,369,520	90.2
Total water-borne commerce.....	296,493,500	100.0

¹ The category of sand, gravel, and stone is composed largely of limestone and other flux materials for the making of iron and steel. A small portion of the tonnage is not of this type, and to this extent the percentage is overstated.

SOURCE: Chief of Engineers, United States Army, *Commercial Statistics Water-borne Commerce of the United States, 1937*.

In the same year the lakewise and Canadian water-borne commerce of Buffalo was 18,187,932 tons. The principal components of this tonnage are shown in table 26. It is evident from this tabulation that Buffalo's commerce is also largely associated with these two industries. The raw materials for the iron and steel industry constituted 75 percent of the total tonnage, while grain made up another 16 percent, the total of both being over 90 percent.

TABLE 26.—*Water-borne commerce of Buffalo, 1937, domestic lakewise and Canadian*

Product	Tons	Percent of total
Coal and coke.....	4,066,159	74.8
Limestone.....	11,943,920	
Iron ore.....	6,262,028	
Scrap.....	355,610	
Iron and steel products.....	960,125	
Total.....	13,607,842	
Grain, feed, and flour.....	2,910,618	16.0
Total specified above.....	16,518,460	90.8
Autos, trucks, and parts.....	399,676	2.2
All other.....	1,269,796	7.0
Total commerce (domestic and Canadian).....	18,187,932	100.0

SOURCE: Chief of Engineers, United States Army, *Commercial Statistics, Water-borne Commerce of the United States, 1937*.

It is clear that the economic effect of the Seaway upon Buffalo must be analyzed in relation to the predominant types of commerce of Buffalo. Not only must this be considered as it affects the harbor activity itself, but, even more particularly, as it affects activity in its industries.

Section 3

THE INDUSTRIES OF BUFFALO AND THE SEAWAY

Since the commerce of the port of Buffalo is made up principally of raw materials of the iron and steel industry, and of grain, the effects of the Seaway upon these industries are of the greatest significance. Most of the criticism of the project has centered upon its potential injury to the grain trade. Hence, this will be considered first.

The grain trade of Buffalo may be segregated into two distinct categories. First, Buffalo receives grain for processing in its mills. Secondly, it serves as a transshipment point in the flow of grain to the Atlantic seaboard, as well as to other eastern points for export, processing, and consumption.

Most of the criticism of the Seaway is not in connection with the flour-milling industry but rather in regard to the grain transfer business. In exporting flour to Europe, ports at the head of the Lakes will gain a direct deep-water route. By the same token, however, Buffalo becomes a deep-water seaport so that it, too, can export directly. There should be little change in their relative standing on this account. Flour for domestic consumption on the Atlantic coast will be able to use the Seaway. Here, too, Buffalo has access to this new coastwise movement. Although the position of Minneapolis is improved by the Seaway, the position of Buffalo is benefited also. This is one reason for believing that the shift of milling to the head of the Lakes is not likely to be substantial.

There is one other set of circumstances which makes a radical shift from Buffalo industry improbable. The mills at Minneapolis and Buffalo are in large part owned by the same companies. Relocation of production is subject to their administrative decision, and they are unlikely to make shifts which would entail large capital losses for smaller gains in transportation costs.

The study of grains and flour milling which is presented in Part III of the Survey reports does not base its estimates of potential traffic and transportation savings upon the assumption of a shift of milling activity to the head of the Lakes. The only change visualized in that report is that Minneapolis flour will not be transferred at Buffalo but will proceed in a continuous voyage to the Atlantic coast. In regard to export flour, the report does not count on any increased exports from Minneapolis, although it is felt that some movement of this type may develop.

An adverse influence would develop only if large milling plants were to be established in the Atlantic coast cities. Then, it would be possible to ship grain through the St. Lawrence Seaway to those centers for milling, instead of to Buffalo. This development cannot be accurately predicted. Since there is no great surplus of unused

or partly utilized capacity on the Atlantic, the shift in production cannot be made immediately without new construction of elevators and milling centers. The savings in transportation costs are by no means great enough to justify abandoning existing capacity to build new plants. Therefore, if such a shift does occur it will probably come as additional demand arises for new capacity, or as existing plants in Buffalo become worn-out or obsolete. Such events are far distant in time. So many other factors may intervene that prediction becomes impossible.

For all these reasons, it does not seem at all likely that flour milling in Buffalo will be adversely affected. Any such change is much too remote in time to evaluate.

Buffalo is also a transshipment center in the eastward flow of grain to the Atlantic coast either for export or domestic consumption. At present three different routes are utilized by grain from Buffalo: Via Erie Barge Canal to Albany and New York; via rail to New York and other Atlantic ports; and via St. Lawrence Canals to Montreal and St. Lawrence ports.

In this role, Buffalo is competitive with Georgian Bay points in Lake Huron, and other Canadian ports on Lake Erie (Port Colborne), Lake Ontario and St. Lawrence River (Kingston, Prescott).

The reasons for the use of the water-rail routes instead of the all-water St. Lawrence route exclusively and the importance of Buffalo in this transfer are twofold. First, a large amount of grain arrives at lower Lake ports after the close of the navigation season on the St. Lawrence, and must use rail to reach the seaboard. Secondly, the offerings of grain in the spring and fall are too large for the St. Lawrence Canals to handle, and the rail routes are pressed into service.

This situation is summarized in the testimony of William H. Coverdale, representing the New York State Chamber of Commerce, at the Senate hearings on the St. Lawrence Waterway Treaty of 1932:⁶

The alternative Buffalo route (water and rail) and the Georgian Bay route (water and rail) are closely related both as to functions and rates. Their principal function is to transport to North Atlantic export ports during the closed season of navigation, grain which has been transported by water and stored at Buffalo and Georgian Bay ports during the open season of navigation. Their secondary function is to meet the peak demands of the grain traffic after the water routes are operating at maximum capacity, and at no other time. Such peak demands occur generally in the early spring and late fall of each year, which are the seasons of greatest export demand. Neither of these water and rail routes enjoy any substantial volume of grain traffic until the Buffalo and Montreal all-water routes have more

⁶ Hearings before a subcommittee of the Senate Committee on Foreign Relations on S. Res. 278, 72nd Cong., 2d sess., p. 677.

grain offered than they can handle, nor until the all-water rates exceed the combined lake and rail rate, a situation which has not arisen in recent years and need not be anticipated.

In the light of this specific function of the port of Buffalo, in what way may the Seaway affect its grain traffic? The new waterway would permit a single uninterrupted voyage from the head of the Lakes to Montreal, to the North Atlantic ports of the United States, or to Europe direct. On a trip of this type it would not be necessary to employ the rail routes from Georgian Bay ports or from Buffalo, or to transfer from Lake ships to St. Lawrence Canal boats.

If such continuous voyages were to be used exclusively, Buffalo would lose all its transfer business on grain destined to ocean ports. However, such a shift would meet many obstacles. The most important factor is that of the closed navigation season. If the St. Lawrence all-water route were to displace the existing lake-rail movements, the total volume of exports and Atlantic coast consumption would have to move in the open season. This would necessitate the building of appropriate storage capacity in the Atlantic ports or in Europe. At present, practically no storage of American or Canadian grain is being done abroad.⁷ The reason for this is quite apparent. When grain is stored for the winter in elevators at the head of the Lakes or in lower Lake ports, no outlay is made for the cost of transportation across the Atlantic until the commodity is ready to move into consumption. If grain were to be stored in Europe, this cost of transportation from the head of the Lakes, about 16 cents per bushel or over \$5.00 per ton, would be tied up in the form of idle capital for the considerable period of time involved in winter storage. In addition to the tying up of large amounts of money, storage in Europe would mean increased insurance costs inasmuch as the loss of a bushel of grain then would cost about 16 cents more than the loss of a bushel stored at the head of the Lakes. In other words, the value of the commodity to be insured has increased by the amount of the entire cost of transportation to Europe.

Another obstacle to this shift in the routing and storage of grain arises in the case of the huge Canadian harvests which occur too late in the fall to use all-water transportation. Much of this crop now uses the joint water-rail routes.⁸ To utilize the all-water route, it would have to be held in storage all winter. This would mean that its sale would be delayed for as long as 5 months. Finally, the storage

⁷ Report of the Royal Grain Inquiry Commission, Dominion of Canada. Sessional Paper No. 35, Ottawa, Canada. January 7, 1925, p. 191. "There is approximately 34,000,000 bushel capacity, public storage silos and flat warehouses at the ports of the United Kingdom, and 1,550,000 at Rotterdam. Much of this storage is not used. It does not pay the owners interest on the investment. Wheat or grains will not go into public storage in the Old Country unless forced there. It takes the wheat out of its regular channels, and it costs too much to do this."

⁸ Report of the Royal Grain Inquiry Commission, *op. cit.* p. 146.

of grain abroad instead of on the Lakes carries this disadvantage: In the latter case, the grain has a choice of markets, so that it is free to seek the best one. If it is held abroad, it cannot be diverted to a more favorable market without incurring additional cost of transportation. For all these reasons, any substantial shift towards storage abroad is unlikely.

The problem of shipping all the grain by the new St. Lawrence route can be accomplished in another way. Instead of storing in Europe sufficient grain to meet the winter consumption requirements, it would be possible to build the necessary capacity at the North Atlantic ports. Here again the difficulties enumerated above would be encountered, although in smaller degree. A new disadvantage would arise, in that a continuous voyage to Europe would not be possible. Hence some of the savings in transportation costs which could be applied towards the construction of new elevator capacity would be lost.

Those cereals which are to be consumed along the Atlantic seaboard could more feasibly be stored there in sufficient quantity to meet the off-season requirements because further ocean transshipment would not be necessary. This is a distinct possibility. However, this is an extremely long-term matter. The problems enumerated in connection with storage abroad would still be present in large degree. For example, late grain would have to be held over at the Lake heads for the new navigation season. It is more likely, that such new capacity would arise as additional consumption of grain or the depreciation of Lake storage capacity necessitated the building of new elevators. In the light of such conditions, the erection of new elevator capacity in the Atlantic ports is probable only in a limited degree and over an indefinitely long time-span. Consequently, computations in Part III of the potential traffic over the new Seaway have been based upon in-season movements.

Upon this reasoning, the loss of grain shipments from Buffalo by rail would amount to its in-season movements to the Atlantic ports for export and domestic consumption. There are no published figures of the volume of such traffic. Rough estimates only can be obtained. Exports and retention for use during this period in the ports of New York, Boston, Portland, Philadelphia, and Baltimore amounted to 1,726,550 tons annually.⁹ Deducting from this the shipments eastward of grain over the Barge Canal of 871,000 tons,¹⁰ we obtain a total of rail movements to these ports of 855,550 tons. Of this quantity, a portion is represented by rail shipments directly from Chicago, Kansas and other points in the west. However, there is no

⁹ See Pt. III, appendix B.

¹⁰ See table 27.

way of estimating this tonnage. To this extent the losses accruing to Buffalo's trade will be overestimated.

Although the rail movement is much heavier during the winter, there is no way of measuring this. Consequently to be generous in estimating the maximum loss, it will be assumed that 60 percent moves during the navigation season. Application of this figure to the total rail movements yields a figure of 513,330 tons or 17,110,000 bushels on wheat basis. This represents the maximum loss of annual grain shipments by rail from Buffalo to the Atlantic seaboard, without deducting direct shipments of grain from St. Louis, Chicago, and other centers to North Atlantic ports.

The preceding discussion applies to the transfer from Lake ship to rail at Buffalo. The other transfer activity consists in loading grain from Lake carriers into smaller ships for navigation on the St. Lawrence canals. With the deepening of the St. Lawrence, it is said this transfer will be obviated in large part and Buffalo will lose this business.

TABLE 27.—*Eastward Movement of Grain Over the Erie Canal*

Year	Bushels (wheat basis)	Year	Bushels (wheat basis)
1929.....	28, 575, 747	1936.....	20, 181, 739
1930.....	41, 358, 386	1937.....	8, 519, 535
1931.....	40, 408, 962	1938.....	35, 992, 511
1932.....	39, 750, 569		
1933.....	26, 535, 996	Average.....	29, 031, 917
1934.....	26, 906, 271		
1935.....	22, 089, 455	Tons.....	870, 966

SOURCE: For the years 1929 to 1932, Chief of Engineers, United States Army, *Commercial Statistics, Water-borne Commerce of the United States*; from 1933 forward, the Lake Carriers' Association, *Annual Reports*.

The evidence concerning this point shows that the deepening of the Welland Canal has already reduced this activity to an unimportant position. On August 6, 1932, the opening of the Welland with a depth of 25 feet instead of the previous 14 feet extended the operation of Lake carriers to points on Lake Ontario and the St. Lawrence River. This situation is set forth in the Annual Report, Lake Carriers' Association, 1933, as follows:

The increasingly heavy shipments of grain to ports east of Lake Erie, due to the ability of the large grain carriers to navigate as far east as Prescott on the St. Lawrence River is shown by deliveries thereto of more than 82 million bushels or 27 percent of the total Lake movement, whereas in 1930, the year preceding the opening of the new waterway, total shipments were only 22½ million bushels or 6½ percent of the total.

The growth in receipts at Kingston and Prescott is notable. Elevators were not established at those ports until the new Welland was completed and the combined receipts of 33 million

bushels compare with a total of 307,199 bushels when the elevators went into commission in 1930.

By comparing the total grain movement through the St. Lawrence Canals with that of Buffalo's shipments to Canada, it is possible to see the decreasing importance of Buffalo in this movement (table 28).

After the work on the Welland Canal was completed in 1932, there was a sharp drop in Buffalo's exports to Canada. Before that time Buffalo's participation in St. Lawrence shipments was substantial. For the 6 years preceding the opening of the improved Welland, the Buffalo shipments to Canada amounted to 27.1 percent of the total St. Lawrence grain traffic. In the 6-year period after the opening of the Welland Canal, this proportion averaged only 4.6 percent. In terms of bushels this business amounted to only 4,572,000 annually.

TABLE 28.—*Grain shipments, St. Lawrence Canals and Buffalo shipments to Canada*

Year	St. Lawrence traffic (thousands of bushels)	Buffalo to Canada (thousands of bushels)	Percent Buffalo to St. Lawrence traffic
1925	135,484	34,192	25.2
1926	123,196	21,465	17.4
1927	175,440	37,704	21.5
1928	184,300	62,482	33.9
1929	81,202	18,806	23.1
1930	95,313	19,828	20.8
1931	100,406	10,243	10.2
1932	121,980	16,048	13.2
1933	98,587	3,540	3.6
1934	74,274	2,185	2.9
1935	73,630	3,703	5.0
1936	96,605	7,093	7.3
1937	110,055	1,554	1.4
1938	149,693	3,360	2.2

SOURCE: Data on grain shipments from Buffalo to Canada from the Chief of Engineers, United States Army, *Commercial Statistics, Water-borne Commerce of the United States*. St. Lawrence Canals traffic from 1925 through 1932, obtained from Corps of Engineers, United States Army, *Transportation on the Great Lakes* (revised 1937), p. 183. For subsequent years from Dominion Bureau of Statistics, Canada, *Canal Statistics*.

The conclusion is clear that such activity is no longer important. As far as Buffalo is concerned, the damage has been done by the improvement to the Welland Canal. Even if the remaining Canadian transfer is taken from Buffalo by the new waterway, the loss would be small, amounting to less than 5 million bushels annually. On a wheat basis of 60 pounds to the bushel, this amounts to 150,000 tons per year. This traffic is not likely to disappear completely, however, since there will always be ships which would pick up grain at Buffalo for foreign ports after having discharged their import cargoes at Lake Erie ports.

In recapitulation, the rail transfer of grain in Buffalo was estimated to have a maximum annual average potential loss of 551,470 tons or

17,110,000 bushels. The Canadian grain transfer at Buffalo if lost entirely would bring this total up to 663,000 tons or over 22,000,000 bushels.

Now it is necessary to translate such losses into terms of economic activity—employment and pay rolls. Total receipts of grain in the Port of Buffalo both for processing and transshipment for the period 1929–38 were 3,740,076 tons annually.¹¹ The estimated loss of over 663,000 tons constitutes 17.7 percent of this total.¹² Let us assume that employment among elevator workers, longshoremen, and stevedores is reduced proportionately. The number of such workers was estimated at 1,000. A reduction of employment of 17.7 percent of 1,000 workers amounts to 177, or in round numbers, 200 workers.¹³ At average annual salaries of \$2,000, the pay-roll loss would be \$400,000 per year.

Another way of approximating the economic loss to Buffalo is on the basis of revenues. In the Senate Committee hearings on the St. Lawrence Treaty of 1932, testimony of shipping men indicated that transfer charges from upper to lower Lake vessels ranged from 0.677 cents per bushel to 0.89 cents.¹⁴ The published charge for loading and unloading grain at Buffalo is one cent per bushel.¹⁵ The estimated loss was 22,000,000 bushels per year. At 1 cent per bushel, the revenues lost would be \$220,000. This does not include storage charges. However, in the preceding discussion it was pointed out that the changes in the routing of grain applied to in-season movements, and not to grain stored for the winter at Buffalo. For this type of transfer the short period storage is given free as part of the elevating and transfer charges.

It should be pointed out again that the volume of traffic lost is overstated to the extent that it is impossible to eliminate from our calculations the shipment of grain to the Atlantic coast directly by rail from Chicago, Milwaukee, Kansas City, etc. In effect, our calculations have included these movements as a loss to Buffalo. Likewise not offset in the estimated diversion is the activity which will be created by the loading of ocean ships at Buffalo with grain. These factors tend to make the estimate of losses an overstatement.

While the figures presented in this discussion cannot be considered as predictions, they do give us an idea of the magnitudes involved. The net conclusion is that the losses in revenues may range from one

¹¹ Part III, appendix B, table 6.

¹² This is an overstatement of the loss to the extent that longshoremen, stevedores, etc., are engaged in other freight handling besides grain.

¹³ Even this is too high because the storage function is not materially affected, as explained in the next paragraph.

¹⁴ Hearings before a subcommittee of the Senate Committee on Foreign Relations on S. Res. 278, 72d Cong., 2d Sess., p. 675.

¹⁵ Corps of Engineers, United States Army, *Port and Terminal Charges at United States Great Lakes Ports*, 1939, p. 57.

quarter to one-half million dollars annually. This may involve the jobs of 200 workers. Compared to the total number of gainfully occupied persons in the industrial area of 371,000, the percentage is 0.054. Thus even if the employment loss has been underestimated by 100 percent, the error involved would make only .054 percent difference in total employment.

The potential effects of the St. Lawrence upon the grain and flour trade of Buffalo have been discussed. The other major industry group of Buffalo which is heavily dependent upon lake transportation consists of iron and steel and their products. It has been shown that this group is by far the most important manufacturing industry in Buffalo. Consequently it is vitally important to see what the St. Lawrence Seaway may mean to it.

A study has been prepared by the Survey upon this subject.¹⁶ It shows that the steel producing centers located on the Great Lakes will be benefited both in domestic and foreign trade. In the foreign trade, the Lake producers are at a disadvantage compared with those at Bethlehem, Pa. and Sparrows Point, Md., because of the longer rail hauls involved in getting to deep water. The Seaway will eliminate this difficulty and enable the producers in Chicago, Cleveland, Buffalo, and other lake shore cities to compete on an equal footing. This is particularly significant for the independent producers of the Great Lakes.

How important the Seaway may become to the steel and machinery industries is indicated by their leading position in United States' export trade. From 1928 through 1937, annual machinery exports averaged \$348,903,000. The corresponding figure for iron and steel products is \$124,528,000. Together these two industries totalled almost one-half billion dollars, to be exact, \$473,431,000. During the current war exports are much greater than these average figures. Buffalo has not been fully participating in this trade because of the transportation disadvantages.

A similar situation exists in respect to intercoastal trade. Iron and steel manufactures constitute by far the largest item in shipments from the Atlantic to the Pacific coasts. Yet Buffalo accounts for a very small percentage of this commerce, yielding to producers situated more favorably in respect to the Atlantic shore. In 1937, the intercoastal trade westward in iron and steel manufactures amounted to 1,367,798 tons, of which 1,025,462 tons originated in the Middle Atlantic ports.¹⁷ In addition, the Chicago and Youngstown producing areas shipped large quantities to the West Coast by rail, amounting to 293,032 tons. By way of comparison, the Buffalo mills sent only 25,085 tons to the Pacific coast in 1937. Thus out of a total of

¹⁶ Part III, appendix N.

¹⁷ U. S. Maritime Commission, *Economic Survey of Countries and Intercoastal Shipping, 1938*, p. 48.

1,660,830 tons of domestic shipments to the Pacific coast, Buffalo accounted for 1½ percent of the tonnage. That Buffalo is getting a much smaller share of the market on the Pacific coast than other producing areas in the United States can be seen from its productive capacity in iron and steel. In 1935, the Buffalo Industrial Area had 4.45 percent of the steel ingot capacity and 4.1 percent of the hot rolling mill capacity of the United States.¹⁸ The 1937 Census of Manufactures shows that it produced over 4 percent of the value added in steel works and rolling mill products, yet it supplied only 1.5 percent of the shipments to the west coast in that year. The situation in regard to overseas exports of iron and steel products is similar, in that Buffalo suffers from a transportation disadvantage.

In the light of these facts, the advent of the Seaway must have an important bearing on the iron and steel products and machinery industries of the Buffalo Industrial Area. The existing transportation disadvantages in reaching overseas and west coast markets will be eliminated. An expansion of sales in these markets may therefore be logically expected. Since these industry groups constitute by far the most important elements in the Buffalo area, even a small percentage improvement would involve a large number of jobs.

Although no precise forecast can be made, it is possible on the basis of conservative assumptions to indicate the importance to Buffalo of increased sales in these industries. On the basis of about 4½ percent of the nation's productive capacity in iron and steel products, and of only 1½ percent of the sales in the markets indicated, it might seem logical to suggest that Buffalo may increase its share of these markets by 3 percent of the total. Due to the fact that these industries contain many large-scale units in which administrative decisions as to the geographic allocation of production play a large part, this figure cannot be taken as a definite forecast. This aspect of imperfect competition will be treated in a later paragraph. However, for present purposes it is enough to assume that the lowered cost of transportation will be reflected, without much doubt, in increased sales, and that a small percentage increase is of substantial economic interest to the Buffalo area.

For example, what increase in employment may be engendered if Buffalo increased its share by 1 percent of the sales abroad and on the West Coast? In the latter market, the shipments in 1937 were shown to be approximately 1,660,000 tons. One percent of this quantity would amount to 16,600 tons. Computations based upon the types of iron and steel products entering into intercoastal trade in 1937, indicate that an average value of \$85.00 a ton is a reasonable estimate. Hence an increase of 16,600 tons would amount to \$1,411,-

¹⁸ U. S. Department of Commerce, *Basic Industrial Markets in the United States. The Iron and Steel Industry*, December 1936.

000 in sales value. In exports of iron and steel, the United States averaged \$124,528,000 per year for the period 1928-37. One percent of this sum is \$1,245,280. The combined value of a 1 percent increase in the intercoastal and export trade is \$2,656,280 annually.

This figure can be reduced to terms of employment by estimating the value of products per wage earner in the iron and steel industry. In 1937 this was \$8,680¹⁹ for the United States. Consequently, employment of wage earners associated with this volume of increased sales of iron and steel may amount to 360 persons. Including salaried and supervisory employees, the round number of employees is 400.

In the machinery industry, what would an increased share of 1 percent of United States exports represent in terms of employment? Foreign sales of machinery for the period 1927-38 averaged \$348,903,000 annually, 1 percent of which is \$3,489,000. After deducting 10 percent of the sales price to cover the raw material costs of producing the steel to be incorporated in the machinery products the value added by manufacture would be at least \$3,140,000. Assuming that the value added by manufacture per wage earner in the United States for this industry is typical of this field in Buffalo, we obtain an estimate of wage earners of 865.²⁰ If salaried officers and employees are included, the number is increased to 945. The total estimate of increased employment in the iron and steel and machinery industries would then amount to 1,345 people if Buffalo participated in the west coast and export business by only an additional 1 percent.

At this point, it is necessary to enlarge somewhat upon the problem of the presence of very large firms in the iron and steel industry, with plants in more than one section of the country, and whose action in allocating production cannot be foretold. To be specific, the Bethlehem Steel Company not only is the largest steel producer in the Buffalo Industrial Area, but has plants in Bethlehem, Pennsylvania, and Sparrows Point, Maryland. Even with the Seaway, this company may wish to confine its overseas export and intercoastal business to the latter plants. This element of administrative discretion makes it impossible to predict the effect of the Seaway upon exports of steel products.

Although this one company is a large factor in the Buffalo situation, there are other large plants and a great many small and medium-sized

¹⁹ Daugherty, De Chazeau, and Stratton, *Economics of the Iron and Steel Industry*, McGraw-Hill, 1937. Vol. I, p. 387. An adjusted figure for value of products which eliminates duplications in the Census data is here given. From this, an average value of product per worker in the integrated production of steel for 1929 of \$6,900 is obtained. This was adjusted for price change from 1929 to 1937 as shown in *Iron Age*, and for increased productivity of workers as shown in WPA National Research Project, report No. 8-1, part II, p. 99.

²⁰ The cost of raw materials assembled at Buffalo is deducted to obtain value added by manufacture, since this item does not accrue to Buffalo people. The raw materials, ore, coal, limestone, etc., are a very small item in the cost components of machinery manufacturing, and a deduction of 10 percent leaves a conservative value added estimate. From the United States Census of Manufactures, the value added by manufacture per wage earner in 1937 was \$3,627 in the production of machinery, not including transportation equipment,

TABLE 29.—Number of firms, by number of employees, ferrous metals and products, and machine products, Buffalo Industrial Area, 1936

	Number of employees								
	1,000 or more	500 to 999	300 to 499	200 to 299	100 to 199	50 to 99	25 to 49	10 to 24	Less than 10
METALS AND PRODUCTS, NOT INCLUDING MACHINE SHOP PRODUCTS									
Metals and metal alloys: Smelting, refining, and ore dressing	1	3			2	2		1	1
Steel making and iron and steel rolling mills	2	0	1		3	0		1	
Structural, ornamental, and architectural iron, steel, and bronze							5	5	10
Boilers and tanks		0	0	0	1	1	5	5	2
Iron foundries		1	2	1	6	5	4	5	2
Furnaces and heating apparatus	1	0	0	1	2	0	0	0	0
Forgings		1			1			1	1
Machine-tool attachments, dies, and moulds						2	2	2	5
Cutlery, saws, and hand tools		1		1				4	4
Screw-machine products and hardware specialties	1	1		1		3			5
Fireproof equipment: Metal furniture, doors, sash, radiator enclosures, etc.			1					1	2
Refrigerators, hotel and restaurant supplies, coolers, soda fountains							4		2
Sheet-metal goods		1	1		1	3	4	9	17
Wire and wire goods		1	1			3	2	1	7
Total, metals and products	5	4	10	3	14	22	22	35	58
MACHINE SHOP, MACHINE BUILDING, MACHINE PRODUCTS, AND GENERAL MACHINE WORK									
Elevators, dumb-waiters, and heavy machinery			1	1		2	1	2	2
Engines, motors, pumps, and compressors	1				1	1	4		4
General machine building and machine shop		1			1	2	4	5	35
Special machine building			2		1	3	4	4	10
Electrical apparatus and appliances (not including radios and parts)		1			2	1	2	8	13
Radios and radio parts	1								
Gears, valves, bearings, plumbing supplies, and miscellaneous machine products					1	3	1	4	7
Fine machines, business and recording machines, meters and firearms		1				1	1	1	3
Instruments								2	4
Total, machine products	2	3	3	1	7	13	17	26	78
Total of all items	7	7	13	4	21	35	39	61	136

SOURCE: *Directory of New York State Manufacturers*, published by the Journal of Commerce, New York, 1937.

plants which will benefit from the Seaway and can be counted upon to take advantage of the new competitive opportunities presented by it. Table 29 shows the number of companies by number of employees in selected branches of the iron and steel products and machinery industries in 1936. The listing counts companies, not plants. Only ferrous metals were included, and certain activities in plating, polishing, enameling, galvanizing were not considered. For the industry groups tabulated there are a total of 7 companies employing over 1,000 workers, 7 from 500 to 1,000; 13 from 300 to 500; 4 from 200 to 300; 21 from 100 to 200, or a total of 52 companies with more than 100 workers. There are 135 firms from 10 to 100 workers, and 136 firms with less than 10 employees. Among the larger producers in the iron and steel group besides Bethlehem Steel Company are: The Republic Steel Company with more than 1,000 employees;

a subsidiary of National Steel Corporation with 300 to 500 workers; the Vanadium Corporation of America of similar size; the electro-metallurgical division of Union Carbide and Carbon Company making nickel alloys with over 1,000 employees. Also among those firms with over 1,000 employees are: The American Radiator Company and Trico Products Corporation, the latter producing automobile accessories. In the machine shop and machine building group are found Worthington Pump and Machinery Corporation, and Colonial Radio Corporation, each with over 1,000 men, Remington Rand, Inc., U. S. L. Battery Corporation, and Buffalo Forge Company, each employing between 500 and 1,000 people. This tabulation does not cover the transportation equipment field where such large plants are found as the Ford Motor Company and Chevrolet-Buffalo assembly units, the Fisher Body Buffalo Division, the Harrison Division of General Motors Corporation, the Houde Engineering Corporation, and Fedders Manufacturing Company, Inc.

Without further discussion it follows that the benefits of the Seaway for Buffalo in the iron and steel and machinery industries do not depend upon the administrative decision of a single firm for their realization, inasmuch as there is a substantial group of large firms. The second point is that there is such a large number of medium size and small firms engaged in these industrial groups that the benefits of the Seaway will be widespread and not confined to any particular company. It is well to note here, that unlike the transportation of crude oil or the raw materials for iron and steel, these products are not adapted to company owned bulk carriers, but rather to common carriers, thus assuring the smaller producers an opportunity to participate fully in the advantages of the Seaway route.

Before leaving this subject, the effects upon the harbor activity of the Port of Buffalo itself should be mentioned. First, any increase in Buffalo's sales of iron and steel products abroad or in the far western markets means new business for the port. Thus, an increase of its share by one percent of the total would mean some 35,000 tons of new traffic annually. This does not include any machinery shipments. In the second place, increased receipts of raw materials such as coal, iron ore, limestone, etc., are necessary. For every ton of steel or iron produced, there must be assembled about four tons of these materials. Because of these two factors, the harbor activity of Buffalo will be stimulated.

Section 4

DIVERSION AND NEW TRAFFIC FOR THE SEAWAY

The implications of the proposed Seaway for the two industries in Buffalo most closely related to water transportation, namely, grain

handling and milling and the iron and steel industry, were analyzed in the preceding sections. Since these industries account for 90 percent of the tonnage of the port, there remains only 10 percent of the tonnage which may be examined to establish the extent of possible diversion of traffic.

Many of these products are not transshipped. They either originate in the Buffalo area, or are received for use in the area. Hence they are not divertible and would not bypass the port of Buffalo. Such, for example, are petroleum and its products, and many food products.

Two commodities received in substantial quantities in Buffalo need to be examined for potential divertibility, namely, automobiles and sulfur. The Interstate Commerce Commission has made a study of the transportation of new automobiles in the year 1938.²¹ Shipments of cars from Buffalo received from beyond were one of the items studied. These statistics indicated that only a small quantity were sent to points in New England and the Middle Atlantic States. The areas participating in this traffic and quantities received via Buffalo were as follows:

	<i>Short tons</i>
Hartford, Conn.-----	116.7
New York Area, N. Y.-----	82.5
Scranton, Pa.-----	258.0
Philadelphia, Pa.-----	1,727.9
	2,185.1

The total receipts of automobiles by water in Buffalo for shipment beyond in 1938 was 116,949 tons. The potentially divertible traffic of 2,185 tons amounts to less than 2 percent of the total. Hence the conclusion seems justified that most of these receipts were for local distribution. The potentially divertible traffic is of insignificant tonnage.

The situation in regard to sulfur is that the port of Buffalo serves as a transshipment point via the Lakes for Erie Barge Canal receipts. In 1937 Buffalo shipped out 115,471 tons by lake steamer. The St. Lawrence Seaway will enable sulfur to be carried in a continuous voyage from the Gulf ports to upper Great Lakes ports without going through Buffalo.

It appears that of the 10 percent of harbor traffic of Buffalo which is not connected with the iron and steel industry or the grain trade, the only commodity moving in substantial tonnage which is divertible is sulfur. At 1937 levels of activity this amounted to somewhat over 100,000 tons. Of the total lakewise commerce of Buffalo, this represents much less than one-half of 1 percent.

²¹ I. C. C. Docket Number 28,190. *Shipments of New Automobiles*. See answers to schedules B and C.

The commodity studies prepared by the present Survey indicate that certain commodities may participate in the new coastwise and intercoastal movements. Besides grain and cereal products moving eastward, there would also be lard and other packing-house products, dairy products and poultry, as well as machinery, automobiles, and iron and steel products. The latter would likewise share in the movement to the Pacific coast. Water-borne receipts at Great Lakes ports will probably include raw and refined sugar, wood pulp and paper products, fruits and bananas, and citrus fruits as well as lumber and canned goods from the Pacific coast.

The extent to which Buffalo may participate in this trade has been analyzed in another chapter of this report. Consumption of citrus fruits and bananas during the open season was studied for the Buffalo trading area as outlined in the Atlas of Wholesale Grocery Trading Areas of the Department of Commerce. With a population of 1,364,753 in 1930, the area may receive 4,777 tons of fresh citrus fruit, 1,364 tons of canned citrus fruit from Florida during the open season via the Seaway.²² Banana imports were estimated at 8,870.²³ Receipts of sugar in the trading area, estimated on an open-season movement of 58 percent of the annual shipments and a per capita consumption of 100 pounds, amounts to 68,237 tons. These three commodities alone thus constitute 81,884 tons of potential new traffic for the port.

The potential volume of lumber receipts can only be indicated by the existing volume of shipments from the Pacific coast to the State of New York. In 1936, shipments from California, Oregon, Washington, and Idaho amounted to 722,428 thousand board feet.²⁴ Douglas fir weighs about 1½ tons per thousand board feet, hence 722,000 million board feet would amount to well over 1 million tons. Although there is no way of ascertaining precisely what proportion of the State total was destined for Buffalo, it is certainly conservative to estimate it at 10 percent. On this basis a movement of over 100,000 tons may eventuate.

The figures which have been presented are only rough calculations and not exact predictions. Only a few commodities have been covered. In spite of these limitations they indicate that the port of Buffalo stands to gain substantial tonnage in new coastwise and intercoastal movements.

A few remarks may be made about the effect of the Seaway upon other transportation and freight handling activities in the Buffalo area; trucking, warehousing, railroad terminals, etc. The general effect of the Seaway which has been discussed above is to decrease the

²² Part III, appendix F, tables 8 and 11.

²³ Part III, appendix G.

²⁴ Lumber Statistics from U. S. Department of Agriculture, Forest Service, *Lumber Distribution and Consumption*, 1936, tables 5 and 8.

importance of Buffalo in the transshipment of a few bulk commodities moving long distances, notably grain and sulfur. In compensation for this, its importance in the warehousing and distribution into the adjacent areas of a large number of other commodities will undoubtedly increase.

It is well to note that the latter activities are far more intricate than the former. To handle diversified products of high value is far more expensive than to transship bulk, standardized articles. The high stevedoring costs per ton of general cargo compared with the low costs of grain elevation supports this point. This means that much more revenue per ton of freight handled will be paid to the workers and business men of Buffalo for the new traffic than will be lost on the diverted traffic. Secondly, although the length of haul of railroad shipment out of Buffalo may well be shorter on the new traffic, the activities of loading and handling these cars will require more man-hours and command higher rates. The length of haul away from Buffalo is of secondary economic interest to the area, since it is not directly affected by this. On the other hand, distribution of general cargo of new St. Lawrence traffic into the tributary area of Buffalo may well stimulate trucking activities in which local firms and workers have a direct interest.

A summary of the entire discussion reveals that the largest loss to Buffalo is likely to be in its grain transfer activities, a loss estimated to affect 200 jobs. In addition, transshipment of sulfur of about 100,000 tons a year would be lost. Against these adverse influences the following favorable factors can be placed. The major manufacturing industries of Buffalo would find increased foreign and inter-coastal markets. The result will be an increase in shipments of iron and steel products, machinery, and other articles made in Buffalo. This, in turn, would stimulate increased receipts of ore, coal, limestone, and other raw materials. Other new traffic for the port of Buffalo would arise as it distributed to the surrounding areas inter-coastal receipts such as canned goods, lumber, and citrus fruits. Overseas foodstuffs for distribution from its harbor would be bananas, sugar, and possibly other fruits and nuts from Mediterranean and South American ports. Although a precise balance sheet of losses and gains cannot be drawn up, the rough indications given of volume of consumption and productive facilities indicate clearly that the port of Buffalo will have a net increase in activity as a result of its becoming a deep-water harbor. Other freight handling facilities such as warehouses, trucking, and railroad terminals would participate in these new activities.

This report does not pretend to take up other implications of the St. Lawrence project for Buffalo. Neither the stimulus of the outlays for

construction nor the industrial growth which low cost power will make possible are treated here. Yet both will have tremendous benefit for the industrial activity of Buffalo, as Part VI, which deals with the probable consequence of low cost power of the St. Lawrence, reveals. A further element of direct importance is the potential shipbuilding in the Great Lakes area which will be feasible with a deep-water outlet to the Atlantic. The expanded requirements for both naval and merchant vessels and the location of raw materials and labor as well as existing shipbuilding facilities in this area point the way for such a development. The implications for the iron and steel and machinery production of Buffalo of this program are obvious.

UNITED STATES DEPARTMENT OF COMMERCE

JESSE H. JONES, *Secretary*

The St. Lawrence Survey

PART V

The St. Lawrence Seaway and Future
Transportation Requirements



N. R. DANIELIAN, *Director*

ST. LAWRENCE SURVEY

Reports of the St. Lawrence Survey

- PART I.** History of the St. Lawrence Project.
- PART II.** Shipping Services on the St. Lawrence River.
- PART III.** Potential Traffic on the St. Lawrence Seaway.
- PART IV.** The Effect of the St. Lawrence Seaway upon Existing Harbors.
- PART V.** The St. Lawrence Seaway and Future Transportation Requirements.
- PART VI.** The Economic Effects of the St. Lawrence Power Project.
- PART VII.** Summary Report of the St. Lawrence Survey.

UNITED STATES DEPARTMENT OF COMMERCE

JESSE H. JONES, *Secretary*

The St. Lawrence Survey

PART V

The St. Lawrence Seaway and Future
Transportation Requirements



N. R. DANIELIAN, *Director*

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FEBRUARY 25, 1941.

THE PRESIDENT,
THE WHITE HOUSE,
Washington, D. C.

DEAR MR. PRESIDENT: I have the honor to transmit herewith Part V of the reports of the St. Lawrence Survey. In this part there is an extensive analysis of future traffic possibilities in the United States in the light of growth in population, employment, productivity, and other related factors that influence agricultural and industrial production and consumption.

The St. Lawrence Seaway is here viewed in the perspective of future transportation requirements of the country.

The summary of the facts and conclusions is given in the letter of submittal of Dr. N. R. Danielian, Director of the St. Lawrence Survey.

Very sincerely,

WAYNE C. TAYLOR,
Acting Secretary of Commerce.

LETTER OF SUBMITTAL

FEBRUARY 23, 1941.

The Hon. SECRETARY OF COMMERCE,
Washington, D. C.

DEAR MR. SECRETARY: I have the honor to submit herewith Part V of the reports of the St. Lawrence Survey. This report deals with the future transportation requirements of the United States, and attempts to evaluate the position which the St. Lawrence Seaway will hold in the transportation system of the country. In the preparation of this report the Survey has been assisted by Professor Edgar M. Hoover, Jr., and Mr. Edgar Epstein. The report has been reviewed by many experts in the various branches of the government whose comments and criticisms have been of great value. The charts were executed by Mr. Earl G. Millison, Chief of Graphic Services, and Mr. George Newman, Head Statistical Draftsman, Work Projects Administration.

It is not the purpose of this report to make definite predictions of amount of traffic at any given point of time in the future. Such an objective would be unattainable. The main purpose of the report is to answer these questions: (1) Will the St. Lawrence Seaway divert traffic from the railroads? (2) Do the railroads have such excess capacity that a new medium of transportation such as the St. Lawrence Seaway is unnecessary? (3) Is the seasonal movement of traffic such that the St. Lawrence Seaway will actually cause idleness of railway equipment in the season of open navigation?

This study shows that the St. Lawrence Seaway, besides assisting the railroads in caring for a greatly enhanced traffic, will in fact improve the economical operation of railroads by smoothing out the seasonal variations in rail traffic. Often opponents of the project have reiterated that while they will be burdened with traffic, and hence with the expense of constructing and maintaining facilities to carry cargoes in the 5 months of the winter when the Seaway is closed, "for 7 months of the year these facilities must stand unprofitably idle." This is a plain misstatement of fact. The peak of rail traffic comes in August, September, and particularly October. The facilities constructed to take care of traffic in these peak months *now* stay idle in the winter time. If the St. Lawrence Seaway were operating, the railroads would be freed from constructing and maintaining equipment for these peak summer months, which now stay unprofitably idle on sidings during the winter months. The St. Lawrence Seaway thus will improve the average utilization of cars and locomotives by taking care of a part of the peak load.

In the light of the facts revealed in this report, the Survey is led to the following conclusions:

1. Under very conservative assumptions of employment conditions, assumptions which are at the lower limit of political tolerance, average tons of freight originating in the decade of 1950 will probably be between 242,000,000 and 374,000,000 greater than the average of 1930-39. The 10,000,000 tons of additional American traffic which may use the St. Lawrence at maximum utilization would be but a fraction of the expected increase in railroad activity.

2. The railroads of the United States, though much improved in operating efficiency, have reduced space capacity and tractive power to such an extent that, in the net, their carrying capacity is no more than in the decade of 1920-29. This will not be sufficient to meet traffic requirements of the future.

3. The railroads must, therefore, expand their capacity by purchase of equipment and expenditures on way and structures. The St. Lawrence Seaway will accommodate a small part of the increased demand for transportation. It is an alternative method of meeting a part of our future transportation requirements.

4. The railroads are now burdened with seasonal peak traffic that comes in late summer. The equipment used in carrying this peak traffic stays idle in the winter time. The St. Lawrence Seaway will help the railroads to improve the average utilization of their equipment by taking a part of the load off the peak. This means that the railroads will not have to buy the equipment to meet the October peak to the extent that the St. Lawrence Seaway will carry some of the peak load. As a result, the St. Lawrence Seaway will improve the average utilization of railroad rolling stock.

These conclusions are the result of an extensive study by the Survey of the economic forces that influence traffic in agricultural, manufactured, and mineral products. Among the factors carefully examined and weighed are population growth and geographical distribution, concentration of agricultural production, trends in consumption of foodstuffs and processed products, and the effect of mechanization of agricultural operations upon traffic. Diversion of traffic from railroads has been also considered. An analysis of these elements shows that traffic in agricultural products, which in 1939 accounted for 11.8 percent of total tons of freight originated on Class I railroads, and yielded 20.2 percent of their revenues, will increase in the future at a faster pace than population, because the production centers of principal agricultural commodities have been moving westward, while the concentration of population still remains in the east; the improvement of packing and canning processes have reduced waste and increased utilization of byproducts; and the dispossession and urbanization of farm population have tended to diminish farm consumption and to increase purchases in the market. Assuming an increase in traffic on Class I railroads only in proportion to population, the average of tons

of freight originating of agricultural products during the decade of 1950 would be nearly 12,000,000 tons greater than the average of 1935-39. Making allowance for further diversion of traffic from the railroads, and allowing for export trade commensurate with the least favorable conditions of the past decade, the increase in tons of freight of agricultural products would be probably 5,000,000 short tons. This one increment of future rail traffic in itself would make up for one-half of the additional American traffic of 10,000,000 tons that may utilize the St. Lawrence at full capacity utilization.

A thorough examination of the past trends in manufacturing production, employment, hours of work and productivity per man-hour indicates that even under very pessimistic assumptions with regard to employment, traffic in manufactured products must increase very materially over the experience of the past decade.

Manufactured products gave rise to 25 percent of total tons of freight originated on Class I railroads during 1938. This study shows that assuming no more than 10 million persons working in manufacturing enterprises at an average of 35 hours per week, at a rate of production per man-hour moderately higher than at present, the decade of 1950 would produce tons of freight originated in manufactured products which would be 102,000,000 tons higher than the average of 1930-39. This figure allows fully for all past and probable future diversion of traffic.

The National Resources Planning Board estimates that there would be 9.8 million persons employed in manufacturing when the economy is operating at an annual income of 70 billion dollars (1936 dollars). In view of the increase in population, the national economy operating at these levels would probably leave 10 to 15 million persons unemployed. This is mentioned to indicate that the assumption here made which allows an increase of 102,000,000 tons of manufactured freight originating, above the average of the past decade, is extremely conservative.

If the employment in manufacturing were 11.5 million persons, then the tons of freight originating in manufactured products on Class I railroads would be 150,000,000 tons higher than the average of 1930-39. This increment of future additional traffic would in itself make up for fifteen times the additional American traffic of 10,000,000 tons that may utilize the St. Lawrence at full capacity.

It is the conclusion of the Survey that this figure or a higher figure is the more likely increase in the average rail traffic during the next decade. Although at these levels of industrial activity the problem of unemployment will not have been solved, conditions would probably be nearer to the lower limit of political tolerability. With employment in manufacturing at 11.5 million persons, national income would be between 80 and 90 billion dollars (1936 dollars), and unemployment less than 10 millions.

Commensurate developments in mineral industries when 10 million persons are engaged in manufacturing, promise to produce tons of freight in mineral products originated on Class I railroads 132,000,000 tons higher than the 1930-39 average. This figure, too, makes allowance for diversion. If the second assumption, 11.5 million persons employed in manufacturing, is taken as the basis, then the corresponding tons of freight originated in mineral products would be 214,000,000 tons higher than the average of 1930-39.

This study reveals that the average tons of freight originated of all kinds, carload and less-than-carload lots, during the decade of 1950 would be, at a very conservative estimate, 1,100,000,000 tons. At this level, tonnage originated would be 28 percent higher than the average of the decade of 1930-39. It is very possible that the average tonnage in the next decade may approximate 1,232,275,000, at which rate it would be 43 percent higher than the preceding decade. The actual tonnage increase over the average of 1930-39 would be, in the first case 242,000,000, and in the second case 374,000,000.

In the face of these magnitudes it is plain that the additional American traffic of 10,000,000 tons that may use the St. Lawrence Seaway at its maximum utilization recedes into insignificance. A glance at the Interstate Commerce Commission statistics will show that the annual fluctuations of traffic on American railroads are many times this amount.

Under these circumstances, the additional traffic that will utilize the St. Lawrence Seaway will be a slight, almost unnoticeable, recession from the large increases in traffic which the railroads can confidently anticipate. In fact, the very estimates which are made in this report for the decade of 1950 will be reached sooner under the impetus of the national defense program. The next question, then, is whether the railroads can meet this growing demand upon their services without expanding their facilities.

Here some explanation is needed about the carrying capacity of railroads in the United States. This is a highly controversial subject. It is here intended merely to recite a few facts which will help answer the question: Will the railroads have to expand to take care of future traffic requirements? The claim of the Association of American Railroads is correct that there have been many operating improvements which have increased carrying capacity in spite of reduction in car capacity and tractive power of locomotives. Average number of freight cars per train has increased from 35.6 in 1920 to 48.5 in 1939, and, as a result, revenue and non-revenue freight per train has increased from 708 in 1920 to 813 in 1939. Although there has been much fluctuation in the intervening period, the trend has been definitely upward. Average speeds of freight trains between terminals has increased steadily from 10.3 miles per hour in 1920 to 16.6 miles per hour in 1938, a 60-percent improvement. This rate of speed includes stop-over at way stations.

As a result of all these changes in operating factors, the carrying capacity of railroads, for a given amount of equipment, has definitely improved. This is shown by the net ton-miles per freight-train-hour, which expresses the results of railroad operating efficiency in loadings per car, number of cars per train and speed of travel. The net ton-miles per train-hour has increased from 7,500 ton-miles per hour in 1921 to 13,500 ton-miles in 1939. This is an 80 percent improvement in 19 years. As compared with 1929, the improvement is 30 percent.

On the other hand, there has been considerable reduction in car capacity and tractive power. The capacity of serviceable cars went down from 99 million tons in 1929 to 74 million tons in 1938, a reduction of over 25 percent. Tractive power of freight locomotives was down by 16 percent in the same interval. Furthermore, the average length of rail haul increased by 10 percent between 1929 and 1939.

In the light of these facts, the best that can be said is that the railroads, at the close of 1938, had a carrying capacity which was probably comparable with late 1920's, although it remains still to be proved whether the operating efficiency in speed and train loadings can be maintained under the strains of increasing traffic loads.

In spite of these improvements in performance, the railroads of the United States will need much expansion in order to meet the traffic estimates made here under very conservative assumptions. Although the medium estimate of average tons originated for the decade of 1950 is 1,100,000,000 and a possible estimate is 1,232,000,000, the railroads will have to be ready to meet not only these average conditions, but also the cyclical variations. During the decade of 1920-29, the variations were 23 percent below and 10 percent above the average of the decade. During 1930-39 the variations were 25 percent below and 35 percent above the average of the decade.

On a base average of 1,100,000,000 tons, the peak year may require capacity to carry, on the basis of 1920-29 experience, 1,209,000,000 tons, and on the basis of 1930-39 experience, 1,480,000,000 tons. On the base average tonnage originating of 1,232,000,000, the amplitude of cyclical variation will carry the tonnage in peak years to much higher levels.

The railroads as at present organized and operated are not able to meet such increased demands for service in spite of the splendid improvement in operating efficiency. They will have to expand their facilities. They will have to buy much equipment, and according to Interstate Commerce Commission studies, they will have to spend much money on maintenance of way and structures, and additions and betterments. The St. Lawrence Seaway will do no more than assist in carrying a small part of the greatly increased load in the future for which the railroads are not yet equipped.

Very truly yours,

N. R. DANIELIAN, *Director,*
St. Lawrence Survey.

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THE ST. LAWRENCE SEAWAY AND FUTURE TRANSPORTATION REQUIREMENTS

INTRODUCTION

The St. Lawrence Seaway, when constructed, will undoubtedly become an important channel of transportation in the foreign as well as coastwise and intercoastal trade of the United States. Precisely for this reason, fear is entertained in some quarters that it will result in an impairment of the usefulness of existing transportation facilities, principally the railroads. In this report, an attempt is made to estimate the importance of the St. Lawrence Seaway as a method of transportation, with particular reference to its possible effects upon the railroad system of the United States.

Any major private or public undertaking which requires large outlays for benefits which will not materialize until some time in the future imposes the necessity of making informed reasonable assumptions with regard to future demand. The seaway, undertaken immediately, would take 4 years to complete, if expedited as an emergency project, and 7 years, if pursued at a normal pace. Once constructed, it would be a permanent addition to the transportation system of the country. It is necessary, then, to evaluate the place of the St. Lawrence Seaway in the national transportation system, and to analyze its effect upon the existing systems, in the light of future demand for transportation 10, 20, or 30 years from now. It is not possible to obtain a sound evaluation of the Seaway without placing it in the perspective of the future transportation requirements of a growing population and industry. In this report, therefore, an attempt will be made to estimate the future traffic requirements of the country.

There are, mainly, five modes of freight transportation: Railroads, water carriers, motor vehicles, pipe lines, and airplanes. These five methods of transportation compete with each other for available traffic. Air transportation has not yet reached the stage where it constitutes any considerable threat to the other modes of transportation in anything but passenger and mail traffic. Of these modes of transportation the principal one to receive attention in this report will be railroads.

This report will be limited to freight transportation since the St. Lawrence Seaway will not be an important element in passenger travel.

The basic unit of measurement of freight transportation is ton-miles, which depends upon the number of tons of goods transported and the distance over which they are carried. It is necessary, therefore, to make acceptable assumptions with regard to tons of traffic and average distance of transportation, as of the time when the Seaway becomes a settled means of transportation.

The carrying capacity of the seaway when constructed will, of course, be limited to the load that can be accommodated during the open navigation season. This has been estimated to be 16 million tons a season over and above the traffic that is now utilizing the 14-foot canals on the St. Lawrence River. This traffic in recent years has amounted to between 8 and 9 million tons per season. The additional 16 million tons of traffic would be divided between the United States and Canada. It is assumed that as much as 10 million tons of this new capacity may be utilized by American interests.

The number of tons of traffic originated depends upon many factors—upon the levels of production, consumption, and foreign trade. Many forces influence the level of productive activity and the amounts of consumption and foreign trade. The size of the population is one of those influences, and the most easily predictable. Shifts in consumption habits and technological changes influence the amount of production. The most important, and the least predictable influence affecting the rate of production and consumption is the general tempo of economic activity or, to state it in stricter economic terms, the rate of employment of resources.

The second component part of demand for transportation, namely, distance over which traffic must be carried, depends upon the location of centers of production and consumption. The geographical distribution of natural resources and population, and the extent of local industrial specialization, naturally influence the distance traveled by raw materials and finished goods between source of origin and place of consumption. Relative costs of transportation and differential costs of production (including cost of labor, energy and taxes), and, finally, changes in consumer tastes that cause shifts in demand which affect the location of production, all influence the distance traveled by commodities from source to destination. Assumptions must, therefore, be made with regard to these factors in estimating future transportation requirements, with particular reference to average length of haul of freight traffic.

Traffic potentialities in the future are analyzed in this report in three sections, dealing with agricultural production, manufacturing production, and the products of mines. This is necessary since different forces operate upon these three general categories, and sources of information and the techniques of analysis must be particularized. In each case the principal purpose of the analysis is to determine, in

the light of the past behavior of these industries, what the future transportation requirements may be. As a transportation system, once built, will be available for use over many decades, the most that is necessary for the purpose of planning such a future transportation system is a conception of transportation requirements which may be approximated within wide limits over a period of years. In this report, the estimates for the future, calculated on the basis of known factors, will be presented not as definite possibilities in any given year, but mainly as an average of conditions over a decade or a score of years. The succeeding analyses pretend to offer no more than the establishment of reasonably defensible assumptions for the future within conservative limits.

The analysis of the forces that affect transportation in the three major categories of traffic—agricultural, manufactured and mineral products—are presented in chapters I, II, and III. Then in chapter IV the problem of diversion of traffic from railroads to other means of transportation is discussed. Full allowance is made for past and probable future diversion in making estimates of railroad traffic.

After the establishment of conservative estimates of future traffic possibilities the condition and carrying capacity of American railroads are briefly reviewed in chapter V. In this connection not only are the car capacity and tractive power considered, but also the efficiency factors and the maintenance expenditures over the past two decades are carefully weighed. Then, finally, the St. Lawrence Seaway is placed in the perspective of future transportation requirements of the United States, in the light of the carrying capacity, and the seasonal and cyclical behavior of railroad traffic.

CHAPTER I

TRANSPORTATION REQUIREMENTS OF AGRICULTURAL PRODUCTS

Agricultural products in 1939 originated 106,613,462 tons of freight, 11.8 percent of the total freight carried by Class I railroads, and contributed \$682,956,820 of revenue, or 20.2 percent of the total freight revenue of class I railroads. The principal agricultural commodities which accounted for this freight and revenue are listed in table 1.

With respect to future transportation needs, agricultural goods are of three kinds, each subject to separate analysis.

First, there is a large number of agricultural products for which there are available per capita consumption figures for a long number of years past. In the case of these products, therefore, the analytical problem is simplified. There are reliable estimates of future population which, in combination with per capita consumption, make it possible to arrive at reasonable estimates of future transportation requirements.

TABLE 1
Agricultural commodities transported—Class I railroads, 1939

Commodity group or class	Freight traffic originated		Freight revenue	
	Tons	Percent of total	Dollars	Percent of total
Wheat.....	22,284,550	20.9	74,839,583	11.0
Corn.....	10,342,189	9.7	33,816,722	5.0
Flour, wheat.....	8,638,491	8.1	34,361,755	5.0
Mill products, n. o. s.....	7,891,188	7.4	23,802,225	3.5
Products of agriculture, n. o. s.....	6,211,984	5.8	26,330,619	3.9
Fresh fruits.....	6,040,976	5.7	124,506,656	18.2
Sugar beets.....	5,823,460	5.5	3,763,750	.6
Fresh vegetables.....	5,779,562	5.4	101,127,160	14.8
Barley and rye.....	3,907,539	3.7	12,310,133	1.8
Cattle and calves.....	3,787,230	3.5	31,749,616	4.7
Cotton.....	3,366,871	3.1	24,185,961	3.5
Fresh meats, n. o. s.....	2,939,897	2.7	44,735,960	6.5
Oats.....	2,733,057	2.6	10,052,943	1.5
Hogs.....	2,071,316	1.9	14,924,940	2.2
Cottonseed, cottonseed meal and cake.....	1,775,093	1.7	6,110,864	.9
Animal products, n. o. s. (other than fertilizers and fertilizer materials).....	1,331,752	1.2	9,773,116	1.4
Flour, meal, and cereal.....	1,273,164	1.2	6,844,203	1.0
Dried fruits and vegetables.....	1,234,657	1.1	12,830,459	1.9
Vegetable oilcake and meal, except cottonseed.....	1,025,289	1.0	3,512,227	.5
Dairy products.....	1,019,630	1.0	17,305,735	2.5
Sheep and goats.....	940,968	.9	9,498,188	1.4
Hides and leather.....	849,363	.8	7,629,283	1.1
Tobacco, leaf.....	828,809	.8	6,644,728	1.0
Rice.....	726,686	.7	2,947,630	.4
Packinghouse products, edible, n. o. s., not including canned meats.....	646,565	.6	7,628,730	1.1
Hay, alfalfa, and straw.....	624,459	.6	3,600,075	.5

TABLE 1—Continued

Agricultural commodities transported—Class I railroads, 1939—Continued

Commodity group or class	Freight traffic originated		Freight revenue	
	Tons	Percent of total	Dollars	Percent of total
Flaxseed.....	543,939	0.5	1,799,732	0.3
Meats, cured, dried, or smoked.....	499,363	.5	7,611,096	1.1
Wool.....	294,885	.3	4,666,421	.7
Poultry, live and dressed.....	279,241	.3	6,422,482	.9
Meal, corn.....	234,457	.2	774,542	.1
Fish or sea animal oil.....	213,608	.2	1,569,383	.2
Peanuts.....	204,234	.2	2,167,009	.3
Horses, mules, ponies and asses.....	152,243	.1	2,255,588	.3
Grain, n. o. s.....	73,462	.1	347,048	.1
Butterine and margarine.....	20,399	(¹)	366,878	.1
Animals, live, n. o. s.....	2,886	(¹)	43,920	(¹)
Total, agricultural products.....	106,613,462	100.0	682,956,820	100.0

¹ Less than one-tenth of 1 percent.SOURCE: Interstate Commerce Commission, Bureau of Statistics, *Freight Commodity Statistics of Class I Steam Railways in the U. S.*, calendar year 1939.

A second category of agricultural products enters into consumption only after going through processing and manufacturing operations. In this category are, for example, almost all the vegetable and animal oils. In the case of these products, the analysis applied in this section attempts to arrive at per capita consumption equivalents or to study, by other methods, future developments in consumption and industrial uses.

In third place, there is the problem of exportable agricultural products. This requires separate study, since the forces bearing upon the export movement of American agricultural products are variable and, in the present state of the world, not easily predictable.

In the following sections of this chapter these different classes of traffic in agricultural products are examined.

Section 1

DOMESTIC CONSUMPTION OF FOODSTUFFS

Per capita consumption of foodstuffs has been studied by the Bureau of Agricultural Economics and the Agricultural Adjustment Administration.¹ The amount of foodstuffs available for sale in the retail market has first been determined, and this amount has been converted to a per capita basis.² The results of the investigations are presented in table 2.

¹ *The Agricultural Situation*, January 1939, p. 15.² The general method of computation used by the Bureau of Agricultural Economics (as used for individual products) was to consider production of the commodity in any year, make allowances for changes in the stocks of that commodity during the course of the year, subtract exports, add imports, and allow for farm consumption and waste in transport. The result of that computation is called amount available for sale in the retail market.

Inspection of this table shows that total per capita consumption of the principal food products has been almost unchanged over the period studied, 1920-38. The fact that even in two periods with such violent changes in general business conditions as occurred between 1925-29 and 1930-35, per capita food consumption changed less than 3 percent, indicates that this stability of consumption will probably be characteristic of the future.

It should not be concluded from this, however, that total traffic in agricultural products destined for human consumption will increase in the future no more than proportionately to the increase in population.

TABLE 2

Apparent per capita consumption of principal agricultural products, 1920-38[Pounds per capita per year]¹

Commodity or group	Period				
	1920-38	1920-24	1925-29	1930-35	1934-38
Cereal products.....	215	228	226	211	196
All potatoes.....	163	172	163	157	159
Sugar and sirup.....	110	106	118	107	108
Dairy products:					
Manufactured.....	43	38	43	43	47
Fruits:					
Fresh ²	197	185	201	196	206
Dried.....	6	6	6	6	6
Vegetables ³	139	122	135	141	160
Lean meats and fish.....	131	137	133	129	126
Eggs.....	30	28	32	32	30
Beans, peas, nuts.....	14	11	14	16	16
Fats (excl. butter).....	46	44	47	47	46
Coffee, tea, spices, and chocolate.....	17	16	17	18	19
Total food.....	1,141	1,093	1,135	1,102	1,119

¹ Consumption of foodstuffs in terms of estimated weight available for sale in retail market.

² Fresh and canned fruit in terms of fresh fruit, on basis of total population, consumption of watermelons and cantaloupes per urban inhabitant.

³ Fresh and canned vegetables in terms of fresh. Vegetables for market only, based on urban population, except onions. Onions and all others based on total population.

SOURCE: United States Department of Agriculture, Bureau of Agricultural Economics. Adopted from *Agricultural Situation*, January 1939, p. 15.

Such a limited increase would exist only if the following conditions were to exist or if departures from these conditions were in opposite directions in such amounts as to counterbalance each other precisely and leave the sum total of their effects unchanged:

1. Both production and consumption of agricultural-marketed foodstuffs are distributed relatively in the same geographic pattern as at present;
2. The relative consumption of raw goods and of processed foods do not change;
3. There is no improvement in the waste factor in processing of foods;
4. No new uses for existing waste products are discovered;