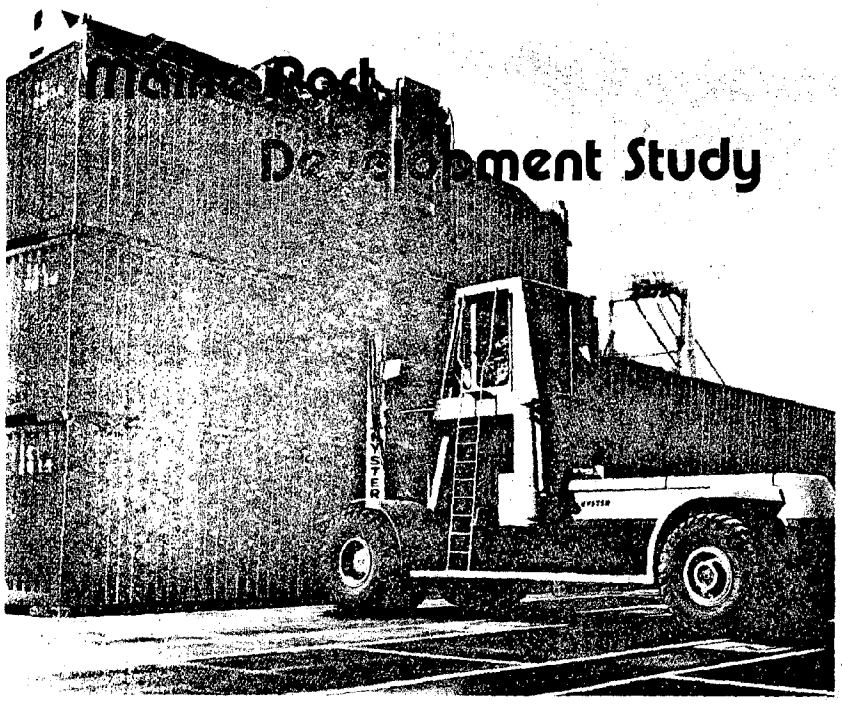
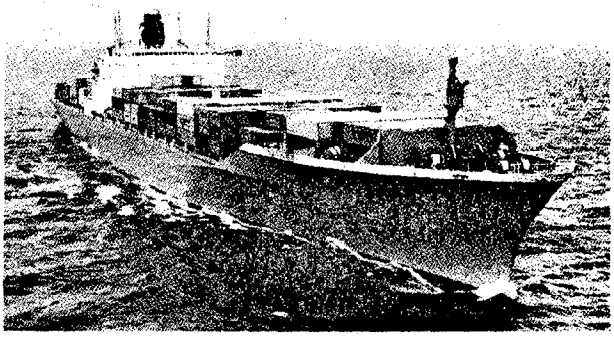




Feasibility Study of the Development of Cargo Handling Facilities at Maine Ports

Maine Department of Transportation

Fay, Spofford & Thorndike, Inc.
Engineers Boston
January 1978

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

Maine. Coastal Zone Management Program
HE554.A3 F39 1978

COASTAL ZONE
INFORMATION CENTER

FEASIBILITY STUDY OF THE DEVELOPMENT OF CARGO HANDLING FACILITIES AT MAINE PORTS

Submitted to
the
Maine Department of Transportation
and the
Maine State Planning Office

by
Fay, Spofford & Thorndike, Inc., Engineers
with assistance from
Economics Research Associates

Boston

January, 1978

This Report is part of the Coastal Program of the State of Maine. Financial assistance has been provided by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972.

TABLE OF CONTENTS

		Page
	SUMMARY	vii
CHAPTER 1	STATEMENT OF THE ISSUE	1-1
CHAPTER 2	BACKGROUND	2-1
CHAPTER 3	ANALYSIS	3-1
3.1	Port and Harbor Characteristics	3-1
3.2	Layout of a Modern Port Facility	3-13
3.3	Market Demand and Opportunities for Expanded Port Activity	3-17
3.4	Export Trends in Pulp, Paper and Paperboard Products	3-81
3.5	Market Demand and Opportunities for Expanded Port Activity-Summary Findings	3-88
CHAPTER 4	ALTERNATIVE COURSES OF ACTION	4-1
4.1	Market and Site Analysis Implications	4-1
4.2	Alternative Development Options	4-6
4.3	Summary	4-19
CHAPTER 5	RECOMMENDATIONS	5-1
5.1	Selection of a Site	5-1
5.2	Description of New Cargo Facilities at Sears Island	5-7
5.3	Estimated Construction Cost of the Sears Island Facility	5-17
5.4	Economic Impact of Port Facilities Investments in Maine	5-20
5.5	Financing Port Improvements	5-29
5.6	Cargo Potential at Sears Island	5-35
5.7	Operation of the Port	5-40
5.8	Support by Maine's Industries	5-45

LIST OF FIGURES

Figure		Page
3.1	Location of Port Communities Under Study	3-3
3.2	Typical Modern Port Layout	3-15
3.3	Major Exports of Maine Pulp, Paper and Paperboard Mill Products Reported in 1976	3-32
3.4	Representative Export Movements of Miscellaneous Forest Products Reported by Several Maine Manufacturing Firms, 1976	3-33
3.5	Foreign Exports of Pulp (TCC 2611) from North Atlantic Ports	3-36
3.6	Foreign Exports of Paper and Paperboard (TCC 2631) from North Atlantic Ports	3-37
3.7	Foreign Exports of Newsprint (TCC 2621) from North Atlantic Ports	3-39
3.8	Potato Processing Plants	3-44
3.9	Representative Export Movements of Maine Potato Products as Reported by Several Firms, 1976	3-45
3.10	Representative Export Movements of Maine Fish Products as Reported by Several Firms, 1976	3-47
3.11	Major Canned Fish and Seafood Processing Plants	3-48
3.12	Representative Export Movements of Containerized Cargo as Reported by Several Maine Firms (Exclusive of Forest Products and Potato Products), 1976	3-50
3.13	Representative Imports of Foodstuffs as Reported by Several Maine Manufacturing Companies, 1976	3-52
3.14	Representative Import Movements of Wool as Reported by Several Maine Textile Companies, 1976	3-53
3.15	Approximate Geographic Area within which Maine's Two Principal Ports Offer Relative Distance Advantage Over Other Ocean Ports	3-66

LIST OF FIGURES (Cont'd)

Figure		Page
3.16	Geographic Zones and Representative Port Traffic in 1976	3-68
3.17	Employment in Paper and Allied Products Industries, (SIC 26) 1975	3-82
4.1	Potential Port Development Sites in Searsport	4-9
4.2	Potential Port Development Sites in Portland	4-12
5.1	Proposed Sears Island Site	5-10
5.2	Cargo Port Apron Details	5-11
5.3	Typical Cross Section at Paper Transit Shed	5-13
5.4	Cross Section--Access Embankment	5-14
5.5	Sears Island Port Layout	5-16

LIST OF TABLES

Table		Page
3.1	Port Evaluation	3-4
3.2	Waterborne Commerce by Principal Commodity at Portland Harbor	3-20
3.3	Waterborne Commerce by Principal Commodity at Searsport Harbor	3-22
3.4	Commodities Shipped Through the Port of Portland, 1975	3-23
3.5	Commodities Shipped Through the Port of Searsport, 1975	3-24
3.6	State of Maine Imports, 1976	3-27
3.7	State of Maine Exports, 1976	3-28
3.8	Selected Commodities Shipped to Foreign Destinations Through Major United States Atlantic Ports, 1975	3-35
3.9	Selected Commodities Shipped to Foreign Destinations Through Major Canadian Atlantic Ports, 1975	3-41
3.10	State of Maine Imports, 1976	3-56
3.11	State of Maine Exports, 1976	3-58
3.12	Comparison of Cargo Potential at One or More Maine Ports and Cargo Handled at Competing Ports in 1975	3-78
3.13	Trends in U.S. Exports: Selected Pulp, Paper, and Paperboard Products	3-84
3.14	Summary of Pulp, Paper, and Paperboard Exports from Canadian Atlantic Ports, 1975	3-85
3.15	Major Pulp, Paper and Paperboard Shipments from Canadian Atlantic Ports to Foreign Destinations, 1975	3-86
5.1	Estimated Construction Cost for Sears Island Facility	5-18
5.2	Manufacturing Industries Placing a Significant Value on Access to Waterborne Commerce	5-30
5.3	Examples of EDA Participation in Port Facilities Development	5-36

SUMMARY

The purpose of this study has been to determine the potential for new or expanded port cargo-handling facilities in Maine. Particular emphasis has been placed on a facility with the capability of handling the wide range of forest products produced in the state. A major impetus for this study was the State's desire to have more of its exports and imports move through Maine's ports, if such movement could be found to be practical and economical. Both engineering and economic considerations have been closely coordinated throughout the course of the study.

Existing ports which presently handle general cargo were examined for their suitability as the site for a port development project. Each was evaluated regarding such characteristics as existing cargo facilities, land availability for new or expanded facilities, highway and rail access, depth of water, and availability of other port-related services. These investigations revealed that the Portland and Searsport areas are most suitable as a site for a cargo port development project, whether it be a new or expanded facility.

The economic analysis has determined that forest products and related materials, as well as agricultural products, constitute a very large portion of Maine's export and import traffic. However, a significant percentage of this traffic, particularly export traffic, is presently moving through ports other than those in Maine, such as Saint John, Boston, and New York. Within Maine, Searsport has been found to handle far more general cargo than any other port in

the state.

Examination of the hinterland potential of Maine's ports has revealed that, for all practical purposes, they will be limited to that cargo originating from or destined to Maine. Various factors, including advantages which other ports can offer with regard to such considerations as rates and steamship schedules, etc., preclude this potential hinterland cargo, particularly that from Canada, from probably ever moving through Maine's ports. Within Maine, the port of Searsport offers a three-to-one advantage over Portland, on a geographical basis, in the amount of cargo which could reasonably be attracted.

Five alternative courses of action have been suggested with regard to future port development, based on the results of the engineering and marketing analyses. These include: (1) a new facility at Searsport, (2) upgrading the existing facilities at Searsport, (3) a new facility at one of two locations in Portland, (4) upgrading of the existing Maine State Pier in Portland, and (5) the "no-build" or "do-nothing" alternative, whereby no new active port development strategy would be encouraged or followed by the state. Implications of each alternative have been examined, with the result being the recommendation that a new facility be constructed at Searsport.

The site chosen for a new cargo terminal at Searsport is on the southwest corner of Sears Island. The proposed facility consists of a 1,200-foot berthing area and apron connected to the island by a 2,300-foot embankment, on which containers can be stored. Both rail and highway access are provided. A paper transit shed, a general cargo transit shed, and a freezer facility have been located

on the apron. The administrative complex is located on the island itself, which has an additional 300-plus acres available for port-related development. The construction cost of the proposed facility has been estimated to be approximately $41 million, of which approximately $25 million could be directly spent within the State of Maine for labor and construction materials. The benefit to the economy of Maine from this expenditure could be expected to be $58.7 million when indirect impacts are also taken into consideration. Not all of the costs of port development are expected to be borne by the State of Maine. Private interests could be anticipated to share in some costs, leaving the State with approximately $29 million to finance. Assuming a 6 per cent interest rate over a 25 year payback period results in a present value of constructions costs of approximately $56 million. Thus, the benefit-cost ratio for the State's investment in port development <u>from construction expenditures alone</u> is 1.05. This does not include benefits from continuing jobs provided at an expanded cargo port, benefits to Maine industries from lowered shipping costs, or benefits from possible expanded production by existing or new industries.

Potential sources of State funding for the port development include general obligation bonds and revenue bonds, although the former method is preferable. Development could potentially be aided by grants, loans, and/or development financing guarantees available through the U.S. Economic Development Administration. In addition, the State of Maine should actively solicit the financial participation of local industries.

It is recommended that the port operation be contracted to a stevedore, since these organizations have the most experience in

port operations. It is too early at this time to predict accurate port operating costs.

Development of a major new cargo facility should only be carried out with the active support of the State's largest industries, as they would receive the most direct benefit from a new port. If these industries are not willing to fully support the new port, it should not be constructed.

CHAPTER 1 STATEMENT OF THE ISSUE

This study has been conducted to determine the potential for the development of new or the modification of existing cargo-handling facilities at Maine ports. Particular emphasis has been placed on the examination of the potential for a terminal facility that has the specific capability of handling the wide range of forest products that are exported from the State of Maine, yet maintains flexibility with respect to the handling of other cargo types. Particular questions which this study has addressed include the following:

(1) Is there sufficient long-range potential for general cargo-shipping through Maine ports to justify additional facilities or to modify or expand existing facilities?

(2) What commodities might be shipped through Maine ports, from what origins, and under what conditions?

(3) What will the role of forest products be in cargo port development?

(4) Where in Maine should new (if any) cargo port facilities be located?

(5) If otherwise feasible, what specific port sites and facilities would be most suitable for developing forest-products port traffic?

(6) What are the general characteristics of facilities, operations, and technologies which might be employed in a cargo terminal, and specifically a forest-products terminal?

(7) What are the estimated costs and economic benefits of such a forest-products terminal?

CHAPTER 2 BACKGROUND

In December of 1976, the Maine Department of Transportation and the Maine State Planning Office executed an agreement to begin a Port Planning and Development Program. This program has three objectives: (1) to provide the State with information about the current condition of port facilities in Maine, (2) to identify and evaluate possible port development opportunities in Maine, and (3) to prepare both short- and long-range capital improvement plans.

The program has been divided into two phases. Phase One has been completed and includes an inventory of major port facilities, the identification of short-range facility needs based on obvious demands, and the identification of future studies needed to assess Maine's long-range port potential. This report is part of Phase Two of the program and has the objective of analyzing cargo port development. Other tasks being performed during Phase Two include the completion of the inventory work for most ports, an analysis of the State's role and policy in port planning and development, and a detailed analysis of future facility needs for the fishing and recreational industries.

The Phase One work effort has identified forest products (paper, pulp) as the major Maine export and cargo-port development opportunity. Accordingly, one of the major thrusts of this study has been the investigation of facilities able to effectively handle the movement of such products. The analysis of other product movements or cargo types, however, has not been excluded, due

to the desire to maintain facility flexibility relative to the handling of all possible future types of general cargo.

In the year 1976, Maine's combined imports and exports totaled approximately 29 million tons, of which 28 million tons was petroleum and petroleum products. Imported products other than petroleum (amounting to approximately 230,000 tons in 1976) include salt, caustic soda, tapioca, gypsum, sardines, and lumber. Most of this tonnage (86 per cent) is moved through Maine ports. However, only slightly more than one-half of Maine's exports (a total of approximately 484,000 tons in 1976) are handled at ports in Maine. Dominant exports from Maine are, as could be expected, forest products and food products.

There has been increasing concern about the volume of goods produced in Maine and exported, or destined for Maine as imports, which move by ship but which do not pass through Maine ports. Instead, these goods are being handled at other east-coast and Canadian ports including St. John, Boston, New York, Philadelphia, and even Baltimore. The reasons behind this use of other ports are many, but the end result is that Maine is losing the opportunity for handling this cargo along with the economic benefits associated with it, such as increased employment, tax revenues, potential for industrial development, etc. Accordingly, the State would like to see its ports capture more of this traffic, but only if a feasible port development plan can be developed.

The handling of large volumes of dry cargo through Maine ports is hampered by a number of problems. The following quotations effectively touch upon some of these problems: "Containerization,

which only a few years ago was an innovative shipping technique, has now become a vital part of international commerce. Its cost efficiency...is the single most significant factor which has again developed sharp competition between nations, ports, and ocean carriers. Survival in the world trade is totally dependent upon the ability of each to adapt to the technical requirements of the mode."[1]

"...a transportation revolution of immense importance to international trade commenced when intermodal technology was formally introduced to the European trades in 1966 after having been fully tested on the United States domestic trade routes for ten years....We must acknowledge that these are indeed giant challenges that must be met during the next five to ten years.... During that short time frame, a second generation of ships, containers, and trailers will be either on the planning board or already built. New opportunities will emerge on trade routes not presently open to intermodal transport and will necessitate enormous capital commitments. The vast capital investments committed to date, amounting to billions of dollars, and the replacement costs for the new generation of equipment, as well as the ongoing replacement of rail and highway equipment, focus clearly on the dimensions of the challenges ahead."[2]

"In the short space of ten years, the United States' general cargo ports have been virtually rebuilt on the Atlantic, Pacific, and Gulf Coasts and are being rebuilt on the Great Lakes. Many of the smaller U.S. ports lost their traditional breakbulk trades

---

[1]Port of Boston Handbook 1977-1978, Boston Shipping Association, Inc., 1977.

[2]R.D. Carter, Carter Transport Associates: Transport 2000, March/April 1977.

in the process. All major ports are in the container trades. Smaller ports survive by specialization without containers, but their opportunities are limited."[3]

One of the key ideas from the preceding quotations concerns the "revolution" which has taken place in marine cargo-shipping--a revolution with which the ports in Maine have generally failed to keep pace. Maine's ports were designed to meet the needs of another era and have not been able to adequately adapt to meeting the requirements of modern shipping. This study addresses the feasibility of making Maine a more active participant in this shipping revolution.

The following chapter of this report includes an analysis of existing conditions with regard to both port facilities and goods movements. The port facilities analysis includes such topics as availability of land for expansion, rail and highway access, depths of channels, and, of course, a brief description of what specific dry-cargo-handling facilities are in use today. The goods-movement analysis includes a description of the types and quantities of products being imported and exported today as well as a discussion regarding the prospects of attracting these goods and others to Maine ports.

Chapter 4 is a presentation of the alternative courses of action, and their implications, which result from the port-facilities and marketing analyses described in Chapter 3. Included is the option of no action. Finally, specific port-facility

---

[3]"Advocacy in the Board Room," by Thomas T. Soules, President, American Association of Port Authorities: American Seaport, August, 1977.

recommendations for a cargo facility optimized to serve the forest-products industry but able to accommodate all types of general cargo are offered in Chapter 5. These include a port site and facility configuration, port facility operational characteristics, the costs and benefits associated with port operation, and an analysis of the State's role in the planning and operation of such a facility.

CHAPTER 3 ANALYSIS

This chapter includes two major sections dealing with maritime activity in Maine today as it relates to dry cargo. The first section discusses existing port and harbor characteristics, with emphasis on Portland and Searsport. Included is a discussion of a layout of a typical modern port facility able to effectively handle containers, forest products, general cargo, and dry bulk cargo. The second section of this chapter describes an analysis of market opportunities for a cargo port in Maine, including a description of existing goods movements. Information contained in these sections will be used as the basis for the selection of a location for the development of new and/or additional cargo-handling facilities.

3.1 Port and Harbor Characteristics

Today Maine has two major ports which handle significant volumes of cargo. These ports are Portland and Searsport. In 1975 Portland handled approximately 27.5 million short tons of cargo, of which more than 99 per cent was petroleum or petroleum products. Only approximately 50,000 short tons of general cargo moved through Portland during that year, which included 14,000 tons of fish and 23,000 tons of asphalt. Searsport's total tonnage for 1975 was much less than Portland's, at a total of 1,366,000 short tons. Like Portland, most of this tonnage was petroleum or petroleum products. However, Searsport's volume of general cargo during 1975 was 5 to 6 times (260,000 tons) that of Portland

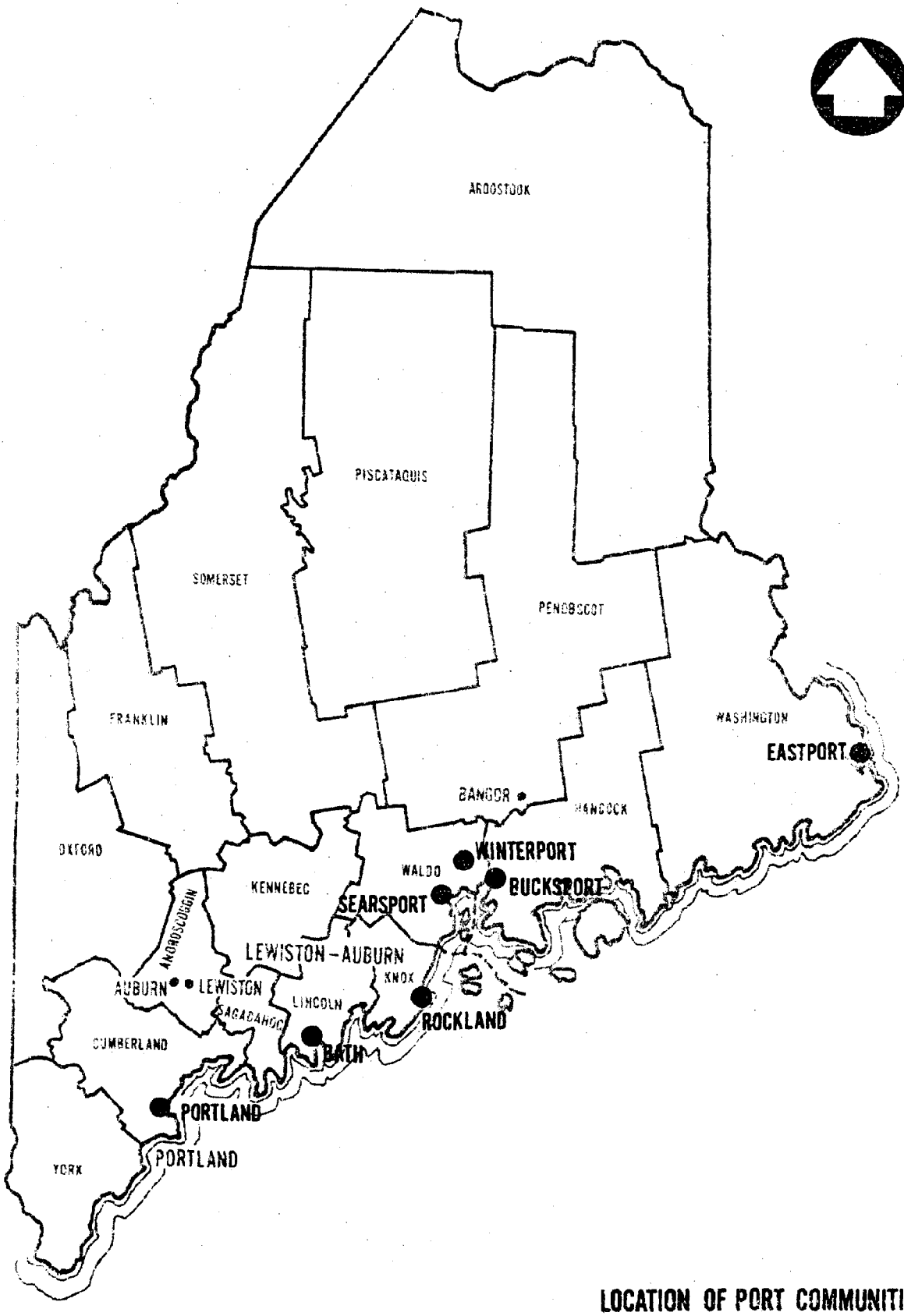
during the same year. Because these two ports are by far the most active cargo ports in Maine today, they will receive primary attention in this analysis. However, several other ports will be discussed, including Eastport, Bucksport, Winterport, Rockland, and Bath. The ports of Bangor and Brewer will not be discussed in great detail as they presently handle only petroleum and petroleum products. Additionally, it is unlikely that they would ever develop major general cargo handling facilities because of their location at the head of navigation of the Penobscot River, which in that area is generally too shallow for large oceangoing vessels. Figure 3.1 shows the relative locations of these communities within Maine.

Existing Cargo Facilities and Land Availability

The availability of existing facilities is certainly an item that merits investigation, but is not critical, as an improved port might rely on completely new facilities. More important, perhaps, is the availability of land for development. Table 3.1 summarizes the existing facilities at a number of ports in Maine and also highlights available land at each location.

From Table 3.1 it can be seen that the only two ports with major existing dry cargo handling facilities are Portland and Searsport. Several other ports have minor facilities of various types.

In Portland, the only dry cargo facility currently in use is the Maine State Pier, a facility largely inadequate for today's needs, although it has been maintained in good condition. Its inadequacy is due largely to its low load-carrying capacity. Facilities of its type were generally designed to support loads



LOCATION OF PORT COMMUNITIES
UNDER STUDY

Figure 3.1

Table 3.1

Port Evaluation

Municipality	Existing Dry-Cargo Facilities	Suitable Land Availability	Rail Access	Highway Access	Depth of Water
Portland	Maine State Pier	2 Sites, Can. Nat./ MDOT, PT#3	Good, 4 RR's.	Good-Excellent I-295	Outer Channel 45' Inner Channel 35'
Searsport	B&A Sprague	Sears Island	Searsport-- good. Island-- new connection.	Fair-- Route 1 New access required at Sears Island	Channel 35' Deeper off Sears Island
Bath	Limited	No suitable	Good	Fair-Good Route 1 I-95 nearby	Shipyard 32'
Rockland	None	No suitable	Good	Fair-Poor Route 1 Tourist section	Channel 18'
Bucksport	Paper Mill Wharf	No suitable	Good	Fair Route 1 I-95, 35 miles	34' at Petroleum Pier 24' at Papermill
Winterport	Limited	No suitable	Poor	Fair Route 1A I-95, 15 miles	28'
Eastport	Limited	Industrial Park Land Available	Good but abandonment possible	Poor I-95 over 100 miles away	28' at Breakwater Very deep water close to shore

in the vicinity of 500 pounds per square foot and 20-ton capacity truck cranes. Today, it is not uncommon to design piers with the ability to support 1,200 pounds per square foot and able to accommodate 200-ton-capacity truck cranes. Other facilities in Portland include the former Portland Terminal No. 1, a general cargo pier but now used as the International Ferry Terminal and Portland Terminal No. 3, an inactive bulk handling pier.

There appears to be two sites in the Portland area which could conceivably be developed as a major dry-cargo site. One site is at the location of the former Canadian National piers. A portion of this property is now owned by the Maine Department of Transportation. The site covers approximately 50 acres, although much of this area is water. The property is generally surrounded on the land side by various industrial facilities. The second site is the Portland Terminal No. 3 property, located upstream from the "Million Dollar Bridge." This property, owned by the Maine Central Railroad, covers approximately 50 acres and is long and narrow in shape. This shape, along with the railroad right-of-way running through it for its entire length, somewhat detracts from the value of the property for use as a major port facility. In addition, the channel is located close to shore in this area, which could result in conflicts between ships at the berth and ships in the channel unless a reduction in land area for the shore facility was made.

There are two major existing piers at this location, one owned by the Bangor and Aroostook Railroad and the other by the C. H. Sprague Company. The B&A pier handles dry cargo and petroleum while the Sprague facility handles dry bulk and petroleum.

As with the Maine State Pier, both of these facilities are largely inadequate by today's standards.

There is only a limited amount of land available at Searsport for the development of a new cargo terminal. However, on nearby Sears Island there would be over 300 acres of land which could be used for port purposes. Part of Sears Island has been reserved by the Central Maine Power Company for the location of a coal-fired electric generating plant. The remainder of the island is generally available. A possible detrimental aspect of this location, however, is the distance from the island's shoreline to deep water, a distance of approximately 2,000 feet.

As stated previously, several other ports in Maine handle or have handled some dry cargo. Winterport sees shipments of agricultrual products, particularly potatoes and potato products while Bath receives occasional shipments of road salt. Bucksport has shipped some forest products in the past and receives petroleum. The Bangor-Brewer area also receives petroleum. Most of the facilities at these ports are private, specialized facilities, not suitable for major sustained dry cargo-handling operations by large oceangoing vessels.

With few exceptions, there does not appear to be suitable land available at these locations for the development of a major cargo facility. Eastport, however, does have a 50-acre industrial park site on the waterfront which could be used as a port site. There is deep water immediately offshore from this location.

Rail Access

Rail access to a port site is an extremely important

consideration in selecting a port cargo facility location, especially since the advent of containerization, as many loaded containers may travel by rail. Rail access is also highly desirable for large bulk shipments and as a public-relations selling point, in that it provides the opportunity to remove many large trucks from the area's highways. Table 3.1 briefly highlights the rail access situation for the port locations under study.

The Portland waterfront is directly served by two railroad companies--the Portland Terminal and the Canadian National. Service to many of the existing wharves is provided by these two railroads by means of a track running down the center of Commercial Street. The Portland Terminal is a wholly-owned subsidiary of the Maine Central Railroad and performs a switching/interchange function in the Portland area, connecting the Maine Central, Canadian National, and Boston & Maine railroads. Track conditions vary throughout the Portland area but could be considered to be in only fair-good condition in the area of the waterfront. From the Portland area, however, good rail connections can be made in all directions.

The existing port facilities at Searsport are directly served by a line of the Bangor and Aroostook Railroad from Northern Maine Junction (Bangor area). The railroad owns much of the property on the Searsport waterfront area, including the existing dry cargo pier. The railroad also owns Sears Island, on which the Central Maine Power Company plans to construct a major coal-fired generating facility. Plans for this facility include rail access to this island. The line from Northern Maine Junction to

Searsport is in fair-to-good condition and is maintained to allow speeds of 40 miles per hour. Connections to all points can be made at Northern Maine Junction (Maine Central Railroad), Brownsville Junction (Canadian Pacific Railroad) and St. Leonard, N.B. (Canadian National Railroad).

All of the ports being investigated in this study, with the exception of Winterport, currently receive direct rail access to their waterfronts, which is provided over various branches of the Maine Central Railroad. The line to Eastport, which in turn connects with another branch from Bangor to Calais, is in poor condition with abandonment proceedings pending before the ICC. Bucksport receives service over a branch from Brewer Junction. Rockland and Bath are both located on the same branch line which originates in Brunswick. These latter two lines are both in fair to good condition. The closest rail service to Winterport is the Searsport branch of the Bangor and Aroostock Railroad, located two to three miles from the waterfront at that location.

From an operational standpoint, none of the railroad lines investigated appear to be operating at or even close to capacity. Accordingly, it can be assumed that additional traffic flows which would be associated with an expanded port development operation could be handled by the railroads with relative ease.

A factor to consider in the selection of a cargo port site is the relatively high cost of new railroad construction, especially where a right-of-way through a developed area would be required. This fact would tend to exclude from further consideration any site not already directly served by rail or located

close to an existing rail line.

Highway Access

As with rail access, an important consideration in the selection of a port site is its accessibility to highway transportation. A good roadway network serving the port and its waterfront is a definite prerequisite. While a four or six-lane divided facility directly on to the pier is not required, rapid access to such a facility is certainly essential. A good highway network ensures that goods bound to and from the port by truck can move efficiently. Comments on the existing highway networks in the study areas are contained in Table 3.1.

The Portland area has excellent highway access opportunities. The city is directly served by a multitude of highways, including the Interstate System (I-95 and I-295). Access to the Interstate System (I-295) from the Portland waterfront is less than one mile away by Commercial Street and St. John Street or Franklin Street. The Portland waterfront itself is served by Commercial Street. This street, although wide, is often partially obstructed by parked trucks and moving railroad trains. The street is in need of upgrading and improved traffic-control measures.

Access by highway to Searsport is fair. It is located on U.S. Route 1 and, in addition, is also served by several State highways in the area. Access to the Interstate System is at Bangor (30 miles away) or Augusta (55 miles away). The existing waterfront facilities at Searsport are presently served by a narrow two-lane road not designed to handle substantial traffic. Access to the Bangor and Aroostook pier from this road is poor. An

even narrower road, part of it unpaved, presently extends from U.S. Route 1 to the isthmus connecting Sears Island to the mainland.

Highway access opportunities to the remaining ports under study vary considerably by site. For example, access to the Eastport area served primarily by U.S. Route 1, a two-lane facility and State Route 190 is poor, as the nearest interchange with the Interstate System is over 100 miles away. The Bucksport and Winterport areas have fair highway access, being located on U.S. Routes 1 and 1A, respectively, with travel time to the Interstate System being about a half hour. Access to Rockland could be rated as only fair. It is located along a busy (tourist-oriented) section of U.S. Route 1 with the nearest Interstate interchange some 45 miles away. The highway network in the Bath area is good to excellent with the Interstate System being less than 10 miles away in Brunswick, by means of an upgraded four-lane section of U.S. Route 1.

It should be noted that in regard to both highway and rail access one of the critical factors that will be involved in the decision regarding a port location will be the consideration of where the products which could be expected to be shipped through the port are coming from or going to.

Depth of Water

An issue which certainly should be considered in the selection of a port site is the depth of water, particularly in any access channels and alongside piers at the present time, and the practicality of achieving deeper water should it be warranted

at some time in the future. The trend today is toward larger and deeper-draft vessels of all types, whether they be container ships or colliers. Table 3.1 summarizes existing conditions at the various locations.

Portland is a "deepwater" port able to accommodate large oceangoing vessels. A 45-foot channel runs from the sea to Fort Gorges. Above Fort Gorges the channel is 35 feet to the Portland Bridge, beyond which the channel rapidly becomes more shallow. The mean range of the tide in Portland is 9.0 feet. There are proposals before the U.S. Army Corps of Engineers to deepen the channel in the Fore River.

Searsport is another deepwater port which frequently handles large oceangoing vessels. Water depths of greater than 40 feet can be found to within one mile of Mack Point, the location of the existing Bangor and Aroostook and C.H. Sprague facilities. The controlling depth within the access channel is 35 feet. Water depths of greater than 40 feet can be found approximately 2,000 feet or less offshore from Sears Island.

Bucksport and Bath are able to accommodate large oceangoing vessels, as is Winterport to some extent, although Winterport is more severely limited in vessel size because of depths in the Penobscot River. Rockland is not able to accept oceangoing cargo ships, as its approach channel is only 18 feet deep. While the depth of water alongside the breakwater in Eastport is only approximately 20 feet, very deep water can be found immediately offshore.

The fact that a particular cargo port site does not

currently have sufficient water depth in any access channels and/or alongside the piers does not automatically eliminate it from further consideration, as it is always possible to provide greater depth through dredging. However, the costs and environmental considerations associated with dredging often make such action undesirable, especially if there are alternative sites with sufficient water depth available.

Port Related Services

In addition to the piers, transit sheds, cranes, forklifts, transportation, etc., needed for the direct service of cargo vessels, there are a number of services which such ships require. Some such services are relatively easy to provide and do not in general require major capital investments. The provision of customs and immigration officials are an example. These officials are currently based at several locations in Maine but could easily travel (as they do now) to other locations as required. Other services, however, may be much more difficult to provide and do require large capital investments. An example of this type of service is towboats (tugboats). At present, there are towboats based only in Portland and Belfast. The Portland towboats additionally serve Bath as well as the Portland/South Portland complex. The Belfast towboats handle Penobscot Bay, with Searsport and Bucksport being the primary ports served. While these towboat companies could theoretically serve other ports in Maine, the travel distances involved, and the associated costs, would tend to make such operations impractical. Such would be the case for Eastport, and to a lesser degree, Rockland.

There are, of course, other examples of services required by oceangoing vessels while in port. They range from fresh water supplies to vessel repairs. All of these factors should be taken into consideration in selecting a port site.

3.2 Layout of a Modern Port Facility

As an integral part of this port analysis study, a layout for a typical modern cargo facility has been prepared for illustrative purposes. This layout has been prepared with the handling of forest-related products as its chief function, but again with physical and operational flexibility to accommodate other types of dry cargo. As shown in Figure 3.2, it includes facilities for handling containerized cargoes, break-bulk, and other dry bulk cargoes, such as coal. It should be noted that the layout as shown has not yet been site-adapted for any port in Maine, nor are all of the facilities shown, and the magnitudes of such, necessarily required.

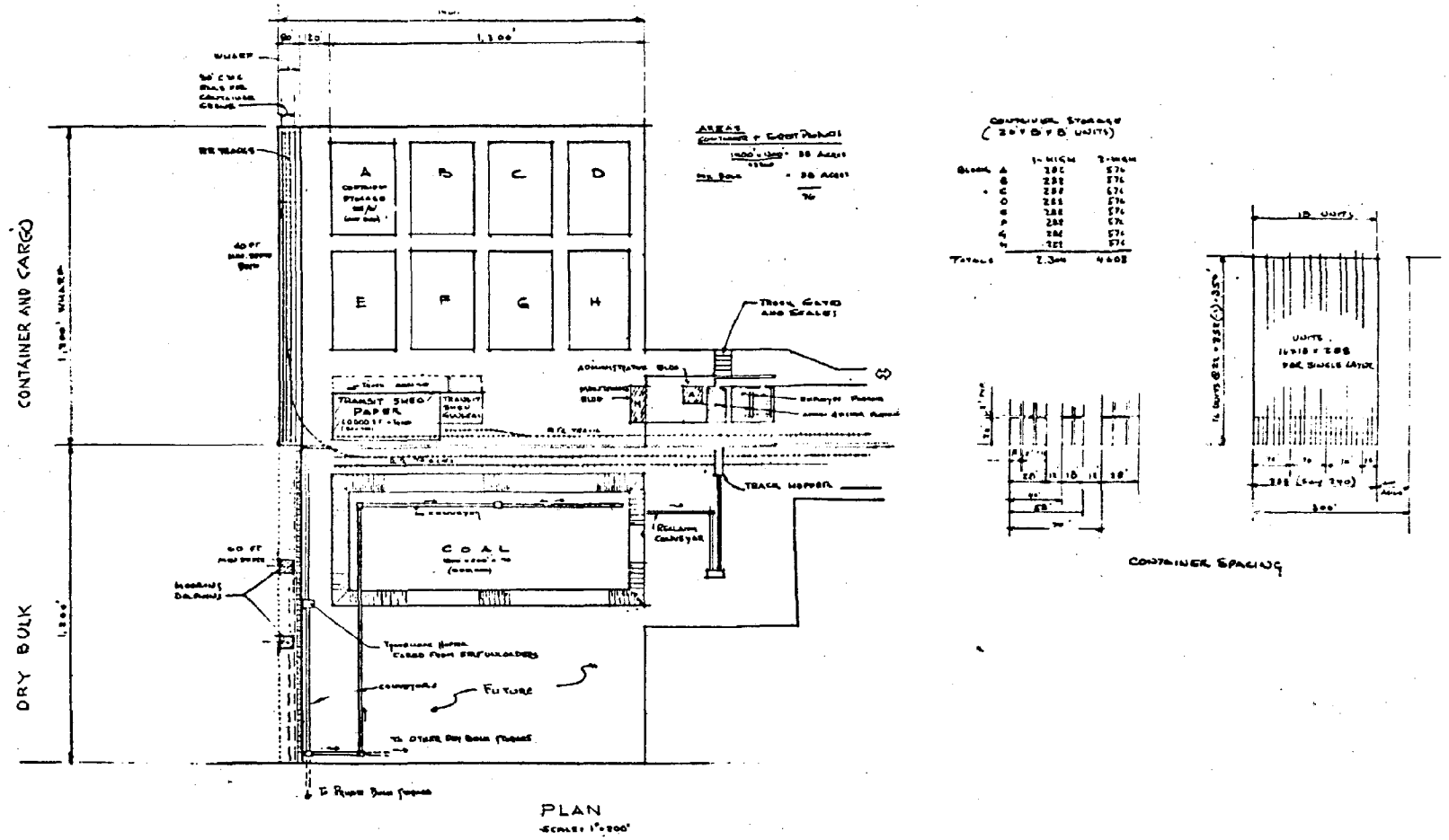
The typical layout plan features two berths. One berth is at a 1,200-foot wharf, which includes provisions for 50-foot center-to-center rails for a container crane. This length of wharf could conceivably allow for the berthing of two small ships simultaneously or one larger ship. The minimum depth alongside the wharf is 40 feet. The second berth shown is a 1,200-foot berth intended for dry bulk. Mooring dolphins are utilized instead of a wharf since a loading/unloading platform is not required. The depth alongside this berth is shown to be 60 feet in order to accommodate the very large bulk carriers now in service and planned for the future. These bulk carriers would carry such items as coal or other similar products.

The container storage yard consists of eight separate areas, lettered A through H on the plan. Each of these areas is approximately 350 feet by 240 feet (not including the aisles between them) and is capable of accommodating 288 twenty-foot containers, assuming that they are stacked only one high. Details of the container spacing arrangements within each area are also shown on the plan. The total container storage area would not necessarily have to be constructed initially; various incremental staging schemes are possible.

Also located near the wharf are two transit sheds for accumulation of cargo. The largest structure contains 60,000 square feet and would be used for paper-products storage. An adjacent structure is for the storage of general cargo. Each can be accessed by rail or truck. There is a substantial clear distance between the paper transit shed and the wharf and between the truck bay area of the transit sheds and the container storage yard. Such clearances allow for unimpeded movement of vehicles, etc., through the facility.

Support facilities located at the site include an administration building, parking lots for employees and visitors, a maintenance building, and truck scales.

The other major facility shown in Figure 3.2 is a dry bulk storage area for coal or other similar products. The coal storage area would provide for the storage of 600,000 tons of coal, assuming a pile height of 40 feet. The use of self-unloading vessels is assumed. The coal is collected in a traveling hopper at water's edge and moves to the storage area by a conveyor-belt



TYPICAL PORT LAYOUT

Figure 3.2

system. There is a second conveyor system for reclaiming the coal from the storage area for transfer to waiting railroad cars. The railroad cars would carry the coal to various inland destinations. As the plan shows, additional acreage has been allocated for other dry bulk storage. These additional storage areas can be connected to the same or a parallel conveyor system used for coal unloading.

The entire area shown in Figure 3.2 occupies approximately 95 acres. Of that total, the container and forest-products area consumes 38 acres and the dry-bulk storage areas consume 38 acres, with the remainder being utilized for parking lots, the weighing station, etc.

The layout shown in Figure 3.2 will form the basis for specific port cargo facility recommendations, once the locational requirements and cargo-type and cargo-volume requirements of the marketing analysis, presented next, have been identified and discussed.

3.3 Market Demand and Opportunities for Expanded Port Activity

The following section examines the market for expanded or improved port services and facilities within Maine. Principal considerations in this analysis include the following: 1) the extent to which Maine industries require and may benefit from expanded or improved facilities at one or more Maine ports; 2) the amount of traffic originating from or destined to industries within Maine that is likely to pass through an improved or expanded port facility(ies); and 3) the amount of traffic originating from or destined to industries outside the state of Maine that is likely

to utilize improved or expanded Maine Port(s) (the "hinterland potential"). Subsequent sections will consider whether or not improved or expanded port services and facilities are necessary or desirable with respect to their potential for increasing jobs and income to Maine residents, and tax revenues to the state or local governments. Particular attention is given to the forest products industry, as it has been identified in Phase One as the leading current user of Maine ports with the greatest growth potential.

The Two Busiest Ports

Historical shipping activity at Maine's two major ports, Portland and Searsport, is shown in Tables 3.2 and 3.3. By 1975, the most recent year for which comprehensive data are available, the great majority of total tonnage passing through both ports was in petroleum. Petroleum, coal, and gas products accounted for 83 per cent of Searsport's 1975 tonnage, 99.8 per cent of Portland's. Trade in these commodities is well established, and is expected to continue as the predominate traffic at the two ports.

Other commodities offer potential opportunities for port traffic, and are considered as the focus of this report for two reasons: 1) although tonnage can be expected to be much smaller than petroleum, coal, and gas shipments, the value per ton (not only in product terms, but in handling and related jobs as well) is often much higher for dry cargoes, and 2) the presence of efficient and conveniently located port facilities for the handling of dry cargoes (supported by adequate inland transportation systems) may be important to the functioning of several of Maine's key industries.

As shown in Table 3.4, important items handled at Portland in 1975 included the following exports: fresh and frozen vegetables, live animals, textile products and textile waste, paper and paperboard, pulp and paper waste, synthetic rubber, synthetic fibers, and machinery. Except for machinery, none of the export items totaled more than 1,000 tons. Significant imports of dry cargoes at Portland in 1975 included processed fish, wood pump, and electrical machinery. The harbor also handled substantial amounts of fish and shellfish landings, amounting to almost 14,000 tons.[1] As noted previously, however, non-petroleum, coal, and gas products accounted for only 0.2 per cent of Portland's total tonnage in 1975.

At Searsport, the tonnage and percentage of non-petroleum related products is higher than at Portland, as shown in Table 3.5. Major commodities exported from Searsport in 1975 were as follows:

Commodity Exported	Short Tons
Fresh and frozen vegetables (primarily potatoes)	4,583
Newsprint paper	23,281
Paper and paperboard	19,964
Wood pulp	6,380

Major imports through Searsport in 1975 included the following: rock salt (138,984 tons), tapioca and other vegetable products (15,288 tons), chemicals, bauxite, and gypsum. Considerable differentiation in functions was evident at the two ports and is discussed later.

[1] Primarily internal landings

Table 3.2

Waterborne Commerce By Principal Commodity
At Portland Harbor
(Thousands of Short Tons)

	1950	1955	1960	1965	1970	1975	% Change 1970-75
IMPORTS							
Crude Petroleum	4,165	10,351	11,768	12,627	23,039	22,076	- 4.0
Nonmetallic Minerals	35	74	66	37	26	--	--
Food Products	--	--	2	10	5	3	-60.0
Pulp & Paper	84	40	32	25	--	1	--
Chemicals	--	--	--	5	84	0	--
Petroleum Products	325	260	532	1,957	1,419	1,054	-26.0
Primary Metal Products (Asphalt)	--	--	4	1	67	23	-66.0
All Others	--	3	3	4	3	2	-33.0
EXPORTS							
Farm Products	89	63	22	39	--	1	--
Food Products	--	14	9	2	--	--	--
Pulp & Paper	--	39	--	1	10	1	-90.0
Waste & Scrap Materials	--	43	85	--	--	1	--
All Others	17	--	3	--	1	3	+200.0
COASTWISE RECEIPTS							
Coal	545	615	424	38	--	--	--
Crude Petroleum	19	--	--	--	--	--	--
Petroleum Products	1,984	2,188	2,716	2,986	3,874	3,619	- 6.6
Metal Products	--	4	7	14	--	--	--
Chemicals	2	3	--	7	29	--	--
Nonmetallic Minerals	30	32	17	--	2	--	--
All Others	18	11	7	7	1	--	--

Table 3.2 (Continued)

	1950	1955	1960	1965	1970	1975	% Change 1970-75
COASTWISE SHIPMENTS							
Petroleum Products	449	404	379	570	934	585	-37.0
All Others	22	8	8	8	4	--	--
LOCAL							
Fish-Shellfish	30	39	31	24	20	14	-30.0
Crude Petroleum	--	--	--	--	10	--	--
Petroleum Products	10	26	52	103	488	174	-64.0
All Others	1	1	1	--	--	--	--
GRAND TOTAL	7,825	14,218	16,168	18,463	30,017	27,566	- 8.0

Total Tonnage Increase 352% During the 25 Year Period

--No Traffic Reported

Source: Waterborne Commerce of the United States, published by the Department of the Army Corps of Engineers

Table 3.3

Waterborne Commerce By Principal Commodity
At Searsport Harbor
(Thousands of Short Tons)

	1950	1955	1960	1965	1970	1975	% Change 1970-75
IMPORTS							
Metallic Ores (Bauxite)	--	--	--	6	14	8	-43.0
Nonmetallic Minerals (Salt, etc.)	--	22	--	40	212	145	-32.0
Food Products	--	--	--	28	19	15	-27.0
Chemicals	10	52	--	15	20	10	-50.0
Petroleum Products	137	258	448	681	551	748	+36.0
All Others	1	--	--	57	--	--	--
EXPORTS							
Pulp & Paper[1/]	--	52	48	33	32	49	+53.0
Vegetables	220	--	--	--	--	5	
All Others	5	--	--	--	--	30	
COASTWISE RECEIPTS							
Coal	320	253	92	52	--	--	--
Nonmetallic Minerals	18	87	92	68	--	--	--
Chemicals	52	6	60	--	--	--	--
Petroleum Products	--	461	200	438	154	243	+56.0
All Others	--	--	--	--	--	30	--
COASTWISE SHIPMENTS							
Petroleum Products	--	--	--	--	6	113	+1883.0
All Others	2	--	--	--	--	--	--
GRAND TOTAL	768	946	890	1,418	1,009	1,366	+35.4

Total Tonnage Increased 78% During the 25 Year Period

1/ Includes newsprint

--No Traffic Reported

Source: Waterborne Traffic of the United States, published by the Department of Army Corps of Engineers

Table 3.4

Commodities Shipped Through The Port of Portland, 1975

FREIGHT TRAFFIC, 1975

(SHORT TONS)

COMMODITY	TOTAL	FOREIGN		DOMESTIC			
				COASTWISE		INTERNAL	LOCAL
		IMPORTS	EXPORTS	RECEIPTS	SHIPMENTS	RECEIPTS	
TOTAL	27,565,807	23,158,552	15,807	3,618,892	584,566	13,780	174,110
0103 CORN	2	----------	2	----------	----------	----------	----------
0119 OILSEEDS, NEC	84	----------	84	----------	----------	----------	----------
0129 FIELD CROPS, NEC	4	----------	4	----------	----------	----------	----------
0131 FRESH FRUITS AND TREE NUTS	21	----------	21	----------	----------	----------	----------
0132 BANANAS AND PLANTAINS	619	----------	619	----------	----------	----------	----------
0141 FRESH AND FROZEN VEGETABLES	332	----------	332	----------	----------	----------	----------
0151 LIVE ANIMALS	18	----------	18	----------	----------	----------	----------
0191 MISCELLANEOUS FARM PRODUCTS	72	----------	72	----------	----------	----------	----------
0841 CRUDE RUBBER AND ALLIED GUMS	25	25	----------	----------	----------	----------	----------
0861 FOREST PRODUCTS, NEC	169	169	----------	----------	----------	----------	----------
0911 FRESH FISH, EXCEPT SHELLFISH	13,884	76	817	226	34	12,731	----------
0912 SHELLFISH, EXCEPT PREPARED	1,049	----------	----------	----------	----------	1,049	----------
1311 CRUDE PETROLEUM	22,075,652	22,075,652	----------	----------	----------	----------	----------
1411 LIMESTONE	25	----------	25	----------	----------	----------	----------
2011 MEAT, FRESH, CHILLED, FROZEN	30	17	13	----------	----------	----------	----------
2031 FISH AND SHELLFISH, PREPARED	2,872	2,791	81	----------	----------	----------	----------
2034 VEGETABLES AND PREP, NEC	1	----------	1	----------	----------	----------	----------
2039 PREP FRUIT AND VEG JUICE, NEC	111	----------	111	----------	----------	----------	----------
2042 PREPARED ANIMAL FEEDS	137	19	118	----------	----------	----------	----------
2049 GRAIN MILL PRODUCTS, NEC	25	----------	25	----------	----------	----------	----------
2081 ALCOHOLIC BEVERAGES	46	46	----------	----------	----------	----------	----------
2099 MISCELLANEOUS FOOD PRODUCTS	53	6	47	----------	----------	----------	----------
2111 TOBACCO MANUFACTURES	94	----------	94	----------	----------	----------	----------
2211 BASIC TEXTILE PRODUCTS	988	2	986	----------	----------	----------	----------
2212 TEXTILE FIBERS, NEC	23	23	----------	----------	----------	----------	----------
2311 APPAREL	22	4	18	----------	----------	----------	----------
2419 WOOD CHIPS, STAVES, MOLDINGS	4	----------	4	----------	----------	----------	----------
2421 LUMBER	140	----------	140	----------	----------	----------	----------
2431 VENEER, PLYWOOD, WORKED WOOD	36	----------	36	----------	----------	----------	----------
2491 WOOD MANUFACTURES, NEC	33	8	25	----------	----------	----------	----------
2511 FURNITURE AND FIXTURES	146	5	141	----------	----------	----------	----------
2611 PULP	1,198	1,178	20	----------	----------	----------	----------
2631 PAPER AND PAPERBOARD	472	41	431	----------	----------	----------	----------
2691 PULP AND PAPER PRODUCTS, NEC	587	12	575	----------	----------	----------	----------
2711 PRINTED MATTER	216	----------	216	----------	----------	----------	----------
2812 DYES, PIGMENT, TANNING MATS	9	----------	9	----------	----------	----------	----------
2819 BASIC CHEMICALS AND PROD, NEC	156	56	100	----------	----------	----------	----------
2821 PLASTIC MATERIALS	327	1	326	----------	----------	----------	----------
2822 SYNTHETIC RUBBER	820	----------	820	----------	----------	----------	----------
2823 SYNTHETIC (MAN-MADE) FIBERS	995	----------	995	----------	----------	----------	----------
2831 DRUGS	1	----------	1	----------	----------	----------	----------
2841 SOAP	94	----------	94	----------	----------	----------	----------
2851 PAINTS	46	4	42	----------	----------	----------	----------
2876 INSECTICIDES, DISINFECTANTS	1	----------	1	----------	----------	----------	----------
2879 FERTILIZER AND MATERIALS, NEC	51	51	----------	----------	----------	----------	----------
2891 MISCELLANEOUS CHEMICAL PROD	455	38	417	----------	----------	----------	----------
2911 GASOLINE	2,071,241	102,187	----------	1,653,560	313,162	----------	2,332
2912 JET FUEL	65,455	----------	----------	64,762	693	----------	----------
2913 KEROSENE	183,424	----------	----------	148,330	32,928	----------	2,166
2914 DISTILLATE FUEL OIL	1,964,574	239,476	----------	1,480,569	234,879	----------	9,550
2915 RESIDUAL FUEL OIL	1,103,145	712,017	----------	231,621	1,899	----------	157,608
2916 LUBRICATING OILS AND GREASES	1,999	----------	282	----------	----------	----------	1,717
2918 ASPHALT, TAR, AND PITCHES	37,402	----------	----------	37,402	----------	----------	----------
2951 ASPHALT BUILDING MATERIALS	267	----------	267	----------	----------	----------	----------
2971 PETROLEUM AND COAL PROD, NEC	2,438	----------	16	2,422	----------	----------	----------
3011 RUBBER AND MISC PLASTICS PROD	288	18	270	----------	----------	----------	----------
3111 LEATHER AND LEATHER PRODUCTS	36	26	10	----------	----------	----------	----------
3211 GLASS AND GLASS PRODUCTS	276	----------	276	----------	----------	----------	----------
3241 BUILDING CEMENT	10	----------	10	----------	----------	----------	----------
3251 STRUCTURAL CLAY PRODUCTS	34	----------	34	----------	----------	----------	----------
3281 CUT STONE AND STONE PRODUCTS	67	----------	67	----------	----------	----------	----------
3291 MISC NONMETALLIC MINERAL PROD	336	----------	336	----------	----------	----------	----------
3313 COKE, PET ASPHALTS, SOLVENTS	23,320	23,047	273	----------	----------	----------	----------
3315 IRON, STEEL SHAPES, EXC SHEET	93	56	37	----------	----------	----------	----------
3317 IRON AND STEEL PIPE AND TUBE	243	----------	243	----------	----------	----------	----------
3319 IRON AND STEEL PRODUCTS, NEC	222	217	5	----------	----------	----------	----------
3321 NONFERROUS METALS, NEC	85	----------	85	----------	----------	----------	----------
3322 COPPER ALLOYS, UNWORKED	9	2	7	----------	----------	----------	----------
3324 ALUMINUM AND ALLOYS, UNWORKED	341	68	273	----------	----------	----------	----------
3411 FABRICATED METAL PRODUCTS	932	56	876	----------	----------	----------	----------
3511 MACHINERY, EXCEPT ELECTRICAL	1,887	146	1,741	----------	----------	----------	----------
3611 ELECTRICAL MACH AND EQUIP	1,906	977	929	----------	----------	----------	----------
3711 MOTOR VEHICLES, PARTS, EQUIP	405	11	394	----------	----------	----------	----------
3721 AIRCRAFT AND PARTS	1	----------	1	----------	----------	----------	----------
3731 SHIPS AND BOATS	32	16	16	----------	----------	----------	----------
3791 MISC TRANSPORTATION EQUIPMENT	51	----------	51	----------	----------	----------	----------
3911 INSTR, TIME, PHOTO, OPT GOODS	22	2	20	----------	----------	----------	----------
3911 MISC MANUFACTURED PRODUCTS	108	65	43	----------	----------	----------	----------
4012 NONFERROUS METAL SCRAP	21	----------	21	----------	----------	----------	----------
4022 TEXTILE WASTE, SCRAP, SWEEP	589	----------	589	----------	----------	----------	----------
4024 PAPER WASTE AND SCRAP	745	----------	745	----------	----------	----------	----------
4112 COMMODITIES, NEC	1,658	1	9	----------	971	----------	637

TOTAL TON-MILES. 38,092,815.

Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States,1975.

Table 3.5

Commodities Shipped Through the Port of Searsport, 1975

FREIGHT TRAFFIC, 1975

(SHORT TONS)

	COMMODITY	TOTAL	FOREIGN		COMESTIC COASTWISE	
			IMPORTS	EXPORTS	RECEIPTS	SHIPMENTS
	TOTAL	1,365,860	925,615	84,249	243,336	112,659
0141	FRESH AND FROZEN VEGETABLES	4,583	----------	4,583	----------	----------
0841	CRUDE RUBBER AND ALLIED GUMS	18	18	----------	----------	----------
0861	FOREST PRODUCTS, NEC	3	3	----------	----------	----------
0911	FRESH FISH, EXCEPT SHELLFISH	65	65	----------	----------	----------
1051	ALUMINUM ORES, CONCENTRATES	7,625	7,625	----------	----------	----------
1411	LIMESTONE	5,911	5,911	----------	----------	----------
1491	SALT	138,984	138,984	----------	----------	----------
2034	VEGETABLES AND PREP, NEC	15,258	15,258	----------	----------	----------
2211	BASIC TEXTILE PRODUCTS	4	4	----------	----------	----------
2491	WOOD MANUFACTURES, NEC	4	4	----------	----------	----------
2611	PULP	6,380	----------	6,380	----------	----------
2621	STANDARD NEWSPRINT PAPER	23,281	----------	23,281	----------	----------
2631	PAPER AND PAPERBOARD	19,964	----------	19,964	----------	----------
2819	BASIC CHEMICALS AND PROD, NEC	9,972	9,972	----------	----------	----------
2821	PLASTIC MATERIALS	5	5	----------	----------	----------
2911	GASOLINE	52,817	----------	----------	48,772	4,045
2912	JET FUEL	44,923	----------	----------	44,523	----------
2913	KEROSENE	71,448	54,434	----------	7,180	9,834
2914	DISTILLATE FUEL OIL	141,904	----------	29,972	100,027	11,905
2915	RESIDUAL FUEL OIL	806,203	693,122	----------	42,804	70,277
2991	PETROLEUM AND COAL PROD, NEC	16,628	----------	----------	----------	16,628
3316	IRON AND STEEL PLATES, SHEETS	117	117	----------	----------	----------
3317	IRON AND STEEL PIPE AND TUBE	2	2	----------	----------	----------
3319	IRON AND STEEL PRODUCTS, NEC	20	20	----------	----------	----------
3411	FABRICATED METAL PRODUCTS	67	67	----------	----------	----------
3511	MACHINERY, EXCEPT ELECTRICAL	69	----------	69	----------	----------
3611	ELECTRICAL MACH AND EQUIP	1	1	----------	----------	----------
3911	MISC MANUFACTURED PRODUCTS	2	2	----------	----------	----------
4022	TEXTILE WASTE, SCRAP, SWEEP	2	2	----------	----------	----------

Source: U.S. Army Corps of Engineers, Waterborne Commerice of the United States,1975

Other Maine Ports

Other Maine ports handled much lower levels of traffic than the top two, and were largely involved in the handling of petroleum and related products. Exceptions include the following specific items (1975):

Port	Commodity	Short Tons
Bucksport	liquid sulphur	51,750
Rockland	finfish	17,053 1/
Eastport	finfish	15,672 1/
Lubec Channel	finfish	20,404 1/
Stonington	finfish	8,777 1/

Other cargo-handling facilities are not shown in the statistics but should be noted. These include a small freezer storage facility and dock recently constructed at Winterport by a private entrepreneur primarily for the export of potatoes (particularly frozen and flake products), blueberries, and other crops. The St. Regis Paper Company has a mill located alongside relatively deepwater anchorage at Bucksport, although it reported no waterborne exports from this harbor in recent years.

Evaluation of Major Commodity Movements in Maine Involving Waterborne Shipments

Land and waterborne movements for a number of important commodities originating from or destined to Maine are evaluated in the following pages. Inland points of origin or destination for commodities shipped by water are important to consider, as they reflect the areas currently or potentially served by Maine ports. A further consideration is to identify which ports outside the state are handling commodities originating from or destined to

1/primarily internal landings

Maine, and to what extent improved or expanded port services and facilities within Maine are likely to affect these movements.

Much of the data on which this evaluation is based were derived from the March 1977 telephone survey of known importers and exporters conducted by the Maine Department of Transportation. (Since the survey covered shipments in 1976, the information is not to be compared with the 1975 Corps of Engineers statistics cited previously, nor to be confused with data covering 1975 that will appear subsequently.) The survey data has been supplemented for this report by a number of in-depth personal and telephone interviews with producers, shipping agents, inland carriers, and others involved in handling the major commodities identified.

Data in Tables 3.6 and 3.7 summarize the results of MDOT's export-import traffic survey. Approximately 690,100 tons of non-petroleum related cargoes originated at or were destined to points in Maine during 1976. About 19 per cent of these cargoes were handled in containers.

Imports of non-petroleum products in 1976 totaled 230,350 tons, of which 24,057, or 10.4 per cent, were containerized. Maine's two major ports, Searsport and Portland, handled 86.4 per cent of the state's imports of non-petroleum products in 1976. Tonnage at Searsport totaled 188,351, or 81.8 per cent of these imports. Tonnage at Portland totaled 10,595, or 4.6 per cent of non-petroleum imports. Ports outside Maine handled the remainder of non-petroleum imports in 1976.

Exports originating in the state of Maine totaled 459,699 tons in 1976, of which 106,781 tons, or 23 per cent, were containerized. Significantly, only 53 per cent of this tonnage was

Table 3.6

State of Maine

Imports

1976

Summarized by Commodity and Port

Commodity	Portland	Searsport	Saint John	Boston	New York	Other Ports	Total
Petroleum Products	27,195,006	932,297					28,127,303
Alcohol Beverages						9,800	9,800
Bauxite		8,835					8,835
Gypsum		42,933					42,933
Lumber						6,500 1/	6,500
Salt		88,597					88,597
Sardines	5,000						5,000
Seaweed	3,170			3,165	3,165		9,500
Soda		32,153					32,153
Sugar		3,136					3,136
Tapioca	1,225	12,697					13,922
All Other Products	1,200			3,212	4,022	1,540	9,974
Totals	27,204,401	1,120,648	---	6,377	7,187	17,840	28,357,653

1/ Montreal - Three Rivers

Total Break Bulk and Liquid	28,333,596
Total Containers	24,057
Total Tonnage	28,357,653

Source: MDOT Telephone Survey, March 1977

Table 3.7

State of Maine

Exports

1976

Summarized by Commodity and Port

Commodity	Portland	Searsport	Saint John	Boston	New York	Other Ports	Total
Paper Forest Products							
Newsprint		33,847	15,000				48,847
Paper				1,500	1,500		3,000
Printing Paper				45,000			45,000
Pulp and Paper	23,900 2/	1,719	77,000				102,619
Tissue Paper				720			720
Paper Plates				10			10
Resin Impregnated Paper					500		500
Lumber		1,981					1,981
Core Board					80		80
Fiber Board				65	60		125
Wooden Grandstands				400			400
Sub-total	23,900 2/	37,547	92,000	47,695	2,140		203,282
Food Products							
Potatoes	9,750	168,000				15,000 1/	192,750
Dehydrated Potatoes				10,000			10,000
French Fries and Flakes		12,600	27,000	15,000	5,800		60,400
Potato Meal		1,000					1,000
Blueberries					750	750	1,500
Chicken Parts					18		18
Eggs					2,400		2,400
Frozen Fish						500	500
Sardines				750			750
Squid and Tuna						2,400	2,400
Sub-total	9,750	181,600	27,000	25,750	8,968	18,650	271,718
All Other Products	241			6,496	1,865	15	8,617
Grand Total	33,891	219,147	119,000	79,921	12,973	18,665	483,597

1/ Winterport
2/ Originates in New Hampshire

Source: MDOT Telephone Survey, March 1977

handled by ports within the state. Tonnage at Searsport totaled 219,147, 48 per cent of the 1976 export total. Portland handled 9,991 tons of Maine's waterborne exports in 1976, 2 per cent of the state's export total. Winterport handled 15,000 tons, or 3 per cent of the state's 1976 exports. It is important to note that 192,750 tons of waterborne exports originating in Maine in 1976 were fresh potatoes, nearly 42 per cent of that year's total export tonnage. This situation resulted from conditions of extreme drought in Europe which created an export market for Maine and other U.S. potato products that has rarely been seen in the past. It is more instructive and reliable, therefore, for future planning purposes, to examine export shipments not including fresh potatoes. The chart below compares import and export tonnages by major port, for cargoes originating at or destined to points in Maine not including fresh potatoes and petroleum products.

Port	1976 Export[1/] Tonnage	Percent of Total Exports	1976 Import[2/] Tonnage	Percent of Total Imports	1976 Imports & Exports	(%)
Searsport	51,147	(19.2)	188,351	(81.8)	239,498	(48.2)
Portland	241	(<0.1)	10,595	(4.6)	10,836	(2.2)
Saint John	119,000	(44.6)	--	--	119,000	(23.9)
Boston	79,921	(30.0)	6,377	(2.8)	86,298	(17.4)
New York	12,973	(4.9)	7,187	(3.1)	20,160	(4.1)
Other	3,655	(1.4)	17,840	(7.7)	21,495	(4.3)
TOTALS:	266,937	(100.0)	230,350	(100.0)	497,287	(100.0)

[1/] products originating in Maine only

[2/] products destined to Maine only

Source: MDOT March 1977 telephone survey

As data in the above chart indicates, Searsport is currently the principal port serving Maine's overall trade in foreign import and export of non-petroleum products. Searsport is particularly important as an importer of raw materials; notably salt, gupsum, soda, and tapioca. By contrast, Portland plays a relatively minor role in Maine's overall import-export trade, handling only 2.2 per cent of non-petroleum tonnage in 1976. The port of Saint John, New Brunswick, is the leading handler of commodities produced in Maine and destined for foreign export, followed by Boston and then Searsport. The following paragraphs discuss Maine's export and import trade in greater detail, with attention to inland movements by transport mode as well as waterborne shipments of certain commodities through Atlantic ports outside Maine.

Export Patterns

The two major industrial sectors in Maine engaged in the production of commodities destined for foreign export are forest products and food products. Together, these industry groups accounted for over 97 per cent of Maine's foreign export tonnage in 1976. Not including shipments of fresh potatoes, for reasons discussed previously, food products totaled 27 per cent of Maine's overall export tonnage in 1976, while forest products amounted to 70 per cent of that year's export traffic. In the discussions which follow, these industries and others are reviewed in the context of land and waterborne transportation patterns. In a subsequent section, the forest products industry is further analyzed with respect to local and national trends in production and export trade.

Forest Products. Figure 3.3 provides information on major exports of papermill products originating in Maine in 1976. As data in this figure illustrates, over 75 per cent of the inland movement of Maine's paper mill products was by motor carrier in 1976. About 36 per cent of total tonnage was shipped by container. (While more precise data on these movements is reported in the MDOT survey, it is described here in summary form to avoid disclosure of major individual shipments.) Major non-containerized (bulk) shipments destined for export passed through the ports of Saint John and Searsport in 1976. Searsport was the only port to which substantial inland movements by rail were recorded in 1976.

It should be noted that Portland handled nearly 24,000 tons of pulp and paper destined for foreign export in 1976. However, all of this tonnage originated outside the state of Maine. In 1977, pulp and paper shipments for export originating in Maine and passing through the port of Portland are expected to reach approximately 20,000 tons by year's end. This latter movement, which is entirely by rail to the port, was made possible by the Maine Central Railroad's publication of a special commodity rate and the development of a unitized bulk parcel handling procedure at the port by the stevedore which has greatly increased handling efficiency.

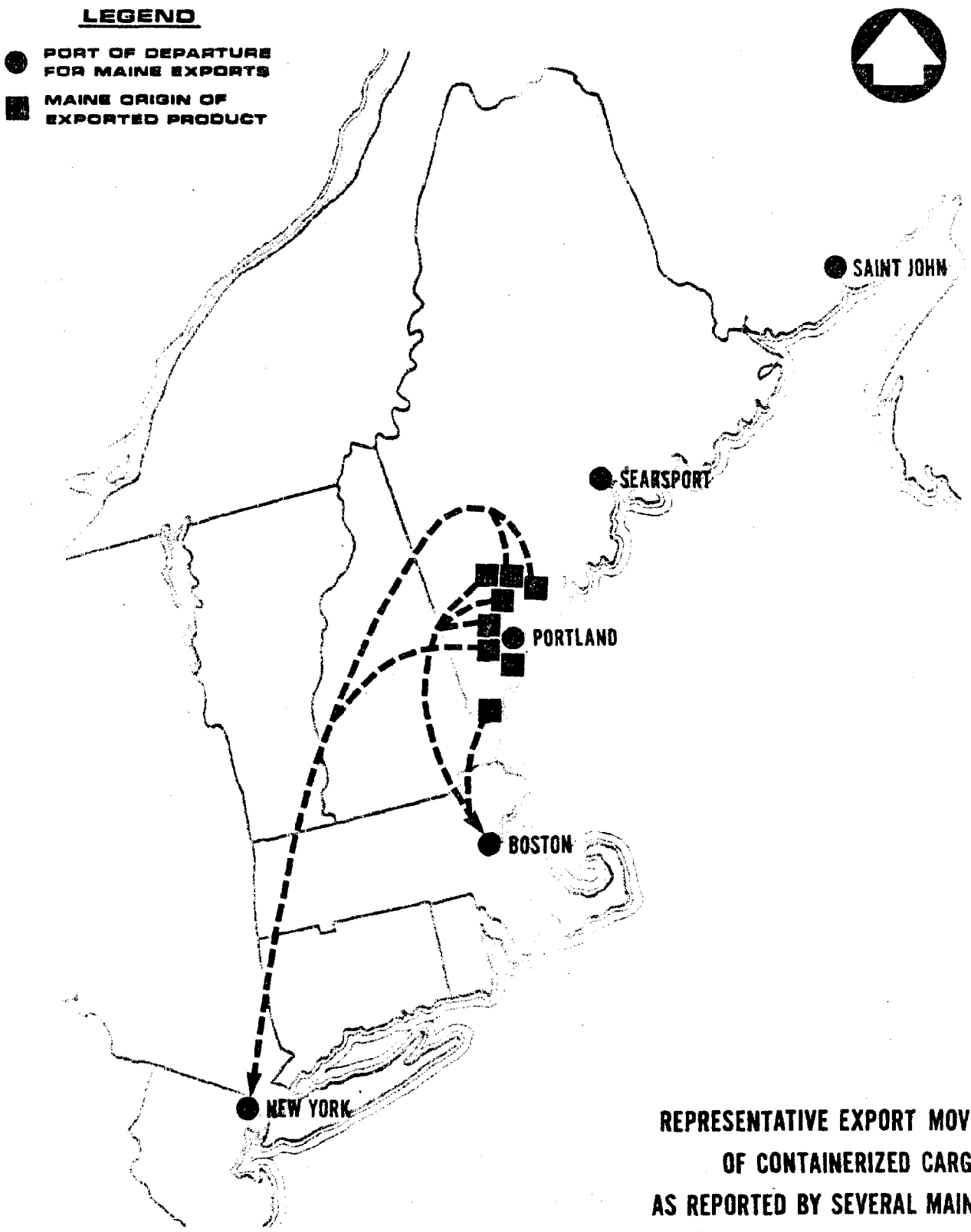
Exports of wood-based manufactured products originating in Maine during 1976 are shown in Figure 3.4. Total shipments of these commodities amounted to 545 tons, 0.3 per cent of the state's forest products export tonnage. None of these shipments went through Maine ports. All were carried by motor carrier to either Boston or New York. In one of these instances, use of an outside Maine port was reportedly due to a lack of container handling

PORT	TONNAGE AND CARGO TYPE (B = BULK ; C = CONTAINERS)	COMMODITIES	TRANSPORT MODE
ST. JOHN	B, C — 92,000 TONS	NEWSPRINT, PULP AND PAPER	PRIMARILY MOTOR CARRIER
BOSTON	B, C — 47,000 TONS	PULP, PRINTING AND TISSUE PAPER	MOTOR CARRIER
SEARSPORT	B, C — 38,000 TONS	NEWSPRINT	RAIL
NEW YORK	C — 1,500 TONS	PAPER	MOTOR CARRIER

SOURCE: MDOT TELEPHONE SURVEY AND ECONOMICS RESEARCH ASSOCIATES

MAJOR EXPORTS OF MAINE PULP, PAPER AND BOARD MILL PRODUCTS REPORTED IN 1976

Figure 3.3



REPRESENTATIVE EXPORT MOVEMENTS OF CONTAINERIZED CARGO AS REPORTED BY SEVERAL MAINE FIRMS (EXCLUSIVE OF FOREST PRODUCTS AND POTATO PRODUCTS), 1976

SOURCE: ECONOMICS RESEARCH ASSOCIATES

Figure 3.4

capability, while in most instances the routing to the larger ports was due to their scheduled liner service and larger base of operations which permits them to consolidate shipments from various locations.

Table 3.8 provides information on selected commodities exported to foreign destinations through major United States Atlantic ports in 1975 (the latest year for which comparative data were available). Of particular interest at this point are shipments of major mill products, namely pump, newsprint, paper and paperboard. As discussed previously, some of the export tonnage in pulp paper and paperboard at the ports of Boston and New York originates in Maine. The port of New York is the principal marshaling point for foreign exports of pulp, paper and paperboard products produced in the Northeast states, while Norfolk primarily handles products originating in the upper tier southern states. The ports of Philadelphia and Baltimore also serve vast hinterlands, although they are relatively less important in the paper and paperboard trade than New York or Norfolk.

Figure 3.5 shows the proportion of pulp exports through major U.S. North Atlantic ports in 1973, 1974, and 1975. In two of these three years (1974 excepted), Searsport ranked behind only the port of New York in pulp exports. Figure 3.6 shows comparable data for paper and paperboard exports. For these commodities, Searsport typically exports less than each of the major ports (1975 excepted). In spite of the relatively large tonnages shown in Table 3.8 for paper and paperboard exports through ports from Norfolk to Searsport in 1975, combined tonnages from these ports amounted to less than

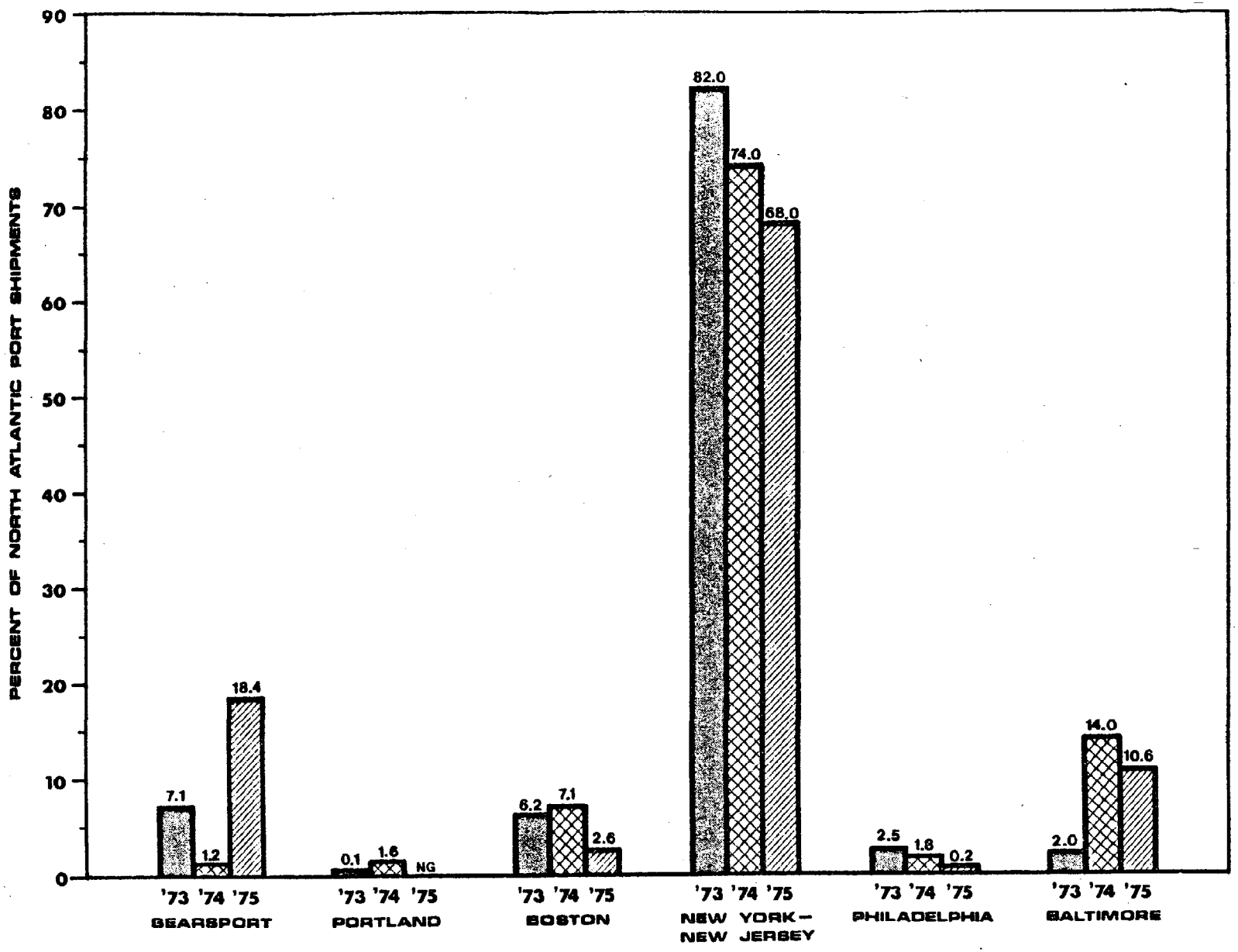
Table 3.8

Selected Commodities Shipped to Foreign Destinations Through Major United States Atlantic Ports, 1975

Commodity	Tons exported from: Searsport	Portland	Boston	New York-NJ	Philadelphia	Baltimore	Norfolk,etc.[1/]
Fresh fish, exc. shellfish	--	817	22	7,638	124	194	256
Fish & shellfish, prepared	--	81	48	6,405	45	455	465
Pulp	6,380	20	930	23,581	86	3,654	32,505
Newsprint	23,281	--	10	24.555	1,495	358	1,024
Paper & paperboard	19,964	431	22,630	159,549	17,756	18,093	51,117
Pulp, paper, paper-board, n.e.c.	--	575	692	51,656	3,771	10,098	6,768
Wood Chips, staves, moldings	--	--	34	1,583	290	989	200
TOTAL PORT EXPORTS (all commodities)	84,249	15,807	546,592	6,725,527	5,104,070	13,858,536	43,343,843
TOTAL PORT IMPORTS (all commodities)	925,616	23,158,652	5,987,864	48,965,523	28,386,479	20,656,890	7,556,277
PORT TOTAL	1,365,860	27,565,807	24,719,452	117,814,618	52,029,803	52,661,448	66,937,115
(% Petro, gas, coal)	(83.0%)	(99.8%)	(87.8%)	(72.8%)	(58.6%)	(47.5%)	(78.9%)

[1/] Includes Nofrolk Harbor, Newport News, Hampton Roads

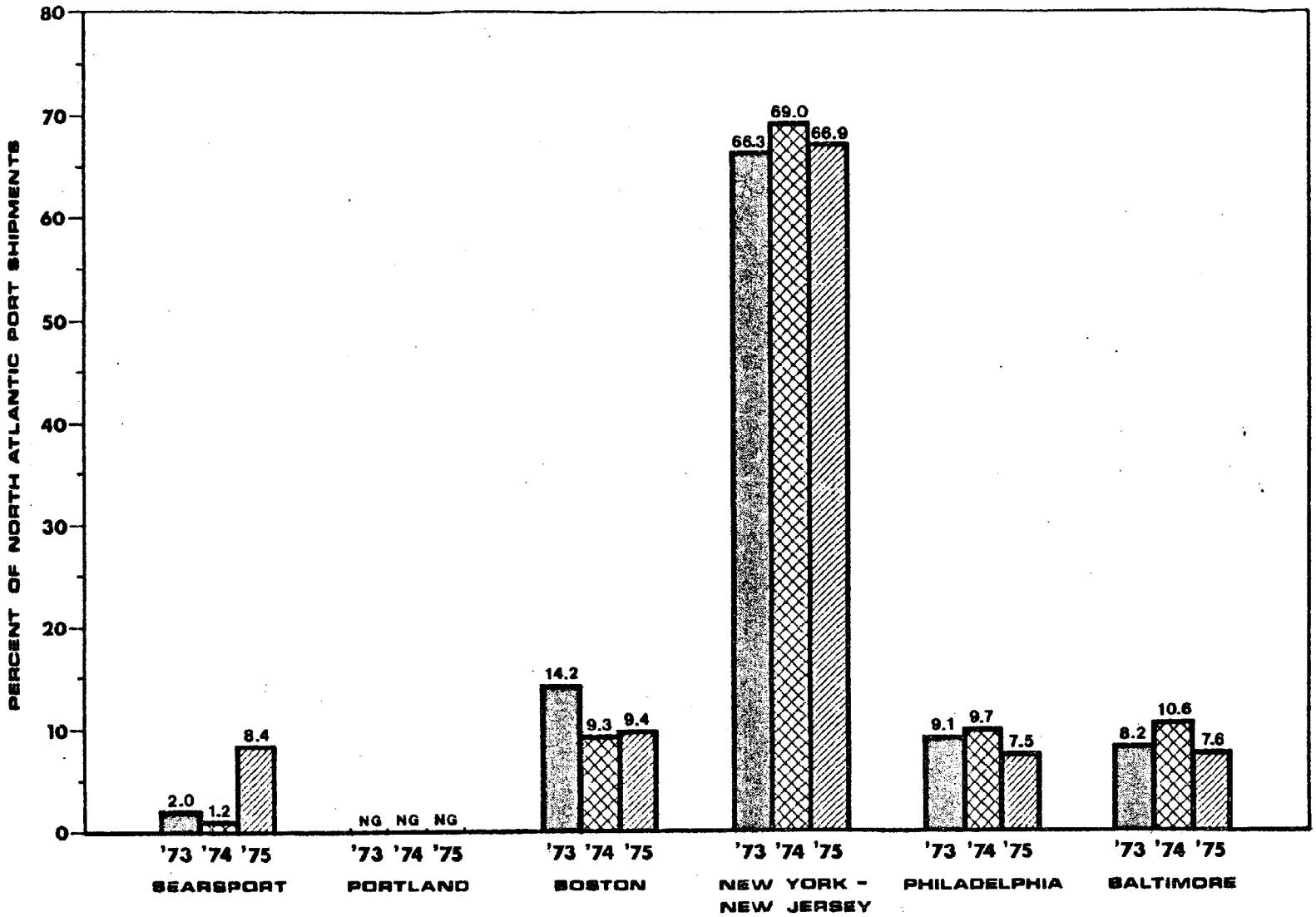
Source: Waterborne Commerce of the United States, 1975, U.S. Army Corps of Engineers; and Economics Research Associates



FOREIGN EXPORTS OF PULP (TCC 2611)
FROM NORTH ATLANTIC PORTS

SOURCE: U.S. WATERBORNE COMMERCE AND ECONOMICS RESEARCH ASSOCIATES

Figure 3.5



FOREIGN EXPORTS OF PAPER AND PAPERBOARD (TCC 2631)
FROM NORTH ATLANTIC PORTS

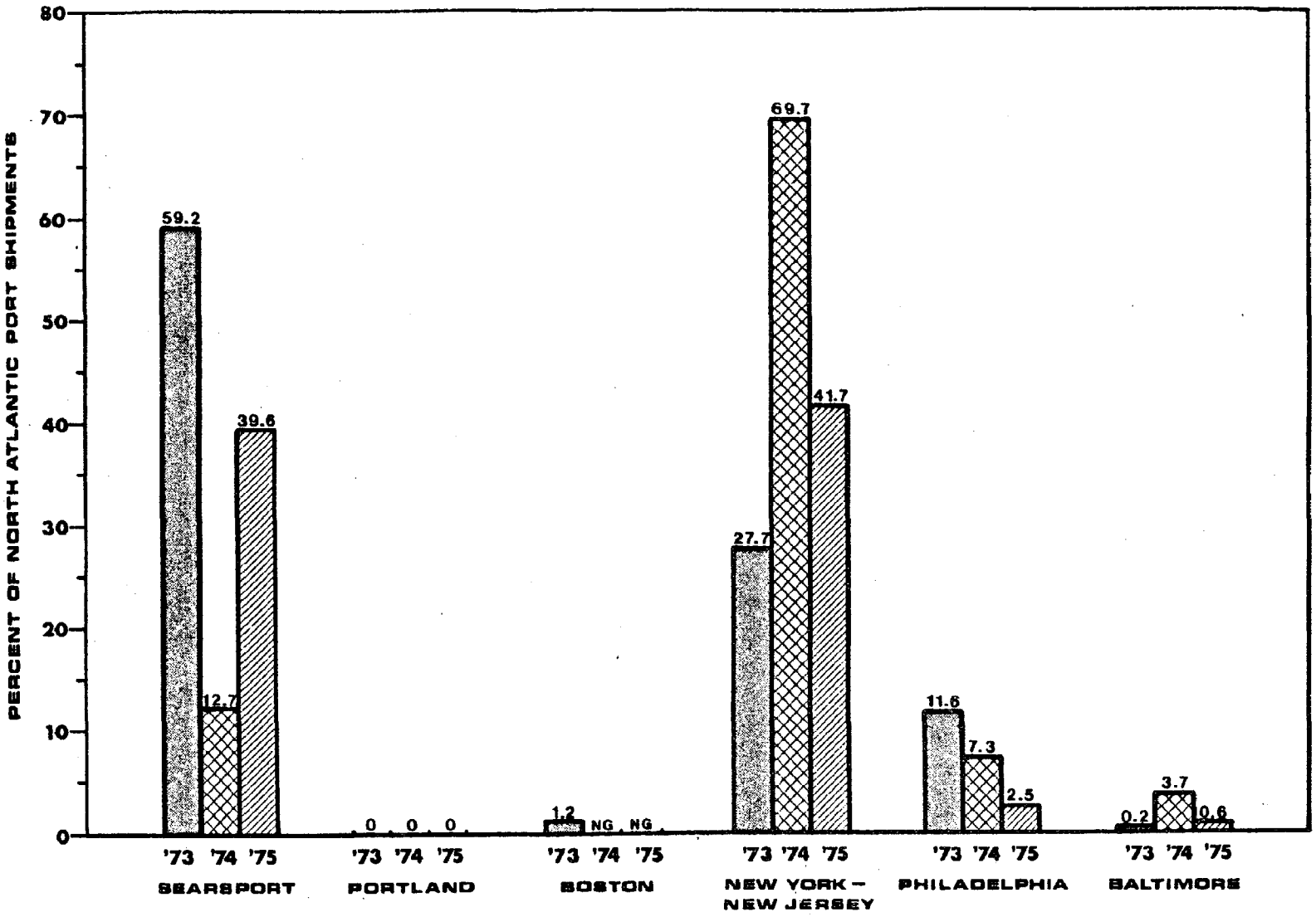
SOURCE: U.S. WATERBORNE COMMERCE AND ECONOMICS RESEARCH ASSOCIATES

Figure 3.6

10 per cent of overall U.S. exports in paper and paperboard. Similarly, pulp exports from these ports was less than 3 per cent of U.S. overall pulp exports in 1975. These overall trends are discussed in greater detail later, and are cited here mainly for reference.

Figure 3.7 shows the proportion of newsprint exports from major U.S. North Atlantic ports in 1973, 1974, 1975. With the exception of 1974, Searsport shows greater than or substantially similar export tonnages in newsprint as the other ports listed. It is interesting to note that, on a tonnage basis, Searsport handled less newsprint for export in 1973 than in either 1975 or 1976, although its 16,772 tons in 1973 was 60 per cent of the total exported from U.S. North Atlantic ports that year, which was a very low year for overall U.S. newsprint exports. In fact, newsprint exports from Searsport in 1973 amounted to nearly 18 per cent of all U.S. newsprint exports. In contrast, 1974 was a very big year nationwide for newsprint exports--in fact, the largest volume in a ten year period--while Searsport's 7,497 tons was its lowest in the three year period and represented only 4 per cent of the U.S. total. In 1975, the ports of Searsport and New York accounted for nearly 30 per cent of all U.S. newsprint exports.

Canada's Atlantic Coast exports of pulp and newsprint in 1975 far surpassed that of the U.S. Atlantic coast ports listed, as the chart below indicates:



FOREIGN EXPORTS OF NEWSPRINT (TCC 2621)
FROM NORTH ATLANTIC PORTS

SOURCE: U.S. WATERBORNE COMMERCE AND ECONOMICS RESEARCH ASSOCIATES

Figure 3.7

	1975 Exports from Major U.S. Atlantic Coast Ports[1] (short tons)	1975 Exports from Major Canadian Atlantic Ports[2] (short tons)
Pulp	67,155	646,951
Newsprint	50,723	946,080[3]
Paper and paperboard	289,540	118,339

[1]Includes Searsport, Portland, Boston, New York, Philadelphia, Baltimore, and Norfolk

[2]Includes Montreal, Quebec, Trois-Rivieres, Baie Comeau, Port Alfred, Saint John and Halifax

[3]Certain smaller Canadian Atlantic ports handle substantial volumes of newsprint. Canadian exports of newsprint from all Atlantic ports totaled 1,686,555 tons in 1975.

Data in Table 3.9 show exports of the above and selected additional commodities from major Canadian Atlantic ports in 1975. It is interesting to note that in 1975 the port of Saint John alone exported nearly five times the pulp tonnage shipped from all U.S. Atlantic ports listed. Saint John also handled more newsprint in 1975 (190,008 tons) than was exported from all ports in the United States that year (188,000 tons), and was exceeded in its newsprint export tonnage by several other ports as well (including Baie Comeau, Port Alfred, and Botwood (not listed).

The port of Saint John has recently constructed a major forest products terminal to help assure its continued predominance in that trade, and has been established as a major port of call for international liner service as well as bulk parcel operators. In April 1977, for example, 32 vessels were loaded at the Port of Saint John with nearly 200,000 tons of dry cargoes destined for export.

Table 3.9

Selected Commodities Shipped to Foreign Destinations Through Major Canadian Atlantic Ports, 1975

Commodity	Halifax	Saint John	Montreal	Quebec	Trois-Rivieres	Baie Comeau	Port Alfred
Fish, fresh or frozen	5,101	536	169	--	--	--	--
Fish, salted or cured	6,005	89	229	--	--	--	--
Fish, canned	1,716	1,459	309	--	--	--	--
Potatoes	3,623	70,137	30	--	--	--	--
Pulp	16,057	321,057	47,549	5,651	20,135	--	26,517
Newsprint	4,242	190,008	9,923	94,557	157,813	290,631	198,906
Paper	4,356	11,136	6,949	1	--	--	--
Paperboard	5,337	25,039	797	1,134	1,980	--	948
Containerized freight	668,951	220,559	780,800	265,885	--	29	--
TOTAL PORT EXPORTS (all commodities)	3,284,274	2,101,253	4,803,774	3,064,385	883,679	3,477,322	354,141
TOTAL PORT IMPORTS (all commodities)	5,495,901	6,765,621	3,754,654	4,011,456	256,006	1,188,476	3,186,454
PORT TOTAL	8,780,175	8,866,874	8,558,428	7,075,841	1,139,685	4,665,798	3,540,595
(% Petro, gas, coal)	(53.8%)	(73.5%)	(19.2%)	(51.4%)	(2.6%)	(0.6%)	(1.0%)

Source: Shipping Report, Part II, International Seaborne Shipping (by port), 1975, The Ministry of Industry, Trade and Commerce, November 1976, and Economics Research Associates

The frequency of regularly scheduled liner service is a major factor accounting for the large volume of forest products shipments originating in Maine and destined for export through the port of Saint John. Other contributing factors include the following: Saint John's proximity to major papermills in Washington and Penobscot counties; container handling facilities; unit trains and utilized bulk handling services; substantial subsidies from the Canadian national government which help make port charges, rail and common carrier trucking rates to be competitively favorable over those in the United States.

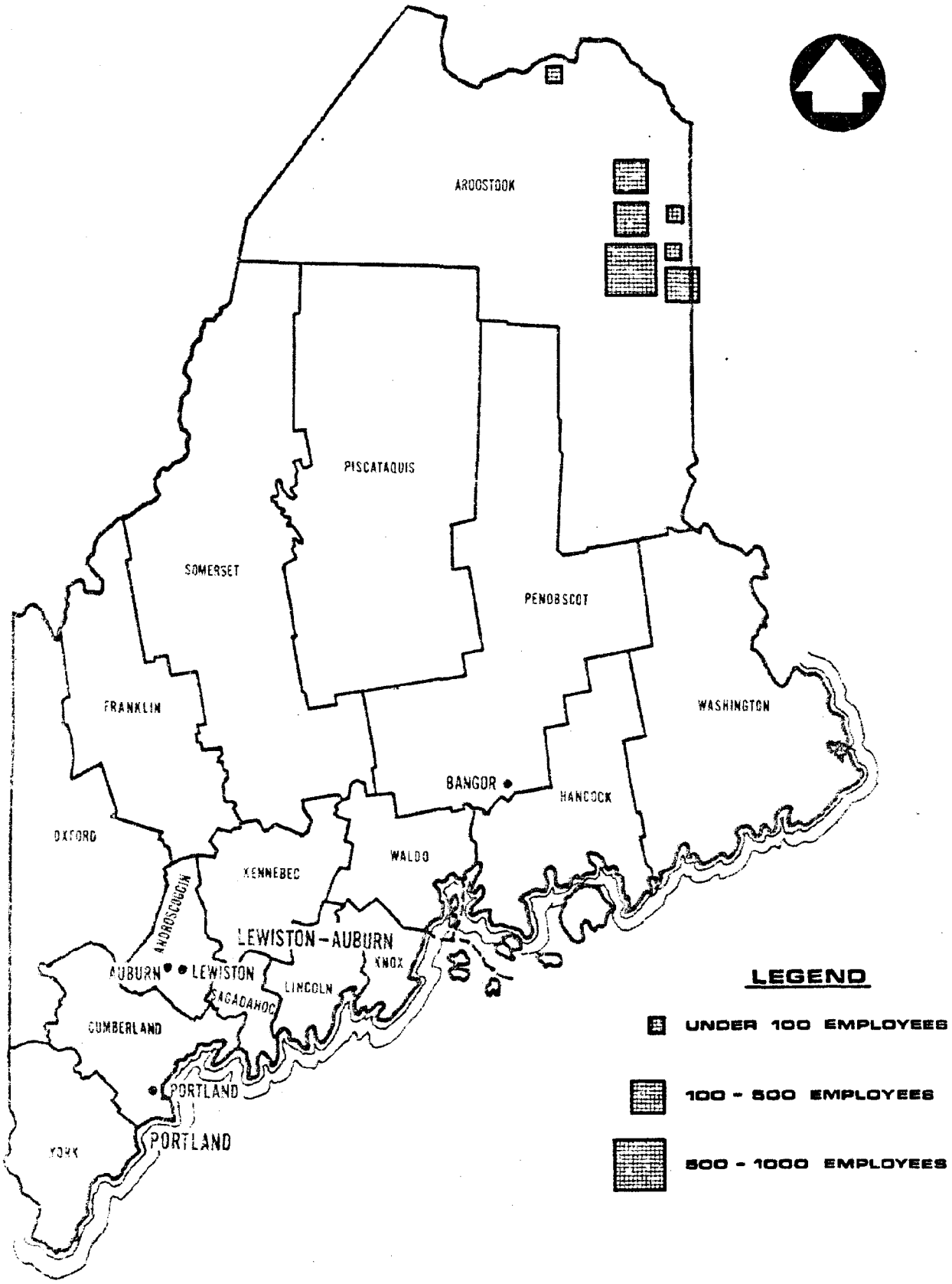
Canadian rail service, and rail/trucking tariffs are important factors in evaluating Maine ports' hinterland potential, which will be examined later. They are relatively less important, however, than the other factors noted with respect to export movements originating in Maine. Efforts have been made by Maine railroads and motor carriers to obviate some of the tariff disadvantages. An example is the special commodity rate which the Bangor and Aroostook provides for newsprint shipped by rail through Searsport, as well as the relatively liberal free time (20 days) allowed for storage of newsprint, printing, and other groundwood papers at that port. Another example, discussed previously, is the special commodity rate recently instituted by the Maine Central Railroad for pulp and paper shipments to Portland. These kinds of services have made it competitively advantageous to ship certain commodities through Maine ports, and are examples of the actions that will need to be taken by inland carriers if more of Maine's export traffic is to pass through one or more of its ports. Competitive joint rates--that is, involving commodities shipped for export over both Bangor

and Aroostook and Maine Central tracks--are lacking according to some of the major producers contacted.

Potato Products. Potato growing is concentrated in Aroostook County which is also the location of a number of potato processing plants, as shown in Figure 3.8. Products exported from these plants, which go principally to Britain and Northern Europe, include the following: frozen french fries, dehydrated potato flakes (instant mashed potatoes) and potato meal. During 1976 a vast tonnage of fresh potatoes was exported through Searsport, Winterport and Portland. As noted previously, this is a highly atypical movement, precipitated by conditions of extreme drought in Europe. Normally, fresh potatoes are not exported in large quantities.

Figure 3.9 shows representative movements of Maine potatoes and potato products in 1976. About 11 per cent of total tonnage was shipped by container in 1976. Export shipments of potato products in 1976, not including fresh potatoes, totaled 43,300 tons, of which 35 per cent moved via container. The inland transport mode for potato and potato products shipments varied in 1976, with some tonnage carried by rail and private truck while the majority moved by motor common carrier.

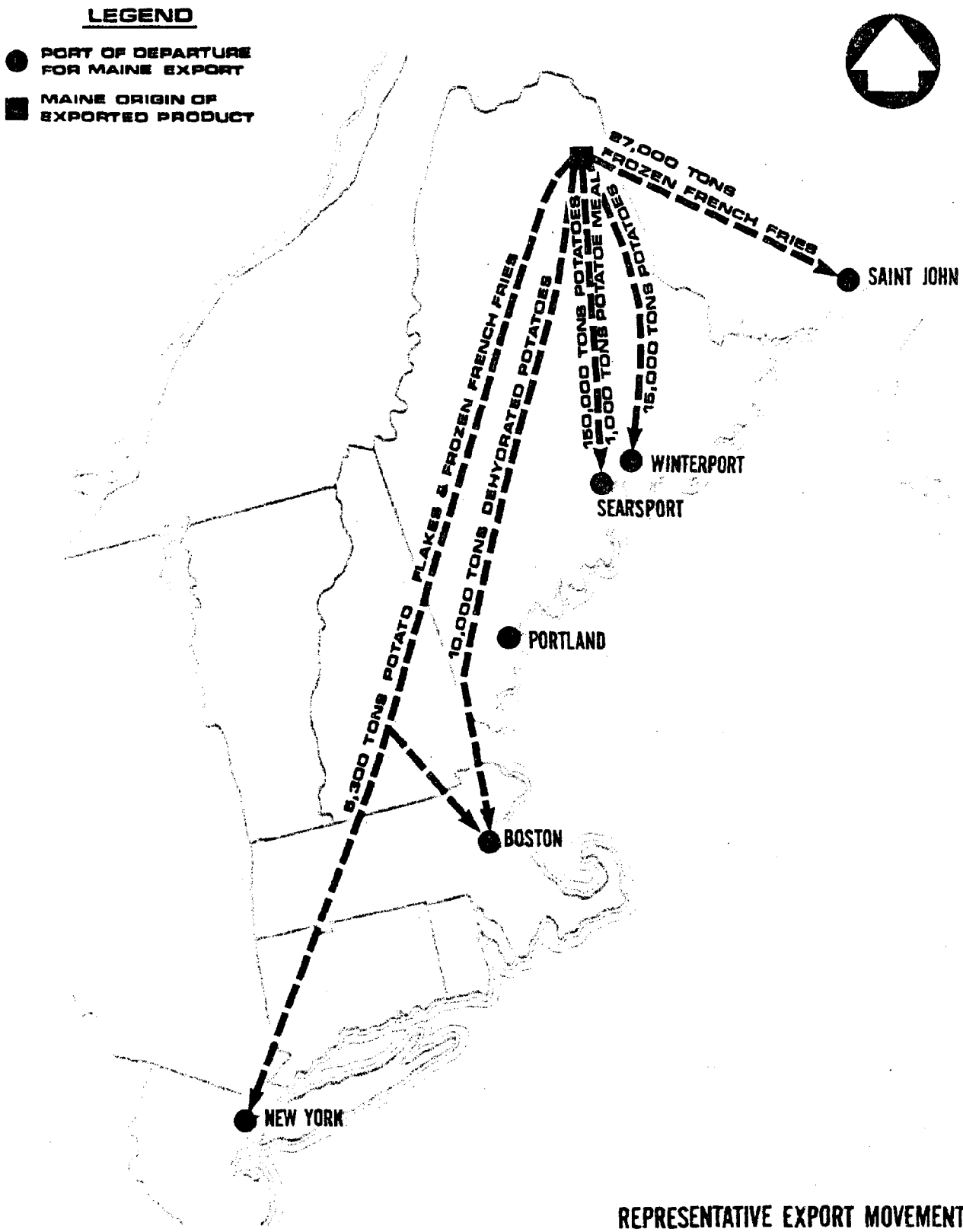
Export markets for potato products, particularly frozen french fries, have been expanding in recent years, largely as a consequence of the rapid growth of fast-food outlets in Europe. Export markets for potato flakes and meal are also increasing according to the producers contacted. It is likely that export tonnages for potato products originating in Maine will rise in future years, perhaps 10 per cent per year to 1985. It is also



SOURCE: U.S. COUNTY BUSINESS PATTERNS AND ECONOMICS RESEARCH ASSOCIATES

POTATO PROCESSING PLANTS

Figure 3.8



SOURCE: ECONOMICS RESEARCH ASSOCIATES

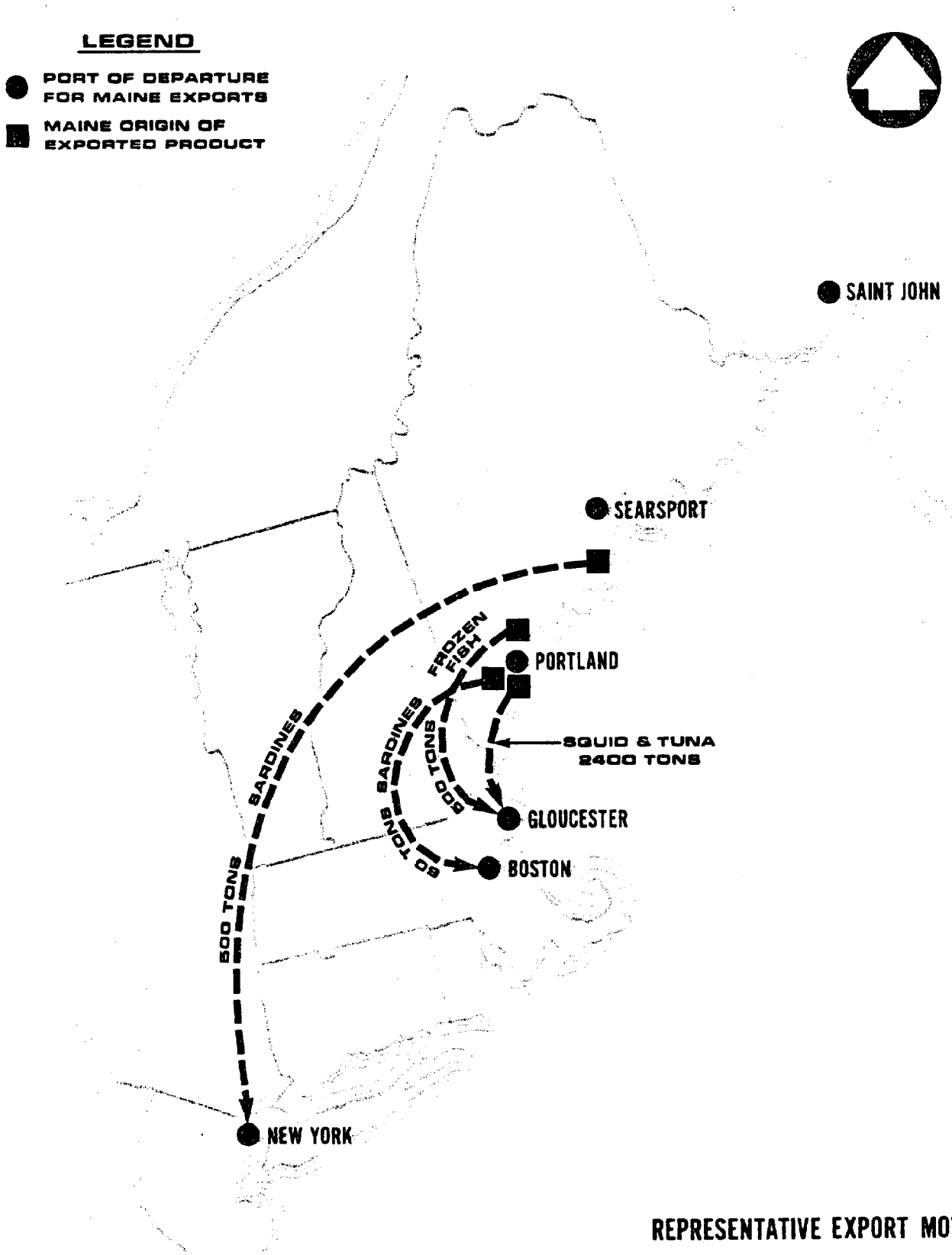
REPRESENTATIVE EXPORT MOVEMENTS OF MAINE POTATO PRODUCTS AS REPORTED BY SEVERAL FIRMS, 1976

Figure 3.9

likely that more of these shipments will be containerized, to avoid damage and spoilage during transit. Nearly all the producers contacted stated that they prefer to ship as much as possible in containers, whether by rail or motor carrier. Searsport is the preferred location of Maine's potato producers for expanded port facilities, particularly container handling capability, because of its relative proximity to their plants as well as the availability of direct rail connections.

Fish Products. Figure 3.10 shows representative export movements of Maine fish products in 1976. All of the tonnage was in bulk form and was shipped by motor carrier to Gloucester, Boston, or New York. Nearly 84 per cent of Maine's fish exports went through the port of Gloucester, Massachusetts, where a large cold storage facility permits shipments to be consolidated for export. Currently, adequate refrigeration or freezer storage facilities are lacking at Maine ports, although strong interest is now being shown for a cold storage warehouse in Portland.

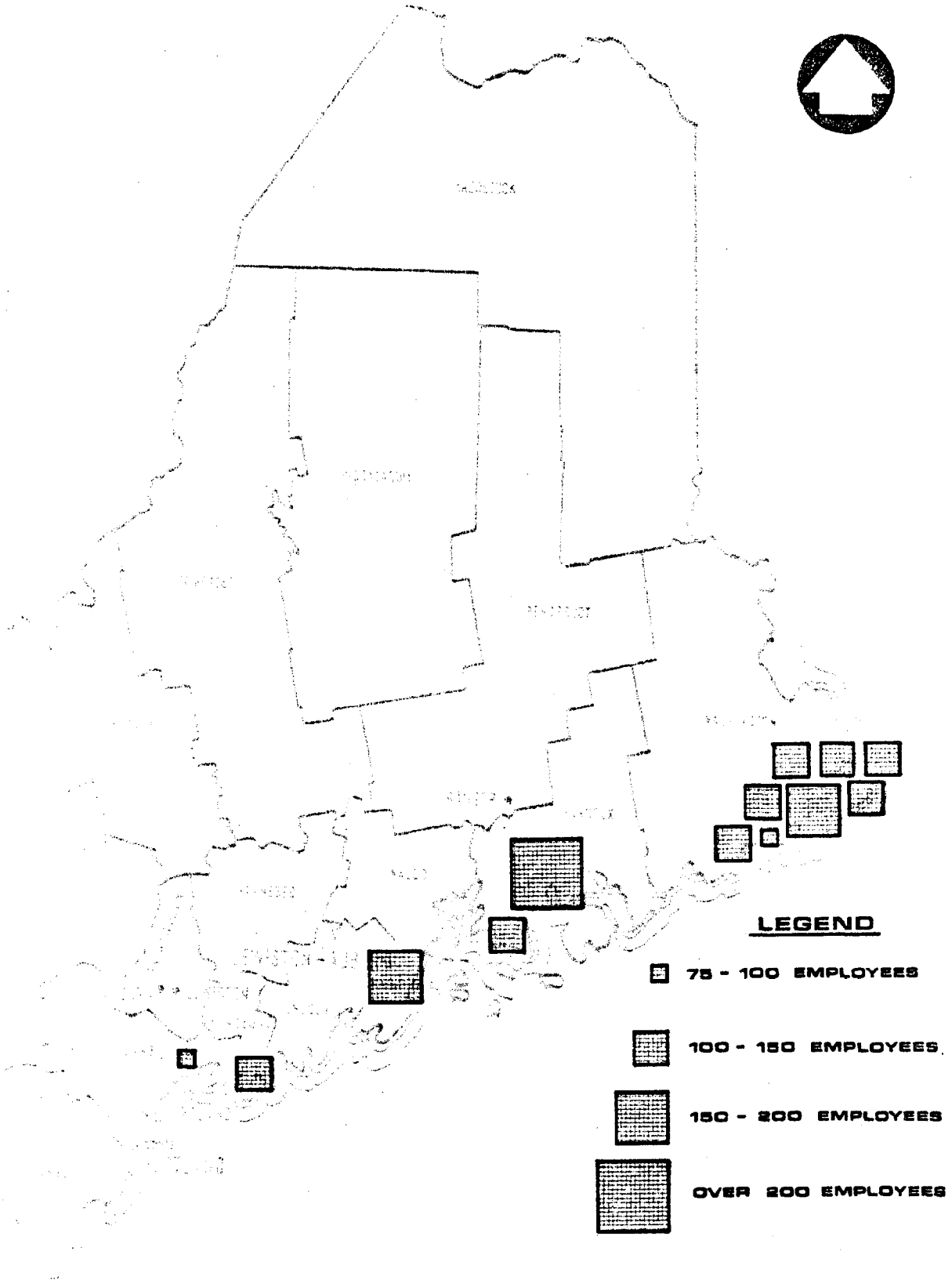
Reference to Tables 3.8 and 3.9 shows that Maine's 3,460 tons of frozen and canned fish destined for foreign export compares favorably with the 1975 tonnages noted at other ports (export tonnage from Gloucester was not available, although the port handled over 160,000 tons of fresh and frozen fish in 1975, about half of which can be attributed to internal landings and a substantial portion of the remainder to frozen imports). A number of major canned fish and seafood processing plants are located in Washington and Hancock counties, as shown in Figure 3.11, although export shipments from these plants (if any) were not reported in the MDOT survey.



REPRESENTATIVE EXPORT MOVEMENTS OF MAINE FISH PRODUCTS AS REPORTED BY SEVERAL FIRMS, 1976

SOURCE: ECONOMICS RESEARCH ASSOCIATES

Figure 3.10



SOURCE: U.S. COUNTY BUSINESS PATTERNS (1975) AND ECONOMICS RESEARCH ASSOCIATES

MAJOR CANNED FISH AND SEAFOOD PROCESSING PLANTS

Figure 3.11

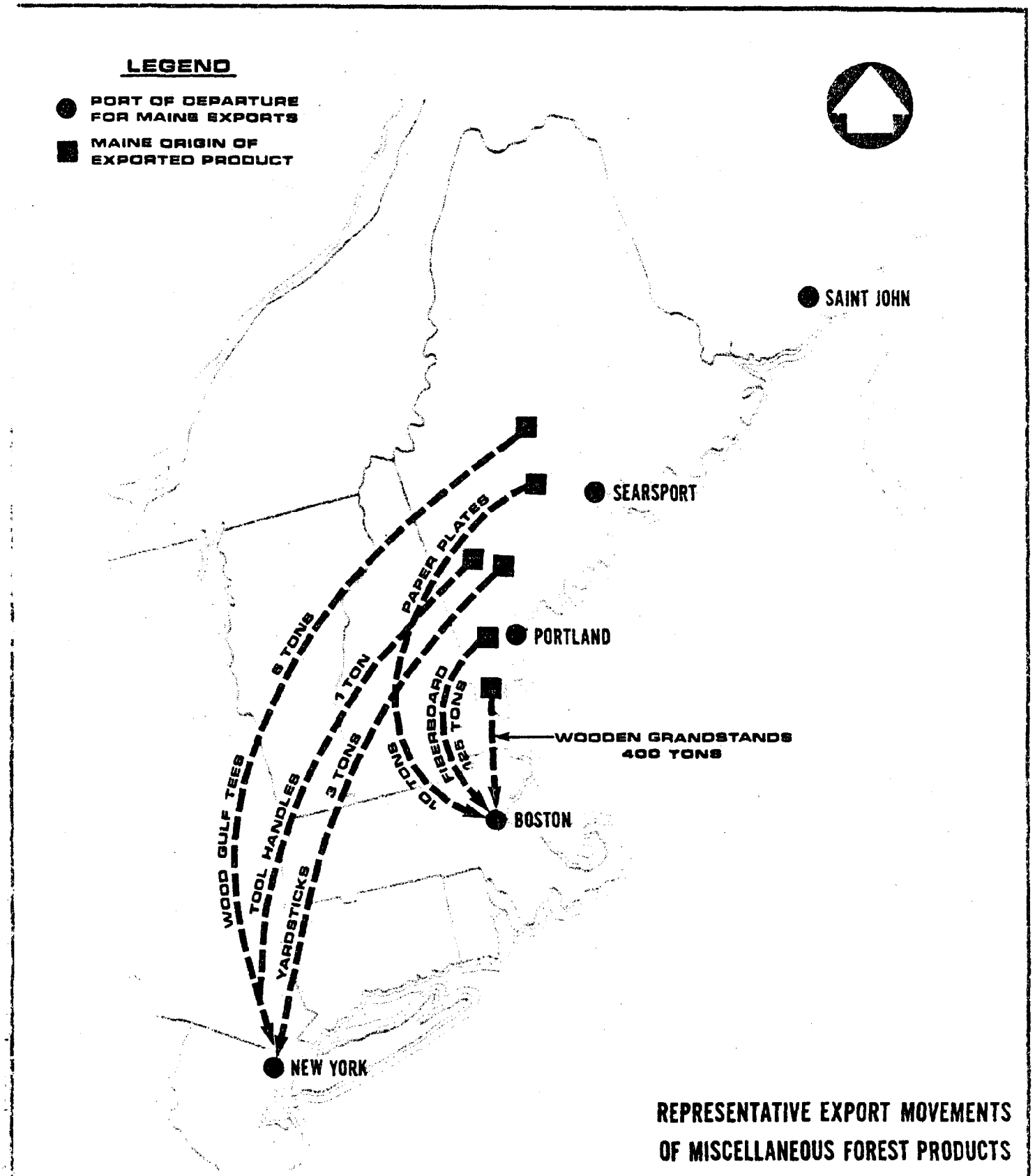
Other Food Products. Exports of other food products originating in Maine in 1976 totaled 3,918 tons, including 1500 tons of blueberries, 18 tons of chicken parts, and 2,400 tons of eggs. Most of these shipments were in containers and moved by motor carrier to New York, where such small individual shipments are consolidated for export with commodities originating in other areas.

Other Containerized Freight. Figure 3.12 shows representative export movements of containerized cargo in 1976, other than in the forest and food products discussed previously. None of these shipments exceeded 500 tons annually, with the larger movements including treated paper, valves, and bottled water. Total shipments of miscellaneous containerized freight amounted to less than 2,000 tons in 1976.

Import Patterns

Imports destined to Maine firms that were recorded in the MDOT survey totaled 230,350 tons in 1976, 188,351 tons of which, or 81.8 per cent, passed through Searsport harbor. According to the survey, 24,057 tons, or 13 per cent of the recorded import tonnage was containerized freight, which passed principally through the ports of Boston and New York. Only 11,631 tons of imports in bulk form, or 5.6 per cent of the bulk import tonnage, was unloaded at ports outside Maine. In 1975, imports of non-petroleum products totaled 178,062 tons at Searsport and 29,320 tons at Portland, for a total of 207,382 tons that year.

Nearly 75 per cent, or 173,000 tons of the non-petroleum import tonnage reported in the MDOT survey for 1976 consisted of four commodities: gypsum, caustic soda, bauxite, and rock salt.



SOURCE: ECONOMICS RESEARCH ASSOCIATES

REPRESENTATIVE EXPORT MOVEMENTS OF MISCELLANEOUS FOREST PRODUCTS AS REPORTED BY SEVERAL MAINE MANUFACTURING FIRMS, 1976

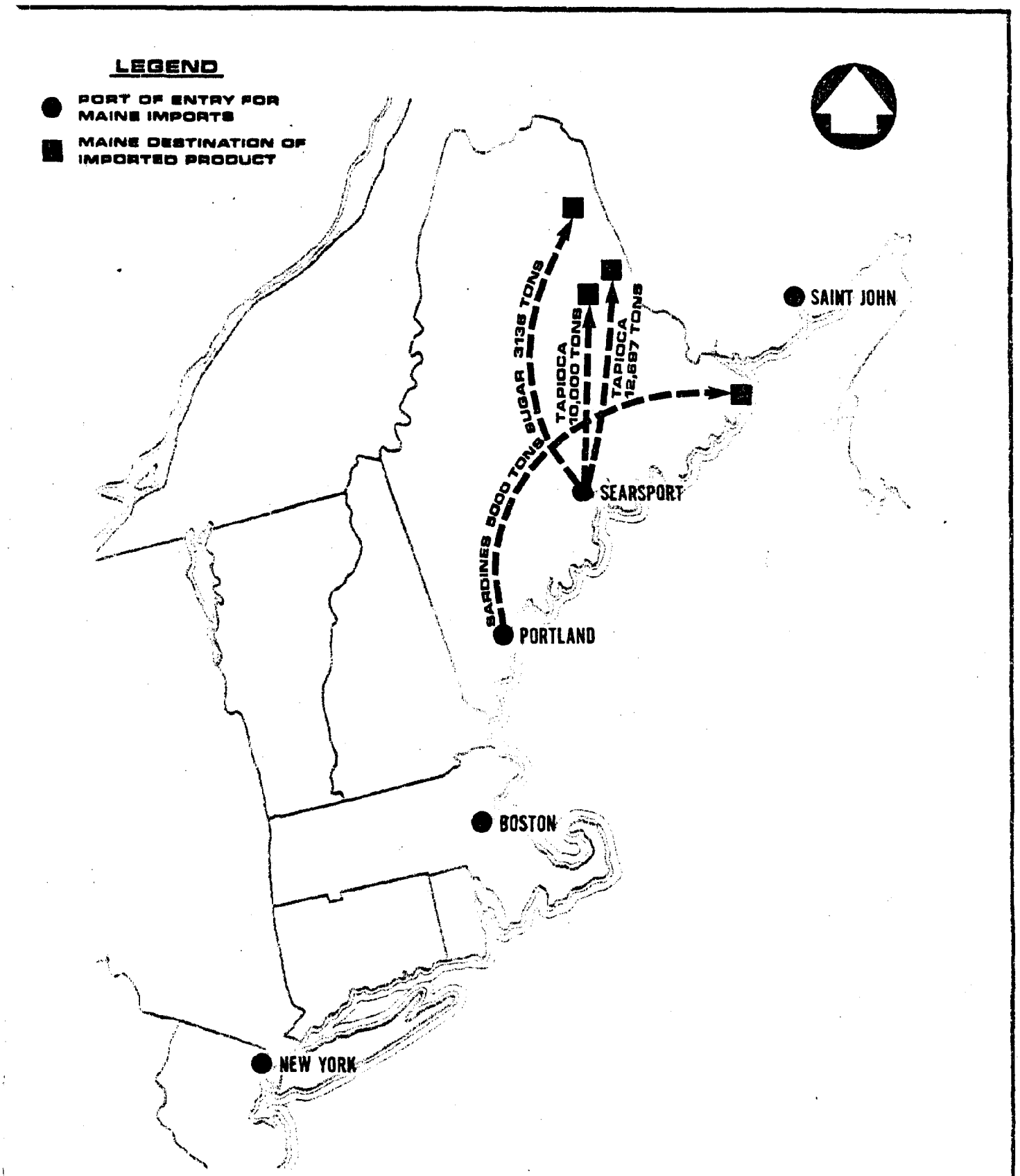
Figure 3.12

Caustic soda, a liquid, is primarily utilized by paper mills, while gupsum is important to the manufacture of cement. These commodities, plus rock salt and bauxite whose uses vary, were all imported through Searsport via private port facilities and were moved inland by truck and rail.

Figure 3.13 shows representative movements of imported foodstuffs in 1976. With the exception of sardines, inland transport of these commodities was by rail. Searsport was the principal unloading port for imported foodstuffs in 1976, handling 25,833 tons, or 84 per cent of the 30,833 reported tonnage. Tapioca, an important ingredient in the processing of potato products, accounted for nearly 74 per cent of foodstuffs imported in 1976. About 1,000 tons of tapioca imports were containerized in 1976, although users report an increasing trend toward this form of shipment.

Figure 3.14 shows representative movements of imported wool in 1976. Imports of this commodity, which totaled 2,524 tons in 1976, were moved inland entirely by motor carrier with about 21 per cent of total tonnage in containers.

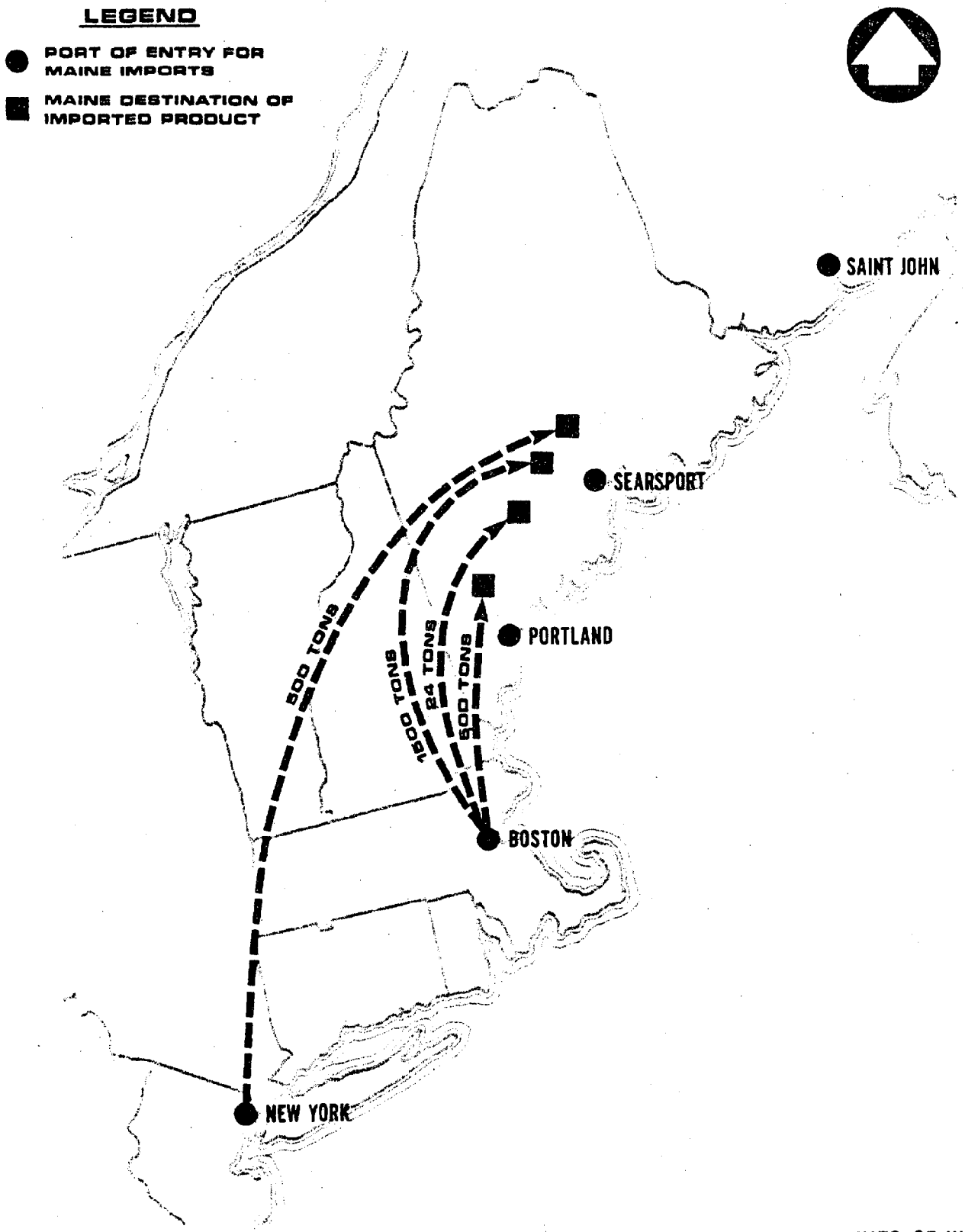
Imports of all other commodities in 1976 totaled 33,650 tons. Largest of these shipments included the following: 9,800 tons of alcoholic beverages, through New York, Boston, and Baltimore; 6,500 tons of lumber through Montreal and Trois Rivieres; 9,500 tons of seaweed through New York, Boston, and Portland; 1,920 tons of bearing parts through New York; and 1,200 tons of stoves and parts through Portland. Nearly 70 per cent of this tonnage was containerized, with virtually all inland movement via motor carrier.



SOURCE: ECONOMICS RESEARCH ASSOCIATES

REPRESENTATIVE IMPORT MOVEMENTS OF FOODSTUFFS AS REPORTED BY SEVERAL MAINE MANUFACTURING FIRMS, 1976

Figure 3.13



SOURCE: ECONOMICS RESEARCH ASSOCIATES

REPRESENTATIVE IMPORT MOVEMENTS OF WOOL AS REPORTED BY SEVERAL MAINE TEXTILE COMPANIES, 1976

Figure 3.14

Summary of Maine's Import-Export Trade

Data in Table 3.10 shows imports to the state of Maine in 1976 by cargo type, originating foreign country, and U.S. Port of Entry. Data in Table 3.11 shows exports originating in Maine in 1976 by cargo type, U.S. port of loading, and destination foreign country. The chart below summarizes import and export traffic of non-petroleum products reported in the MDOT survey for Maine firms in 1976, not including fresh potatoes:

Maine Based Waterborne Import-Export Traffic in 1976:

	1976 Total Tonnage	Tons of Break Bulk	Tons of Containerized Freight	Number of Containers Annually
Imports	239,125	215,068	24,057	1,373
Exports	266,947	160,166	106,781	5,501
TOTAL	506,072	375,234	130,838	6,874

Source: MDOT survey and Economics Research Associates

As discussed previously, the principal industries engaged in foreign export shipments from Maine are pulp, paper and paperboard mills and food products, particularly potato products. Much of the imported commodities are also destined for use by these industries, even as the particular producers may not be directly involved in the waterborne shipping of certain commodities. An example of this is caustic soda destined for the paper industry. The chart below estimates total import and export tonnages by major industry group:

Waterborne Imports and Exports by Selected Major Industry Group in 1976:

Major Industry Group	1976 Import Tonnage	1976 Export Tonnage	Import plus Export Tonnage	Tonnage of Containerized Freight
Pulp, paper and paperboard mills	90,581[1/]	178,982	269,563	64,651
Potato Products	14,833	71,400	86,233	30,800
All Other Food Products[2/]	37,197	8,396	45,593	12,150
Footwear, leather and leather goods	625	3,307	3,932	3,877
Textile Products	3,545	12	3,557	532
Mis. mfg. Products	5,544	3,952	9,496	6,500

[1/] Does not include imports of pulp since waterborne portion was not known. Pulp supplied to Maine mills from outside sources totaled 243,185 tons in 1976. Much of this total comes from Edmonton, N.B., to a papermill in Madawaska.

[2/] Does not include alcoholic beverages.

Source: MDOT survey and Economics Research Associates

As data in the above chart indicates, pulp, paper and paperboard mills are directly or indirectly connected with at least 269,563 tons of waterborne imports and exports, or 53 per cent of Maine's total import-export tonnage in 1976. Food products, including potato products, accounted for 131,826 tons, or 26 per cent of the total traffic. Thus, these groups together comprise at least 79 per cent of Maine's import-export trade in non-petroleum products. In the past, Searsport has handled most of the import shipments generated by these industries, while

Table 3.10

State of Maine

Imports

1976

Commodity	Liquid and Break-Bulk Tons Annual	Number Containers Annual	Container Tons Annual	Originating Foreign Country	U.S. Port of Entry
Alcohol Beverages		490	9,800	Canada - Puerto Rico United Kingdom	New York, Boston, Baltimore
Aluminum	100			France-Belgium-Italy	Boston, New York
Bauxite	8,835			Various	Searsport
Bearing Parts		48	1,920	Japan	New York
Burlap, Raw		2	8	Scotland	Boston
Cloth (Raw Materials)		25	500	Various	Port Elizabeth
Clothing	11			New Zealand-Iceland-England	Boston, New York
Copper	75			France-Belgium-Italy	Boston, New York
Copper Tubing	30			Germany	Boston
Electrical Wave Guides	12			Japan	Boston
Fish Netting	2			Japan	Boston
Gypsum	42,933			Various	Searsport
Hides-Plastic Resin		9	145	England	Boston
Leather Board		24	480	England	Boston
Lumber	6,500			Canada-South America	Montreal or 3 Rivers
Machinery (Paper Maker)	325			Western Europe	Port Elizabeth, Boston

Table 3.10 (Continued)

Commodity	Liquid and Break-Bulk Tons Annual	Number Containers Annual	Container Tons Annual	Originating Foreign Country	U.S. Port of Entry
Nylon Fiber	2			Switzerland	Boston
Petroleum Products	28,127,303			South and Central America Middle East - Africa	Portland, Searsport
Paper	120			Sweden-Finland	Boston
Salt	88,597			Various	Searsport
Sardines	5,000			Norway	Portland
Seaweed		475	9,500	Singapore, Phillipines, Chile	New York, Boston, Portland
Caustic Soda	32,153			Various	Searsport
Steel	1,500			France	Providence
Stove and Parts		120	1,200	Norway	Portland
Sugar	3,136			Unknown	Searsport
Tapioca	22,697			Thailand	Searsport
Processed Textile Material	1,000			Various	Boston- New York
Wire		24	480	Belgium	Boston
Wooden Dowels	40			Indonesia	New Orleans
Wool - Cashmere	2,000	156	24	Australia - South	Boston - New York
Totals	28,333,596	1,373	24,057	Total Tonnage 28,357,653	

Source: MDOT Telephone Survey, March 1977

Table 3.11

State of Maine

Exports

1976

Commodity	Liquid and Break-Bulk Tons Annual	Number Containers Annual	Container Tons Annual	U.S. Port	Foreign Destination
Blueberries		20	1,500	Port Elizabeth Montreal, Quebec	Japan-Europe
Books	8			Boston	England-Australia
Carrageen		12	250	Portland-Boston New York	Europe-Japan
Cartridges-Cassettes		15	300	New York	South America
Canoe Paddle Oars	1			New York	South Africa
Chicken Parts	18			New York	West Indies
Chain	50			Portland-Boston	Europe-South America
Cloth Plastic Woven	12			Seattle New York	Japan-Australia
Core Board		3	80	Port Elizabeth	Puerto Rico
Cordage, Synthetic	2			New York	Germany-Australia
Eggs		76	2,400	New York	Puerto Rico-Hong Kong Singapore
Expansion Joints	400			Port Elizabeth	Various
Fiber Board	125			Boston-New York	Philippines
Hydraulic Parts		24	960	Boston	England-Japan

Table 3.11 (Continued)

Commodity	Liquid and Break-Bulk Tons Annual	Number Containers Annual	Container Tons Annual	U.S. Port	Foreign Destination
Footware		24	480	Boston-Portland	Europe-Spain
Frozen Fish	500			Gloucester	Germany
Golf Tees	6			New York	England-Scotland Sweden-South Africa
Honeycomb Rolls		7	140	Boston	Europe
Lamp Starters	4			Miami	Costa Rica
Light Bulbs (Leads, Dials)	125			New York	Mexico, Germany, England Costa Rica
Leather		68	2,152	Boston-New York	Hong-Kong, China, Korea, Russia
Leather Goods		20	400	Boston-New York	France, South Africa, Italy, Austria, England, Netherlands
Leather, Synthetic		12	120	Boston	Far East, Pakistan
Lumber	1,981			Searsport	Teheran, Iran
Machinery		4	100	New York	Europe, Japan
Marine Instruments	5			Charleston	Europe
Mineral Water		25	438	Boston	Puerto Rico, Bermuda, Caribbean

Table 3.11 (Continued)

Commodity	Liquid and Break-Bulk Tons Annual	Number Containers Annual	Container Tons Annual	U.S. Port	Foreign Destination
Molybdenum Tungsten Products	10			New York	Europe-Japan
Newsprint	33,506	269	15,341	Searsport, Saint John	France-Brazil
Paper		150	3,000	Boston, New York	Australia
Paper, Printing		1,451	45,000	Boston	Europe
Pulp and Paper	102,619[1/]			Portland, Saint John, Boston, New York	Europe, Africa, Japan, Egypt
Paper Tissue		36	720	Boston	Puerto Rico, Europe
Paper Plates	10	20	10	Boston	Jamaica, Australia, Europe
Paper, Impregnated Resin		36	500	New York	Ireland, Africa, Jamaica
Potatoes	183,000			Searsport, Winterport	Europe
Potatoes, Seed and Other	9,750			Portland	Egypt - France
Potatoes, Dehydrated		1,040	10,000	Boston	N.Europe, England, Sweden
Potato, Meal	1,000			Searsport	Holland
Potatoes, Frozen French Fries	39,600			Saint John - Searsport	United Kingdom
Potatoes, Flakes, Granules, and French Fries		2,080	20,800	Boston, New York	England, Holland

[1/] Includes 23,900 tons originating in New Hampshire

Table 3.11 (Continued)

Commodity	Liquid and Break-Bulk Tons Annual	Number Containers Annual	Container Tons Annual	U.S. Port	Foreign Destination
Pearl Essence	5			New York	Various
Plastic Boards, Bars, Rods, Rawhide Mallets and Hammers	55	2	80	Boston, New York	Kobe, Hong Kong, Japan, Germany
Propellers	1			Boston	Finland
Rubber Soles	80	20	20	Port Elizabeth	Haiti, Puerto Rico
Sardines	750			Boston	Puerto Rico, Western Europe
Shock Absorbers		50	1,000	Boston	Spain
Snow Equipment		9	360	Boston	Germany
Steel and Wood Shoe Shanks	500			Boston	Puerto Rico
Squid and Tuna	2,400			Gloucester	Europe, Japan
Transmitters	50			New York, Boston	Europe, Taiwan, Australia
Transfer Coating Equipment		6	180	Boston	Far East
Wooden Grandstands		20	400	Boston	United Kingdom, North Europ
Wood and Plastics	250			Boston	South America, Puerto Rico, Caribbean

Table 3.11 (Continued)

Commodity	Liquid and Break-Bulk Tons Annual	Number Containers Annual	Container Tons Annual	U.S. Port	Foreign Destination
Yard Goods (Cotton-Polyester)		2	50	Boston	Puerto Rico
Yardsticks	3			New York	Central America
Totals	376,816	5,501	106,781		

Grand Totals

Break Bulk and Liquid Tonnage	376,816
Container Tonnage	106,781
Total Tonnage	483,597

Source: MDOT Telephone Survey, March 1977

Saint John, Searsport, and Boston are the principal loading ports for foreign exports.

Maine Ports Hinterland Potential

Broadly defined, the hinterland of Maine ports includes all cargoes originating from or destined to areas both within and outside the state that could potentially be shipped through Maine ports. A number of factors need to be considered in analyzing this potential, including the following: locational advantages and disadvantages, relative to waterborne trading routes and inland markets; total transportation infrastructure, including physical port facilities, rail and highway connections; total transportation costs, including port storage, handling, wharfage, pilotage, etc. plus rail and motor carrier charges; total transportation services, including liner service at the port, unitized rail and bulk handling capabilities, labor productivity in handling, and times of delivery via each transport mode. A number of the above factors are difficult to quantify and it may be misleading to represent some variables, such as tariff characteristics, at a static point in time since they vary depending upon available traffic. Additional factors are also important, such as the established patterns between individual trading partners, including arrangements that in some instances may supersede any or all of the criteria noted above. With these caveats in mind, the following paragraphs assess the hinterland potential of Maine ports.

Locational Advantages and Disadvantages

Compared to the ports of Boston and New York, those in Maine are at a relative locational disadvantage to major markets in the northeastern portion of the United States. And while Maine

would appear to offer an advantage to oceanborne shipping distance to Northern Europe, the actual difference in steaming time between a Maine port and Boston, for example, is insignificant according to the ship operators contacted. Accordingly, Maine ports hinterland potential to major U.S. markets is limited on a pure geographic basis. Even considering portions of New Hampshire and Vermont, for example, Boston is only 18 highway miles further from Burlington than is Portland, while Boston is 34 miles closer to Manchester than is Portland.

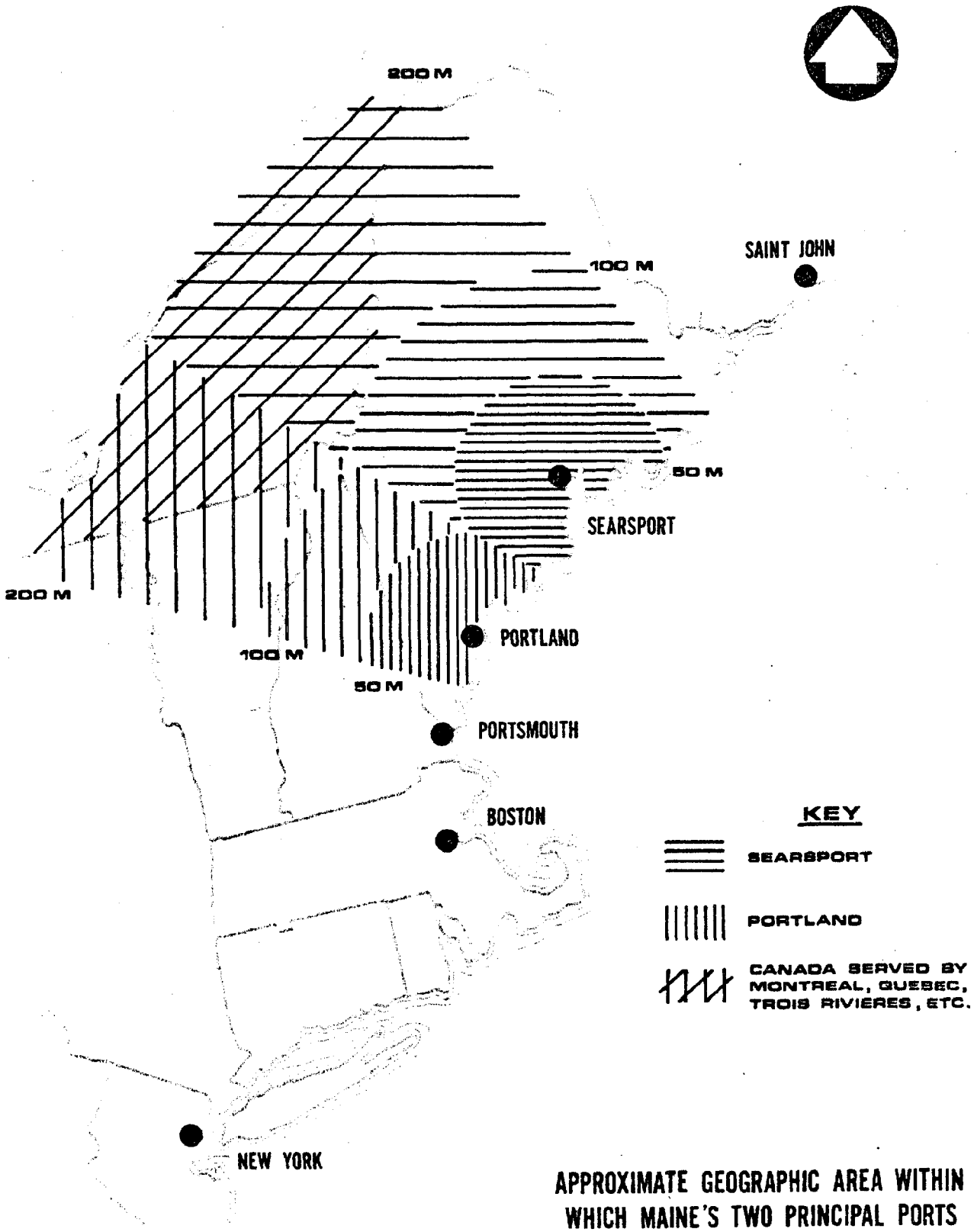
With respect to major market areas in Canada, particularly Montreal and Quebec, both Portland and Searsport would appear to offer some locational advantage over U.S. and Canadian ocean ports. Portland, for example, is 314 miles closer to Montreal than is Saint John, while Searsport is 177 miles closer to Quebec than Saint John. Portland and Searsport are nearly 400 miles closer to these cities than the major Canadian ocean port at Halifax. However, both Montreal and Quebec have substantial port facilities as well as regular ocean freight service. A further consideration with respect to Canadian markets is the policy of that government to utilize ports within its own soil wherever possible, and this policy is firmly expressed in subsidies to rail and motor carriers which enable them to provide competitively lower rates, as well as port investments by the National Harbours Board, Canadian railroads, and Canada's Department of Regional Economic Expansion (principally at Saint John).

The chart below compares distances in highway miles between principal cities in the United States and Canada to which Maine ports are within 50 to 100 miles of other ocean ports:

Major City	Highway miles Distance to Nearest Maine Port	Highway miles Distance to Nearest U.S. Competitive Port	Maine Port Differential (+ = closer; - = further)
Quebec	241 (Searsport)	391 (Boston)	+ 150 miles
Montreal	270 (Portland)	339 (Boston)	+ 69 "
Ottawa	396 (Portland)	435 (New York)	+ 39 "
Burlington, VT	212 (Portland)	230 (Boston)	+ 18 "
Manchester, NH	95 (Portland)	61 (Boston)	- 34 "
Albany[1/]	249 (Portland)	149 (New York)	-100 "

[1/] Beyond Albany and including cities in northern New York, Pennsylvania, and Ohio, ports at Philadelphia and Baltimore are closer than those in Maine by more than 130 miles.

Figure 3.15 shows the approximate geographic area within which Maine's two principal ports, Searsport and Portland, offer relative distance advantage over other ocean ports. Realistically, parts of the zone for each port that fall in Canada should not be considered as offering potential for increasing cargo through Maine ports, because they fall within the hinterland of ocean-serving ports at Montreal, Quebec, and Trois Rivieres, and because Canadian shippers are provided strong incentives to utilize Canadian ports. The same argument cannot be applied, however, for cargoes originating in Maine that fall within the location advantage of Saint John. MDOT's survey of 1976 known import and export traffic showed that 119,000 export tons, or 45 per cent of total export tonnage originating in Maine that year, passed through the port of Saint John. These shipments included papermill products from Washington and Aroostook Counties, and potato products from Aroostook.



APPROXIMATE GEOGRAPHIC AREA WITHIN WHICH MAINE'S TWO PRINCIPAL PORTS OFFER RELATIVE DISTANCE ADVANTAGE OVER OTHER OCEAN PORTS

SOURCE: ECONOMICS RESEARCH ASSOCIATES

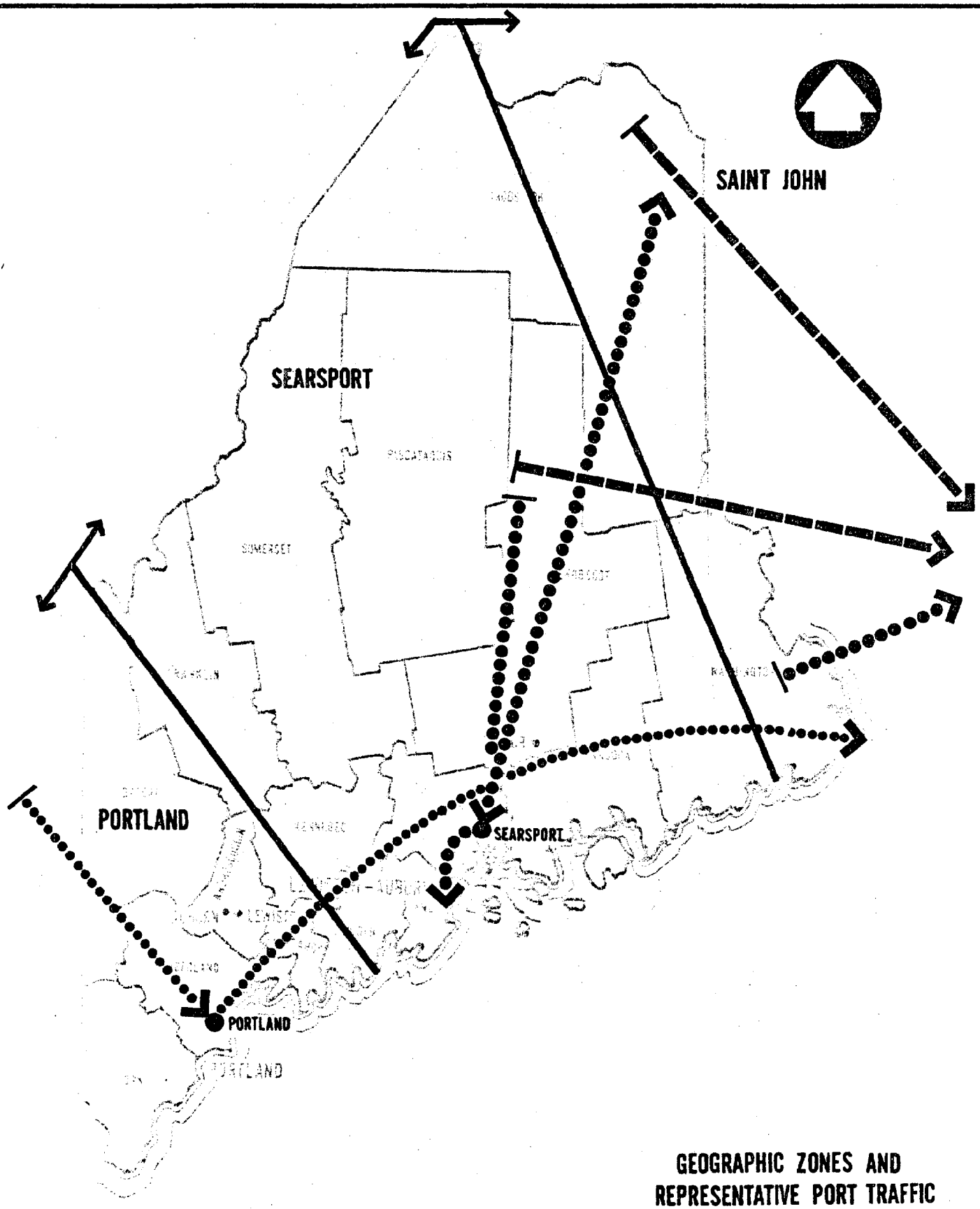
Figure 3.15

Some shipments to Saint John in 1976 originated in areas falling within the relative location advantage of Searsport, although this cargo was containerized and largely moved by motor carrier--two factors for which Searsport offers less than competitive services. Conversely, Searsport loaded substantial potatoes and potato products shipments in bulk form in 1976, which also originated in Aroostook County.

Portland's hinterland now includes exports of paperboard mill products which originate in Berlin, New Hampshire. Much of the import and export traffic for which Portland offers a relative location advantage over other ports now passes through Boston and New York, primarily because those ports offer efficient container handling facilities and international liner service (which is essential to small lot shipments.)

Shipping potential at both Searsport and Portland has been limited to individual shipments of sufficient size (1,000-2,000 tons minimum, for relatively low value bulk commodities, according to the shippers contacted) to attract a bulk parcel operator. It is typically not worthwhile for a bulk parcel operator, whose profit efficiency depends upon rapid turnaround time at each port, to handle a number of small shipments requiring calls at a number of ports. These and other transportation service factors are as important to a port's cargo potential as is its relative location advantage, and will be discussed in greater detail subsequently.

Keeping in mind that a number of factors other than geography affect a port's hinterland potential, Figure 3.16 compares the zones of relative location advantage provided by Maine's two principal ports with the hinterland represented by actual shipments



GEOGRAPHIC ZONES AND REPRESENTATIVE PORT TRAFFIC IN 1976

SOURCE: MDOT SURVEY AND ECONOMICS RESEARCH ASSOCIATES

in 1976. The chart below compares import and export tonnage by port in 1976 that falls within and outside their respective zones of apparent location advantage:

	1976 Import Tonnage Within Zone[1]	Imports Outside Zone	1976 Export Tonnage Within Zone[2]	Exports Outside Zone
Saint John	--	--	104,000	15,000
Searsport	172,351	16,000	35,314	15,833
Portland	10,095	500	24,141	—
TOTALS (per cent)	182,446 (91.7)	16,500 (8.3)	163,455 (84.1)	30,833 (15.9)

[1] Not including petroleum products

[2] Not including fresh potatoes

Data in the chart above and Figure 3.16 indicate that, with some notable exceptions, the vast majority of Maine's import and export traffic in 1976 handled by Saint John, Searsport, and Portland, fell within each port's respective area of relative location advantage. It should be noted that hinterlands for the ports of Boston and New York extend into all parts of Maine, as reference to prior figures will illustrate. Nevertheless, for future planning purposes it may be instructive to compare Maine's total import and export traffic potential, based on the 1976 survey, that falls within each port's relative location advantage.

HYPOTHETICAL PORT HINTERLANDS, BASED ON 1976 SHIPMENTS AND RELATIVE LOCATION ADVANTAGE

	IMPORTS	EXPORTS	TOTAL	(per cent)
Saint John	16,500	101,263	117,763	(23%)
Searsport	196,200	98,267	294,467	(58%)
Portland	17,650	81,569	99,219	(19%)

Source: MDOT survey and Economics Research Associates

Strictly on the basis of geographic location, Searsport appears to offer an advantage over Portland in serving more import and export tonnage originating from or destined to points in Maine. Portland's cargo potential, which already includes nearly 24,000 export tons annually originating outside the state of Maine, is more limited both in a geographical sense and by the fact that many of the shipments destined to or originating from areas in the vicinity of Portland are relatively small and sporadic.

Transportation Facilities, Services, and Costs

Transportation facilities important to the functioning of a port include rail and highway connections, as well as berthing, handling, and storage facilities at the port. Transportation service factors include delivery time to market, encompassing inland as well as port and oceanborne travel time; inland and port handling capabilities; and availability of steamship service. Transportation costs include those involving inland carriers; pilotage, berthing, storage, loading and unloading costs at the port. These factors are assessed as they affect the cargo potential of Maine's two principal ports, and on the potential for consolidating Maine's traffic at a single port.

Railroads. Both Portland and Searsport are well served by rail connections. The Maine Central, Canadian National and Boston & Maine railroads maintain lines that run directly to the port of Portland, via the Portland Terminal Company, while the Bangor and Aroostook railroad has a direct line to Searsport and inland connections with Maine Central, Canadian Pacific, and Canadian National. Theoretically, any or all of Maine's import and export

traffic moved via rail could pass through a single port.

Railroad tariff and service characteristics will determine in some measure whether or not this potential is realized. Currently, ports at both Portland and Searsport are handling shipments via rail that move on specific commodity rates in addition to liberal handling charges as well as liberal demurrage provisions and free storage time at the port. Examples of commodities for which Portland or Searsport provide advantageous rail shipping and storage charges include the following:

MAINE PORTS SHIPPING RATE ADVANTAGES

Port	Commodities	Competitive Tariff Provisions
Searsport	Potato Products	Rail shipping rate
	Newsprint	Rail shipping, handling, storage
	Groundwood printing paper	Rail shipping rate and handling
Portland	Pulp and paper	Rail shipping rate, storage, handling

Not only have such provisions enabled the above commodities to move through Searsport or Portland with competitive advantage in shipping cost to the port, but also experience gained in ship loading has resulted in increased labor productivity, thus making costs to the steamship operator competitive as well. In most instances, however, these special tariff advantages now apply exclusively to single line haul shipments. That is, they do not include commodity shipments involving more than one railroad. An exception is frozen foodstuffs shipments from Aroostook County to Portland, which move via the Bangor and Aroostook and Maine Central Railroads.

It should be emphasized that current tariff differences provide only one measure of a port's cargo potential. Special commodity tariffs to a port are initiated only if the port can manage the induced traffic--that is, arrange steamship service and provide efficient handling and adequate storage. Although this is somewhat of a "chicken-egg" problem, since the port's ability to attract vessels and develop handling efficiency depends upon its having cargo to service, current tariffs are significant only with regard to existing port facilities. Moreoever, special tariffs are not published unless, as a minimum, marginal revenues to the railroad exceed the marginal cost of the lower rate. Thus, special tariffs on commodities with small export or import tonnage would not be expected, especially to ports like Searsport and Portland where no regular liner service is now available.

A similar line of reasoning can be applied to comparisons between ports based on current labor costs and productivity, and on other port service costs such as pilotage and wharfage. These costs tend to rise and fall depending upon the vessels and cargoes being handled, and on facilities inherent to the port--such as cranes, forklifts, working aprons, distance between storage and loading facilities, etc. Thus, it would not be meaningful to compare present costs at Maine ports with those more established in facilities and cargo volume, such as Saint John, Boston, and New York. The efficiency of a port often depends on the particular stevedore at that port.

In 1976, 50 per cent of the import tonnage whose mode of inland transport was recorded in the MDOT survey moved via rail,

virtually all carried by the Bangor and Aroostook railroad. Approximately 20 per cent of the export tonnage in 1976 moved via railroad, with the vast majority also shipped on the Bangor and Aroostook(BAR). BAR's historical involvement in import and export traffic is based in part on their ownership of pier facilities at Searsport, and on the relatively large tonnages of foreign bound cargoes destined to or originating from areas to which the railroad provides direct single haul service in Penobscot and Aroostook Counties.

A hinterland potential pertinent to Maine's railroads, because of connections to Canada and the relative location advantage afforded by ocean ports in Maine, includes the shipping of commodities to or from U.S. Great Lakes areas, such as Chicago and Detroit. It was thought that U.S. generated imports and exports to or from these areas could be efficiently moved by Canadian railroads to points in Maine and then proceed via a Maine-based carrier, or in the case of Canadian National Railroad involve no transfer, to a Maine port. The advantage to U.S. inland shippers, it was thought, would be the unit train rail service (a single train entirely loaded with a single commodity, involving no car transfers or additional handlings) which Canadian carriers can provide. Both the Canadian National and Canadian Pacific Railroads afford single haul service with unit trains covering the entire continent, a provision that U.S. railroads are not able to meet.

While this concept appears promising in the abstract, contacts in the course of this study as well as historical attempts by persons in Maine to develop such traffic, indicate that Canadian

railroads are interested in serving Canadian ports, not ones in Maine, although the Canadian railroads would gladly move traffic from the U.S. to Canada if it was available. Canadian railroads have made substantial investments in ports at Saint John and Halifax, while much of the U.S. Great Lakes traffic which moves by rail to an ocean serving port outside those in the Great Lakes is handled at Montreal, Quebec City, or Trois Rivieres. While Portland continues to function as a major importer of petroleum destined to Montreal, trade in dry cargoes has dwindled to virtually nothing in recent years, and Canadian bound petroleum moves via pipeline. At one time, substantial traffic in Canadian farm products (particularly flour) passed through the port of Portland, but 1965 was the latest year in which significant farm products tonnages are recorded at Portland.

Motor Carriers. Nearly 80 per cent of Maine's export tonnage, and 50 per cent of imports, were reported in the MDOT survey to have moved by motor carrier in 1976. Motor carriers handled a substantial portion of bulk-form shipments, and most of the freight transported in containers. The principal advantage motor carriers offer rail shipments is faster delivery times. Containers, whether moved by motor carrier or rail, are less subject to breakage and spoilage in handling, and for commodities sensitive to such problems there has been an increasing trend towards containerization.

There are basically two kinds of motor carrier service--licensed common carriers and contract carriers. While ICC data does not distinguish motor carrier rates separately by these two types of operators, in many instances contract carriers reportedly

provide shipping at lower rates than common carriers. Since a contract carrier may be dependent on a single shipper for most or all of its traffic, the financial position of such operators may be less stable than a common carrier. Contract truck operators handled only a small proportion of Maine's import and export trade moved via motor carrier in 1976, according to the MDOT survey.

Of Maine's two principal ports, Portland is the better served by highway facilities, with nearby connections to Interstate 95. Highway access to the vicinity of Searsport is also adequate, but trucks must maneuver a narrow dirt passageway to reach the general cargo pier owned by the Bangor and Aroostook Railroad. A further disincentive for motor carrier use of the Searsport pier is the charge applied by BAR of 16 cents/100 lbs. of frozen fish, 17 cents/100 lbs. of general cargo, and 33 cents/100 lbs. of tapioca flour and starch. Such charges effectively reduce Searsport's locational advantage for import and export shipments by motor carrier, and partly as a consequence of this fewer cargoes pass through that port. There have been exceptions where such charges were not prohibitive to motor carriers use of Searsport, with 1976 potato shipments a notable example. It should be re-emphasized that the current general cargo pier at Searsport is privately owned and designed principally for the railroad's use.

Port Facilities and Services

Facilities and services at ports throughout Maine have been described in prior sections of the report. The advantages and disadvantages of current facilities and services at the two major cargo ports in the state, with respect to their potential for

increasing cargo volume, are summarized in the chart below:

CURRENT PORT FACILITY AND SERVICE CHARACTERISTICS
RELATED TO INCREASED CARGO OPPORTUNITIES

	Portland	Searsport
Principal Advantages	o Scheduled Service by Norwegian-American Lines o Existing pulp and paper movements with unitized bulk handling o Pilotage, customs, etc. o Planned cold storage warehouse o Substantial covered storage	o Existing newsprint and potato products movements with favorably rated labor productivity o Pilotage, customs, etc.
Principal Disadvantages	o Limited container handling capability on the pier o Limited working apron on the pier o Limited marshaling and storage area for containers and heavy bulk commodities on the pier o Limited backland area for off-pier storage	o No scheduled service o Limited container handling capability on the pier o Limited working apron on the pier o Limited marshaling and storage area for containers and heavy bulk commodities on the pier o Limited backland area for off-pier storage o Lack of freezer or cold storage warehouse

For either Portland or Searsport to effectively compete for cargo potentially available from their apparent hinterlands, some or all of the port facility disadvantages noted above will need to be corrected.

Summary of Maine Ports Hinterland Potential

As discussed in the preceding paragraphs, a number of factors affect the potential for increased cargo to be handled at one or more Maine ports. Principal among these are the following: the locational advantages afforded by a port's geographic position relative to the origin and destination points of import or export shipments and relative to the geographic position of competing ports; rail and highway connections and service to and from the

ports; costs of shipping by rail or motor carrier to and from the port, including special commodity tariffs relating to existing port facilities and services; the availability of sufficient and timely cargo tonnages to attract regular liner service or bulk parcel operators; the presence of port facilities that can adequately manage available cargoes, including dry storage, marshaling area, working aprons, loading and unloading facilities.

For future planning purposes, it may be assumed that port services in Maine, including labor costs and productivity, will be reflective of the facilities provided for storage, handling, and the volume and types of cargo available for service, and that such services and costs will be at least as good, if not better, in Maine as those at competing U.S. ports. Contacts with shippers bear out this hypothesis, as their ratings of port services relate primarily to the cargoes being handled and the facilities currently in operation. Saint John reportedly offers lower handling costs than Maine or other U.S. ports, but this factor could be largely obviated by the location and time of delivery advantage that a Maine port would afford, or by special commodity rates, free storage time at the port, or other incentives if necessary.

Data in Table 3.12 lists the cargo potentially available within the respective ports. For these reasons, potential growth in production and exports by pulp, paper and paperboard mills in Maine is further analyzed in a subsequent section.

Another industry which has shown substantial import and export tonnages in the past is food products, particularly potato products. Combined import and export tonnages for food industries

Table 3.12

Comparison of Cargo Potential at One or More

Maine Ports[1] and Cargo Handled at

Competing Ports in 1975

(short tons, excluding petro/coal/gas products only)

	Portland	Searsport	Searsport and Portland Combined	1975 tonnage at: Saint John	Boston
Imports	17,650	196,200	213,850	664,971	1,013,036
Exports	81,569[2]	98,267	179,836	1,716,784	546,592
Total Tonnage	99,219	294,467	393,686[3]	2,381,755	1,559,628

[1]Based on 1976 shipments within relative location advantage of Maine ports, excluding fresh potatoes; 1976 shipments for other ports were not available.

[2]Includes 23,900 tons originating outside Maine

[3]Figure excludes products within location advantage of Saint John. Total Maine-based traffic, excluding fresh potatoes, was 497,287 tons in 1976.

Sources: MDOT survey, U.S. Waterborne Commerce Statistics, Canadian Shipping Statistics, and Economics Research Associates

in Maine amounted to approximately 132,000 tons in 1976 (not including fresh potatoes), or 26 per cent of the Maine-based traffic that year. And while much of Aroostook County falls within the location advantage of Saint John, most of the imported commodities destined to Aroostook County and many exports now pass through Searsport, in large part a result of the rail rates and service available there.

A major consideration in food products exports is the availability of freezer and cold storage facilities at the port. Export growth is expected in Maine's food products industries, perhaps 6-10 per cent per year in frozen potato products, for example, although the leading exporter now is a Canadian based firm which has indicated it will continue to use port facilities at Saint John. Parenthetically, Maine's leading forest products exporter in 1976, located in Washington County, also shipped through Saint John, which offers location advantages over Searsport or Portland.

Another factor, which potentially relates to a number of industries' use of Maine ports, is the possibility of coastwise service from or to Maine and other U.S. Atlantic Coast ports. Currently, a New York based enterprise is planning to construct a number of small, multi-purpose vessels (7,200 long-ton capacity, with ro-ro, container, liquid, and dry bulk handling capabilities) whose sole purpose would be to service domestic coast-wise trade. Past attempts to develop this kind of service for non-petroleum products have not gone beyond planning stages. In fact, the current venture is predicated upon petroleum shipments that would

be loaded in Virginia and unloaded at Portland. For general cargo shipments, however, would-be domestic coastwise operators have typically found that they could not provide service that would be competitive in cost and delivery time with inland railroads or motor carriers. However, in view of the increasing costs of energy, and the fact that waterborne shipping is far more efficient in energy utilization (on a ton moved per mile basis) than land transport, conditions favor such a venture now much more than in the past. The vessels are planned for the capability to roll on-roll off (ro-ro) trucks, a feature which reduces handling costs and may make short-haul waterborne shipments of general cargo more feasible. If a coastwise domestic service can be made competitive with inland transport, then Maine is a logical place to develop traffic. The state's location disadvantage to major U.S. markets, the large volume of paper products and food products produced in Maine for consumption outside the state, as well as the relatively poor service afforded by many Northeast railroads, suggests that competitively priced waterborne transport between Atlantic coast ports may offer beneficial service to many of Maine's industries. It was not possible at the writing of this report to evaluate impacts of the planned domestic coastwise service more fully, as the rates of the carrier, port handling, and delivery times are not yet known. According to the developers, the first vessel may be on-line by the second quarter of 1979.

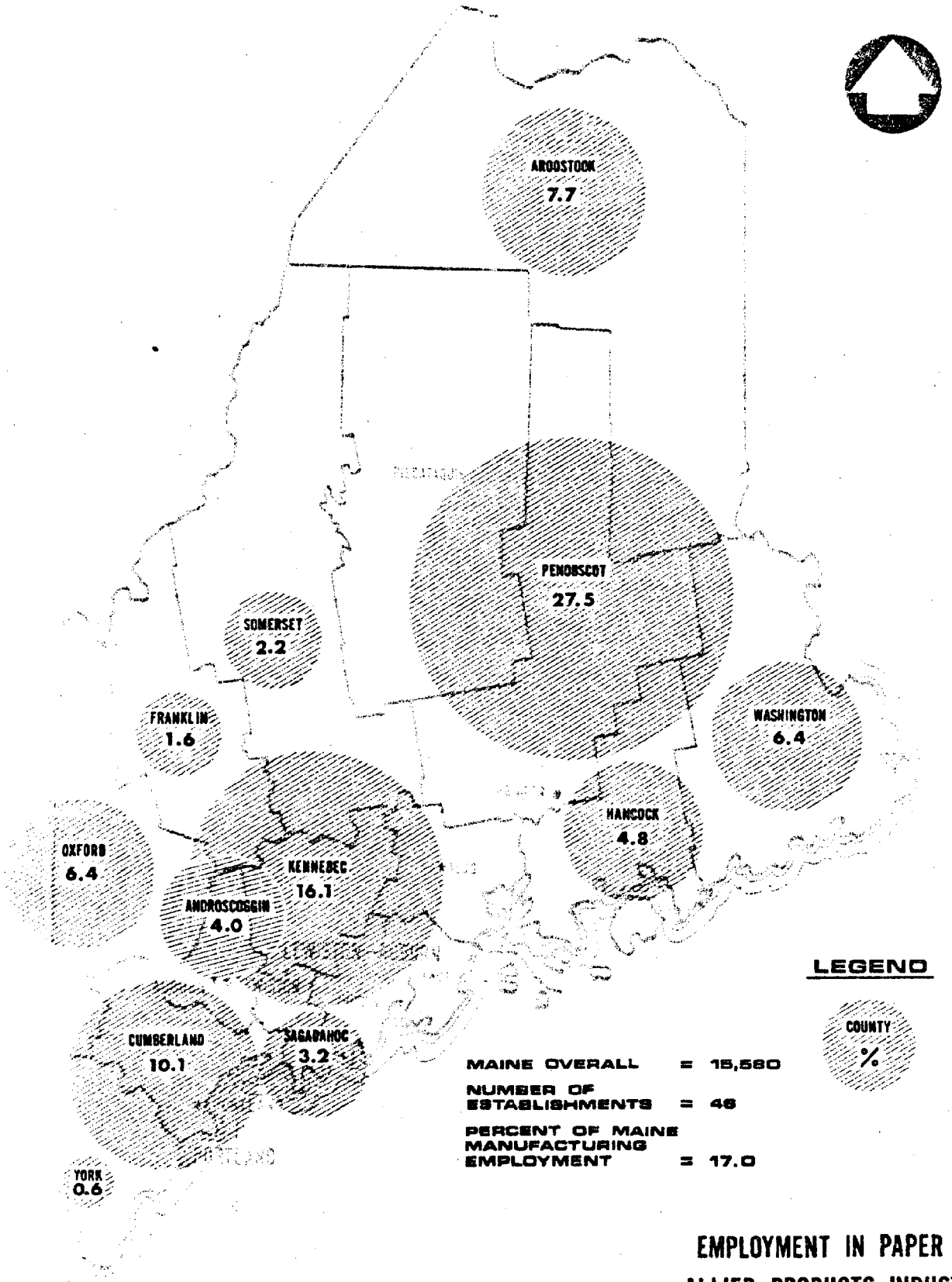
Another consideration with respect to Maine ports' cargo potential relates to the heavy traffic at Saint John during winter months. Saint John is an ice-free port and handles cargoes during the winter which might otherwise be shipped via a St. Lawrence

River port. Demurrages are not uncommon at Saint John, particularly in winter months, and Canadian based shippers are reportedly given preferential handling when the port is overloaded. Paper brokers felt that a Maine port could capture trade during the winter that might otherwise pass through Saint John. This potential will be influenced by the extent to which the new forest products terminal at Saint John effectively increases port capacity, which is not known at the present time.

3.4 Export Trends in Pulp, Paper and Paperboard Products

As discussed in prior sections, pulp, paper, and paperboard mill products constitute by far the heaviest export traffic originating in Maine, amounting to 70 per cent of the state-based export tonnages--twice as much as all other non-petroleum cargoes combined in 1976. Tonnage in commodities imported for use in pulp, paper, and paperboard production is also substantial, amounting to 40 per cent of the import tonnage recorded in MDOT's survey for 1976. A substantial tonnage of pulp is also imported by Maine mills, although the waterborne portion is not known. This relative importance of pulp, paper, and paperboard mills to the overall market for port traffic in Maine warrants special consideration.

Figure 3.17 shows countywide employment in paper and allied products (SIC group 26), an industry group in Maine which is predominantly comprised of mill employment. As data in the figure indicate Penobscot County, followed by Kennebec and Cumberland Counties, held the largest shares of paper and allied products employment in 1975 (latest year for which county data is available). In 1976, 70 per cent of Maine's forest-products waterborne exports came from mills in Penobscot and Washington Counties, according to the MDOT



SOURCE: U.S. COUNTY BUSINESS PATTERNS AND ECONOMICS RESEARCH ASSOCIATES

EMPLOYMENT IN PAPER AND ALLIED PRODUCTS INDUSTRIES (SIC 26) 1975

Figure 3.17

survey. The MDOT survey also reported that waterborne imports for use in paper production were largely destined for Penobscot County.

Most of Maine's 1976 exports from all mills were in paper products, especially newsprint, while pulp, paperboard, and lumber represented less than 6 per cent of forest-products export tonnages from Maine in 1976. Table 3.13 shows overall U.S. exports in selected pulp, paper, and paperboard products from 1965 to 1975. As data in the table indicates, U.S. exports of newsprint have been relatively small--about 15 per cent of 1975 paper exports, for example. In contrast, newsprint is the major foreign export item originating in Maine. From the MDOT survey and data in Table 3.13, it is estimated that 70-80 per cent of overall U.S. newsprint exports originate at Maine mills. The U.S. historically has imported 65-70 per cent of the newsprint consumed in this country, and newsprint is roughly one-sixth of overall U.S. consumption of paper and paperboard.[1] In 1976, an estimated 7.9 million tons of newsprint were imported to the United States.

One of the principal suppliers of U.S. newsprint is Canada. Data in Table 3.14 shows exports of selected mill products from Canadian Atlantic ports in 1975. As data in the table indicates, the United States is the leading market for Canadian newsprint exported from Atlantic ports, followed closely by Europe. Table 3.15 provides a more detailed breakdown of Canadian mill exports in 1975, showing U.S. Atlantic and Gulf ports to be the principal recipients of newsprint.

Returning to data in Table 3.13, it is instructive to note the relatively small proportions of U.S. production in pulp, paper,

---

[1] U.S. Industrial Outlook in 1977, U.S. Department of Commerce, Domestic and International Business Administration.

Table 3.13

Trends in U.S. Exports: Selected
Pulp, Paper, and Paperboard Products
(1,000 short tons, except as noted)

Item	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Trend Line[1/] 1980	1985	1990
1. Paper, total	559	609	584	630	619	616	633	650	721	1,056	1,096	1,156	1,380	1,604
(% of U.S. production)	(2.91)	(2.95)	(2.79)	(2.81)	(2.62)	(2.61)	(2.66)	(2.56)	(2.72)	(3.93)	(4.69)	(4.13)	(4.68)	(5.23)
2. Paperboard, total	1,178	1,295	1,470	1,957	2,084	2,163	2,443	2,370	2,245	2,664	1,954	3,154	3,738	4,323
(% of U.S. production)	(5.65)	(5.74)	(6.66)	(7.99)	(7.99)	(8.49)	(9.35)	(8.31)	(7.67)	(9.55)	(8.06)	(10.71)	(12.18)	(13.65)
3. Woodpulp, total	1,402	1,547	1,721	1,916	2,103	3,095	2,175	2,253	2,344	2,802	2,565	3,395	4,006	4,616
(% of U.S. production)	(4.12)	(4.23)	(4.69)	(4.69)	(4.91)	(7.11)	(4.95)	(4.82)	(4.85)	(5.79)	(5.99)	(6.59)	(7.34)	(8.08)
4. Newsprint	84	99	90	129	127	144	166	145	97	188	165	208	247	285
(% of U.S. production)	(3.85)	(4.22)	(3.46)	(4.36)	(3.90)	(4.30)	(5.00)	(4.20)	(2.80)	(5.54)	(4.80)	(5.02)	(5.43)	(5.83)
5. Printing & Writing Papers, total	146	159	149	203	213	237	263	260	236	380	397	473	590	706
(% of U.S. production)	(1.29)	(1.28)	(1.18)	(1.49)	(1.47)	(1.64)	(1.82)	(1.66)	(1.40)	(2.29)	(2.72)	(2.80)	(3.37)	(3.94)
6. Fine Paper	47	54	48	67	82	87	102	95	121	163	173	218	280	342
(% of U.S. production)	(2.13)	(2.15)	(2.03)	(2.53)	(2.74)	(2.96)	(3.40)	(2.85)	(3.17)	(3.97)	(5.44)	(5.63)	(6.93)	(8.22)
7. Wood chips	--	--	--	--	--	2,613	1,926	2,524	3,466	3,866	3,177	4,980	6,348	7,715

[1/] Trend Line Analysis based on linear regression extrapolation

Source: Production: Bureau of the Census, U.S. Department of Commerce, Current Industrial Reports, Series M26A, Pulp, Paper, and Board;
Exports: Bureau of the Census, U.S. Exports - Schedule B Commodity and Country, Reports FT410; and Economics Research Associates

Table 3.14

Summary of Pulp, Paper, and Paperboard
Exports from Canadian Atlantic Ports
1975

Distribution	Commodity totals (tons and per cent of shipments)							
Region	Newsprint	(% of T)	Paper	(% of T)	Pulp	(% of T)	Paperboard	(% of T)
Europe	513,231	(30.4)	2,527	(12.5)	512,442	(79.2)	61,032	(62.2)
Middle East	43,137	(2.6)	81	(0.4)	15,525	(2.4)	4,152	(4.2)
Africa	4,053	(0.2)	10,245	(50.7)	11,620	(1.8)	1,693	(1.7)
Far East	121,408	(7.2)	87	(0.4)	70,325	(10.9)	1,860	(1.9)
South America	190,724	(11.3)	2,468	(12.2)	12,590	(1.9)	7,989	(8.1)
Caribbean & Central America	180,734	(10.7)	4,816	(23.8)	8,589	(1.3)	21,389	(21.8)
United States	633,269	(37.5)	-	-	24,449	(3.8)	-	-
TOTALS	1,686,555	(100)	20,224	(100)	646,951	(100)	98,115	(100)

Source: Shipping Report, Part I, International Seaborne Shipping (by country), The Ministry of Industry, Trade and Commerce, November 1976, and Economics Research Associates

TABLE 3.15

Major Pulp, Paper and Paperboard
Shipments from Canadian Atlantic Ports
to Foreign Destinations, 1975

Country of Destination	Commodity totals: (short tons) Newsprint	Paper	Pulp	Paperboard
United Kingdon	386,706	3	157,545	29,331
Belgium-Luxembourg	5,287	649	48,379	4,666
France-Atlantic	9,829		70,708	
West Germany	27,298	68	67,151	6,130
Greece			1,086	6,956
Ireland	12,171	888		
Italy			50,323	
Netherlands	29,840	752	63,084	7,860
Spain	42,100	167	6,981	3,880
Poland			11,322	
Yugoslavia			35,863	2,209
EUROPE TOTAL	513,231	2,527	512,442	61,032
Iran	11,582			1,650
Israel	4,248		6,814	
Lebanon	1,628	58		2,327
Saudi Arabia	550	14		
Sudan	543			
Syria	838			128
Turkey		5	5,953	47
Egypt	23,748	4	2,758	
MIDDLE EAST TOTAL	43,137	81	15,525	4,152
Nigeria		4,974	270	
South Africa	281	3,052	9,515	388
Algeria			1,835	
Angola	1,181	77		
Cameroon		665		
Ivory Coast		877		
Liberia		64		
Tunisia	1,891	536		1,305
AFRICA TOTAL	4,053	10,245	11,620	1,693
India	26,114	4		
Malaysia	12,797	1		10
Singapore	2,217			
People's Republic of China				1,850
Indonesia	3,088			
Japan	3,345		68,354	
Korea			536	
Taiwan	901			
Thailand	13,349			
Australia	59,567	82	89	
Bangladesh			1,355	
FAR EAST TOTAL	121,408	87	70,325	1,860
Argentina	31,100	837		
Brazil	47,514	320	5,355	60
Chile	825			
Columbia	39,681	10		
Equador	5,444	56		7,864
Peru	20,040			
Uruguay	549			
Venezuela	45,571	1,245	7,235	65
SOUTH AMERICA TOTAL	190,724	2,468	12,590	7,989
Bermuda	595	283		
Belize	102			6
Barbados	797	429		
Jamaica	8,736	1,838		78
Trinidad-Topag	5,322	1,791		152
Costa Rica	9,203	23		6,025
Cuba	881	7	2,068	3,914
Dominican Republic	5,665	322		
El Salvador	2,203			
French West Indies	326			
Guatemala	828			
Haiti		13		
Honduras	851			7,335
Mexico	105,725		6,521	
Northern Antilles	1,709			
Nicaragua	3,458			
Panama	4,161	49		3,879
Puerto Rico	30,172	61		
CARIBBEAN AND CENTRAL AMERICA	180,734	4,816	8,589	21,389
U.S. Pacific	21,495		6,463	
U.S. Great Lakes	60,556			
U.S. Atlantic and Gulf	551,218		17,986	
U.S. Total	633,269		24,449	
TOTAL ALL ABOVE:	1,686,555	20,224	616,951	98,115

Source: Shipping Report, Part I, International Seaborne Shipping (by country), The Ministry of Industry, Trade and Commerce, November, 1976, and Economics Research Associates.

and paperboard products destined for foreign export. In 1975, for example, roughly 6.2 per cent of overall U.S. production in pulp, paper, and paperboard was exported. In Maine during 1976, an estimated 6.4 per cent of pulp, paper, and paperboard produced in the state was exported to foreign markets.[1] Thus, it appears that Maine mills overall are exporting a similar proportion of total production as the average for the United States as a whole. It is important to remember, however, that the leading commodity being shipped from Maine mills for foreign export has been newsprint, whereas in the nation as a whole newsprint constitutes a relatively small proportion of exported paper products.

By year-end 1977, capacity at Maine mills is estimated to be 3.4 million tons annually, a substantial increase due to new plant construction and expansion at several existing mills. Assuming that the operating ratio of Maine mills is comparable to that expected for the United States overall in 1977 (estimated by the U.S. Department of Commerce to be 94.7 per cent), production by year-end would total 3,219,800 tons. This would represent a 15-per cent increase over the production reported at Maine mills during 1976. Exports are not expected to increase by this same proportion in 1977, principally because the major addition to mill capacity is a new plant which is not yet exporting to foreign markets, while other capacity increases have occurred at existing plants where exports have been a smaller than average proportion of total production. However, according to the producers contacted, exports may be expected to increase in future years in accordance with the expanded capacity, other market factors notwithstanding.

---

[1]Derived from Paper Information Center figures of 2,800,516 tons produced in 1976, and MDOT survey reporting 178,982 tons of Maine-based exports.

Data in Table 3.13 provides a trend-line extrapolation of overall U.S. exports in selected pulp, paper, and paperborad products. The trendline analysis, which is based on export and production figures from 1965 to 1975, suggests that U.S. exports of the listed items will increase both in absolute tonnage and as a proportion of total production. By 1980, an estimated 7.1 per cent of total production in pulp, paper, and paperboard may be exported from U.S. mills, 8.8 per cent in 1990 if present trends continue. Applying these percentages to the present production estimated for Maine mills (that is, not accounting for possible increases in capacity or operating ratios) suggests that state-based exports will increase to 229,000 tons in 1980 and 283,000 tons by 1990, compared to 178,000 tons in 1976. As noted, these estimates do not consider substantial changes that may take place in international markets, nor do they consider possible shifts in the market emphasis of Maine's producers. Thus, the trend-lines should be viewed as conservative projections. According to the producers contacted, Maine's exports in paper products may total 300,000 tons by 1980. Recent contacts indicate a potential for an additional 100,000 tons of wood chips being exported from Maine by 1980. These figures do not include possible waterborne shipments of products destined for domestic markets, should a competitive coastwise water transportation service develop as planned by 1980.

3.5 Market Demand and Opportunities for Expanded Port Activity -- Summary Findings

1. Major ports serving waterborne commerce in Maine include Searsport; Saint John, New Brunswick; Boston; Portland; and New York. Competitively, they are differentiated as follows:

a. Searsport currently handles the largest volume (in tons) of Maine-based imports and exports, with 1976 movements through the port (not including fresh potatoes) representing 48.2 per cent of the total traffic. The majority of cargoes moved through the port of Searsport are large bulk shipments of commodities destined to or originating from paper mills in Penobscot County and potato products firms in Aroostook County. These industries Statewide are also the largest users of ports in general, either at Searsport or elsewhere, accounting for nearly 80 per cent of non-petroleum waterborne shipments in 1976.

b. Saint John, New Brunswick, is the second leading port serving Maine's overall import and export trade, with shipments through that port representing 23.9 per cent of total tonnage in 1976. Saint John is the principal exporter of Maine-based products, handling 44.6 per cent of export tonnage reported in the MDOT survey. Products shipped through Saint John in 1976 originated at paper and pulp mills in Washington and Penobscot counties, and frozen potato products from Aroostook County. The principal advantages offered by the port of Saint John include geographic proximity to major shippers in Washington and Aroostook counties, container handling facilities, and regular liner service resulting from the large volume of commerce (mostly Canadian based) handled at the port.

c. Boston is the third leading port handling non-petroleum products destined to or originating in the State of Maine. Total tonnage through Boston in 1976 represented 17.4 per cent of Maine based traffic, with 30 per cent of export tonnage originating in Maine shipped from Boston. Boston serves a variety of cargo types, mostly from industries in the southern portion of the state, offering container handling facilities and regular liner service for small lot shipments. Similarly, the port of New York, which handled 4.1 per cent of Maine-based imports and exports in 1976, offers frequent ship sailings to various destinations because of the high volume of traffic consolidated there. Maine-based shipments through New York, as well as Boston and Saint John, represent a small proportion of the total traffic for which these ports provide geographic and facility handling advantages.

d. Portland handled a relatively small volume of Maine-based non-petroleum cargoes in 1976, accounting for 2.2 per cent of total import and export tonnage. This situation has improved recently with the advent of a unified handling procedure and special rail rate for bulk pulp and paper shipments, which has resulted in Maine-based cargoes for export through Portland that are predicted to total 20,000 tons annually. The port of Portland also handles bulk shipments of pulp and paper for export from a mill in New Hampshire, and has plans to provide a cold storage facility which will enhance the prospects of handling trade in alcoholic

beverages and food products.

2. The "hinterland" potentially served by Maine ports is affected by a number of factors, including geographic location with respect to the points of origin and destination of major cargo movements; rail and highway connections; rail and motor carrier service and costs; port facilities and services.

a. The geographic area within which one or more Maine ports potentially offer shipping distance advantage over competing Atlantic ports is essentially limited to the State of Maine and portions of New Hampshire. Northward, the port of Saint John, New Brunswick, offers distance advantage over the major Maine port at Searsport to portions of Washington and Aroostook Counties, and most of the shipments originating in Maine that pass through St. John came from these areas. In fact, during 1976, 92 per cent of Maine based imported cargoes and 84 per cent of exports handled by Saint John, Searsport, or Portland were within each port's zone of relative geographic advantage.

b. Factors other than distance also affect the use of ports outside the state. At Saint John, for example, container handling facilities, established cargo volume with regular liner service, a recently completed forest products terminal, and the fact that government subsidies have contributed to inland transportation and port service costs being less expensive than in the U.S., all provide Saint John competitive advantages. Moreoever, thriving ports at Montreal, Quebec, Trois Rivieres, and elsewhere, backed by Canadian investments

and policy to utilize home soil ports, have effectively minimized the possibilities for Maine ports to handle cargo originating in or destined to Canada (with the exception of crude petroleum which moves from Portland to Montreal via pipeline). Canadian carriers are also not likely to use a Maine port for cargoes originating from or destined to other U.S. areas outside Maine, and have indicated no interest in developing traffic along these lines despite a number of attempts by persons in Maine to generate cargo movements in partnership with Canadian railroads.

c. A factor which could significantly affect cargo potential at Maine ports is the possibility of waterborne service from or to Maine and other U.S. Atlantic coast ports. Due to the rising costs of energy and the fact that on a ton moved per mile basis waterborne transport is far less consumptive of energy than railroads or motor carriers, conditions now favor the development of a domestic coastwide service far more than in the past. A New York based enterprise is currently planning to have the first of six vessels that would offer such a service on-line by mid-1979. If waterborne transport between Maine and U.S. Atlantic ports is available, and can be offered at competitive rates and reasonable delivery times compared to inland carriers, it could potentially be utilized by a number of Maine's industries. Principal beneficiaries of

such a service could be producers of frozen potato products, pulp, paper and paperboard mills, lumber, wood chips, and other shippers of large bulk items that now have a competitive location disadvantage for reaching major U.S. markets.

d. Of the major ports in Maine currently handling significant non-petroleum cargoes, Searsport offers the better location advantage for serving Maine-based imports and exports. Nearly three times as much cargo (on a total ton basis) is potentially available within the location advantage of Searsport compared to Portland. At Eastport, the lack of north-south rail connections and relatively poor highway access effectively limit that port's location advantage to Washington County, although some potato products producers in Aroostook County have reportedly expressed interest in port facilities development at Eastport. However, much of the export and import tonnage serving potato producers currently moves by rail. The state's leading exporter of frozen potato products is a Saint John based firm. Eastport's proximity to Saint John and its lack of proximity to western, central, and southern areas of Maine (compared to Searsport, for example) are major disadvantages.

3. In 1976, Maine-based waterborne import and export traffic totaled 506,072 tons, not including nearly 193,000 tons of exported fresh potatoes which was a very atypical movement. Seventy-four (74) per cent (375,234 tons) of the adjusted total tonnage (i.e., not including fresh potatoes) was shipped in break bulk form, while

the remaining 26 per cent (130,838 tons) was shipped in containers. Approximately 50 per cent of imports and 20 per cent of exports moved from or to ports via rail in 1976, the rest by motor carrier. Ports within the state of Maine handled about 20 per cent of Maine-based export tonnage (not including fresh potatoes) and 86 per cent of import tonnage in 1976. The greatest potential (on a total tonnage basis), therefore, for increasing cargo activity through one or more Maine ports rests in capturing a greater share of export movements. In the future, this potential will be affected by a number of factors, including the following:

a. Growth in state-based exports, which may exert greater demand for use of a Maine port(s). Significant export growth is expected from pulp, paper, and paperboard mills as a result of increased capacity and production, and growing opportunities for U.S. paper, wood chips, and other products in international markets. By 1980, Maine-based exports of pulp and paper could be 230-300,000 tons annually, an increase of 26-68 per cent over the 179,000 tons recorded for 1976. Added to this is the possibility of 100,000 annual tons of wood chips exports, a movement which has not been seen to date but which is expected to develop by 1980. The products of pulp, paper, and paperboard mills already (1976) account for 70 per cent of Maine-based exports, while inputs to mill production amount to at least 40 per cent of import tonnages. About 24 per cent of import and export tonnage moved by these industries was containerized in 1976. Shipments by these industries represent

a favorable opportunity for Maine ports not only because of the relatively large total tonnage involved, but also because most shipments tend to be in large enough lots to attract bulk parcel steamship operators rather than requiring regular liner service. Another industry which is predicted to increase exports from Maine, and which also tends to ship in large lots, is food products (particularly frozen french fries). Exports of food products totaled 79,796 tons, and are estimated to increase 6 per cent per year to 101,000 tons by 1980. Imports to food producers totaled 52,030 tons in 1976 and if production should increase as a result of growing export demand additional import tonnages would be expected. Approximately one-third (33 per cent) of food products imports and exports were containerized in 1976 and there is growing tendency within these industries to ship via containers. The paper and food products groups combined accounted for nearly 80 per cent of Maine-based imports and exports in 1976.

b. In commodities other than forest and food products, shipping potential through Maine ports is limited by the fact that most cargo movements at any one time are too small for handling by bulk parcel operators, and thus require the availability of regularly scheduled liner service. Even if all Maine-based shipments could be consolidated at a single port, the total volume would not approach that handled at the larger competing

ports such as Saint John, Boston, and New York. These ports will thus continue to offer more regularly scheduled liner service than could realistically develop at a Maine port, and may therefore be more advantageous to many of Maine's small lot shippers. Possible exceptions include imports of alcoholic beverages and exports of fish products, trade which may develop at Portland in the near future.

c. Another factor which affects both the immediate and longer term prospects for increasing cargo activity at Maine ports relates to development of competitively advantageous "combination" rail rates (shipments which move on both of Maine's railroads). Currently, special commodity rates for single haul shipments are available for selected items from both the Bangor and Aroostook and Maine Central Railroads, and have proven to be significant incentive for shipping through Maine ports. Advantageous joint rates are lacking however, and may be important if traffic is to be consolidated at a single port. Unit train service is another factor which would draw more cargoes for shipment through a Maine port.

d. Facilities at Maine ports are currently inadequate to handle many of the cargoes potentially available. Necessary facility improvements include a multi-purpose crane capable of handling both containers and bulk cargoes; warehousing and marshaling areas capable of storing up to one month's cargo volume; freezer and

cold storage facilities; wider working aprons and a strong enough pier to support heavy crane, forklifts, and cargo storage. The costs, economic return, and feasibility of implementing such improvements at one or more Maine ports are evaluated in subsequent sections.

CHAPTER 4 ALTERNATIVE COURSES OF ACTION

The previous chapter described investigations made of various ports along the Maine coast with regard to their suitability for development as a major dry cargo port. Each port was examined with regard to both engineering and market feasibility. This chapter will describe what is perceived to be reasonable alternative courses of action for the State to consider concerning the future of cargo handling in Maine based on these investigations.

4.1 Market and Site Analysis Implications.

From the investigations described in Chapter 3, the communities of Portland and Searsport are suggested to be the only two locations where the development of a major cargo port, specializing in forest products but with general cargo flexibility, might be feasible. The remaining communities are not suggested for further consideration as the location for major State investment in a cargo handling facility due to the engineering or market limitations discussed previously.

Portland and Searsport are the two major dry cargo handling ports in Maine today, with the dry-cargo volume at Searsport being approximately five times that of Portland on an annual basis. They each have good rail and highway access, which are two very important attributes, as a port facility is dependent upon this access to transport the products being shipped to and from their markets in an expedient manner. Portland and Searsport

are also deepwater ports and have sufficient land available to develop a site which would be adequate to serve both Maine's existing and future needs. Furthermore, in addition to having port support personnel experienced in cargo handling, they already also have all the backup facilities, such as towboats, customs, etc., needed for a port to operate.

From a marketing point of view, they are favorably located with regard to many potential shippers, yet not so located with respect to other major ports outside of Maine, such as Boston and Saint John, New Brunswick, so as to be totally in direct competition with them for increased cargo movements in Maine. As previously stated, they are also the only two ports currently handling significant volumes of dry cargo on a regular basis in Maine. This factor is especially important because, besides the desire to expand Maine's port cargo industry, it is also important to preserve its existing levels of port cargo activity. This study has pointed out present limitations and possible future obsolescence, due to load and storage limitations, age, condition, and other reasons of the present major dry cargo facilities in Portland and Searsport. New or expanded port development at Portland and Searsport can be viewed, at minimum, as replacement facilities which would exist to serve present dry cargo activity should these other facilities be incapable in the future to perform such a function.

Of the remaining locations examined for possible consideration as a port site--Bath, Rockland, Winterport, Bucksport, and Eastport--all are suggested to be less advantageous for development as a major cargo terminal in Maine. Bath is disadvantageous

largely on account of its lack of a suitable harbor site with sufficient area to locate a major facility, although rail and highway access are both good. Water depth and navigational restrictions within the existing channel are also potential drawbacks of a Bath location. Rockland also suffers from both the lack of a suitable harbor site and a shallow channel (18 feet) which would prevent large oceangoing vessels from entering the harbor. In addition, Rockland is located on a section of U.S. Route 1 which experiences very heavy influxes of tourist traffic during the warm weather months, a fact which could hinder road access to the site during several months of the year.

Winterport and Bucksport also do not appear to have suitable sites for a major port facility development. Winterport and to some extent Bucksport lack the depths needed by the new, large oceangoing vessels. Lastly, the waterfront at Winterport is not served by rail, the nearest rail line being several miles away. The cost to extend a rail spur from the nearest rail line to Winterport, depending on the exact alignment, could be potentially prohibitive, both dollarwise and with respect to its impacts on man and the environment.

Of all the communities outside of Portland and Searsport, Eastport probably has the most to offer with regard to a port cargo facility development potential. It has extremely deep water very close to the shore and could, theoretically, handle any size and type of ship, both existing and planned. It has a harbor site which is suitable for development, the land area of which is approximately 50-60 acres (not including that land on which the

siting of an oil refinery is being considered). However, Eastport has several disadvantages relative to its selection as the site for a major general cargo port development. First, it is located in a geographically remote area of the state, removed from many of the potential market areas and/or shippers who might utilize it as a major cargo port. Highway access to Eastport is relatively poor, with U.S. Route 1 being the only major highway in the area, and the nearest connection to an Interstate Highway (I-95) System being over 100 miles away. This relatively poor highway access and the general remoteness of the site are not conducive to attracting shipments through the port originating or destined overland from locales to the south and west. Additionally, the future of the existing rail service to Eastport is very much in doubt, as the Maine Central Railroad has applied to the Interstate Commerce Commission for permission to abandon the Eastport branch. Finally, from yet another geographical point of view, and with respect to the marketing aspects of a major new facility, Eastport appears to be located much too close to the port of Saint John, New Brunswick to ever hope to compete favorably for major cargo movements. Saint John possesses modern cargo-handling facilities especially with respect to forest products, and an established market. It handles more forest products in a single year than any other port on the east coast of Canada and the east and Gulf Coasts of the United States. This last reason, coupled with its remoteness with respect to most Maine port traffic, places Eastport at a considerable disadvantage when compared to other Maine port locations to the west and south.

The City of Eastport is actively interested in redeveloping its waterfront. Along this line, it has established a Port Authority and has had prepared a waterfront development program, which includes a new breakwater, a marina, and several new wharfs. The breakwater, as currently envisioned, is 50 feet in width and approximately one-half mile long. While the primary purpose of this breakwater would be to protect the waterfront, the City also hopes to use it as a cargo pier for serving deep-draft vessels. Plans show two truck travel lanes and a railroad track on the breakwater with a widened truck turnaround area at the end. No storage area is provided on the proposed breakwater, the intention being to load and unload cargo directly to and from the trucks and the railroad. Some goods would be transferred to and from a proposed industrial area in the northern section of Eastport. The U.S. Army Corps of Engineers will investigate Eastport's waterfront development program under a three year, $150,000 study.

While the Eastport area does not appear to be the ideal location for a major cargo facility to serve the entire State of Maine, there would be some potential for the use of the proposed breakwater by industries in the area. Several such firms have expressed interest in using a facility at this location. In this regard, it is suggested that the breakwater, if constructed, be widened over the 50 foot width currently proposed in order to facilitate any cargo handling which might occur.

The fact that the communities other than Portland and Searsport are not being considered as desirable potential sites for a major new forest products and general cargo facility by no

means suggests that they have no future as a cargo port. Rather, these communities should continue to concentrate on the specialized cargo movements which many of them now serve, such as fish products, frozen vegetables, etc. Of course, they would also be free to try to attract other types of cargo which could move through their ports. Additionally, private investors would certainly have the opportunity to invest in facilities at these ports if desired. However, as the site of perhaps only a single large public investment in port cargo development in Maine in the near future, they do not possess the potential which Portland and Searsport possess.

In summary, the ports of Portland and Searsport have been selected for further consideration in this study for the location of a major cargo facility. They are the two Maine ports which most significantly possess the attributes that such a facility would require. The remaining coastal communities should concentrate their efforts on continuing to handle the more specialized cargoes for which they presently have facilities.

4.2 Alternative Development Options

The investigations conducted during this study suggest that there are five possible major courses of action which Maine can follow regarding future port development.

These include (1) the development of a major new faility in the Searsport/Sears Island area, (2) upgrading existing facilities at Searsport, (3) development of a major new facility at one of two locations in Portland, (4) upgrading existing Maine State Pier at Portland, and (5) the "no-build" or "do-nothing" alternative.

Each option will be discussed in detail in the following paragraphs.

New Facility at Searsport

Investigations of the Searsport area have suggested that the preferred location for a new cargo port facility is on Sears Island. This island covers approximately 940 acres and is located immediately offshore from Searsport. It is connected to the mainland by a small peninsula. The island is at present undeveloped, but the Central Maine Power Company intends to use approximately one-half of the island (400 acres) as a site for a major coal-fired power generating plant. Central Maine Power has also reserved a smaller parcel of land (175 acres) on the southwest corner of the island as an alternative site for a nuclear power plant. A total of approximately 300-350 acres remains available for cargo port development, which is an important advantage of this location. This land area has potential for use in direct support of the port facility itself and/or as a site for future location of cargo port-dependent industries. This land area should be sufficient for anticipated port needs far into the future.

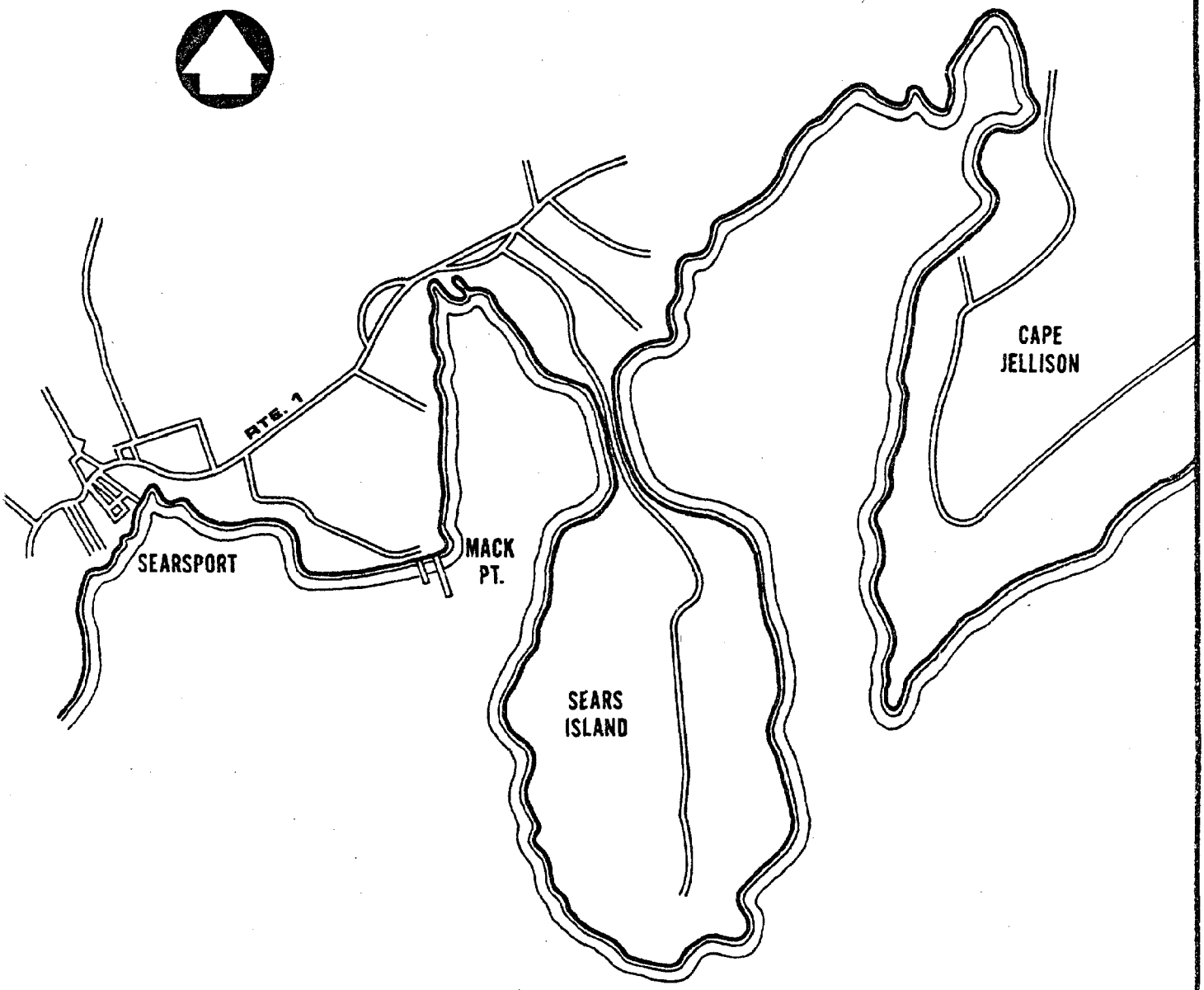
A second advantage associated with the Sears Island location is the availability of 40-foot and deeper water adjacent to the island within a reasonable distance offshore. Even deeper waters (50 to 60 feet) are located further offshore, and are within a distance that would still be practical for facility expansion at some time in the future. Of course, dredging to provide deeper water closer to shore is possible at this site, as it is at all sites. However, the conditions under which the

U.S. Army Corps of Engineers' approval of dredging is permitted are increasingly being made more difficult to achieve, due to the potential environmental impacts of such a course of action.

From the marketing point of view, the Searsport area possesses the strong advantage that it has an established dry cargo market; significant volumes of dry cargo are presently shipped through the port. Additionally, the Searsport area is centrally located in the state and is advantageous in its location with regard to origins and destinations of products which have been identified to be shipped through a major Maine port facility, especially forest products.

One potential disadvantage of this location is the current lack of rail and adequate roadway access to the island and the necessity of constructing this access on some type of causeway from the mainland. However, the distance involved is not unreasonable, as U.S. Route 1 and a major branch of the Bangor and Aroostook Railroad currently serving Searsport are located just inland from the isthmus. Also, the Central Maine Power Company already has plans to provide this rail and highway connection to the island to serve their proposed power facility.

The preferred site on the island for the port facility would be in the southwest quadrant (see Figure 4.1). The facility would generally consist of (1) an embankment of 900,000 square feet extending approximately 2,000 feet from shore, which would be utilized for highway and rail access and for container storage purposes; (2) a 1200 foot wharf with a 200-foot apron width, representing two normal ship berths (or one large ship berth) and



POTENTIAL PORT DEVELOPMENT
SITES IN SEARSPORT

required space for vessel loading and unloading; (3) and an area containing transit sheds for forest products and other break-bulk cargo. It is assumed that all of the facility with the exception of the wharf could be on fill. There would be a large area on land reserved for potential bulk storage. The estimated cost of such a facility, including applicable equipment, would be in the neighborhood of $40 million, exclusive of any land acquisition. A potential disadvantage of this facility is its offshore location, requiring large quantities of fill and its related expense.

Improvement of Existing Facilities at Searsport

An alternative to development of a completely new port cargo facility in the Searsport area is the upgrading of existing facilities. The principal advantage of this scheme is the potential cost savings realizable from implementation of such a "limited-build" facility as compared to an entirely new facility. However, as one might expect, such an option also has its disadvantages. One such disadvantage could be that the cost savings relative to a major new facility, though real, may be surprisingly small. A more serious disadvantage could be the lack of a significant net benefit realized by such an investment due to the facility's inherent limitations. An improvement to the existing facilities at Searsport would require a widened apron. With such an apron, the types of cargoes, vessels, and heavy loads typical of today's traffic and future traffic could be handled. However, the present facilities adjacent to the new apron which would remain in use, including the transit sheds and other storage areas, would still be unable to handle these heavy

loads and there are no substantial areas for possible expansion of such storage space with possible future increases in demand. A heavy financial investment, therefore, in a facility that might be still deficient in the long-term should be carefully considered. Additionally, there would be the added expense of creating a new berth as a result of the existing berth being occupied by the new apron, and the added expense of equipment such as a container crane and 120,000 pound capacity forklifts.

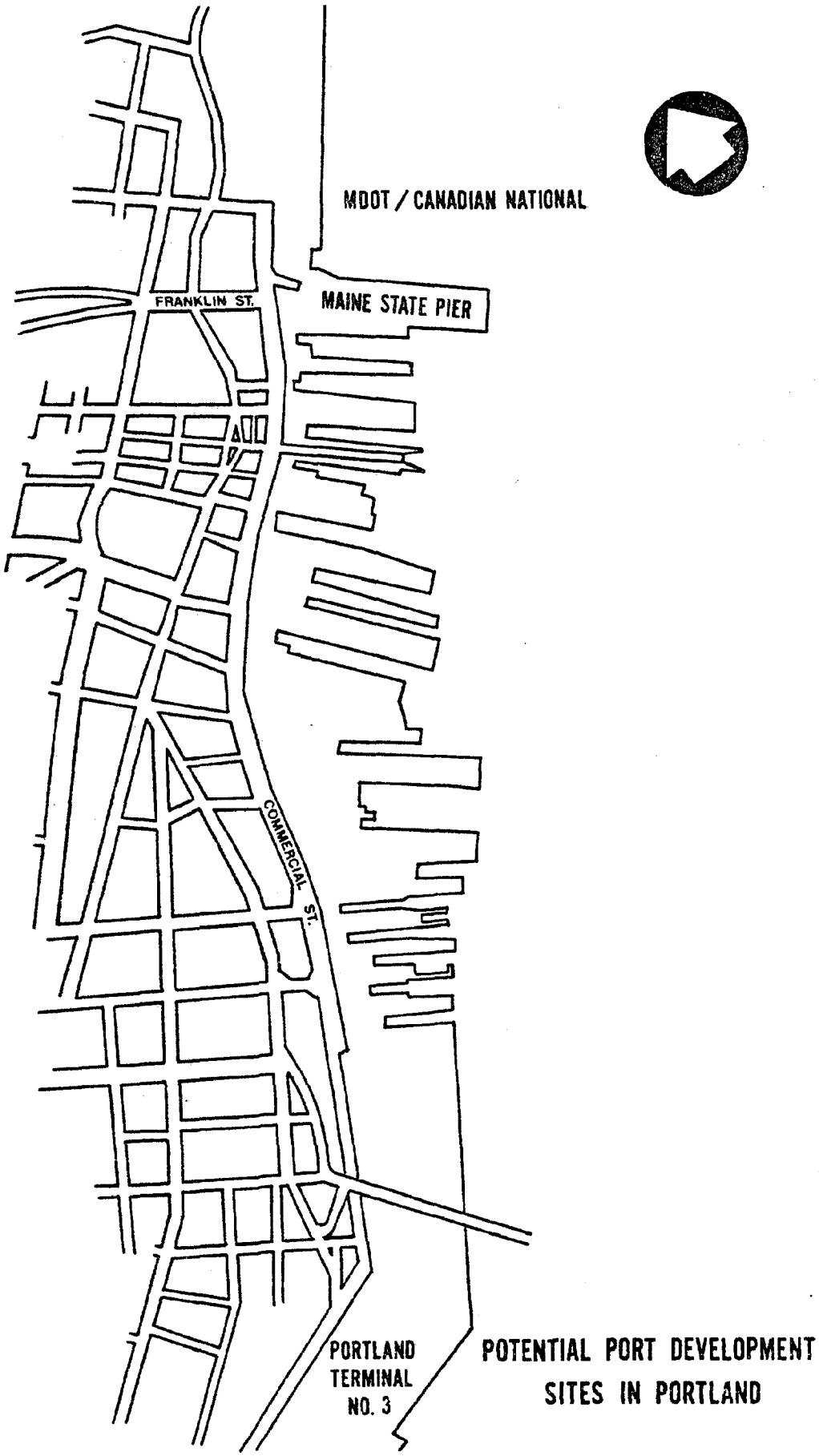
An upgraded existing facility would still only be served by a 35-foot channel, unless of course dredging was to be undertaken at additional expense. Again, a channel of this depth would probably tend to hinder future port operations and growth, as ships with anticipated deeper and deeper drafts enter service.

From the marketing point of view, this program, with its physical, operational, and space limitations, would most likely not attract the volume of traffic that a completely new facility would attract. That is, some types of cargo that would need to use the transit sheds, because of weight and/or size, could not be accommodated by this upgraded facility. Additionally, the upgraded facility would not have the efficiency of a new facility, and would thus not be as attractive as some other, more modern port facilities to the potential shipper.

New Facility at Portland

Two locations in the Portland area which could potentially be developed into a new cargo port are the Portland Terminal Number 3 site and the MDOT/Canadian National site.

The Portland Terminal Number 3 site (Figure 4.2) refers



POTENTIAL PORT DEVELOPMENT SITES IN PORTLAND

Figure 4.2

to that property between the so-called "Million Dollar Bridge" and the U.S. Route 1 bridge along the Fore River. The property is generally rectangular in shape and is owned by the Portland Terminal Railroad and the Portland Gas and Light Company. It was formerly used for handling bulk cargo but is not presently in use.

One of the major advantages of this site is the excellent land access available to the site. It is directly served by rail (the Portland Terminal Company) and is less than one mile away from two major highways--U.S. Route 1 and Interstate Route 295. A second advantage of this location is that the cargo facility could be built with little or no filling and construction on piles required, a potentially considerable cost advantage.

The Portland Terminal No. 3 site has a number of disadvantages associated with it, however. One of the most serious is its location with respect to the harbor. It is on the Fore River above (upstream of) the "Million Dollar" Bridge. The depth in this river channel is identified in harbor charts as being 35 feet, but the latest edition of the Coast Pilot reports a controlling depth of only 28 feet above the bridge and 30 feet in the turning basin. Thus, the size of vessels which can use this channel, and a potential new cargo facility, without dredging, is limited. The bridge itself represents a constriction on the size of vessels which can pass through, as its opening is only approximately 96 feet in width. With the bridge open, the elevated bascule girders project inside the line of fenders from 3 to 5 feet on one side and 5 to 8 feet on the other. The resulting net clearance between the open girders is about 83 feet.

Proposals have been advanced in the past for deepening the Fore River Channel and replacing the bridge by a high-level structure. However, no commitments to accomplish these changes have been made to date.

Another problem with the channel at this site is its closeness to the site itself. A vessel docked at this location might protrude into the channel. Thus, it appears that some of the land at the site might have to be sacrificed to relocate the wharf away from the channel or the channel itself might have to be relocated if this location was developed.

Rail access, which was mentioned earlier as a strong asset, also presents a problem in that the right-of-way (used to serve other waterfront locations and to connect to the Canadian National) passes through the property, thereby eliminating a sizable portion of the land from use. This right-of-way could be relocated off the property several hundred feet to an abandoned rail right-of-way but at considerable cost, including bridges.

Finally, a potential disadvantage of this site over the long-term is the apparent lack of available land for expansion. The site is hemmed in by U.S. Route 1A and surrounding development, which would result in property takings if major expansion were desired. There is additional railroad-owned land apparently available along the Fore River at St. John Street on the other side of U.S. Route 1, but this land is too remote from the terminal site to be practical for use.

A study prepared in 1972 estimated the cost for developing a container facility at this location to be approximately

$19 million. This cost included the costs of dredging; a wharf; enbankment, slopes, and slope protection; paving, drainage, and lighting; railroad access; both a tire-mounted and rail-mounted crane; yard equipment; an operations and maintenance building; and a 30,000 square foot transit shed. The 1977 price of this facility would be approximately $28 million. This price does not include costs which would be required for a paper transit shed, a freezer building, etc. In fact, it is doubtful that this site could accommodate all of these structures efficiently.

The other site in the Portland area which could conceivably be developed into a major cargo port facility is generally that once used by the Canadian National Railroad for piers and grain storage elevators. Much of the property is water, with a portion now owned by the Maine Department of Transportation and the remainder by the Canadian National.

This site enjoys the same basic advantage as those of the Portland Terminal No. 3 site, namely, excellent rail and highway access. The Canadian National Railroad provides direct service to the waterfront area at this location, with a connection to the Portland Terminal Railroad also being available. Regarding highway access, the new Franklin Street Arterial offers connections to Interstate Route 295 less than one mile away.

This site has an advantage over the Portland Terminal No. 3 site with regard to its position within the harbor. That is, it is located below (downstream from) the "Million Dollar Bridge" and is located closer to deeper water, although the channel depth at this location is also 35 feet. Again, as for other alternatives, the channel could be deepened by dredging but potentially at considerable cost and environmental impact.

One of the prime disadvantages of this site is the poor harbor bottom conditions known to exist. Past studies, particularly one performed for an oil terminal at this location, have indicated that construction over the water area on fill would most likely not be possible due to the poor bottom soil conditions. Accordingly, a major structure would most likely have to be constructed on piles. Because of the limited amount of land area available, a significant portion of the cargo facility would have to be built on these piles, an extremely expensive undertaking. It is estimated that to construct a 1000 by 900-foot container facility on piles at this location would cost in the vicinity of $75,000,000, exclusive of any buildings and equipment.

As with the Portland Terminal No. 3 site, this location is generally surrounded by other types of development, thus seriously limiting its long-range expansion potential, unless additional property could be acquired. The available property is most likely of sufficient size to meet today's needs for a modern port but could become deficient at some time in the future.

From the market analysis point of view, the sites in Portland are advantageous locationwise with regard to manufactured goods but not so much so with regard to forest products. Most of the major forest products producers are located in central and northern Maine and would thus find Searsport more convenient. Portland also has some disadvantage locationwise in being closer to the major port of Boston. That is, some potential users might find it only a little more inconvenient from a distance point of view to use Boston, which has, however, a superior shipping schedule.

Improvements of Existing Facilities at Portland

The Maine State Pier is the existing general cargo facility in Portland. Like existing facilities in Searsport it is old (built over 50 years ago), but has been maintained in good condition. All of its structures are obsolete by modern standards because of their relatively low-load-carrying capacity and the limited amount of room available for maneuvering of equipment on their decks, due to narrow aprons. These strucures were designed for another era when cargo was moved on the pier by hand carts. The transit sheds reflect a similar era in that they contain large numbers of supporting columns inside which make the use of modern cargo-handling vehicles difficult or inefficient.

As described for Searsport, an apron-widening project could be conducted at the Maine State Pier along the eastern side. Such an addition would allow heavier loads to be brought out on the pier and would give vehicles and equipment more room to maneuver.

The prime advantage of this alternative is, like Searsport, that it could be undertaken at a cost less than that of building a completely new facility. For example, it is estimated that a 50 foot apron including railroad track, a crane, and two forklift trucks could be constructed for approximately $8-9 million. There would also be an additional cost for dredging a new berth, as the new apron would occupy the existing berthing area. Again, as for upgrading existing facilities at Searsport, the cost savings are offset by one of the major disadvantages associates with the Maine State Pier location, namely, the lack

of space for long range expansion. In essence, the rehabilitated pier would be able to function for some period of time but would eventually become hindered or obsolete in its operation because of backland marshalling area limitations. Thus, it would appear that this course of action taken alone would merely "buy time." Additionally, the problem with load limitations on the existing aprons and transit sheds would not be solved and a new berth would have to be dredged alongside the new apron.

As discussed for the alternative of rehabilitating the existing facilities in Searsport, it is likely that a rehabilitated port in Portland would not attract the volume and types of cargo that a new facility would attract.

The "No-Build" Alternative

This alternative is, as the name implies, the option of doing nothing to provide any new or upgraded facilities to serve Maine's dry cargo needs. The existing dry cargo facilities in Portland, Searsport and other Maine ports would continue in operation without change, or as they exist today.

From an engineering and economic point of view, the short-term apparent advantage of this alternative is that no large investment of public funds would be required for the construction, operation, and maintenance of a new facility or the upgrading of an existing facility. However, this advantage is strictly short-term. Over the long run, preserving the status quo will most likely require increased maintenance expenditures due to the age of existing facilities. Furthermore, such an action will do nothing to remedy the prime problem now facing these facilities; that is, their functional obsolescence, due to

their inability to handle modern cargo loadings with modern equipment.

Over the long-run, these facilities will require replacement, both due to age and obsolescence, if Maine is serious about maintaining even only its present port cargo activity. The longer existing facilities are maintained without upgrading or replacement, the greater is the potential that shippers and steamship lines will increasingly turn to those modern ports such as Boston and Saint John, able to accommodate their needs because of their adaptation to the changing times and characteristics of the cargo industry.

4.3 Summary

Portland and Searsport were described in this chapter as being the two locations in Maine, for both engineering and market reasons, with the greatest potential for a major new or expanded dry cargo facility. Other port communities, while being less advantageous as the location for a major cargo port, are still suitable for the specialized cargoes now passing through them, and maintenance and expansion of such activity should be encouraged both at the State and local level.

Five alternative courses of action which could be followed regarding port development in the Portland and Searsport areas were also described in this chapter, including their advantages and disadvantages from both engineering and marketing points of view.

Chapter 5 will recommend which one or more of these alternatives the State of Maine should follow and will include a discussion of the implications--benefits, costs, risks, etc.--of such a course of action.

CHAPTER 5 RECOMMENDATIONS

This chapter presents recommendations for the development of modern dry cargo facilities in Maine. Included is the selection of a port and site, and either a new facility, or an upgrading of an existing facility; a discussion of its physical layout, operational characteristics, costs, and potential benefits; and possible means of facility financing.

5.1 Selection of a Site

The end result of this study must be a selection of a course of action for the State of Maine to follow with regard to dry cargo port development and a forest products terminal in particular. The previous chapter presented a number of alternatives that could conceivably be followed and included the options of development of a new port site on Sears Island, upgrading of the existing Searsport facilities, development of a new port site at one of two locations in Portland, upgrading of existing faciliites in Portland, and the so-called "do-nothing" alternative. Relative advantages and disadvantages of each option were discussed.

From the investigations conducted during this study it is concluded that the options involving upgrading of the existing facilities or "doing nothing" will not meet the State of Maine's objective of attracting increased cargo movements through Maine ports. The upgrading efforts would essentially be "stopgap" measures and would not remedy the major problems currently associated with Maine's cargo handling operations,

particularly antiquated facilities and lack of marshaling space. Moreoever, the "do-nothing" or "no-build" alternative would most likely result in reductions in port traffic now handled by Maine ports because of age and severe load and space limitations, even by today's standards, without consideration of attracting new traffic. In the meantime, the cost to maintain the superstructures of these aging facilities is constantly increasing, and these facilities' eventual need for replacement sometime in the future cannot be ignored. Only modern facilities are seen as being capable of handling today's traffic and attracting new traffic far into the future. Because of the major investments, public and private, required and because of the anticipated market for a modern port cargo facility, only one new facility, one site, can be reasonably considered. Even then, the potential economic benefits should be closely scrutinized, as will be presently, to assess its overall feasibility. All three potential sites given serious consideration in this study--(1) Sears Island, (2) Portland Terminal Number 3, and (3) Canadian National/MDOT--could be developed as this single new modern cargo port facility, although each has its particular advantages over the others with regard to such factors as potential market, cost, location, channel depth, room for expansion, etc. However, it is recommended that as a first choice, a new dry cargo facility, with a particular emphasis on forest products, be developed on Sears Island at Searsport.

The recommendation of the Sears Island site is made for the following reasons:

(1) The Searsport location offers substantial advantages over the Portland area (and the remainder of the state) with regard to market potential. From the marketing point of view, the Searsport area offers a number of advantages over the Portland area as a site for a modern cargo port, especially one having an emphasis on forest products. One advantage is that Searsport presently handles substantially more non-petroleum products than Portland. For example, in 1976 Searsport handled 48.2 per cent of all import and export cargoes originating from or destined to points in Maine (not including fresh potatoes and petroleum products) while Portland only handled 2.2 per cent. While Portland's percentage would be higher if New Hampshire traffic was included, it would still be far less than Searsport's percentage. Additionally, strictly on a geographic basis, Searsport appears to have a 3 to 1 advantage over Portland in potential import and export cargo originating from or destined to points in Maine, as discussed in Chapter 3. Portland's cargo potential, which includes over 20,000 export tons annually originating outside of Maine, is more limited both in a geographical sense and by the fact that many of the shipments destined to or originating from areas in the vicinity of Portland are relatively small and sporadic.

Specifically with regard to the forest products industry of the State, in 1976 approximately 70 per cent of the State's waterborne forest products exports came from Penobscot and Washington Counties while nearly all forest products imports were destined for Penobscot County. The Searsport area is much closer

to this traffic than is Portland. The volume of dry cargo and the area more conveniently served (market area) are substantially greater at Searsport than at Portland.

(2) The Sears Island location offers immense development opportunities for the cargo-handling facilities themselves as well as other related industries which may wish to be located close to the waterfront. Over 300 acres are available on the island for such purposes, not including those portions of the island reserved for use by the Central Maine Power Company. The sites in Portland, on the other hand, do not offer such long range growth potential. They are of a more limited size (approximately 50 acres each, including substantial water area) and are constrained from expansion by various types of adjacent development, some of which are not necessarily compatible with cargo port usage. The area around the waterfront is beginning to come under pressure from retail/restaurant interests connected with the development and expansion of the so-called Old Port Exchange District. Other development pressures along the Portland waterfront include potential development of a fish terminal and facilities to support offshore oil exploration. Thus, while the Portland sites would be adequate to serve today's needs, their long range expansion potential seems far more restrictive, perhaps even prohibitive, than at the Sears Island site.

(3) The Sears Island location also offers deeper water alongside the berth (approximately 45 feet) than is available in Portland without dredging. This is important as the trend in cargo vessels is toward deeper drafts, and dredging is becoming more difficult under existing government policies.

(4) Secondary advantages of Sears Island over the Portland sites include well established port services for the handling of dry cargo, as Searsport has accommodated larger volumes through the years than Portland in recent years. Though highway and rail access to both Portland and Searsport are good, Sears Island is also more centrally located, especially with respect to north central and northern Maine forest products and agricultural products which are presently shipped through Maine ports for export.

The cost of a facility at Sears Island is significantly less than the cost of a comparable facility at the Canadian National /MDOT site in Portland. The cost of constructing a facility on the Portland Terminal Number 3 site, based on a design and estimate prepared for that site in 1972, may be somewhat less than that for Sears Island, although it is not clear that a comparable facility could indeed be built at this location. However, the cost savings associated with the Portland Terminal Number 3 site when compared to the Sears Island location are suggested to be outweighed by its physical and operational disadvantages as well as its reduced market potential. Its first major physical and operational disadvantage is that it is constricted by the bridge clearance of the Million Dollar Bridge. To illustrate, container ships of the PENOBSCOT class, designed by the Bath Iron Works Corporation, are 102 feet in width while the maximum bridge clearance width is only 96 feet. A report entitled "Merchant Vessel Size in United States Offshore Trades by the Year 2000" published in 1969 by the Committee on Ship Channels and Harbors, the American Association of Port Authorities, estimates that the

largest container ships by that time will not exceed 950 to 1000 feet in length, but they are expected to be 110 to 115 feet in width. Thus, these container ships would not be able to use the site unless a new bridge or alterations to the existing structure were constructed. A 1972 study for the Maine Department of Transportation estimated 1977 construction costs of a high level bridge at this location at almost $40 million. Other estimates have put the cost as high as $75 million.

The second major constriction of the Portland Terminal Number 3 site is the 35-foot channel depth of the Fore River (reported to be only 28 feet in the Coast Pilot). While, perhaps, adequate for today's standards, the trend is unquestionably toward vessels with deeper and deeper drafts. Many of the planned container vessels would find this channel depth inadequate for their needs. Of course, the channel could be dredged to 40 or 45 feet (as some have proposed), but at added cost. Thus, while the Portland Terminal Number 3 site itself may have an initial cost advantage over the Sears Island site, it has two serious off-site operational constrictions which limit the size of vessels able to use it. The cost to correct these off-site deficiencies would far exceed any initial cost advantage the site itself has over the Sears Island location. Additionally, as discussed previously, the Portland sites do not offer the market potential that the Sears Island site does.

Taking all of these considerations into account, the Sears Island site is suggested to be the most advantageous site for the development of a new cargo port facility. However, should the cost be found to be not acceptable to the State, the less

expensive options of a new Portland Terminal site and upgraded existing facilities at either Portland or Searsport are suggested to still be preferable to "doing nothing", because they will at minimum (upgrading option) tend to preserve existing cargo activity and serve as suitable replacement facilities for those existing operations in the future.

The following section will describe the preliminary layout of the proposed cargo port on Sears Island, including a more complete cost estimate.

5.2 Description of New Cargo Facilities at Sears Island

The previous chapter identified the southwest quadrant of Sears Island (see Figure 4.1), as the most logical site on which to construct a major new cargo facility in the Searsport area. This section will describe in some detail a preliminary layout of such a facility. This layout reflects both engineering and marketing considerations; that is, the location of the berthing area, for example, was dictated by the topography of the area while the size of such items as the transit sheds is based on projected levels of cargo to be handled. It must be stressed that the layout shown is preliminary. The exact configurations would be determined from subsequent engineering design investigations.

The proposed facility contains various items, several of which will be briefly described here. There will be a wharf suitable to carry high-speed, heavy duty, rail-mounted or rubber-tire-mounted container-handling cranes and equipment. The capacity of the crane should provide for handling about 40 long tons at a distance of about 100 feet from the face of the wharf. The

rail-mounted cranes in common use have this capacity, but rubber-tire-mounted cranes of this same capacity should initially be considered in order to save costs. A rubber-tire-mounted unit, although operating with less speed, can be obtained for approximately one-half of the cost.

A container yard should provide for storage of both 20-foot and 40-foot containers and should reflect expected traffic in size. Very large forklift trucks or portal-type cranes, of 90,000-120,000 pounds capacity each, can be used for handling the containers. The actual capacity and layout of the container storage area should be established during a final design stage when all equipment is selected. The final layout must reflect the limits and capacities of the equipment selected inasmuch as the types of equipment vary in operating characteristics.

A Ro-Ro (roll on - roll off) facility will be provided for ships which load or discharge wheel-mounted trailers on their wheels over ramps directly from the hold.

An adjustable ramp is provided at one end of the wharf to permit the unloading or loading of traffic through the ship's stern. Side port handling can be accomplished directly to any portion of the wharf.

Truck scales are necessary at the facility entrance to control the weight of containers being handled and are provided in a complex consisting of an administration building and maintenance areas.

Two transit sheds have been proposed for this site, one being for forest products and the other for general cargo. Transit sheds are used to hold break-bulk cargo or for the consolidation

of container loads. They should be located convenient to the wharf but remote from the terminal entrance to avoid congestion. They should also have a clear and unobstructed floor area, should provide for heavy equipment to operate within the shed, and should have truck-height loading docks.

A freezer facility has also been provided for the Sears Island terminal for use with some of the various agricultural products which might use this facility.

Figure 5.1 shows the basic layout of the facility and its position relative to the island itself. The major portion of the facility is located offshore on an embankment to take advantage of existing water depths for the wharf area (40-45 feet). It has been assumed that the top of the embankment would be approximately 20 feet above mean low water. For this layout, the only items located onshore are the administration/maintenance buildings, the truck scales, and employee and visitor parking areas. Also located on the island would be land reserved for the possible storage of bulk products, such as coal.

The offshore portion of the cargo facility is shown in more detail in Figure 5.2. As can be seen, provision has been made for a berthing area of 1200 feet, which provides either two 600-foot berths or one longer berth with a depth of approximately 45 feet undredged at mean low water. (The berthing area could, of course, be extended if traffic warranted.) Directly behind the berthing spots is a 200-foot wide apron supporting two railroad tracks (and crane rails if desired.) At the most southern end of the wharf area is shown a Ro-Ro (roll on - roll off) facility, which is utilized for loading and unloading vehicles

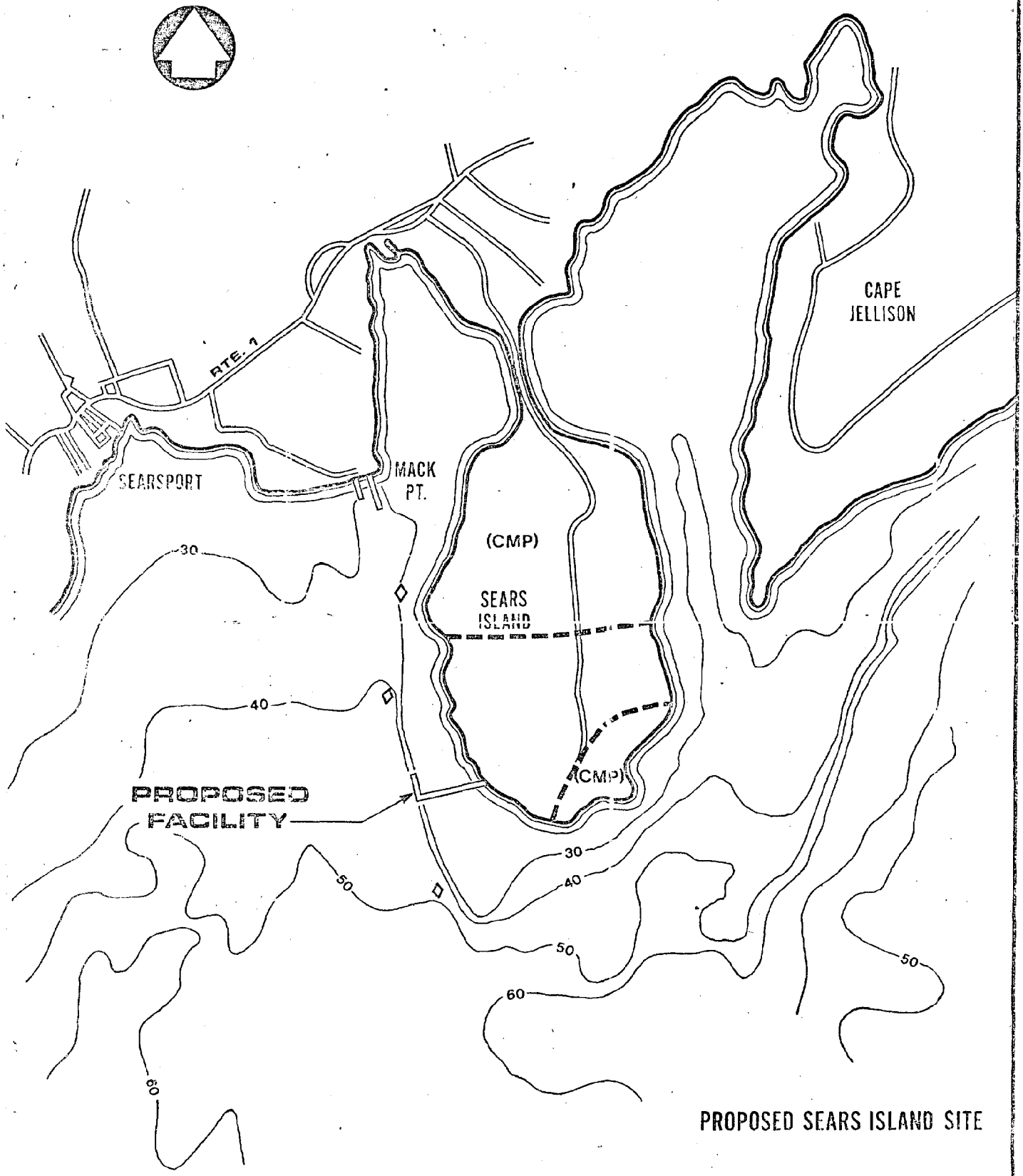
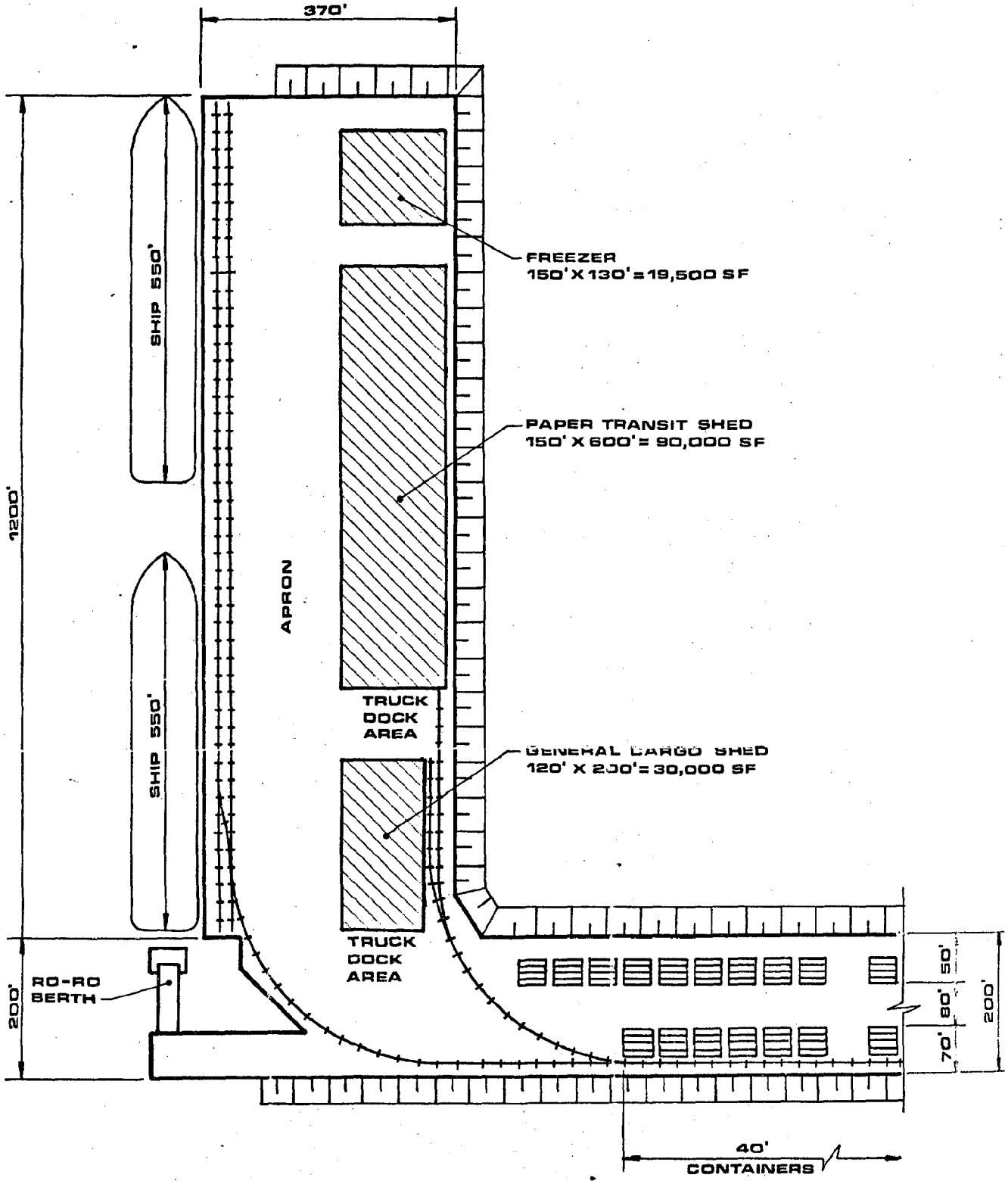

RTE. 1
SEARSPORT
MACK
PT.
CAPE
JELLISON
(CMP)
SEARS
ISLAND
(CMP)
PROPOSED
FACILITY
30
40
50
60
30
40
50
50
60
PROPOSED SEARS ISLAND SITE

Figure 5.1



CARGO PORT APRON DETAILS

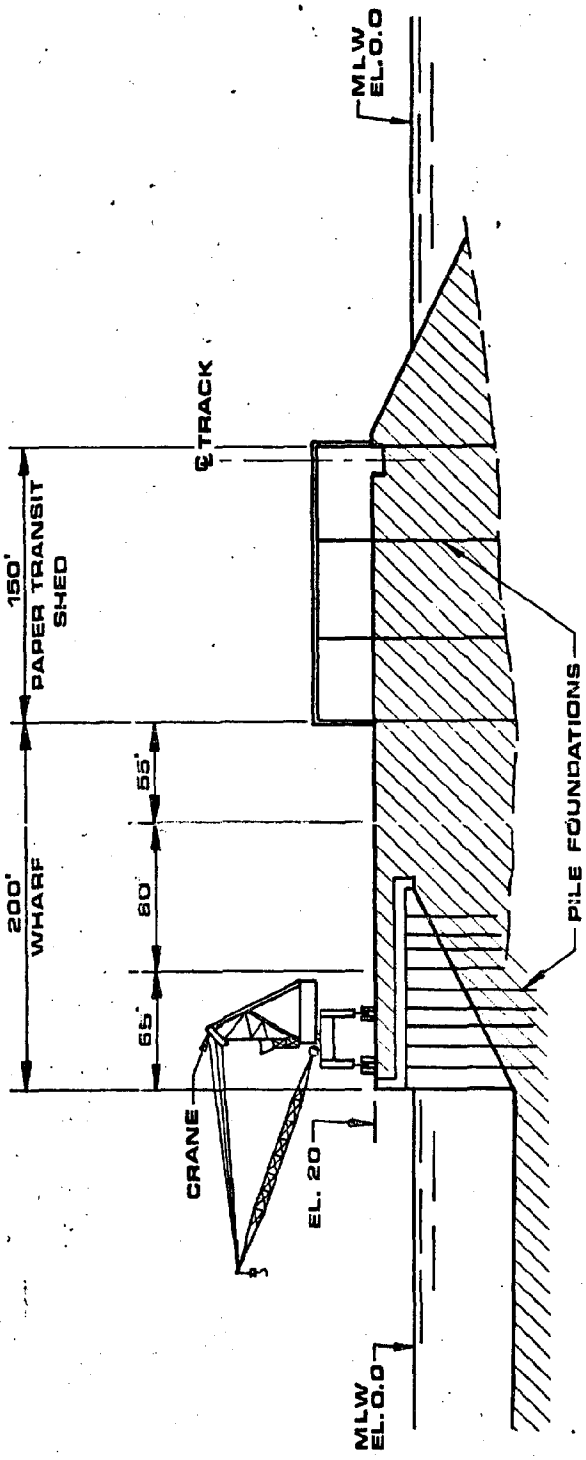
SCALE: 1" = 200'

Figure 5.

which are driven directly on and off appropriately equipped vessels. The clear area of the apron allows sufficient room for vehicles of all types to maneuver during loading and unloading, and can also be used for temporary storage.

Three structures have been shown on the outer portion of the embankment behind the wharf and maneuvering areas. These include a general transit shed with an area of 30,000 square feet, a paper products transit shed of 90,000 square feet, and a freezer facility of approximately 20,000 square feet. All have truck loading areas and are also served by rail. The paper transit shed has its rail docking areas under cover from the elements. Figure 5.3 illustrates a typical cross section of this outer area of the facility in the area of the paper transit shed. The container crane is shown on the apron. Note that the railroad track is depressed through the shed, allowing floor-level transfers between the railroad cars and the shed.

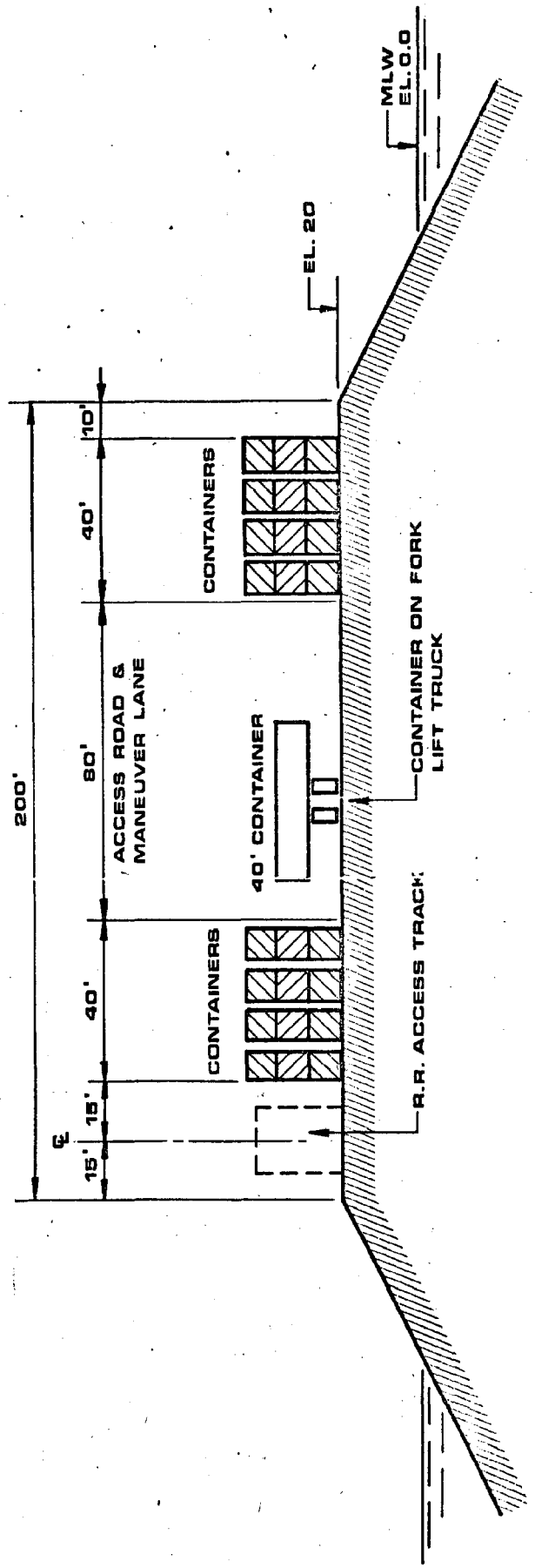
The remaining offshore portion of the facility is an embankment with a width of 200 feet and a length of approximately 2,300 feet. The railroad track serving the berthing area, the transit sheds, and the freezer facility is located along the southern edge of this embankment. In addition to serving as access to the berthing and shed area, this long embankment is also planned as the initial container storage area. Figure 5.4 illustrates a typical cross section of the embankment in this area and shows one possible container storage arrangement. From left to right on Figure 5.4 (or from south to north on the embankment)



TYPICAL CROSS SECTION AT
PAPER TRANSIT SHED

SCALE: 1"=100'

Figure 5.3



CROSS SECTION
ACCESS EMBANKMENT
SCALE: 1" = 40'

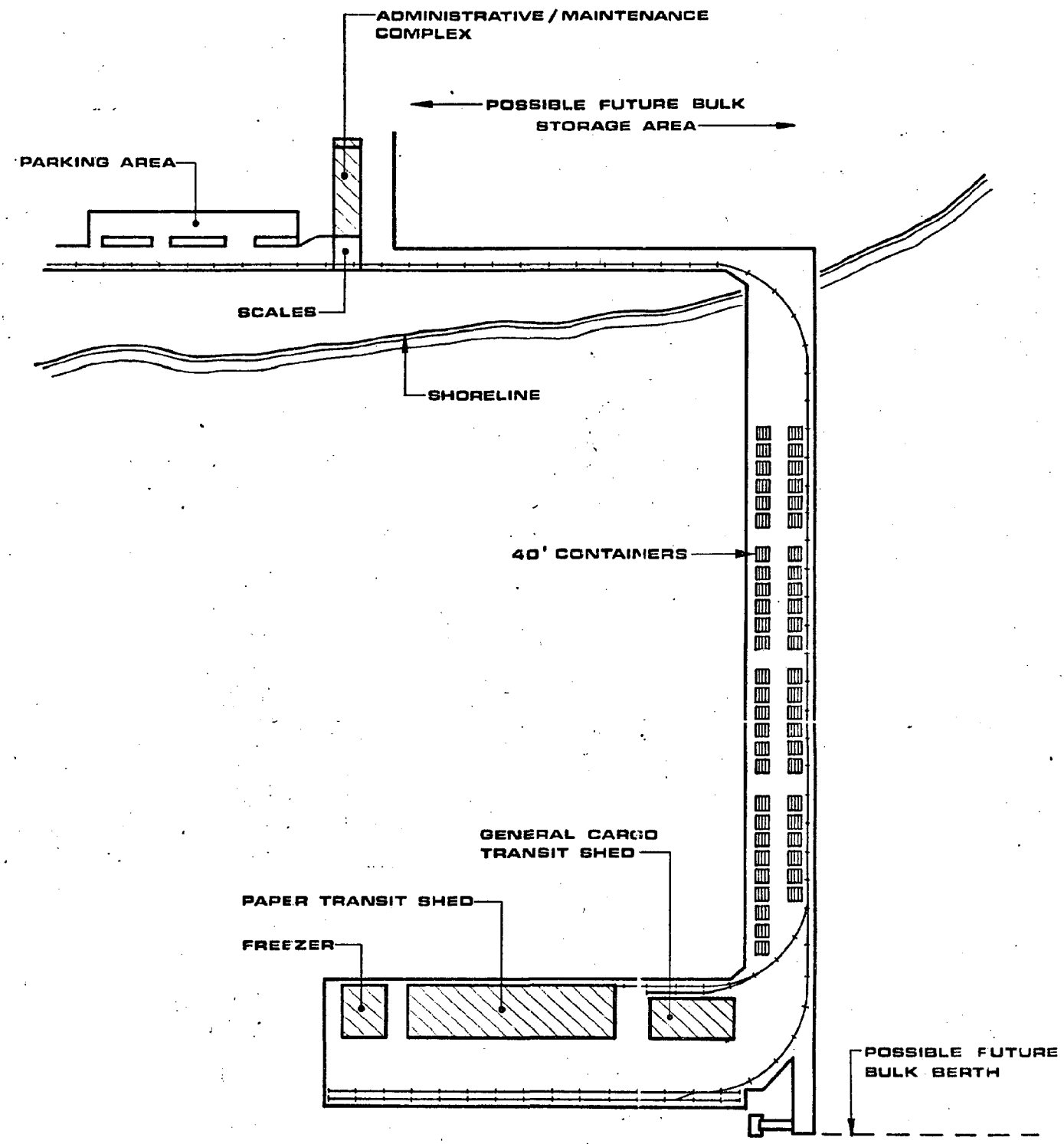
Figure 5.4

there is first a 30-foot railroad right-of-way which can also be used by other types of vehicles when no railroad cars are present. Next to the railroad right-of-way is shown four rows of containers (either 20 or 40 feet in length) stacked three high. The width of this container area is forty feet. Next is an 80-foot right-of-way for all types of highway vehicles. The remainder of the cross section is occupied by another 40-foot wide container storage area and, finally, a 10-foot right-of-way.

The administration complex, the onshore location of which is shown in Figure 5.5, includes area for offices and a locker room, vehicle maintenance, and an equipment garage. Near this complex is an area which, at some time if desired, can be used for the storage of large quantities of bulk cargo, such as coal. The configuration of these storage areas has not been shown but, depending upon the product, could consist of simply paved pads or, perhaps, silos.

Access to the port complex would consist of a two-lane highway paralleled by a single railroad track running from the mainland across a causeway and then continuing along the western shore of the island.

There is a large water area inside of the embankment structure which can be developed at some time in the future for additional container storage areas, transit sheds, or other uses should demand warrant such an expansion. The development costs would be relatively inexpensive as the water is shallow in that area.



SEARS ISLAND PORT LAYOUT

SCALE: 1" = 400'

Figure 5.5

The following section will briefly outline preliminary cost estimates for the facility just described. It will be followed by discussions on facility operating and maintenance costs, benefits, and possible means of financing.

5.3 Estimated Construction Cost of the Sears Island Facility

Table 5.1 lists a preliminary construction cost estimate in 1977 dollars of the facilities just described. While the estimate includes the cost of the rail and highway access to the site, it should be noted that the cost of constructing the causeway from the mainland to the island has not been included.

The estimated construction cost of the facility at Sears Island is approximately $41 million, exclusive of land acquisition costs and exclusive of any bridge structures (causeway) between the mainland and Sears Island. Additional costs would also be incurred if a berth for bulk ships, a conveyor system to move this cargo, and bulk storage areas were to be constructed.

The most expensive items are, as could be expected, the wharf and embankment. In fact, these two items account for approximately one-half of the total cost. The next most expensive item is the paper transit shed. The high cost associated with this building is due primarily to the heavy floor loading which it must support.

The $41 million cost to the State of Maine described in Table 5.1 could conceivably be reduced in several areas. For example, the mobile gantry crane could be replaced with a standard truck crane at less than half the cost. The truck crane would have the added flexibility of being able to be easily moved

Table 5.1

Estimated Construction Cost for Sears Island Facility

Wharf:	1200'	$ 9,600,000
Embankment:	880,000 Sq. Ft.	9,300,000
Riprap:	6,400 L.F.	2,400,000
Paving, Drainage, Lighting:	880,000 Sq. Ft.	2,600,000
Warehouses		
Paper Transit Shed:	90,000 Sq. Ft.	5,500,000
General Transit Shed:	30,000 Sq. Ft.	930,000
Freezer Facility:	19,500 Sq. Ft.	780,000
Miscellaneous Structures		
Administration:	10,000 Sq. Ft.	600,000
Maintenance:	8,000 Sq. Ft.	560,000
Equipment Garage:	6,300 Sq. Ft.	250,000
Locker Room:	3,000 Sq. Ft.	180,000
Scales (5) and Support Facilities		320,000
Ro-Ro Facility:		625,000
Water		
Connection to Searsport:		800,000
Elev. Tank and Equipment		550,000
Railroad Track		
Main Line to Site (Bridge by Others):	12,000 L.F.	1,700,000
On Site:	8,400 L.F.	720,000
	9,000 L.F.	
Entrance Road (Bridge by Others):		750,000
Equipment:		
Mobile Gantry Crane (40-ton capacity @ 100')		1,700,000
Forklifts (2) (120,000 lb. capacity)		600,000
Miscellaneous Vehicles		480,000
		$40,945,000
	SAY	$41,000,000

off-site and used on other projects when not required at the port. However, it does have certain disadvantages, including poor visibility from the cab; i.e., the operator often can not see the deck of the ship being worked.

It is also possible that some facilities, such as the paper transit shed for example, could be leased to their users under long term contracts. The leases would be such that the cost of the facilities would be paid for over the duration of the contract. Other facilities could potentially be paid for by those receiving benefits from the project--i.e., the railroad could pay the cost of providing new track to the terminal while the town could pay the cost of water service installation.

It could also be expected that the terminal operator (stevedore) would supply much of the equipment needed for operation, such as small forklifts, tractors, etc. The operator would not be expected to supply the container crane or large forklifts.

The items described above are suggestions for reducing the cost of this project to the State of Maine. It is not meant to be an all-inclusive list nor is it a requirement to be absolutely followed. Rather, it is an attempt to pass on a portion of the costs of the project to those who will benefit most from it.

The primary emphasis of this port study has not been on the handling of large quantities of dry bulk material such as coal and salt. Accordingly, specific facilities to handle this type of cargo have not been included in discussions to date. However, for informational purposes, a brief description of the facilities necessary to handle such cargo will be given here in the event that such an operation might be desired at some future

time.

A bulk unloading facility could be located adjacent to the general cargo wharf in the approximate position shown in Figure 5.5. The facility anticipates operation with self-unloading, deep-draft bulk vessels discharging their cargo onto a wharf conveyor, where the unloaded materials would be transferred to storage fields on Sears Island. The conveyor system could be arranged with juncture points such that various types of materials could be transferred to different storage areas, as desired. If the need developed for special unloaders, they could be installed on a skeleton track structure.

The facility itself would consist of a 1200-foot access platform and access trestle, two breasting dolphins, three fenders, four mooring dolphins, and approximately 4800 feet of conveyor. The estimated cost of these items, not including any storage facilities on the island (pads or silos) is $10 million.

The remainder of this chapter will discuss future benefits and costs associated with the project, including possible methods of financing.

5.4 Economic Impact of Port Facilities Investments in Maine

The economic impact of investments in port facilities in Maine is discussed in this section from two complimentary perspectives. One aspect of the economic-impact assessment involves consideration of the effect of a port's services on industries within the state, and the effect of expanded port activity on jobs and expenditures involved in its day-to-day operation. It has been somewhat difficult to assign numerical values for this aspect of the impact assessment because of a number of factors

which require more detailed investigation than was possible within the scope of this study, and because of uncertainty in predicting actual port users at this time. An approach to more precise quantification of these impacts is suggested, however. A second perspective involves consideration of the direct and indirect effect on the state's economy of expenditures in the actual construction of the facility at Sears Island. Numerical values have been developed for this aspect of the impact assessments from the preliminary engineering cost estimates and from estimates of the multiplier effect of the particular expenditures expected to be made within the State of Maine.

Impact of Improved Port Services

While it has not been feasible within the course of this study to quantify the economic benefits of improved port services to the State of Maine, it is possible to discuss in qualitative terms what these impacts might be and to outline an approach that may be followed in subsequent work to develop quantitative estimates. Areas of major economic impact are discussed in the paragraphs which follow.

Continuing Jobs at an Expanded Cargo Port. Based on the port's ability to capture a greater share of Maine-based import and export traffic, much of which is now being shipped through ports outside the State, jobs in handling, pilotage, maintenance, and port administration will increase. To the extent that the cost of these jobs will be paid for by port charges for handling and storage, they represent a net benefit to the State economy. The amount of this benefit may be calculated as follows: wages and salaries paid to port workers times the multiplier value of household expenditures

for all items purchased within the State. A hypothetical illustration of how this benefit would be included in an overall benfit-cost evaluation of the project is shown below:

$$B_p = \sum_{i=1}^{25} I_i \times M_i$$

where

B_p = benefits to state economy of new jobs created at port,

$\sum_{i=1}^{25}$ = sum of benefits over 25-year life of state investment,

I_i = income in year "i" to Maine residents employed at the port, and

M_i = multiplier value in year "i" for household expenditures in Maine.

Assuming, for example, that 25 new long-term jobs (net over existing jobs) are provided at the port as a consequence of increased cargo volume through a Maine port, and that the average annual wages, salaries, and benefits for each job is $14,000 (1977), then:

B_p = 25 x $14,000 x 2.7 (estimated multiplier) x 25 (life of state investment)

= $23,625,000.

If 50 new continuing jobs are added, then the impact over 25 years would be double the amount shown, and so forth. Such calculations highlight the relatively large impact to the state's economy of jobs added as a consequence of expanded port activity. An impact of the magnitude shown above would be expected to be realized from the diversion of Maine-based cargoes that are now being shipped through ports outside the state, assuming the growth factors for Maine-based traffic discussed in prior sections of

the report. Additional jobs would be expected at the port if cargo were to increase above the projected amounts, which will be affected by a number of factors to be discussed.

Transportation Cost Savings to Maine Industries. The costs of transport to port could be substantially reduced for a number of Maine's industries if a Maine port were available with facilities and services competitive with those now provided outside the state. For example, MDOT has calculated a transportation cost saving of $475,000 per year to Maine industries if 1976 containerized cargoes were able to be shipped through a Maine port. Assuming an average saving of approximately $100/container, and 15 cents per ton of break-bulk cargo, by 1980 exporters from Maine could realize aggregate cost savings of $600,000 to $1,000,000 per year by shipping to a Maine port. These figures are rough estimates, and do not include the possibility that the port will induce increased export shipments as a consequence of the lower transportation costs that would be available. Moreover, the calculated savings do not include possible advantages in transportation costs that could be provided by a domestic coastwide shipping service for commodities now destined for U.S. markets. On the next page is the outline of an approach that may be followed in subsequent study of transportation cost savings, that could be undertaken when the costs and service of a domestic waterborne carrier are more fully developed.

Also shown on the next page is how in mathematical terms the impact of a substitute shipping mode (i.e., water) for delivery to domestic markets from Maine (or to Maine) can be represented.

Sequence	Analytic Method	Source
1. Identify major bulk shipments to U.S. markets outside Maine.	Survey	Paper producers, food producers, selected other major producers
2. Identify costs of inland transport to broad U.S. destination areas.	Survey	Railroads, motor carriers, major producers
3. Identify costs and delivery times available via waterborne services.	Contact domestic coastwise carrier	
4. Compare costs of alternative modes for commodities whose delivery-time sensitivity is within range of waterborne service.	Ratio comparison	Results of 1-3 above
5. Include job-creation and potential costs savings in overall evaluation of port investments.	Benefit-cost analysis	Result of 4 above

Impact of Substitute Shipping Mode

$$I_{DWS} = \sum_{i}^{n} (T_L - T_W) + (J_P - J_L)$$

Where:

I_{DWS} = Impact of domestic waterborne service on Maine industries transportation costs and employment at the port.

$\sum_{i}^{n}$ = Summation of impact each year the service is in effect during the life of the State's investment in the port.

T_L = Total transportation costs by inland movement only.

T_W = Total transportation costs via domestic waterborne carrier.

J_P = Impact of jobs added at port as a consequence of increased cargo volume (see formulation in prior subsection).

J_L = Impact of jobs lost (if any) to Maine residents by reduced inland transportation in Maine (if any).

Impact of Capital Expenditures

The construction cost of port development at Sears Island is currently estimated at $41,000,000. Included in this cost are expenditures for structural materials, lighting fixtures, piles, machinery and equipment, etc., that are likely to be manufactured and purchased outside the State of Maine, and therefore represent a cost to the project that may provide little direct or indirect or indirect stimulus to the State economy.[1] These costs are expected to amount to approximately $16,000,000, and for the purposes of this analysis are not counted among the direct or indirect benefits to residents and industries in Maine that will result from port facility investments.

In contrast to the expenditures which may "leak" outside the State economy, it is estimated that approximately $25,000,000 of port development costs will be directly spent within the State of Maine, and in turn will produce a multiplier effect (from successive rounds of spending by suppliers to suppliers, and by the expenditures of wages earned by construction workers and other labor). These costs, in addition to construction labor, include purchases of materials such as riprap, concrete (wharf and shed decks, ro-ro bridge foundation and apron deck, and concrete shed walls), paving, and embankment materials. Construction material purchases within the State of Maine are currently estimated at approximately $11,000,000, while labor costs for construction could yield approximately $14,000,000 in wages to state residents.

---

[1]Exceptions include where such materials are purchased from wholesale distributors in Maine or transported by Maine-based carriers.

The expected benefit to the economy of Maine from these expenditures is calculated as follows:

Item	Direct Expenditure	Estimated Multiplier	Direct and Indirect Impact
Construction Materials	$11,000,000	1.90[1]	$20,900,000
Construction	14,000,000	2.70[2]	37,800,000
		Total:	$58,700,000

N.B.: Multiplier values are estimates which may be further refined upon completion of I-O matrix for Maine, now being developed.

From the above calculations, it appears that benefits from construction alone to the state's economy may exceed the total cost of the facility, even with the aforementioned presumption that substantial expenditures will be made out-of-state.

Not all of the cost of port development is expected to be borne by the State of Maine. For example, the state's base share of port improvement costs may be considered to be limited to those items for which no long-term payback should be expected (assuming port revenues are used to cover operating and maintenance costs, and are not used for debt retirement), and would not include items contributed by others (for example, land, railroad and road construction to Sears Island) or items that will be expected to pay for themselves through long-term leasing or other arrangements. More detailed and continuing analysis, as well as practical negotiation, is required to determine the state's share of port

---

[1]Derived from adjusted U.S. Multi-Regional Input-Output Model and Location Quotient calculation for stone, clay, and glass products in Maine.

[2]Same as above for new construction (labor) expenditures.

Source: Economics Research Associates.

development costs, and such refinement is beyond the scope of this study. However, for the sake of this preliminary evaluation, the State's costs (notwithstanding possible EDA participation which could cover some part or all of the State's share if private funds are involved in the remainder) are hypothetically calculated to be as follows:

Item	Cost
Pier Construction (wharf, embankment, riprap, paving, drainage, lighting)	$23,900,500
Miscellaneous Structures (not including transit sheds and freezer facility)	2,535,000
Water Connections and Equipment	1,350,000
Railroad Track on Pier	720,000
Total:	$28,505,000

The above breakdown assumes that, although initial funding may be required from State or federal sources, (1) warehouse construction (totaling $7,210,000 including a paper transit shed, general transit shed, and freezer facility) will eventually be repaid out of leasing arrangements; (2) a main-line railroad connection to the site ($1,700,000), an entrance road ($750,000), and handling equipment ($2,780,000) will be paid for by others.

Although the expected State share of capital costs for port improvements is a preliminary estimate at this time, a tentative calculation of the State's return on investment in port development is outlined below:

Item	
State Costs in Port Development	$29,000,000
Present Value of State Costs Assuming 6-Percent Interest over 25-Year Payback Period[1]	$56,028,000
Economic Impact of Port Facility Construction Expenditures (State Overall)[2]	$58,700,000
Ratio of Economic Benefits from Construction to State Costs	1.05

While a benefit-cost ratio of 1.05 for the State's investment in port development may not appear, on the surface at least, to be a very high rate of return, it should be clearly kept in mind that this represents a benefit to the Maine economy from construction expenditures alone. It does not include benefits from continuing jobs provided at an expanded cargo port, nor does it include benefits to Maine industries from lowered shipping costs, nor does it include the possibility of expanded production by existing or new industries which will have greater access to export markets and may thus increase employment opportunities for Maine residents, as discussed previously.

Other Economic Impacts

Thus far, discussion of the economic impacts of possible port development in Maine has focused on effects to the overall State economy. There are, of course, impacts that accrue specifically within the vicinity of the port. These may include, in

---

[1]Assumes port revenues are not used to pay back any portion of the State's base share.

[2]Includes the direct and multiplier effect within the Maine economy of port construction expenditures.

addition to jobs held at the port by local residents, the possibility of new employment and tax revenues, should existing industries outside Maine locate within the port's vicinity. In an area of substantial unemployment, such as Waldo County, the impact of new jobs and businesses may be valued more highly than the direct dollar effect because of the social as well as economic opportunities they may provide, and because of the lowered unemployment or welfare costs potentially involved. Examples of industries which place a high value on access to waterborne commerce are shown in Table 5.2. Whether or not any of these industries would locate within the vicinity of an expanded cargo port in Maine depends on a number of factors, including: the availability and cost of required labor; land availability and costs; State and local taxes; market orientation of the individual firms (i.e., do they prefer to locate close to resource suppliers--for which Maine may provide advantage for some industries--or do they prefer to locate close to purchasers of final product--Maine's distance away from major markets may be a disadvantage to certain industries); overall State and local business climate--as reflected in the attitudes and perceptions of public officials, private business leaders, and whether or not support and encouragement is extended to potential new business ventures. These factors require more detailed analysis than was possible in the course of this study, but represent a potential that should be considered in subsequent work.

5.5 Financing Port Improvements

A number of factors need to be considered in evaluating financing possibilities for port improvements in Maine. Foremost

Table 5.2

Manufacturing Industries Placing a Significant Value on Access to Waterborne Commerce[1/]

SIC	Industry	Value of Waterborne Transport: Critical[3/]	Value of Waterborne Transport: Significant[4/]
24323	Softwood plywood, exterior type (17)[2/]	12%	47%
26213	Coated printing and converting paper (9)	22	22
26217	Unbleached kraft packaging and industrial converting paper (6)	0	67
26413	Gummed paper and board products (4)	0	50
27522	Label (excluding cloth and wrapper printing, lithographic) (10)	10	10
28151	Cyclic (coal tar) intermediates (7)	14	71
28182	Misc. acyclic chemicals and products (12)	33	58
28191	Synthetic annonia, & compounds (11)	36	45
28213	Thermoplastic resins (less resins for protective coverings) (9)	33	33
28242	Misc. noncellulosic synthetic organic fibers (2)	-	100
28442	Perfumes, toilet water & colognes (4)	25	25
28790	Agricultural insecticidal & fungicidal prep. (10)	10	50
29116	Liquified refinery gases (6)	33	67
33574	Communications wire and cable (9)	11	0
34411	Fabricated structural iron and steel for bldgs. (49)	18	33
34113	Misc. fabricated structural iron and steel (13)	23	31
34431	Heat exchanges and steam condensers (13)	23	23
34460	Architectural and ornamental metalwork (15)	0	40
34616	Metal commercial and home canning closures (6)	17	50
35321	Underground mining machinery (2)	0	50
35361	Hoists (5)	0	40
35423	Misc. metal forming machine tools (5)	0	40
35481	Rolling-mill machinery and equipment (8)	13	25
35521	Textile machinery (8)	0	50
35811	Automatic merchandising machines (5)	0	60
36442	Electric conduit and conduit fittings (6	17	17
36742	Transistors (5)	20	0
37321	Inboard motor boats (all types) (10)	20	30

1/ Exclusive of food processing industries, which were not surveyed.
2/ Figure in parentheses indicates number of firms responding in sample.
3/ Percent of firms assigned a critical value to waterborne transportation at the plant site.
4/ Percent of firms rating waterborne transportation at significant to average value.

Source: U.S. Economic Development Administration, Industrial Location Determinants, (1973), and Economics Research Associates

among these considerations is the function a port serves within the state's overall economy. Very few, if any, ports in the United States operates on a profit-making basis, while many show substantial deficits. While a port may show losses on an internal accounting (direct revenues minus operating and debt retirement costs) basis, its functioning may stimulate production and employment among the port's direct and indirect users and hence contribute positively to employment and tax revenue benefits to the State. Moreover, industries within Maine that ship via water benefit from the lower transportation costs involved in distance and travel-time advantages that a local port could provide.

In the past, the principal Maine industries using ports, within or outside the state, have been pulp and paper producers and food producers. In 1976, these groups accounted for nearly 80 percent of Maine-based import and export tonnages. Therefore, port development in Maine is likely to be most beneficial to these broad industry groups. Investments contemplated by the State of Maine in port facilities development should be undertaken with the assured participation and possible financial commitment of major port users. This commitment could take several forms, including (1) capital outlays for port facility improvements; (2) pledges to ship via an improved Maine port at the reasonable market price of its services; (3) long-term leasing agreements for covered storage at the port; and (4) purchase and/or leasing of specialized equipment (e.g., contract with a stevedore to manage the pier and provide port-packers, forklifts, etc.).

It should be recognized that certain of these commitments may be difficult to obtain, given the alternatives now available for shipping outside the state of Maine. However, since the hinterland potential for an improved Maine port is, in the near future at least, essentially limited to cargoes originating in or destined to points in Maine, support from local industries is critical to the port's functioning.

Since the Searsport area has been identified as offering the greatest potential for serving Maine's overall import and export cargoes, additional participation in the cost of port improvements should be pursued with other developers of Sears Island. In general, industries whose shipping requirements or opportunities would benefit from improved handling, storage, and steamship services at a Maine port are logical candidates for a cost-sharing venture with the State.

Potential sources of State funding include general-obligation bonds and revenue bonds. General-obligation-bond financing would be preferred for the State's share of port facility investments for three reasons: (1) it would free possible port revenues to be used for incremental improvements that may be necessary as cargo volume develops and to attract additional cargoes that may become available; (2) the port may not be a revenue-producing operation, particularly in its early years, and should not be constrained to produce net revenues (on an internal accounting basis) given the function ports serve within the economy of the local area and the state overall(few, if any, U.S. ports have operated in the black and to expect a Maine port to do so would likely price its services at a competitive disadvantage

with those outside the state); and (3) the true economic benefits of a port distribute to many sectors of the state economy, among direct users as well as non-users. It would not be inequitable, therefore, to draw financing from broadbased state tax sources.

In addition to State and private contributions, a possible major source of funding assistance in port development is the U.S. Economic Development Administration (EDA), specifically EDA Grants for Public Works and Development Facilities. To be eligible, a project must be located in an EDA-designated area of substantial unemployment. The unemployment rate in Waldo County (which encompasses the Searsport area) was 10.6 per cent in October, 1977, compared to 7.2 per cent for the State of Maine overall and a 6.3 national rate of unemployment in the same period. The rate of unemployment in Waldo County rose in October from 9.4 per cent the previous month, as did the State of Maine unemployment rate from 6.7 per cent. The unemployment rate for the U.S. overall was 6.6 per cent in September and thus declined in October (to 6.3 per cent). In its latest application for EDA Public Works assistance, the town of Searsport reported an unemployment rate of 17.4 per cent. Since Waldo County, including Searsport, is already an EDA-designated area of substantial unemployment, the area would appear to be a reasonable candidate for EDA assistance in port facilities development.

EDA grants, loans, and financing guarantees have been extensively used by a number of states as part of port development programs. EDA has participated in projects ranging from minor wharf reconstruction to the construction of major new

facilities. EDA awards have included $3,308,000 in grants to the Lake Charles Harbor District, Lake Charles, Louisiana, for construction of a bulk-handling facility; $10,125,000 in grants ($6,075,000) and loans ($4,050,000) to the Port Commissioners of Oakland, California for construction of the Seventh Street Marine Terminal; and $27,000,000 in development loan guarantees to Todd Shipyards, Inc., Los Angeles, California, for construction of ship repair facilities. Typically, EDA grants for port facilities improvements have ranged from $1,000,000 to $3,000,000. Table 5.3 provides a representative listing of EDA-funded port projects between 1966 and March 1977 (latest available data). Data in the table does not include funds disbursed for port planning studies or technical assistance.

Some advantages that investment in a Maine Port at Sears Island may hold in competition for EDA funds may include, in addition to the creation of jobs in an EDA-designated area of substantial unemployment, the following: (1) the inclusion of private enterprise in the overall development of the port (public/private partnerships are encouraged in EDA legislation, administrative regulations and policy); (2) the fact that an improved port facility in Maine may encourage increased exports from U.S. producers, many of which in Maine are already substantial exporters, thereby providing positive contribution to the U.S. balance-of-payments deficit; and (3) the fact that port facility investments will contribute positively to a number of sectors of the Maine economy, which is currently showing an unemployment rate

higher than the national average.

The EDA grant funding ratio is now 50 per cent for Waldo County. However, according to the EDA Qualifications Office in Washington, DC, the fact that Waldo County has shown an average unemployment rate of 12 per cent over the past 24 months may qualify the area for a 70-per cent funding ratio. Contributions for the remainder could include donation of land, investments from private enterprise, or other public sources. Considerable discussion will be needed between State and EDA officials to determine whether or not, and to what extent, EDA may participate in port development at Sears Island, as well as at other ports in Maine.

5.6 Cargo Potential at Sears Island

Previous sections in Chapter 3 have identified the various products currently being exported and imported from Maine. This section will briefly summarize projections of future cargo movements originating from or destined to Maine, including a new Sears Island facility's share of these movements.

Exports

Exports can basically be separated into three broad categories--(1) forest products (pulp, paper, and chips), (2) food products, and (3) other products. Estimates of Maine exports in 1980 of each type of product are given on the next page.

The tonnages shown are for the whole State of Maine and are based upon 1976 tonnage figures as reported in the MDOT survey, adjusted for expected growth and new shipments. Ranges

Table 5.3

Examples of EDA Participation

in Port Facilities Development[1/]

(1966 - March 31, 1977)

Location	Dates of Funding Approval	Type of Project	EDA Participation ($): Grants	Loans	Development Guarantees	Total Approved EDA Participation
Anchorage, Alaska	3/28/69 6/30/73	dock expansion port facilities expansion	$1,158,000 $2,958,000			$4,116,000
Dillingham, Alaska	6/18/67-5/28/76	dock and cold storage facility	$1,643,000	$248,000		$1,891,000
Yukatat, Alaska	9/23/67-12/18/75	cold storage/dock/warehouse	$2,676,000	$601,000		$3,227,000
Oakland Port Commissioners, Oakland, Ca.	5/9/66	7th St. Marine Terminal	$6,075,000	$4,050,000		$10,125,000
San Diego Port District	9/22/66	Marine Terminal	$3,987,000			$3,987,000
Todd Shipyards, Inc., Los Angeles	4/28/75 9/30/76	ship repair facility			$20,250,000 $6,750,000	$27,000,000
Stockton Port District, California	6/17/68	container station construction	$1,140,000			$1,140,000
Cape Canaveral Port Authority, Florida	6/11/71-5/28/76	port expansion	$3,826,000			$3,826,000

1/ Does not include grants for port planning or technical assistance

Table 5.3 (continued)

Location	Dates of Funding Approval	Type of Project	EDA Participation ($): Grants	Loans	Guarantees	Total Approved EDA Participation
Panama City, Florida	10/15/68	port facility construction & renovation	$1,035,000	$1,040,000		
	3/28/73-11/19/74	barge facility	$516,000			
	6/2/75	cargo storage & handling facility	$530,000			$3,121,000
Georgia Ports Authority	1/8/69	new railroad track	$2,080,000			$2,080,000
Lake Charles Harbor District, Lake Charles, La.	6/6/66	bulk handling facility	$3,308,000			$3,308,000
Owensboro, Kentucky	12/6/73	port facilities	$1,388,000			$1,388,000
Grays Harbor, Washington	1/3/72-5/22/74	marine terminal facility expansion	$2,520,000			$2,520,000
Port of Seattle, Washington	1/3/71	container terminal #25	$2,179,000			
		container terminal #115	$2,025,000			$4,204,000
Port of Ilwaco, Washington	5/25/71	mooring basin	$1,125,000			$1,125,000
Port of Everett, Washington	10/15/71	port expansion	$2,768,000			$2,768,000

Source: EDA directory of Approved Projects as of March 31, 1977, and Economics Research Associates

Estimates of 1980 Exports in Tons
(Per Cent Containerized)

Export	Low	Middle	High
Pulp, Paper and Wood Chips	229,000 (30%)	300,000 (25%)	400,000 (20%)
Food Products	90,000 (35%)	101,000 (33%)	110,000 (30%)
Other	10,000 (50%)	12,000 (45%)	15,000 (40%)
Total	329,000	413,000	525,000

have been given for each type of product. Below each tonnage in parentheses is an estimate of the percentage which would move in containers.

A Sears Island facility's share of these exports is a function of many complex variables, including the extent to which Maine's industries would support and use the new facility and decisions regarding the future operation or non-operation of other cargo facilities in the state, such as the Maine State Pier. It is additionally recognized that some shipments are, for various reasons, presently tied into other ports outside of Maine, and that it would be difficult to transfer this business to a Maine port. However, from a purely geographical point of view, the Searsport area has been previously shown to have a locational advantage for approximately 35 per cent of this cargo, with the remainder passing through other ports including Boston, Portland and Saint John. If the Maine State Pier was not in operation for general cargo movements and Maine's industries were to become more supportive of an in-state facility, then the percentage of

exports which could conceivably move through Sears Island might be as high as, say, 80 to 90 per cent.

Imports

Imports to the State of Maine consist of a variety of products totalling approximately 240,000 tons in 1976. However, approximately 170,000 tons of this total consisted of bulk products such as salt, caustic soda, gypsum, and bauxite, which has not been the major type of cargo emphasis of a new facility. The remaining imports in 1976 amount to about 70,000 tons. Estimates for imports (not including bulk products) in 1980 are as follows:

Estimates of 1980 Imports in Tons
(Per Cent Containerized)

Import	Low	Middle	High
All Products	80,000 (35%)	85,000 (33%)	90,000 (30%)

As for exports, the above tonnages are for the State of Maine as a whole. The Sears Island share, based on its locational advantage, could be expected to be in the vicinity of 40 per cent of the total. Again, the percentage which a facility at Sears Island could attract could be significantly higher depending upon the support received from Maine's industries and the availability of competing facilities.

Other Cargo

As has been mentioned previously, the possibility exists for the revival of a domestic coastwise service in the near future. While it is much too early to speculate on the success of such a service, if indeed it does come to pass, the potential for

---

[1]The proposed facilities at Sears Island can be modified to accommodate significant volumes of bulk cargo, if such emphasis is required, in keeping with the facility's desired flexibility.

significant volumes of cargo, particularly paper products, being shipped from Maine on such a service is certainly there.

5.7 Operation of the Port

This section will briefly discuss operating characteristics of the proposed port facility at Sears Island. Among the items discussed will be recommendations as to who should be responsible for day-to-day operation and the types of costs which can be expected to be incurred. Detailed operating cost estimates will not be presented as they would be based on many unknowns that can only be clarified as interest in the port develops.

Operating the Port

There are several options available regarding the type of port operation and management at Sears Island. One option would be for the State to be responsible for the day-to-day operations of the facility, much as it is currently responsible at the Maine State Pier in Portland. Another possibility would be to have a stevedore responsible for day-to-day operations, as presently occurs at Searsport on the privately-owned Bangor and Aroostook pier. Of course, still other arrangements are possible. However, it is recommended that the second option just described be selected for the Sears Island cargo port. One reason for this selection is that it should not be State policy to supplant private industry if private industry is willing to supply the service. The primary reason for this selection is that it puts the day-to-day operation of the facility in the hands of individuals thoroughly experienced in port operating procedures. These people have the know-how to most efficiently run the port. This arrangement would also most likely be the most cost-effective for the State in that the possibility

exists that several organizations might compete for the opportunity to manage and operate the port, with the State selecting that operator who would offer the best return to the State. A contract could be written which would provide incentives for the private operator to attract as much business as possible. One such incentive could be in the form of a clause in the contract giving the operator a percentage of the revenues derived beyond a certain agreed-upon point. To attract this business, the operator would naturally try to keep his costs to a minimum, and his efficiency at a maximum, thus hopefully keeping the costs of port services to the shipper also at a minimum. The lower the port user charges, the greater the likelihood of attracting business to the port.

The exact operating procedures can not be defined at this stage in the port planning process. Rather, they will come about as interest in a new cargo port develops and, ultimately, must result from a decision by those in authority in Maine.

Operating Costs

It should be kept clearly in mind that very few, if any, major public ports in this country operate at a profit in the traditional sense of the word. That is, a return on capital investment should not be expected. Ports are generally subsidized to some extent, but do provide benefits to their users and, more indirectly, to society as a whole, such as increased job opportunities, transportation-cost savings, and stimulation of new port-related industrial and business development. A new cargo port in Maine would most likely not be an exception to this fact.

Many of the costs incurred in operating a new cargo port will be a function of how much cargo is actually handled, who is

chosen to operate the port, etc. However, certain costs will be incurred regardless of these factors. Port security is such a cost. To provide 24-hour coverage year round would require five or six persons, assuming only one on duty at a time, or double that number if two are to be on duty. Other individuals required full time would be three clerks, a secretary, approximately four or five full time maintenance people, and several heavy vehicle operators, in addition to any full time administrators. Other individuals would be needed when a ship was actually in port. These are work gangs typically employed by the stevedore to service a ship in port. Still other individuals would be required to work in the transit sheds and freezer. The number of individuals actually employed by by the State, as opposed to working for the stevedore or some other private organization (as could be the case where a lessee of the transit shed would use his own employees to work there), would be a product of the operating policy selected by the State for day-to-day operations, as previously discussed.

Other costs will also be incurred in port operation. For instance, to light the active working apron would cost in the vicinity of $3.50 per hour (assuming 10-20 candlepower) with an additional cost of $1.20 per hour for the storage area along the embankment (street light intensity only). Such lighting might not be required if the port were not actually operating at night, however. Interior lighting for the paper transit shed and general transit shed is estimated to cost $2.25 and $0.50 per hour, respectively, and $0.90 per hour for the administration complex. To keep a 600,000 cubic foot freezer building at 20°F would cost $37.50 per hour.

It is estimated that approximately $10,000 per year would

be required for various miscellaneous operating supplies while a similar amount could be spent on snowplowing operations. Other costs would be for vehicle operation and maintenance, and maintenance of the various structures. Again, the division of responsibilities for these costs will be a function of the operating method eventually selected.

Thus far, the discussion has dealt exclusively with costs. To recover these costs, various charges are levied against the vessel while it is in port. These charges are generally a function of the total amount of cargo handled at the port and may vary significantly from port to port or even within the same port. While the magnitude of these charges for Sears Island would be the decision of those in authority and can not be determined at this time, the following charts list current charges for comparable facilities in Boston:

MORAN CONTAINER TERMINAL[1]

Dockage	- For each container loaded to or discharged from a vessel	$ 10.00*
	- Minimum charge per vessel per day	200.00
	- Vessel in non-working status, with permission of Terminal Superintendent, per hour	10.00
	Vessel completed loading or unloading, but failing to depart from berth within 30 minutes of completing operations, and with second vessel awaiting berth, per 15 minute period	75.00
Wharfage	- for each container, loaded or empty, passing to or from vessel while berthed	20.00**
Usage	- For each loaded container, loaded to or discharged from a vessel, as follows:	
	20 feet in length	10.00
	35 feet in length	15.00
	40 feet in length	17.00
	Cargo Not Otherwise Specified	15 cents per 100 lbs.

*Barges, up to 310 feet - $ 8.00 per container.
**Barges, up to 310 feet -$16.00 per container.

COMMONWEALTH PIER; PIER 1;[1]
CASTLE ISLAND; ARMY BASE

Dockage	- For each container loaded to or discharged from a vessel as follows:	
	20 feet in length	$ 4.00
	40 feet in length	8.00
	- Per ton of cargo (2,000 lbs. or 40 cu. ft.) Not Otherwise Specified	.50
	- Minimum charge per vessel per day	225.00
	- Vessel in non-working status, as follows:	
	Under 300 feet (Length Over All), per day	100.00
	301 to 600 feet, per day	150.00
	Over 600 feet, per day	200.00
	- Vessel refusing to vacate berth when ordered, per hour	50.00
Wharfage	- For each container loaded to or discharged from a vessel, as follows:	
	20 feet in length	5.00
	40 feet in length	10.00
	- Per Ton of cargo (2,000 lbs.) Not Otherwise Specified	.70
Usage	- for each loaded container, moving through the terminal, as follows:	
	20 feet in length	10.00
	40 feet in length	17.00
	- Per Ton of cargo (2,000 lbs.) Not Otherwise Specified	1.80

[1] The Port of Boston Handbook, 1977-1978, Boston Shipping Association, Inc.

From these charts it can be seen that charges for each 20-foot container, for example, can vary from $19 to $40 within the same port while charges for other sized containers and break bulk cargo also vary. Other revenues which would be received by the port, include charges for leasing space in the transit sheds and the freezer; storing cargo at the port, etc. These charges would offset to some extent the costs of port operation, though again, they probably would not cover all costs. The magnitude of these charges would be set once the volume of cargo to be handled and the method of operation are more clearly defined.

5.8 Support by Maine's Industries

A major impetus behind this cargo port planning study has been the desire of the State to better serve its industries and to encourage coastal development. These industries, the forest products and agricultural industries in particular, would receive the most direct benefits from a new port as they would be the prime users. Thus, it is critical that their active support be obtained before any construction occurs.

Contact with many of Maine's largest industrial firms has been made during the course of this study. Information obtained from these contacts was used as an aid in projecting estimates of future import and export traffic. At no time did any of these firms commit themselves to use a new port facility in Maine, nor were they asked to make such a commitment. However, it is recommended that further discussions with these industries be carried out before any final decision is made whether or not to construct the new port. These discussions should concentrate on generating interest in a new port facility and should involve the solicitation of these firms for their active participation in the port facility. This participation could involve direct financial participation, such as the long-term leasing of facilities (a transit shed, for example) and/or a commitment to actively make use of the port once it is built. It is absolutely critical to the success of the port that it receive strong support from these industries. If this support is not forthcoming, the port should not be constructed.

NOAA COASTAL SERVICES CENTER LIBRARY
3 6668 14103 0207