Maryland. Coastal Zone Management Program

City of Baltimore

Department of Planning

COASTAL ZONE

INFORMATION CENTER

# Baltimore Harbor Energy Facility Study

Coastal Energy Impact Program
Coastal Resources Division
Office of Coastal Zone Management
1980/81

Funded By a Grant from the
Coastal Energy Impact Program
Office of Coastal Zone Management,
Through the Coastal Resources Division,
State of Maryland

Baltimore City
Department of Planning
Larry Reich, Director

Contents

## TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

TABLES | PAGE

## LIST OF TABLES AND FIGURES
(continued)

## LIST OF TABLES AND FIGURES
(continued)

## LIST OF TABLES AND FIGURES
(continued)

# EXECUTIVE SUMMARY

## I. COAL

### A. Dynamics of Movement

An analysis of the port traffic by mode of transportation and type of traffic shows how Baltimore functions as a port and how coal impacts the local economy:

- Of the coal destined to Baltimore, most, or over four-fifths comes in by rail, while two-thirds goes out again by water to foreign nations, other ports in this country and big users on inland waterways. This outbound coal traffic is an important export industry that induces outside economic activities to purchase Baltimore services, generating local jobs and income.

- Almost all (96 percent) of the rail inbound traffic involves further handling in the form of transfer to another transportation mode or break of bulk. Such handling generates local jobs and income in transportation services, warehousing and ship repair.

- The other one-third of the coal coming into Baltimore is consumed locally by Baltimore's industries and is an important input for Baltimore's most important export industry, the steel industry. Four-fifths of the locally consumed coal involves further handling in the form of local barge movements occurring entirely within the port, generating transportation service jobs. A small but growing portion of locally consumed coal is an input into one of Baltimore's most important tertiary service industries, the electric power industry.

### B. Trends

The following are highlights of the most important coal trends occurring in Baltimore:

- Despite many claims of rapid growth in amount of coal handled through the port of Baltimore, trends have been quite moderate and fluctuating from 1973 to 1978. No clear direction or trend could be discerned based upon an analysis of the data alone from this period.

- The significant increase in export coal occurring in 1979 in Baltimore may mark the beginning of a new direction of greater or more consistent growth.

- The improvement in Baltimore's position relative to other Atlantic Coast ports in amount of coal dumped is strikingly evident.

- A steady increase in the importance of Baltimore in the Atlantic Coast in handling coal is occurring despite the erratic trends in local coal traffic, because the amount of coal handled in Atlantic Coast ports, particularly Hampton Roads, has suffered steady erosion during the same period.

C. Demand for Coal

The following factors have been found to be responsible for increasing demand for exports in Baltimore.

National and International

- Low domestic electricity growth, slower than expected shifts of utilities to steam coal and sluggish demand of the steel industry for metallurgical coal have contributed to excess capacity in the coal industry resulting in readily available reserves at depressed prices that are attractive for export.

- Increased shipping costs induced by rise in oil prices make U.S. coal cheaper for Europe compared to more cost-competitively mined Australian coal.

- The political necessity of some countries with large coal needs such as Japan to diversify their sources of supply, in some respects, benefits the U.S.

- The withdrawal of some big European suppliers from the market benefits U.S. export.

- The increasing number of foreign utility conversions to coal has been cited as favoring U.S. export but has not been verified.

- Some countries who have placed restrictions on export of their scarce coal resources cannot satisfy large demands being generated.

Regional and Sectional

- Baltimore is in close proximity to places where steam coal is mined.

- Baltimore has more favorable railroad rates than Hampton Roads for steam and other coal located to the north and west that more than compensates for its more distant location from Europe.

- High demurrage fees caused by limited capacity are being experienced to the same degree in other ports, cancelling any disadvantage to Baltimore.

- Equalization of freight rates such as occurred with Philadelphia may divert exports from Baltimore.

The following factors will be responsible for increases in domestic demand for coal in Baltimore and environs:

- national policy favoring new coal burning power plants or conversion of oil burning power plants to coal.

- BG&E conversion of Wagner plants Nos. 1 and 2 to coal in 1985.

- BG&E construction of a new power plant at Brandon Shores scheduled for conversion to coal in 1984 and 1988.

- Conversion of BG&E's Crane plant No. 1 to coal in 1983.

- Delaware Power and Light Company construction of new coal power plant by 1987 or 1988.

Future Demand

- Future demand is expected to increase moderately at sustained levels, but be somewhat below the current abnormally high levels. The port could support from 20-24 million tons per year of export coal traffic in the next decade.

- The current physical capacity of port and transportation facilities would constrain the handling of moderate growth.

- Differential impacts on diversions of traffic may occur in Baltimore according to the degree to which it keeps abreast of other ports in accommodating national and international demands.

Domestic Coal

- Future demand for local coal will almost double largely due to conversions of local utility plants,

- Future demand for local metallurgical coal may decline.

- Future demand for local steam coal may increase more than four times.

- The principal impact of increases in local demand will be on local railroad facilities.

Impact of Demand on Facilities

The following is expected to be the chief impact of increases of exports and domestic shipments and port-related investment on the transportation infrastructure, particularly the railroad:

- Increased serving yard capacity will be necessary if any further expansion of export facilities occur at Curtis Bay, given the fact that there is not much room for such expansion, because of built up adjacent residential areas.

- The capacity of B&O rail lines serving Curtis Bay may be strained. The degree to which this occurs is related to serving yard capacity and operation in Curtis Bay. Also, the increased capacity on this segment of the line may dampen projected industrial growth further south in Fairfield and Marley Neck. This requires further monitoring and evaluation on the part of the city.

- Railroad line improvements will be needed to serve coal burning power plants coming on line in Wagner Plant and Brandon Shores. Such improvements should be made cognizant of the need for railroad access to Fairfield and Marley Neck.

- Diversion of Conrail's export traffic from Baltimore and Philadelphia should help alleviate mainline tunnel problems and some of the capacity problems of Bayview yards.

- Conrail may not be able to fully share in the growth demand for steam coal from local utilities because of congestion and capacity problems at Bayview yards, and their Canton Coal Pier. Major investments and operational improvements will be required.

Impact of Proposals

Numerous proposals have been made by firms to improve waterside facilities. The following are the expected impacts of some of these proposals:

- The Island Creek project when completed will help the Curtis Bay export pier achieve close to its theoretical or nominal capacity in handling about 14 million tons of coal per year.

- The Consolidated Coal project for converting the Cottman Canton Ore Pier to coal will add a significant amount of capacity for export of coal from the port: 10 million tons of coal per year.

- These two projects alone could be enough to satisfy the moderate growth in export demand projected over the next decade: 20 to 24 million tons of coal per year.

Proposals for Through Traffic

Much of Conrail's through traffic destined to PEPCO's plants at Morgantown and Chalkpoint is routed by Conrail through the Bayview yards. Current traffic volumes on the Amtrak/Conrail line are handled without much delay, but if Amtrak rescheduled Corridor service to operate trains every half hour in each direction and increased intercity and local commuter service, the amount of freight traffic that could be handled on this main Corridor would be severely constrained. Four alternative basic solutions have been proposed, but none has been adopted:1/

- continuation of operations as they are now with several capacity improvements to eliminate interference problems.

- separation of freight and passenger service by shifting all through freight traffic to the B&O main line from Winans to Bayview.

- shifting of passenger service to the B&O line to take advantage of its proximity to the center of Baltimore.

- diversion of through freight from the corridor to tunnels under Baltimore harbor to bypass the center of Baltimore.

Impact of Port Coal Traffic

Economic

Coal most closely approximates bulk transshipment and could conservatively, for example, add about $61 million to the local economy, if coal exports should double.

Environment

The principal impact of the movement and storage of coal will be to increase emissions of fugitive particulate matter.

---

1/Peat, Marwick, Mitchell & Co., Study of the Rail System of the Baltimore Region, Final Report, Prepared by the Maryland Department of Transportation, September 30, 1976.

Recommended Policies of Local Government

The city must find a way to seek partnership with or otherwise induce the railroads to make the following high priority investments to ensure that coal facilities operate at their intended capacity, do not exacerbate local traffic problems, and hurt freight traffic or other industries:

- Increase serving yard capacity in the vicinity of Canton ore pier and Curtis Bay.
- Increase the line capacity to Curtis Bay, Wagner, Brandon Shores, Fairfield and Marley Neck.
- Implement operational improvements and encourage consolidation of or expansion of the railroads' facilities at their Bayview yards.

Other line capacity problems such as the Howard Street tunnel may be relieved by reduced export traffic from Conrail. The ultimate solution to the B&P tunnel capacity problem should be the result of initiatives of the Federal government in cooperation with the C&O and Conrail. Rerouting of Conrail traffic on the B&O main line as indicated in three alternatives posed, will relieve congestion at Bayview, allow for planned increases in Amtrak passenger service and will allow the converted Canton Ore pier to operate more effectively.

## II. PETROLEUM AND PETROLEUM PRODUCTS

The analysis of the movement of petroleum and petroleum products through the Port of Baltimore indicates that:

- Pipelines provide for the largest volume of petroleum coming into Baltimore, transporting "clean" products.
- Waterborne movements accommodate the next largest volume of imports into the port, transporting mostly "dirty" products and smaller amounts of clean products that cannot be handled because of the limited capacity of the pipeline.
- Baltimore is a major net importer and consumer of refined petroleum and petroleum products. It has practically no refineries.
- Refineries in such cites as New York City and Philadelphia on the east coast, Puerto Rico and the Virgin Islands in the Caribbean, and Houston and the Baton Rouge on the Gulf Coast are major suppliers of products for Baltimore.
- Baltimore has a small but important role as a distributor or transshipper of petroleum products via the inland waterway for a region extending from Virginia to New Jersey.

- A small, but significant amount of movement of petroleum products occurs entirely within Baltimore port on barges from oil company terminals to local consumers, primarily BG&E.

- The major portion of residual oil is consumed by utilities and manufacturing. Residential housing units consume the major portion of distillate oil as home heating fuel.

- Within the greater Baltimore region, the City of Baltimore and the areas surrounding the city within Baltimore County consumed the most petroleum products: the city ranked first in consumption of distillate and diesel oil; the surrounding county area ranked first in the consumption of residual and gasoline.

- In regard to waterborne movement of individual petroleum products, the following should be noted:

  -- The small amount of crude petroleum imported into Baltimore reflects the small amount of refining done in the city.

  -- Residual imports are largest in volume, generate a considerable amount of local movement within the port and are largely handled by two oil companies. The principal customer for residual is BG&E.

  -- Distillate imported into Baltimore is second most important in terms of volume. Most goes to storage for distribution by truck, but some is shipped out again over inland waterways serving a sectional market.

  -- Gasoline imported into Baltimore ranks third in importance and Baltimore plays an important role in redistributing gasoline over a wide sectional market to destinations located on inland waterways.

  -- Although the import of asphalts was relatively small, it comprised a significant portion of all oil exported from Baltimore largely because of the presence of asphalt refineries in or near Baltimore.

  -- The small volume of naphtha imported into Baltimore is handled by one company with a small amount consumed in the manufacture of SNG by BG&E.

The demand for electricity is expected to grow at a rate of about four percent per year, half of what it was in the early 1970s. BG&E estimates, optimistically, that its peak demand will grow by five percent this year and about four percent per year through the 1980s. The reasons for this slow growth are:

- a national, and to some extent, local economy that is growing at a slower rate;
- increasing conservation practices by customers;
- increasing use of more efficient appliances; and
- continuing rise in the price of electricity.

Slow growth has resulted in the following:

- the postponement of the opening of the Brandon Shores plant from 1982 to 1984; the new unit will start on coal; and
- the decision of BG&E not to join with PEPCO in building the Dickerson plant in Montgomery County.

In addition to slow growth, the following plants will be converted to coal and will no longer require residual oil:

- Wagner units #1 and #2 are scheduled to be converted to coal in 1985; these plants consumed 1,628,000 barrels of oil in 1978 (see Table III-7); and
- Crane's unit #1 will be converted to coal in 1983; it consumed 1,835,620 barrels of oil in 1978.

These reductions will reduce Hess and Exxon's imports of residual oil and will reduce local barge movements of oil to utility plants.

The prospects are for diminished imports of residual oil during the next decade. Residual oil is one petroleum product that must come by water and has the largest volume of import compared to any petroleum product in the port.

Prospects are for stable or somewhat diminished demand for clean products for the following reasons:

- slower growth or possibly decline in the use of gasoline as it becomes more expensive and the consumer buys more gas-efficient cars; and
- more restricted travel and conservation on the part of the consumer.

Aside from utility demand, there will also be a lower demand for home heating fuel for the following reasons:

- slower industrial and population growth generally;

- practice of energy conservation on the part of customers as oil prices rise; and
- conversion by customers from oil to other fuels.

The Port of Baltimore will experience diminished waterborne traffic for clean oil through the port in the next two to three years because Colonial will have completed its addition of pipeline capacity between Mitchell Junction, Virginia and Dorsey, Maryland. Approximately 20 percent of clean product traffic that is currently going by water will be diverted to the pipeline.

Impacts

Land Use

- The decline in demand for petroleum products and expansion of the pipeline is likely to result in underutilization of piers and facilities by major petroleum suppliers.
- Large amounts of port land are being pre-empted by petroleum uses that no longer demand water access.

Economic

- Reduction in port petroleum traffic will undoubtedly result in some reduction of local port jobs and income in transportation services and ship repair.

Environment

- Environmental problems are not unmanageable and will be lessened somewhat in view of slow growth or decline of petroleum traffic.

III. GAS

The following are the key findings of the analysis of the gas in the Baltimore region:

- Traditional sources of supply from Columbia are unlikely to change. Gas will generally be more available. Growth in demand will slow partly because of BG&E policies. Priorities will not be used to allocate gas.
- Columbia's Cove Point LNG facility presents special safety requirements and requires special monitoring at the regional or state level.
- BG&E's present peak shaving plants are unlikely to expand because of slow growth in demand, economic factors and restricted sites:

-- Spring Gardens LNG plant does not impact the port, has a limited size site, but could possibly expand its storage facilities.

-- Notch Cliff Propane-Air plant does not directly impact the port. With a shift from oil to gas, expansion of production of this type of gas is possible, but the suburban site may be sensitive to any expansion requirements.

-- Soller's Point SNG plant directly impacts the port requiring local movement of naphtha by barge. Economics do not now favor expansion, but if expansion should occur, it will be at another site.

# CHAPTER I--INTRODUCTION

Baltimore owes much of its existence as a mature industrial and commercial city on the east coast to its harbor. The city has evolved around the port. Baltimore harbor is also the site of a vast array of coastal energy activities and facilities. Furthermore, new energy activities and facilities have recently been proposed for the harbor. Despite this, practically no analysis has focused on the impact of energy goods movement and production on the port. The purpose of this report is to analyze the dynamics of energy goods movement through the Port of Baltimore in order to determine the physical, economic, and environmental impacts of the operation, location, and expansion of energy and supporting transportation facilities on the coastal zone of Baltimore harbor.

The study is for the Department of Planning of the City of Baltimore in cooperation with the Energy Coastal Zone Administration of the Department of Natural Resources in the State of Maryland. Federal funds for this study were provided under the Coastal Zone Management Act of 1972, as amended in 1976. It established the Coastal Energy Impact Program to assist states and local governments to plan for and manage the impacts of energy facilities and activities affecting their coastal areas.

This is a particularly propitious time to undertake such a study because the national concern about the ability of ports and supporting transport facilities to handle the increasing demands for export of U.S. coal. Baltimore will undoubtedly be in the forefront if a national policy is ever developed to deal with the effectiveness of the nation's ports. It is the second largest exporter of coal in the nation. Among Atlantic Coast ports, it generally ranks fourth in the volume of such energy goods as crude petroleum, distillate fuel oil, and residual fuel oil. In 1977 it exported 13.1 percent of the nation's coal and 10.4 percent of its miscellaneous petroleum and coal products.1/ It imported about three percent of the nation's distillate fuel oil and gasoline. It performed important transhipment functions to locations on the inland waterway for asphalt, distillate fuel oil, residual fuel oil, and lubricating oils. Purely local movements within the port were quite high, comprising seven percent of such movements nationally.

Coal, petroleum and petroleum products, and liquefied gases accounted for just over half of the total volume of commodities moved through Baltimore harbor. Of the total volume of goods moved through Baltimore, energy commodities

---

1/Waterborne Commerce of the United States, calendar year 1977, Department of Army, Corps of Engineers.

such as coal (24 percent) and residual fuel oil (14.4 percent) were very important. Coal accounted for half of all foreign exports in the port. Residual fuel oil accounted for 11.6 percent of all foreign imports, 30.3 percent of all imports from other ports on the coast, and over half of movements generated entirely within the port. Almost 90 percent of local barge movements within the port were generated by oil and coal.

Manufacturing exports are important to Baltimore's economy in terms of their value and the employment they generate. In 1976 almost five percent of the shipments of manufacturing establishments in the Baltimore metropolitan area were exports.[2/] Total manufacturing shipments were valued at almost 11 billion dollars and Baltimore exports amounted to just over a half billion dollars. About 4.8 percent of all persons employed in manufacturing establishments in Baltimore were directly related to exports. No comprehensive survey exists on the impact of imports or the effect of traffic on other sectors of the economy.

The report that follows discusses in detail the principal energy commodities of coal, petroleum and petroleum products, and gas in three separate chapters. Each chapter considers the dynamics of port movement, demand, and supply in terms of sources, facilities and transportation. The chapters conclude with an assessment of the impact of future trends on port facilities, land use, environment, and the economy.

---

[2/] U.S. Bureau of Census, Annual Survey of Manufacturers, 1976, "Origin of Exports of Manufacturing Establishments".

# CHAPTER II--COAL

## A. OVERVIEW

### 1. National Perspective

Coal is the most important energy commodity handled by the port of Baltimore. Baltimore ranks second in the nation in the amount of coal handled. Most of the nation's coal is moved through the East and Gulf ports, primarily from the large Northern and Mid-Atlantic ports (See Table No. II-1). Facilities for handling the export of coal on the West Coast are negligible. Hampton Roads, Virginia, which includes the ports of Norfolk and Newport News, is the nation's largest coal-export port. In the first quarter of 1980, Hampton Roads shipments of 13.8 million tons accounted for 79 percent of all U.S. coal sent overseas. Baltimore accounted for 13 percent of the volume, while the Gulf ports of New Orleans and Mobile shipped three percent each.1/

### 2. The Baltimore Port

The port of Baltimore is served by three railroads. The Baltimore and Ohio (B&O) division of the Chesapeake & Ohio (C&O) Railroad, carrying the largest amount of coal traffic, serves Baltimore mainly from the north and west, and Consolidated Rail Transportation Corporation (Conrail) serves Baltimore primarily from the north and east. Canton Railroad is a local switching railroad that interchanges with the B&O, Conrail, local industries and its own piers in the Canton area of the Port, one of Baltimore's oldest and most crowded industrial areas. The B&O has a relatively modern coal pier in Curtis Bay in the western part of the port which is the principal facility for export of coal in the port. The pier also handles local barge movements of coal. Conrail operates an old and relatively obsolete Canton Coal Pier in the Canton area in the east end of the port, that is entirely involved in local barge movements of coal within the port area, primarily servicing Bethlehem Steel. Bethlehem Steel has its own piers on which it receives imports of barge coal from Baltimore or Hampton Roads. Canton Railroad performs no interchange in coal traffic and is of interest chiefly because some of its facilities have been under active consideration for conversion to coal.

### 3. Dynamics of Coal Movement Through Baltimore

A detailed analysis of coal traffic through Baltimore by mode of transportation and type of traffic clearly shows how Baltimore functions as a port and how coal impacts the local economy:

---

1/ "Loads Get Heavier For Coal Roads, Ports", Wall Street Journal, July 22, 1980.

such as coal (24 percent) and residual fuel oil (14.4 percent) were very important. Coal accounted for half of all foreign exports in the port. Residual fuel oil accounted for 11.6 percent of all foreign imports, 30.3 percent of all imports from other ports on the coast, and over half of movements generated entirely within the port. Almost 90 percent of local barge movements within the port were generated by oil and coal.

Manufacturing exports are important to Baltimore's economy in terms of their value and the employment they generate. In 1976 almost five percent of the shipments of manufacturing establishments in the Baltimore metropolitan area were exports.[2/] Total manufacturing shipments were valued at almost 11 billion dollars and Baltimore exports amounted to just over a half billion dollars. About 4.8 percent of all persons employed in manufacturing establishments in Baltimore were directly related to exports. No comprehensive survey exists on the impact of imports or the effect of traffic on other sectors of the economy.

The report that follows discusses in detail the principal energy commodities of coal, petroleum and petroleum products, and gas in three separate chapters. Each chapter considers the dynamics of port movement, demand, and supply in terms of sources, facilities and transportation. The chapters conclude with an assessment of the impact of future trends on port facilities, land use, environment, and the economy.

---

[2/] U.S. Bureau of Census, Annual Survey of Manufacturers, 1976, "Origin of Exports of Manufacturing Establishments".

TABLE NO. II-1

Shipment of Coal Through the Port of Baltimore by Mode of Transportation and Type of Movement, 1977

| Mode of Transportation and Type Traffic | In | Direction | | Out |
|---|---|---|---|---|
| Railroad[a] | | | | |
| Chesapeake and Ohio | 8,417,000 | | | 118,000 |
| Conrail | 800,000 | | | |
| Subtotal | 9,217,000 | | | |
| Waterborne[b] | | | | |
| Import | 16 | | Export | 7,054,113 |
| Coastwise Receipts | 82 | | Coastwise Shipments | 10 |
| Internal Receipts | 1,819,982 | | Internal Shipments | 410,203 |
| Subtotal | 1,820,080 | | | 7,346,326 |
| Grand Total | 11,037,080 | | | 7,464,326 |
| Consumed Locally (In-Out) | | 3,572,754 | | |
| Local Water Movements | | 1,474,004 | | |
| Other | | 2,098,750 | | |

Sources:

a/Baltimore Area Rail System Study, Draft Final, Northeast Corridor Project, Federal Railroad Administration, U.S. Department of Transportation, May 25, 1979.

b/National Coal Association, Coal Traffic Annual, 1979 and 1978.

TABLE NO. II-2

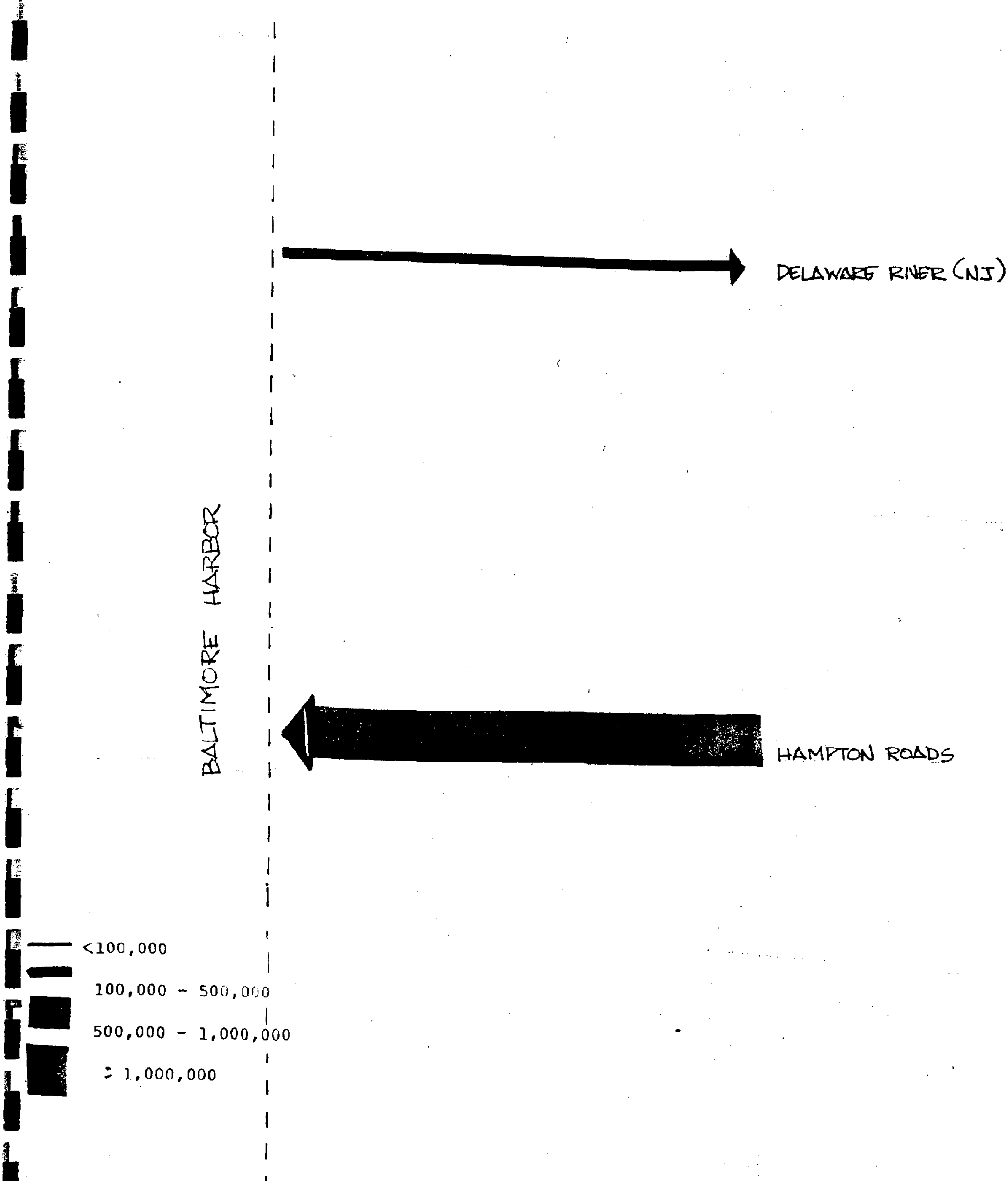
Domestic Coal and Lignite Inland Traffic Originating and Terminating in Baltimore Harbor, 1977

| ORIGIN: DESTINATION: | BALT | DEL. RIVER N.J. | DEL. RIVER PA. | SUBTOTAL NORTH | TOTAL | |
|---|---|---|---|---|---|---|
| BALTIMORE | 1,474,004 | 410,205 | | 410,203 | 1,884,203 | (401,203) |
| DELAWARE (NJ) | | | | | | |
| DELAWARE (R-DE) | | | | | | |
| SCHUYLKIL R | | | | | | |
| SUBTOTAL NORTH | | | | | | |
| CHESAPEAKE BAY | | | | | | |
| POTOMAC R. | | | | | | |
| YORK R. | | | | | | |
| HAMPTON ROADS | 1,819,982 | | | | | |
| SUBTOTAL | 1,819,982 | | | | | |
| TOTAL | 3,293,902<br>(1,819,902) | | | | | |

Source: Waterborne Commerce of the United States, Part I, Waterways Harbors, Atlantic Coast, 1977, Department of Army Corps of Engineers

Figure No. II-1

Domestic Inland Traffic Originating and Terminating in Baltimore Harbor -- Coal and Lignite




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

TABLE NO. II-3

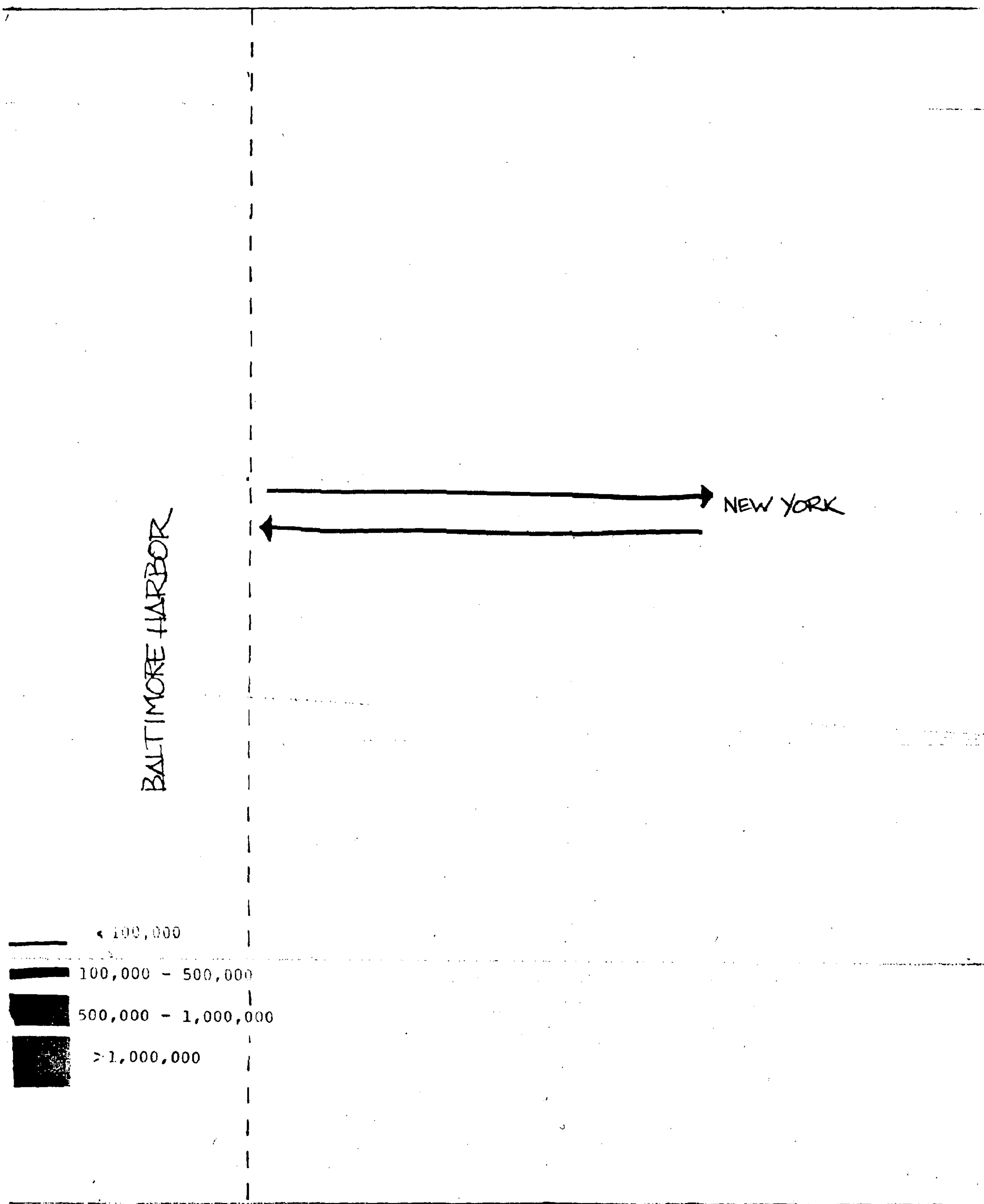
Domestic Inland Traffic Originating and
Terminating in Baltimore Harbor--Coal and Lignite

| | BALT. | N.Y. | PHILA. | P.R. | HOUST. | HONOL. | GUAM |
|---|---|---|---|---|---|---|---|
| BALTIMORE | | 10 | | | | | |
| BOSTON, MA | | | | | | | |
| NEW YORK CITY, NY | 82 | | | | | | |
| NORTHPORT, LI, NY | | | | | | | |
| PHILADELPHIA, PA | | | | | | | |
| PUERTO RICO | | | | | | | |
| ST. CROIX, VI | | | | | | | |
| MISSISSIPPI RIVER | | | | | | | |
| BATON ROUGE, LA | | | | | | | |
| LAKE CHARLES, LA | | | | | | | |
| HOUSTON, TX | | | | | | | |
| PORT ARTHUR, TX | | | | | | | |
| TEXAS CITY, TX | | | | | | | |
| CORPUS CHRISTI, TX | | | | | | | |
| PASCAGOULA, | | | | | | | |

Source: Waterborne Commerce of the United States, Paris, Waterways Harbors, Atlantic Coast, 1977, Department of Army Corps of Engineers

FIGURE No. II-2

Coastline Traffic Originating and
Terminating in Baltimore Harbor -- Coal and Lignite (Tons)




... Data for Calendar Year, 1977

facility to use coal. This amounted to 594,000 tons delivered by the B&O on barges from its Curtis Bay coal pier.[3] Another 800,000 tons of coal was delivered into Baltimore by Conrail and moved by barge from its Canton Coal Pier to Bethlehem Steel's piers at Sparrow's Point. The small amount of local water movement remaining, about 80,000 tons, was accounted for by B&O shipment of coal by barge to Bethlehem from its Curtis Bay coal pier.[4] The two million tons of the remaining differential were probably directly delivered by rail or truck to local industries.

Other significant water and rail movements complete the picture of movements of coal in and through Baltimore. A small proportion of the total coal coming into Baltimore, about 16 percent or less than two million tons, was received by barge via internal waterways. Designated as internal receipts, this movement consists of domestic inland traffic from Hampton Roads, Virginia by barge over the Chesapeake Bay, terminating in Baltimore to serve Bethlehem Steel (see Table No. II-2). Bethlehem owns a large, deeper draft 25,000 ton capacity barge that helps to ship this specialty coal required from southern mines. These mines are served only by the Chesapeake & Ohio and Norfolk & Western, operating out of Hampton Roads. Similarly, an opposing outbound water movement of coal originates in Baltimore and moves by barge via the Chesapeake Bay and Chesapeake and Delaware (C&D) Canal, and terminates at the Public Service Gas and Electric Company of New Jersey's Mercer powerplant on the Delaware River. This accounts for about 400,000 tons, designated as internal shipments.

It pays the New Jersey utility to use this more roundabout route rather than going to Philadelphia and barging upriver, because the "inside Delaware River" rates are higher than the "outside the Cape" rates. The present route involves hauling coal by rail (Conrail) from mines in northern and western Pennsylvania on Conrail via: Altoona, Pa.; Harrisburg, Pa., Columbia, Pa.; Perryville, Md.; Bayview yard, Baltimore; to Canton Coal Pier in the port, where the coal is loaded on barges via the C&O canal.[5] Some of the New Jersey utility's coal is also shipped by the B&O from its barges at Curtis Bay.

Coastwise shipments occur over the ocean among ports of the United States. In Baltimore, such coastwise shipment is not very important. The main intercoastal interchange of coal in and out of Baltimore is with the Port of New York (see Table No. II-3). The inbound movement from New York to Baltimore is greater than the reverse movement (see Table No. II-3). Coastwise movements could have significance in "topping off" a ship's cargo. Recently, large ocean-going vessels have stopped in Baltimore, filling their holds with coal until the draft of the ship reaches the 39 foot depth that marks the Baltimore

---

[3]National Coal Association, Origin, Cost and Quality of Contract and Spot Coal Deliveries by Plant for 1977, p. 86. See also interviews with Robert Lowe, Oct. 23, 1979.

[4]Interview with Herman E. Lehtke, Bethlehem Steel, Nov. 7, 1979.

[5]Interview, F. Miles Day, Nov. 9, 1979.

channel. The ship then moves to Hampton Roads to fill the remainder of its capacity at deeper channel depths prevailing in that port.

## B. TRENDS

The following are highlights of the most important coal trends occurring in Baltimore:

- Despite many claims of rapid growth in amount of coal handled through the port of Baltimore, trends have been quite moderate and fluctuating from 1973 to 1978. No clear direction or trend could be discerned based upon an analysis of the data alone from this period.

- The significant increase in export coal occurring in 1979 in Baltimore may mark the beginning of a new direction of greater or more consistent growth.

- The improvement in Baltimore's position relative to other Atlantic Coast ports in amount of coal dumped is strikingly evident.

- A steady increase in the importance of Baltimore in the Atlantic Coast in handling coal is occurring despite the erratic trends in local coal traffic, because the amount of coal handled in Atlantic Coast ports, particularly Hampton Roads, has suffered steady erosion during the same period.

### 1. Introduction: Statistics and Components of Coal Traffic

Many statistics that have been cited in support of growing coal traffic through the port of Baltimore have been inconsistent and bewildering. Some ambiguity arises because the unit of measure is not defined as to whether long tons (metric unit common in shipping data) or short tons (net tons) are being quoted. Other confusion arises from differing time periods represented. Still greater ambiguity arises over the lack of definition of coal traffic cited. Most often, the coal trends quoted refer to export only or the amount of coal shipped from Curtis Bay coal pier, Baltimore's only export coal facility. Often, purely local barge movements, internal shipments and receipts to and from other ports are not accounted for. For example, not all coal moved from Curtis Bay coal pier is for export, some moves by barge locally to Bethlehem or to local utilities.

The one-time snapshot of the movement of coal through the port above indicated that coal traffic encompasses more than the export of coal. The trends reconstructed for analysis in this report therefore attempt to take into account a more inclusive definition of coal traffic, based on a concept of total amount of coal dumped landside at Baltimore and other ports by railroads. The concept is broader than export coal and accounts for the varied ways of moving coal water side: foreign export, "inside the capes" movement, and other water movements. It does not, however, take into account inbound domestic inland water movements of coal shipped directly to local customers (e.g., internal receipts to Bethlehem) or other water movements that do not involve local railroads (almost negligible in Baltimore). Data available for analysis are from 1973 to 1978.

Using Baltimore data as an example of the scope of statistics on dumped coal it was found that a major portion of dumped coal, almost 70 percent in 1978, is exported to foreign destinations (see Table II-4). A smaller, but significant amount of dumped coal in Baltimore, over one quarter, travels "inside the capes" over domestic inland waterways (including the Chesapeake Bay) or as local water movements occurring entirely within the boundaries of ports. "Other" water shipments involving movements over the ocean to other domestic ports account for only about 4 percent of the total coal dumped in 1978.

An abundance of evidence has been cited indicating growth of Baltimore coal traffic, but none has used the broad concept of dumped coal. Moreover, trend data on dumped coal are current only to 1978. According to interviews,[6] in 1947 11 million tons of coal were shipped through Baltimore. This is certainly higher than indicated by data on dumped coal for the years in this decade analyzed in this report (1973-1978). However, based on current 1980 monthly volumes being handled in Baltimore, 11 to 12 million tons are expected to be shipped through the port, exceeding the 1947 level. Interviews[7] indicate that in 1979, 8,153,048 long tons (equivalent to 9,821,162 metric tons) of coal passed through Baltimore. Other sources[8] indicate that coal shipments in Baltimore increased 52.2 percent from the 1978 total of 5.9 million tons to a total of almost nine million tons in 1979, a record for the port. Still other sources[9] state that the total tonnage of Curtis Bay had already set a record in 1979 exceeding the previous high of 8.4 million tons shipped during 1977.

In order to clarify the confusion, to establish comparability with data on dumped coal used in this report and to update such data to take into account more recent trends as they occurred in 1979, a comparison was made between the figures quoted above and data on dumped coal. The comparison revealed that the previous figures quoted (with only slight differences) were comparable to only that portion of dumped coal statistics that refer to foreign export. The 52.2 percent increase during 1979 quoted above was applied to the 5,386,852 tons of dumped coal exported from Baltimore in 1978 to arrive at an estimate of about 8,883,689 tons of coal exported from Baltimore in 1979 (see Table No. II-4).

---

[6]Interview with Albert J. Knighton, May 21, 1980.

[7]Ibid.

[8]David Reiss, "Port Tonnage for 1949 up 15.4%," Baltimore Sun, December 30, 1979, p. K-7.

[9]David Reiss, "Ship to Top Off Load in Hampton Roads", Baltimore Sun, November 11, 1979.

TABLE NO. II-4

Coal Dumpings at Baltimore, By Type of Traffic, Percent Change, Percent of Total, 1973-1978

| Year | Total Coal Dumpings | Foreign Export | Inside Capes | Other |
|---|---|---|---|---|
| 1973 | 6,714,470 | 4,326,612 | 2,386,858 | -- |
| 1974 | 8,049,684 | 5,939,712 | 2,109,972 | -- |
| Change: No. | +1,335,214 | +1,612,100 | -276,886 | -- |
| % | +19.9 | +37.2 | -11.6 | -- |
| % of Total | | 73.8 | 26.2 | -- |
| 1973 | 9,064,579 | 6,596,513 | 2,468,066 | -- |
| Change: No. | +1,014,895 | +656,801 | +358,094 | -- |
| % | +12.6 | +11.1 | +17.0 | -- |
| % of Total | | 72.8 | 27.2 | -- |
| 1976 | 8,328,387 | 6,4219,105 | 1,722,945 | 126,337 |
| Change: No. | -736,192 | -167,408 | -695,121 | +126,337 |
| % | -8.1 | -2.5 | -28.2 | -- |
| % of Total | | 77.2 | 21.3 | 1.5 |
| 1977 | 9223,275 | 7,076,424 | 1,698,112 | 448,729 |
| Change: No. | +894,888 | +647,319 | -74,833 | +322,392 |
| % | +10.7 | +10.2 | -4.2 | +255.2 |
| % of Total | | 76.7 | 18.4 | 4.9 |
| 1978 | 8,41,547 | 5,836,852 | 2,273,467 | 331,228 |
| Change: No. | -781,728 | -1,239,572 | +575,355 | -117,501 |
| % | -8.4 | -17.5 | +33.9 | -26.2 |
| % of Total | | 69.1 | 26.9 | 3.9 |
| 1979 | N/A | 8,883,889a/ | N/A | N/A |
| Change: No. | | +3,046,837 | | |
| % | | +52.2 | | |
| % of Total | | | | |

a/Estimate based on a 52.2% increase.

Source: National Coal Association, Coal Traffic Annual, 1979 and 1978.

The estimate is comparable to the "almost nine million tons" quoted but was one million tons below the data in long tons cited above,[10] suggesting that the long ton quote may represent more than just exported coal and be comparable to total dumped coal.

2. Trends in Coal Dumped In Baltimore

a. Total Coal Dumped

An analysis of trends in total coal dumped in Baltimore indicates how easy it is to misinterpret the amount of growth in coal traffic in Baltimore. Trends from 1973 to 1978 show that in actual fact, overall growth, although significant, has by no means been very substantial and has shown quite a bit of variation. It is very difficult to differentiate any clear trend from the period covered by the data because the initial base and terminal years of the data series are atypical. The year 1973 is an unusually low level from which to establish a base for comparison. Also, 1978 was the year of a coal strike which constrained growth. Overall, total coal dumped in Baltimore increased 20.5 percent from 1973 to 1978. However, discounting 1973 as representing an abnormally low level of coal traffic to start a trend, the increase from 1974 to 1978 was only 4.8 percent. An examination of the pattern of yearly trends would therefore be more instructive.

In absolute numbers, tonnages have varied within a narrow range between eight and 9.2 million tons in the period from 1974 to 1978. Yearly growth rates have been moderate, ranging between about 10 to 20 percent with declines of eight percent occurring in two of the five years. The direction of trends is uneven and is not easily extrapolated to project future trends. After a large increase from a nadir in 1973, growth diminished and eventually declined from 1974 to 1976. Decline was followed by a healthy recovery of 10 percent in 1977, reaching a peak level of 9.2 million tons for the whole period. A decline occurred immediately thereafter in 1978 as a result of the coal strike. The tonnage handled in that year was only slightly above that handled in 1976.

b. Export Coal

Trends in dumped coal exported in Baltimore generally reveal the same pattern of trends as all coal dumped in Baltimore, which is natural since export coal comprises such a large proportion of total coal dumped, varying from 69 to 77.2 percent in the period analyzed (see Table No. II-4). Trends in export coal, however, appear more volatile at the beginning and end of the period when compared to total coal dumped, with a greater growth rate occurring during 1974 and a greater decline in 1978. Apparently, export coal suffered most from the coal mine strike. Based on the 1979 estimate of exports previously discussed, a substantial recovery in exports of over 50 percent has occurred after 1978. Part of the recovery may be a statistical artifact reflecting the low 1978 levels resulting from the coal strike. Using 1974 as a more typical base year to establish long term trends, however, exports have

---

[10]/8,153,048 long tons is equivalent to 9,821,162 net tons.

increased at an almost comparable rate of 49.6 percent in the period from 1974 to 1979, indicating that first time growth occurring in Baltimore in 1979 has been substantial and its influence over previous trends is pervasive. Similarly, it may well mean there is potential for future large increases.

Export traffic has been an increasingly important component of Baltimore traffic until 1976 when it achieved a peak of 77.2 percent share of total traffic (see Table No. II-4). Its share has declined since that time largely because of increases in "other" type traffic and the negative impact of the coal strike in 1978. As a result, for the first time, its share of total traffic was under 70 percent, at 69.1 percent. Based on the substantial rise in exports in 1979, however, its share of total traffic may be as high as 80 percent or above in 1979. In 1978, the substantial increases in the more local "inside the capes" traffic helped to compensate and maintain some stability in the face of declines occurring in exports during that year. Up to that time, "inside the capes" traffic had been declining.

c. Baltimore Trends In a Regional Context

Baltimore trends appear more positive when compared to comparable trends in dumped coal in the Atlantic Coast ports of New York, Philadelphia and Hampton Roads (see Table No. II-5). In the Atlantic Coast as a whole, after substantial growth in 1973, sharp declines in growth occurred, with increasingly steep rates of decline in the years from 1976 to 1978. As a result of this trend, Baltimore is the only port to show a consistent, steady increase in its importance as a coal port. In 1978, it handled almost one-third of coal dumped at Atlantic Coast ports which is more than double its 15 percent share of Atlantic coast dumped coal in 1973. In 1978, for the first time since 1973, Hampton Roads had less than two-thirds of Atlantic port traffic in coal, largely because of the steep declines in that port's traffic occurring in 1978 because of the coal strike. In 1973, Hampton Roads handled over 80 percent of coal on the Atlantic coast, but it has shown a steady decline in its share since that time. Mines served by the railroads going into Hampton Roads apparently were much more severely affected by the strike than those served by Baltimore's railroads. Also, Hampton Roads coal tonnage did not benefit from significant increases in "inside the capes" traffic as did Baltimore. Before 1978, however, Hampton Roads was experiencing a steady erosion of its share of Atlantic coast traffic. Some of the competitive factors between the two ports will be discussed in later sections on supply and demand.

d. Railroads and Coal Dumped in Baltimore

The Baltimore and Ohio (B&O) railroad has consistently carried about 90 percent of the coal traffic through Baltimore (see Table No. II-6). Tonnages on the B&O ranged from 5.3 million in 1973 to a 8.3 million peak in 1977. The B&O's superior port facilities make it the only railroad capable of directly exporting through the port of Baltimore. Conrail tonnages, on the other hand, ranged from .79 million in 1976 to a peak of 1.4 million tons as recently as 1978. Its Canton Coal pier is a more limited facility and most of its traffic involves either purely local shipments from its pier to Bethlehem Steel or internal shipments over domestic inland waterways to utilities such as Mercer in New Jersey. For this reason, except during 1974, Conrail has consistently had better growth in the so-called "inside the capes" traffic

Table No. II-5

Coal Dumpings at Baltimore and Other Atlantic Ports,
1973-1978, Percent Change, Percent of Total
(Net Tons)

| Port/Railroad | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 |
|---|---|---|---|---|---|---|
| NEW YORK | | | | | | |
| Conrail | 999,458 | 737,039 | 550,934 | 990,400 | 814,971 | 614,643 |
| Change: No. | -- | -262,419 | -186,105 | +439,466 | -175,429 | -200,328 |
| % | -- | -26.3 | -25.3 | +79.8 | -17.7 | -24.6 |
| % of Total | 2.4 | 1.5 | 1.1 | 2.2 | 2.2 | 2.44 |
| PHILADELPHIA | | | | | | |
| Conrail | 142,683 | 1,390,547 | 833,657 | 466,812 | 344,291 | 71,306 |
| Change: No. | -- | +1,247,864 | -556,890 | -366,845 | -122,521 | -272,985 |
| % | -- | +874.6 | -40.0 | -44.0 | -26.2 | -79.3 |
| % of Total | .34 | 2.8 | 1.6 | 1.0 | .9 | .3 |
| BALTIMORE | | | | | | |
| B&O | 5,335,871 | 7,021,871 | 7,904,504 | 7,534,070 | 8,330,130 | 6,973,150 |
| Change: No. | -- | +1,686,000 | +882,633 | -370,434 | +796,060 | -1,356,980 |
| % | -- | +31.6 | -12.6 | -4.7 | +10.6 | -16.3 |
| % of Total | 79.5 | 87.2 | 87.2 | 90.5 | 90.3 | 82.6 |
| Conrail | 1,376,432 | 1,026,027 | 1,160,075 | 794,317 | 893,145 | 1,468,397 |
| Change: No. | -- | -350,405 | +134,048 | -365,758 | +98,828 | +575,252 |
| % | -- | -25.5 | +13.1 | -31.5 | +12.4 | +64.4 |
| % of Total | 20.5 | 12.7 | 12.8 | 9.5 | 9.7 | 17.4 |
| Western Maryland | 2,167 | 1,786 | -- | -- | -- | -- |
| Total | 6,714,470 | 8,049,684 | 9,064,579 | 8,328,387 | 9,223,275 | 8,441,547 |
| Change: No. | -- | +1,335,214 | +1,014,895 | -736,192 | +894,888 | -781,728 |
| % | -- | +19.9 | +12.6 | -8.1 | +10.7 | -8.4 |
| % of Total | 15.8 | +16.0 | 17.8 | 18.1 | 24.8 | 33.5 |
| HAMPTON ROADS | | | | | | |
| C&O | 9,224,231 | 13,324,855 | 13,588,571 | 11,301,817 | 6,943,358 | 5,689,171 |
| Change: No. | -- | +4,100,624 | +263,716 | -2,286,754 | -4,358,459 | -1,254,187 |
| % | -- | +44.5 | +2.0 | -16.8 | -38.6 | -18.1 |
| % of Total | 26.7 | 33.0 | 33.5 | 31.2 | 25.8 | 35.3 |
| Norfolk-Western | 25,311,264 | 27,040,797 | 26,988,993 | 24,804,490 | 19,927,559 | 10,416,277 |
| Change: No. | -- | +1,729,533 | -51,804 | -2,184,503 | -4,876,931 | -9,511,282 |
| % | -- | +6.8 | -.2 | -8.1 | -19.7 | 47.7 |
| % of Total | 73.3 | 67.0 | 66.5 | 68.7 | 74.1 | 64.7 |
| Total | 34,535,495 | 40,365,652 | 40,577,564 | 36,106,307 | 26,870,917 | 16,105,448 |
| Change: No. | -- | +5,830,157 | +211,912 | -4,471,257 | -9,235,390 | -10,765,469 |
| % | -- | +16.9 | +.5 | -11.0 | -25.6 | -40.1 |
| % of Total | 81.5 | 79.9 | 79.5 | 78.7 | 72.1 | 63.8 |
| GRAND TOTAL | 42,392,106 | 50,542,924 | 51,026,734 | 45,891,906 | 37,253,454 | 25,232,944 |
| Change: No. | | +8,150,818 | +438,810 | -5,137,828 | -8,638,452 | -12,020,510 |
| % | | +19.2 | +.95 | -10.1 | -18.8 | -32.3 |

Source: National Coal Assocation, Coal Traffic Annual, 1979 and 1978.

TABLE NO. II-6

Coal Dumpings of Railroad Companies at Baltimore, by Type of Traffic, Percent Change, 1973-1978
(Net Tons)

| | 1973 | 1974 | Change Number | Change Percent |
|---|---|---|---|---|
| TOTAL | 6,714,470 | 8,049,684 | +1,335,214 | +19.9 |
| B&O | 5,335,871 | 7,021,871 | +1,686,000 | +31.6 |
| Conrail | 1,376,432 | 1,026,027 | -350,405 | -25.5 |
| WM | 2,167 | 1,786 | -381 | -17.6 |
| Foreign Export | 4,327,612 | 5,939,712 | +1,612,100 | +37.2 |
| B&O | 4,155,845 | 5,534,135 | +1,378,290 | +33.2 |
| Conrail | 169,600 | 403,791 | +234,191 | +138.1 |
| WM | 2,167 | 1,786 | -381 | -17.6 |
| Inside Capes | 2,386,858 | 2,109,972 | -276,886 | -11.6 |
| B&O | 1,180,026 | 1,487,736 | +307,710 | +26.1 |
| Conrail | 1,206,832 | 622,236 | -584,596 | 48.4 |
| WM | -- | -- | | |
| Other | -- | -- | | |
| B&O | | | | |
| Conrail | | | | |
| WM | | | | |

Source: National Coal Association, Coal Traffic Annual, 1979 and 1978.

TABLE No. II-6 (Continued)

Coal Dumpings of Railroad Companies at Baltimore,
by Type of Traffic, Percent Change, 1973-1978
(Net Tons)

| | | Change | |
|---|---|---|---|
| | 1975 | Number | Percent |
| TOTAL | 9,064,579 | +1,014,895 | +12.6 |
| B&O | 7,904,504 | +882,633 | +12.6 |
| Conrail | 1,160,075 | +134,048 | +13.1 |
| WM | -- | | |
| Foreign Export | 6,596,513 | +656,801 | +11.0 |
| B&O | 6,311,963 | +777,828 | +14.1 |
| Conrail | 284,550 | -119,241 | -29.5 |
| WM | -- | -- | -- |
| Inside Capes | 2,468,066 | +358,094 | +17.0 |
| B&O | 1,592,541 | +104,805 | +7.0 |
| Conrail | 875,525 | +253,289 | 40.7 |
| WM | -- | -- | -- |
| Other | -- | | |
| B&O | -- | | |
| Conrail | | | |
| WM | -- | -- | -- |

TABLE No. II-6 (Continued)

Coal Dumpings of Railroad Companies at Baltimore, by Type of Traffic, Percent Change, 1973-1978 (Net Tons)

| | | Change | |
|---|---|---|---|
| | 1976 | Number | Percent |
| TOTAL | 8,328,387 | -736,192 | -8.1 |
| B&O | 7,534,070 | -370,434 | -4.7 |
| Conrail | 794,317 | -365,758 | -31.5 |
| WM | -- | | |
| Foreign Export | 6,429,105 | -167,408 | -2.5 |
| B&O | 6,429,105 | -117,142 | +1.9 |
| Conrail | -- | | |
| WM | -- | | |
| Inside Capes | 1,772,945 | -695,121 | -28.2 |
| B&O | 1,104,965 | -487,576 | -30.6 |
| Conrail | 667,980 | -207,545 | 23.7 |
| WM | -- | -- | -- |
| Other | 126,337 | | |
| B&O | -- | | |
| Conrail | 126,337 | | |
| WM | | | |

TABLE No. II-6 (Continued)

Coal Dumpings of Railroad Companies at Baltimore, by Type of Traffic, Percent Change, 1973-1978
(Net Tons)

| | | Change | |
|---|---|---|---|
| | 1977 | Number | Percent |
| TOTAL | 9,223,275 | +894,888 | +10.7 |
| B&O | 8,330,130 | +796,060 | +10.6 |
| Conrail | 893,145 | +98,828 | +12.4 |
| WM | -- | | |
| Foreign Export | 7,076,424 | +647,319 | +10.1 |
| B&O | 7,076,424 | +647,318 | +10.1 |
| Conrail | -- | | |
| WM | -- | | |
| Inside Capes | 1,698,112 | -74,833 | -4.2 |
| B&O | 746,912 | -358,053 | -32.4 |
| Conrail | 951,200 | +283,220 | 42.4 |
| WM | | | |
| Other | 448,729 | +322,392 | +255.2 |
| B&O | 302,506 | | |
| Conrail | 146,233 | 19,896 | +15.7 |
| WM | | | |

TABLE No. II-6 (Continued)

Coal Dumpings of Railroad Companies at Baltimore, by Type of Traffic, Percent Change, 1973-1978

| | 1978 | Change Number | Change Percent |
|---|---|---|---|
| TOTAL | 8,441,547 | -781,728 | -8.4 |
| B&O | 6,973,150 | -1,356,980 | -16.3 |
| Conrail | 1,468,397 | +575,252 | +64.4 |
| WM | -- | | |
| Foreign Export | 5,836,852 | -1,239,572 | -17.5 |
| B&O | 5,836,852 | -1,239,572 | -17.5 |
| Conrail | -- | | |
| WM | | | |
| Inside Capes | 2,273,467 | +575,355 | +33.9 |
| B&O | 883,329 | +136,417 | +18.3 |
| Conrail | 1,390,138 | +438,938 | 46.1 |
| WM | -- | | |
| Other | 331,228 | -117,501 | -26.2 |
| B&O | 252,969 | 49,537 | 16.4 |
| Conrail | 78,259 | 67,974 | -46.5 |
| WM | | | |

than the B&O. It is largely because of growth in this type of traffic that Conrail's amount of coal handled grew while the B&O traffic actually declined in 1978.

Trends in B&O coal traffic mirror the pattern of total coal dumped in Baltimore in the period from 1973 to 1978 that has been discussed previously. Conrail follows the B&O pattern except in the beginning and end years of the period. In the initial year, its traffic declined substantially while B&O traffic increased. For reasons explained above, in 1978 its traffic increased markedly while B&O declined significantly. Conrail generally had more favorable growth rates than the B&O except during 1974 and 1976.

As shown in Table II-6, the Western Maryland Railroad, now a division of the B&O, did some exporting from its Port Covington coal pier, but this was discontinued in 1974, because the pier was redundant and inefficient. Table II-6 also shows that Conrail did a small amount of exporting from its Canton Coal Pier until 1975 when it was discontinued because of the fragility of the pier abutments. Thereafter coal traffic originating through Conrail from mines served in Pennsylvania was routed over B&O lines through Baltimore, terminating for export in the B&O's Curtis Bay port facility. Data on dumped coal do not show this traffic as Conrail traffic, but include it under B&O's export data. The Conrail data in this statistical series refer only to goods dumped and moved from Canton Coal pier.

Conrail-originated export traffic is significant in view of the local problems associated with the rail movements it generates at the Howard Street tunnel. The decision of Conrail to concentrate its export facilities in Philadelphia (see later discussion) will result in the diversion of some of this traffic from Baltimore. Separate data obtained from Conrail's Open Top Hopper business group show that Conrail-originated export traffic is small but significant (see Table No. II-7). It ranged from a low of about .65 million tons in 1974 to a high of about 1.2 million tons in 1976. In 1979, Conrail estimates it originated about 11 percent of Curtis Bay export traffic. A steady drop in Conrail's share of Curtis Bay export traffic has occurred from peaks around 17 percent in 1975 and 1976. When Conrail-originated export traffic is subtracted from B&O export data and added to Conrail data, Conrail's growth rates improve in the years 1975 and 1976, but become worse in other years.

## C. DEMAND FOR COAL

### 1. Introduction

Demand for coal in Baltimore can be segregated into three basic components all of which have distinct domestic and export markets: steam coal, metallurgical coal, and industrial and retail coal. Steam coal refers to coal used for the production of power by utilities. Metallurgical coal is used as raw material in making coke which is subsequently used to make iron and steel. Industrial and/or retail coal is used as boiler fuel or for direct heat in other industrial and/or commercial operations. Similar to the nation, the two most important components of demand in Baltimore are steam and metallurgical coal.

TABLE NO. II-7

Conrail Origin Coal To Its Canton Coal Pier Baltimore and To The B&O's Curtis Bay Facility for Export, Net Tons (000's), Number, Percent Change, Percent of Total, 1973-1979

| Year | Canton Coal Pier Domestic | Canton Coal Pier Export | Canton Coal Pier Total | B.O Curtis Bay Pier Export | Grand Total | Total Export 2/ Baltimore | Conrail Export Percent of Total Export |
|---|---|---|---|---|---|---|---|
| 1973 No. | 1,510.9 | 241.6 | 1,725.5 | 865.4 | 2,617.9 | 4,327.6 | 60.5 |
| 1974 No. | 704.0 | 425.9 | 1,129.9 | 646.3 | 1,776.2 | 5,939.7 | 29.9 |
| Change | -806.9 | +184.3 | -622.6 | -219.1 | -841.7 | +1,612.1 | |
| % Change 3 | -53.4 | +76.3 | -35.5 | -25.3 | -32.3 | +37.3 | |
| % of Total | 39.6 | 24 | 63.6 | 36.4 | -- | -- | |
| 1975 No. | 872.4 | 282.0 | 1,154.4 | 1,124.6 | 2,279.0 | 6,596.5 | 34.5 |
| Change | +168.4 | -143.9 | +24.5 | +478.3 | +502.8 | +656.8 | |
| % Change | +23.9 | -33.8 | +2.2 | +74 | +28.3 | +11.1 | |
| % of Total | 38.3 | 12.4 | 50.7 | 49.3 | -- | -- | |
| 1976 No. | 777.4 | -- | 77.4 | 1,152.8 | 1,927.2 | 6,429.1 | 30.0 |
| Change | -98.0 | -282.0 | -380 | 28.2 | -351.8 | -167.4 | -- |
| % Change | -11.2 | -100 | -32.9 | +2.5 | -15.4 | -2.5 | |
| % of Total | 40.2 | -- | 40.2 | 59.8 | -- | -- | |
| 1977 No. | 923.1 | -- | 923.1 | 1,014.9 | 1,938.0 | 7,076.0 | 27.4 |
| Change | +148.7 | | +148.7 | -137.9 | +10.8 | +646.9 | -- |
| % Change | +19.2 | | +19.2 | -12 | +.5 | +10.1 | |
| % of Total | 47.6 | | 47.6 | 52.4 | -- | -- | |
| 1978 No. | 1,472.4 | -- | 1,472.4 | 793.7 | 2,266.1 | 5,836.8 | 38.8 |
| Change | +549.3 | | +549.3 | -221.2 | +328.1 | -1,239.2 | -- |
| % Change | +59.5 | | +59.5 | -21.8 | +16.9 | -17.5 | |
| % of Total | 65.0 | | 65.0 | 35.0 | -- | -- | |
| 1979 No. 1 | 2,000.0 | -- | 2,000.0 | 1,000.0 | 3,000.0 | 8,883.7 | 33.8 |
| Change | +527.6 | | +527.6 | +206.3 | +733.9 | +3,046.9 | -- |
| % Change | +35.8 | | +35.8 | +26 | +32.1 | +52.2 | |
| % of Total | 66.7 | | 66.7 | 33.3 | -- | -- | |

1/Estimates for both Curtis Bay and Canton.

2/Total export coal dumped in Baltimore, National Coal Association, Coal Traffic Annual, 78-79.

3/Percent of grand total.

Sources: Canton - Conrail station department reports
Curtis Bay - Tidewater Coal Bureau in New York
Data provided by Conrail Open Top Hopper Business Group, 10/20/79.

The quality and cost of steam and metallurgical coal differ and have important implications for demand.

a. Steam Coal

For utilities, steam coal is a major cost component of their end product--kilowatt hours of electricity produced. Utilities, therefore, are very sensitive to the price of steam coal. In an effort to hold down costs, utilities tend to buy lower quality coal which has high volatility, high ash content and lower Btu content. The main constraint on the quality of steam coal is the sulfur content imposed by environmental regulations. Utility long term demand is more predictable and less subject to economic vagaries compared to the more volatile steel industry that needs metallurgical coal. Most utility coal, therefore is bought on longer term contracts and in large quantities so that substantial cost savings can be achieved. Also utilities consume pulverized coal which is cheaper. Because of the large quantities involved, they can command cheaper unit train rates. The coal consumed in the industrial sector is generally the same as steam coal and is priced similarly, except economies inherent in large quantities are not available because of the smaller quantities demanded.

The chief constraint on the quality and therefore the price of steam coal is the sulfur content of the coal. Environmental regulations have been an important factor in establishing such quality levels and therefore have influenced demand. Originally, States were given responsibility to develop ambient air quality standards. Such State regulations were established by statute and air quality standards differed according to the degree of the State's commitment.

Beginning in August 1, 1971 and extending through September 1978, however, the federal government took over responsibility for regulating air quality of new utility plants built in that period. Any plants constructed were required to met an emission standard for sulfur dioxide ($SO_2$) of 1.23 pounds of $SO_2$ for every million Btu's of coal burned. The method by which the utility was to achieve this standard was its own business. It could buy low sulfur coal with .7 percent sulfur content or could install expensive scrubbers. Economic decisions were based on the economics unique to each plant location. For example, for a plant located in a region where high sulfur coal was plentiful, the installation of an expensive scrubber allowed it to use the available high sulfur coal at minimal transportation cost. With the availability of low sulfur western coal, many utilities did not make such a capital cost expenditure and opted for use of low sulfur coal.

As of September, 1978 the rules applying to new plants changed. The 1.23 pounds of $SO_2$ per million Btu remained; however, utilities were required to use the Best Available Control Technology (BACT) to remove 70 percent of the sulfur in coals that had a sulfur content of .6 percent or less and 90 percent in coals with a sulfur content from .6 percent or above, up to the 1.2 pound limit. Since it normally takes five years to build a utility plant, the effects of this regulation should be felt beginning in 1983. It would require that new plants install scrubbers, thereby permitting the burning of high sulfur coal. This would contribute to a shift in the demand for high sulfur coal.

Those plants built between 1971 and 1978 and opted for low sulfur coal may be locked into low sulfur coal and become a captive market for this more expensive coal.

b. Metallurgical Coal

For the steel industry, coal is not a critical cost component of production and it can therefore afford to pay more for coal in order to assure quality and availability. The ideal coal for the steel industry has low volatility, low ash, high carbon content, and high Btu content. This type of coal may or may not have lower sulfur content. These qualities give metallurgical coal higher strength and coke yield. This type of coal is less available and commands higher prices. Over time, there have been significant improvements in converting pig iron steel and converting coke to pig iron. The replacement of the open hearth process by the basic oxygen process and electric furnace, as has occurred in Bethlehem Steel at Sparrows Point, has resulted in gains in efficiency with less raw material being needed to produce steel. When prices of metallurgical coal are particularly high, formcoke made from lower grade coals, can be used instead of coke, with the cost savings offsetting inefficiencies inherent to the formcoke process. Most important, in recent years, coke yields (ratios of coal to coke produced) have been becoming lower (higher ratios) reflecting a shift from expensive and scarce lower volatility coal blends to a greater proportion of high volatile coals. Since high volatile coals with low sulfur content can also be used as steam coal, there is an increasing overlap, under certain circumstances between the demand for metallurgical and steam coal. When demand is strong, there is increasing competition for this "swing" coal, making it more difficult for utilities to procure it. However, when demand for metallurgical coal is low and large supplies exist, as has just recently been the case, a coal producer with readily available, high-volatile metallurgical reserves will be willing to sell such coal at lower prices to the steam market.

This section attempts to provide a perspective and to evaluate factors that affect components of demand in Baltimore, particularly steam and metallurgical coal. The three perspectives important in understanding demand that underlie present and future trends in Baltimore are: (1) national or international (2) sectional or regional, and (3) local demand.

National and international economics in the supply and demand for competing fuels as well as for coal chiefly affect Baltimore's export trends in both steam and metallurgical coal. Exports have been a very volatile segment of coal trade in Baltimore. Understanding the national and international events behind the recent rise in exports in Baltimore is crucial to an evaluation of Baltimore's future needs relating to the capacity of its port.

Regional or sectional demand refers not only to demand in the immediate Baltimore metropolitan area, but its trade relationships in the middle or northern Atlantic region extending from Hampton Roads, Virginia, to New Jersey. The relationship of Baltimore to its supply regions in Pennsylvania, Maryland and West Virginia is also an important factor defining its regional trade relationships. Some of these relationships will be discussed in more detail in a later section on supply. Regional considerations are important particularly in relation to domestic power industry's demand for steam coal and for demand for metallurgical coal from the local steel industry in Baltimore. Also, regional factors explain why Baltimore alone among all the Atlantic ports is garnering an increasing share of exports.

Domestic or local demand for coal originates within the United States involving customers in other cities or ports, along inland waterways or in the port of Baltimore. This demand is associated with the needs of a few large steel and utility plants and can be readily quantified and projected (see later section on demand).

The following factors have been found to be responsible for increasing demand for exports in Baltimore.

National and International

- Low domestic electricity growth, slower than expected shifts of utilities to steam coal and sluggish demand of the steel industry for metallurgical coal have contributed to excess capacity in the coal industry resulting in readily available reserves at depressed prices that are attractive for export.
- Increased shipping costs induced by rise in oil prices make U.S. coal cheaper for Europe compared to more cost-competitively mined Australian coal.
- The political necessity of some countries with large coal needs such as Japan to diversify their sources of supply, in some respects, benefits the U.S.
- The withdrawal of some big European suppliers from the market benefits U.S. export.
- The increasing number of foreign utility conversions to coal has been cited as favoring U.S. export but has not been verified.
- Some countries have placed restrictions on export of their scarce coal resources cannot satisfy large demands being generated.

Regional and Sectional

- Baltimore is in close proximity to places where steam coal is mined.
- Baltimore has more favorable railroad rates than Hampton Roads for steam and other coal located to the north and west that more than compensates for its more distant location from Europe.
- High demurrage fees caused by limited capacity are being experienced to the same degree in other ports, cancelling any disadvantage to Baltimore.

- Equalization of freight rates such as occurred with Philadelphia may divert exports from Baltimore.

The following factors will be responsible for increases in domestic demand for coal in Baltimore and environs:

- National policy favoring new coal burning power plants or conversion of oil burning power plants to coal.
- BG&E conversion of Wagner plants Nos. 1 and 2 to coal in 1985.
- BG&E construction of a new power plant at Brandon Shores scheduled for conversion to coal in 1984 and 1988.
- Conversion of BG&E's Crane plant No. 1 to coal in 1983.
- Delaware Power and Light Company construction of new coal power plant by 1987 or 1988.

Future Demand

- Future demand is expected to increase moderately at sustained levels, but be somewhat below the current abnormally high levels. The port could support from 20-24 million tons per year of export coal traffic in the next decade.
- The current physical capacity of port and transportation facilities would constrain the handling of moderate growth.
- Differential impacts on diversions of traffic may occur in Baltimore according to the degree to which it keeps abreast of other ports in accommodating national and international demands.

Domestic Coal

- Future demand for local coal will almost double largely due to conversions of local utility plants.
- Future demand for local metallurgical coal may decline.
- Future demand for local steam coal may increase more than four times.
- The principal impact of increases in local demand will be on local railroad facilities.

2. National and International Factors Influencing Export Demand

The United States has had a long history of coal export, most of which has been limited to the more costly, high quality metallurgical coal. Steam coal traditionally has not been exported in any significant volume, except to Canada. Asia and Europe's demand for steam coal have traditionally been met by imports from Australia, Poland and South Africa. Nationally, in 1980, steam coal exports have been cited as running at an equivalent annual rate of 8.5 million (net) tons up sharply from an export of 2.2 million tons in 1979.[11] In 1979, for example, almost 65 million tons of coal were exported. Of this amount, 14 million tons of steam coal were sent to Canada and 43 million tons were metallurgical coal exports to Japan and Europe.[12] Since total U.S. production in 1979 was about 770 million tons, it can be seen that the remaining less than 2.5 million tons of steam coal exported was relatively insignificant.

The demand for coal in the nation has risen slowly from 1973 to 1977, but not as fast as has been forecast, according to the National Coal Association.[13] Production of coal actually declined in 1978 after the peak had been reached in 1977. Although coal production rose again to exceed 700 million tons in 1979, overall the net increase has been relatively small and fluctuating over the years.[14] As a result, there is still considerable surplus capacity in the coal industry today. During this period, production increased to respond to the slow but steady rise in demand for domestic steam coal on the part of new coal burning power plants that have been built or old ones that converted. However, there have been slower than expected increases in electricity demand. Increasing costs of conversion because of environmental regulation have slowed the switch to coal. Demand for metallurgical coal, on the other hand, has been sluggish and declining since the recession in 1974 dampened the growth in the steel industry. Except possibly for Japan, world steel markets have shown the same pattern. U.S. metallurgical coal has been relatively expensive. As a result, major coal importing countries have been increasingly going to other countries such as Australia for their metallurgical coal. Consequently, U.S. metallurgical exports have declined in the middle and latter portion of the decade. In summary, slower than expected shifts of utilities to steam coal and sluggish demand for metallurgical coal have contributed to excess capacity in the coal industry.

A number of circumstances help explain the sharp rise of U.S. steam coal exports occurring during the later half of 1979 and continuing into 1980.

a. Increasing Shipping Costs

Part of the increase in U.S. exports is due to the increased price of ship fuel. Mainly, as a result of increased OPEC oil prices since the

---

11/Thomas Petzinger Jr., "Inadequate U.S. Port Facilities Threaten Potentially Huge Market For Coal," Wall Street Journal, July 29, 1980.

12/Christopher Madison, "The Coal Industry Remains Uneasy, But an Export Boom May Be On The Way," National Journal, May 24, 1980, p. 848.

13/"Lower Demand, Falling Prices Make Coal Industry Sick," Baltimore Sun, November 11, 1979.

14/Ibid.

Iranian crisis, there has been a sharp increase in the price of bunkering fuel for ships carrying coal. The United States is closer to Europe than other coal exporters, particularly Australia, and therefore, has a cost advantage. Traditionally, Australian price for coal f.o.b. the port has been significantly less than the comparable U.S. price, but U.S. producers now can transport coal to Europe for less than Australia and overcome the cost differential. The higher price of ships' fuel that has helped U.S. export of coal to Europe, theoretically, however, should hurt U.S. trade with Japan. It has been cited that the Sumitomo Corporation in Japan may import as much as 100 million tons of steam coal by 1990 and that such big tonnages could not be satisfied by Australia, South Africa and China alone.15/ Most important, Japan may have politi- cal and diplomatic reasons for including th U.S. among its suppliers.

b. Withdrawal of Poland as an Exporter

Last year, Poland, a major coal producer and exporter to Europe, began to withdraw from the European market in favor of expanded trade with the Eastern bloc of nations and the Soviet Union, which are beginning to experience energy shortages.

c. U.S. Surplus Capacity and Low Prices

As indicated by trends explained above, the coal industry is relatively sick. The symptoms are declining coal prices and low demand. It has been estimated by the National Coal Association that demand in 1978 was running 150 to 200 million tons below capacity and has kept coal prices from rising.16/ Prices of domestic coal on the open market in 1978 ranged from $19/ton to $27/ton.17/ In the summer of 1979, the marked increase of OPEC fuel prices made the exported price of U.S. coal appear more economically favorable. It has been estimated that the U.S. exported price coal at about $50/ton, is one-third cheaper than oil with equivalent energy content.18/ Most brokers on the spot export market are making contracts ranging from $36 - $46 a long ton ($32 - $41/net ton).19/ These low prices have stimulated exports and have helped sop up some of the excess capacity. Under these conditions, metallurgical high volatile coal is being dumped and sold for export as steam coal at depressed prices (see discussion above).

---

15/Thomas Petzinzer, Jr., "Growing Market Overseas For Steam Coal Begins to Draw on Big Supply," Wall Street Journal, Feb. 7, 1980.

16/"Lower Demand, Falling Prices Make Coal Industry Sick," Baltimore Sun, March 11, 1979.

17/Ibid.

18/Thomas Petzinzer, Jr., "Inadequate U.S. Port Facilities Threaten Potentially Huge Market For Coal", Wall Street Journal.

19/Thomas Petzinzer, Jr., "Growing Market Overseas For Steam Coal Begins to Draw on Big Supply, "Wall Street Journal, Feb. 7, 1980.

Most of the export contracts, however, remain short-term. Foreign countries are uncertain as to this country's ability to solve its port capacity problem and under such conditions are reluctant to sign long-term contracts. Already, a significant backlog of ships waiting in East coast ports results in as much as 19 days delay in port. It has been estimated that the demurrage fees or costs of detention resulting from such delay can result in $6 to $8 being added to the per ton cost of exported coal (see discussion below).[20] Transportation costs of coal will increase under ICC regulations in September. It is possible that if a further increase in such transportation-related costs, a sudden reversal of the current weak market or increase in production costs should occur, that the price of coal would rise and no longer be economically attractive for export. However, it is expected that the price of oil may also rise and counterbalance such trends.

d. Conversion of Foreign Utility Plants to Coal

It has been claimed that increases in U.S. exports of coal have resulted from the actions of European countries in converting their generating plants from oil as a source of fuel to coal. However, based on United States experience, it takes from three to five years to build or convert a plant. Under such circumstances, it is believed unlikely that conversions would generate sudden, sharp increases in demand. Much is still unknown, however, about the current and future status of foreign utility plants in regard to coal. Such data will have to be verified before conversion can be established as a contributing factor.

e. Institutional Factors

Some countries, such as South Africa, tax their exports and set a limit on the amount that can be exported in the interests of conserving a critical resource. Even with higher taxes, such coal has been attractive as an export. However, this policy limits the ultimate capacity of such countries in satisfying large export demands and may be a factor favoring export from the United States. Many countries, as a matter of diplomatic policy, prefer to diversify their sources of supply to reduce their vulnerability to external events. The U.S. may be benefitting from such diversification, particularly in regard to Japan. It has been claimed that the declining value of the dollar has helped increae imports, but the National Exporters Association asserts that the influence of this factor is minimal.[21]

3. Regional and Sectional Factors Influencing Export Demand

In Baltimore, the export of metallurgical coal held its own during 1979, showing strong demand. The increase in export demand for steam coal came

---

[20]/Interview with Albert N. Knighton, May 21, 1980.

[21]/David Ress, "October Coal Exports Set Port Record," Baltimore Sun, November 2, 1979.

on top of metallurgical export demand.[22] This trend intensified during 1980. For example, whereas the Chesapeake and Ohio piers in Baltimore and Newport News have mainly handled metallurgical coal, steam coal in 1980 accounted for about 37 percent of their shipments. Japan, traditionally has accounted for 41 percent of the exports from Baltimore, comprised mostly of metallurgical coal.[23] Over the past several years, Nippon Koran KK (NKK), the second largest steelmaker in Japan, has exported an average of 800,000 tons of coal per year through Baltimore and is one of the ports largest customers.[24]

Largely because of Japan, substantial levels of metallurgical exports have been maintained in Baltimore, countering sluggish trends in metallurgical coal demand occurring nationally. Baltimore may be one of the chief beneficiaries of Japan's policy of diversification or its diplomatic policy in desiring to maintain good trade relationships with the U.S.

A number of competitive factors among Baltimore and other Atlantic coast ports explain the increase in demand for coal export from Baltimore. The previous section explained national and international factors influencing the increased demand from Japan and Europe for U.S. steam coal. Increases in export of steam coal have also occurred in Baltimore and the same explanatory factors apply to the increases occurring in Baltimore. The section below focuses on Baltimore's particular advantages and disadvantages in benefitting from secular trends.

a. Proximity to Coal Fields

One of Baltimore's main advantages for the export of coal is its proximity to places where steam coal is mined: West Virginia, Pennsylvania, and western Maryland. In contrast, Hampton Roads has access to vast quantities of higher quality, higher priced, metallurgical coal located in coal fields further south. The lower priced quality steam coal accessible to Baltimore is currently the type of coal most in demand from foreign countries.

b. Favorable Railroad Rates

Baltimore's proximity to steam coal mines is reflected in more favorable rail rates from such mines to Baltimore compared to Hampton Roads. It is more expensive to ship lower priced steam coal from a mine in western Pennsylvania to Hampton Roads than it is to Baltimore. Moreover, as shown in Table No. II-8, rail rates from Baltimore to its supply areas are seven percent cheaper than rail rates from Hampton Roads to its supply areas. Baltimore is not only closer to the right kind of coal, but is generally closer to places where coal is mined. It should be noted that Conrail serving Baltimore and Philadelphia

---

22/David Ress, "Port Tonnage For 1979 Up 15.4%," Baltimore Sun, December, 30, 1979, p. K-7.

23/Interview with Albert J. Knighton, May 21, 1980.

24/David Ress, "October Coal Exports Set Port Record," Baltimore Sun, November, 1979.

TABLE NO. II-8

Rail Rates on U.S. Coal Exports from Mines
To Baltimore and Other Ports of Exit
(Per Net Ton)

BITUMINOUS

| Origin District | Hampton Roads | Baltimore | Philadelphia |
|---|---|---|---|
| Pocahontas - New River | $ 11.99 | -- | -- |
| Kanawha - Thacker - Kenova | 12.23 | -- | -- |
| Kentucky - Big Sandy | 12.51 | -- | -- |
| Reynoldsville - Clearfield - Cumberland - Piedmont - Somerset | -- | 11.20 | 11.20 |
| Greenburg | -- | 11.48 | 11.48 |
| Westmoreland - West Virginia | -- | 11.92 | 11.92 |
| Gauley | -- | 11.92 | 11.92 |

ANTHRACITE

| Origin District | Philadelphia | Baltimore |
|---|---|---|
| All Regions: Prepared & Mine Run Sizes | $ 9.42 | -- |
| Buckwheat #1 & Smaller Sizes | 9.84 | -- |
| Schuylkill Region: Prepared | | 12.42 |
| Lehigh & Wyoming Regions: Prepared | | 12.42 |
| All Regions: Pea & Smaller Sizes | | 12.04 |

Note: Includes the 13.7% rate increase, effective October 15, 1979.

Source: National Coal Assocation, Coal Traffic Annual, 1979, p. II-26.

gives both cities access to the same supply areas, but there is no differential in the rail rate, except that Philadelphia's proximity to anthracite mines is reflected in lower rail rates. At one time, Baltimore had a favorable seven cents per ton transportation rate differential on the Penn Central from bituminous mines in Pennsylvania compared to Philadelphia. Baltimore was closer to these Pennsylvania mines because the distribution of rail trackage favored Baltimore, contributing to lower rail costs. The equalization of the rate, the lack of Conrail export facilities in the port of Baltimore (see later discussion) and the difficulties of interchanging with B&O's export facilities in the port have probably been influential in Conrail's decision to expand its port facilities in Greenwich Pier, Philadelphia even though this pier is not as modern or as deep as the B&O's Curtis Bay facility.

c. Proximity to Europe

Hampton Roads is a half-a-day closer to Europe than Baltimore. It takes an additional half-a-day going to and a half-a-day coming back into Baltimore. This is equivalent to a day's ship cost of about $19,000. However, the higher rail rate from steam coal mines in Pennsylvania to Hampton Roads results in extra costs that are greater than the extra cost of the ship coming into Baltimore. It is cheaper for a ship to come the extra distance to pick up a load of coal in Baltimore than it is for the railroad to move it to Hampton Roads from Baltimore.

d. Channel Depth

The depth of water in the Baltimore port and channels is 39 feet, six inches, while the depth in Hampton Roads is 45 feet. Attempts to dredge the Baltimore channel and harbor to 45 feet have not been realized because of controversy about where to put the spoils. A ship therefore can load much deeper in Hampton Roads and this reduces the unit costs of shipping coal to and from Hampton Roads compared to Baltimore. Reduction in unit costs is particularly important for customers requiring steam coal because, for reasons noted earlier, low coal prices are particularly important for their profitable operation. The relatively shallow channel in Baltimore compared to Hampton Roads, however, is not an important factor in Japanese metallurgical coal trade which has been an important component of Baltimore trade. Japan must use 70,000 ton Panamax ships that have a draft capable of passing the relatively shallow Panama Canal.

e. Demurrage Fees

The limited capacity of Baltimore's port to handle the large demands placed upon it for export of coal will be discussed and evaluated in detail in a later section dealing with supply. The delays in loading ships resulting from such limited capacity, however, have implications for demand which will be discussed here. In May, it typically took 21 days for ships to load at Baltimore because they were waiting for a berth. A $19,000 per day demurrage fee is charged by ship owners for each day a ship is in port above that normally required for loading. It has been estimated that demurrage fees have added $6 to $8 to the per ton cost of coal shipped from Baltimore. Instead of a $38/ton cost of coal shipped from the port of Baltimore, costs per ton now are about $45/ton. Based on the previous discussion, it can be seen that this cost is still competitive with the costs of equivalent energy provided by a barrel of oil, but further increases could negate the advantages of exporting steam coal from Baltimore. However, such delays are common in Hampton Roads as well. To the extent that such delays are equal among ports, there will be no competitive disadvantage to Baltimore in comparison to other ports.

4. Future Export Demand

A major issue for Baltimore is--how long will present high levels of export demand be sustained in the future? An evaluation of the prospects for future demand is important in order to ascertain the size and scope of capital investment in Baltimore's port and whether such investments can be justified or payed back within a reasonable period of time. This analysis indicates that current very high demand for export of U.S. coal to foreign nations is largely the result of market conditions: a glut of U.S. steam and metallurgical coal is now on the market at low prices that are attractive to foreign nations. Markets are notorious for their variability and their impacts are often short-term. The present market is the result of lower growth in the demand for energy, depressed economic conditions in the durable goods industries supplied by the steel industry, and long term lower productivity of the U.S. steel industry in competition with other nations, particularly Japan.

In large part, these events are cyclical and conditions will undoubtedly get better. Under such circumstances, U.S. coal prices will rise somewhat. Also, as the present high level of reserves are consumed at a rapid rate, the surplus of U.S. coal will eventually be reduced. Industry is expected to increasingly convert to coal, increasing domestic demand for steam coal. These trends will tend to increase the price of U.S. coal, making it less attractive for foreign nations to import. It is therefore expected that the current abnormally high levels of export demand will abate somewhat and that demand will be more moderate in the future.

Some of the factors responsible for the current depressed domestic market for U.S. coal, however, have their origin in long term secular trends, and current market conditions may signal a continuation of these secular trends in the future: lower overall U.S. growth in the consumption of energy and the reduced role of the steel industry in the nation's industrial structure. These trends will tend to moderate or dampen any increase in U.S. coal prices. Additionally, oil prices are expected to increase in the long term, making U.S. coal more attractive to other nations, despite some increase in its price. Under such conditions, foreign nations are expected to increasingly rely on coal for some of their power needs. Worldwide demand for coal will therefore increase. As demand increases, and coal becomes relatively more scarce and valuable, foreign coal producers may increasingly restrict their exports or gradually withdraw from the international market to support their own needs or those of favored nations.

It is expected that Baltimore could attract moderate sustained growth in exports, if there were no physical capacity restraints in the port or transportation facilities. Under such conditions it would be possible for the port to more than double its exports to levels of 20 to 24 million tons per year.

The chief limitation on the export of coal will not be demand, but will be related to the conditions of supply, particularly the limited capacity of U.S. ports and transportation facilities such as Baltimore. These limitations, themselves, may be responsible for altering the price structure of coal sufficiently to influence export demand. For example, if moderate demand continues to exceed the nation's capacity, it may induce increased handling and other transportation costs which will have to be factored into an increased price for U.S. coal. More directly, current delays at ports are expected to continue, because large and extensive capital expenditures necessary to remedy capacity problems will take some time to implement. The length of the delay, however, may be reduced somewhat because the reduction from abnormally high levels of demand will reduce the number of ships queuing at U.S. ports. The resulting lower number of days delay in port will lower demurrage fees, reducing the unit price of U.S. coal.

In general, the extent to which Baltimore, because of capacity problems, cannot meet even more moderate demand for export coal, higher prices for coal will be maintained, making U.S. coal exported from Baltimore less competitive on the foreign market and reducing foreign exports. If one port succeeds in solving its problems before another, distinct competitive advantages may occur, possibly resulting in large diversions of coal trade from one port to another. Deepening ports, providing additional piers and increasing railroad capacity for handling coal will reduce unit costs of transporting coal and the demurrage fees associated with delay.

5. Factors Influencing Domestic Demand for Coal

Domestic demand, distinguished from export demand, is that portion of total demand that occurs as coastwise movements between Baltimore and another port, internal receipts and shipments over domestic inland waterways and as purely local shipments within the port of Baltimore itself. The factors influencing this type of demand are entirely different from those exerting an influence on export demand. In 1977, about 3,704,281 tons of coal was handled in such domestic movements of which about 60 percent was internal movements and almost 39 percent was purely local movement. Coastwise shipments, largely to and from New York, were almost negligible. It is estimated that most, or about 71 percent of domestic demand, was comprised of metallurgical coal going to Bethlehem Steel. The remaining 29 percent was destined to utilities.

a. Metallurgical Coal

The bulk of coal received by Bethlehem Steel in 1977, or almost 70 percent, consisted of internal movements of metallurgical coal from southern mines to Hampton Roads and then by barge directly to Sparrows Point. Such a movement is expected since most of the higher quality metallurgical coal is located in the "southern" region (see section on supply). The remaining share comes from Pennsylvania and West Virginia fields served by Conrail and shipped by barge from the Canton Coal pier. The future demand for metallurgical coal and these types of movements is dependent on level of economic activity at Bethlehem Steel and the general health of the steel industry, especially on the East coast. At present, the steel industry is in a slump, in large part resulting from a decline in domestic automobile production. Bethlehem Steel, last year expected the demand for coal to remain stable, depending on the health of the steel industry. It serves a market extending from New England to Florida. The further industrial growth of the South has made that segment of the market more important. Also, U.S. Steel has a big competitive plant further north in Philadelphia that influences demand occurring in Baltimore. At best, it is believed that domestic demand for metallurgical coal will be sluggish and may decline somewhat in the next few years.

b. Steam Coal

Although steam coal shipped to utilities now comprises only a little less than 30 percent of domestic demand for coal in Baltimore, its share is expected to grow. The national policy of inducing local utilities to convert to coal or to build new coal-burning plants is a factor favoring local growth. Strict environmental regulation (see previous discussion) governing the quality of air pollution tends to make the conversion or the construction of such new plants expensive, which tends to slow or retard such growth.

(1) Wagner

In 1977, 594,000 tons of coal was shipped to BG&E's Wagner plant Number 3 entirely through the B&O via rail barge from its Curtis Bay facility. In 1979, the volume of coal handled at Wagner was relatively stable, declining only slightly to 545,000 tons.[25] By 1980, BG&E decided to diversify its sources of supply at Wagner and 170,000 tons of its coal requirements will be shipped by Conrail through its Canton Coal pier. Wagner's existing oil burning units number 1 (137 Mgw) and number 2 (134 Mgw) are scheduled to be converted to coal in 1985.[26] Conrail hopes to serve these Wagner plants in the same manner it now serves unit number 3, but it will be in competition for such service with B&O, since both the B&O and Conrail serve some of the same coal supply areas in Pennsylvania.

(2) Brandon Shores

BG&E is constructing a new power plant at Brandon Shores not far from the Wagner power plant complex. It will consist of two units of 600 megawatts each. Unit number 1 was originally scheduled to start up on oil in January, 1982, but has been shifted to 1984 for start-up on coal. Unit number 2 originally scheduled to start up on coal in January 1985, is now scheduled to start up in 1988. Conrail and B&O are expected to compete to serve this plant. Much depends upon what types of coal are used in the plants in relation to the fields served by either or both of the two railroads.

A number of options are being considered for transportion of coal to Brandon Shores that may influence what railroad(s) serve the site. First,

---

[25] "Cost and Quality of Fuels for Electric Utility Plants - 1979, Energy Information On Data Reports", Energy Information Agency, DOE, June, 1980, p. 81.

[26] This and subsequent conversion dates were obtained from ICF data on Edison Electric Institute's survey of utility CEOs.

coal could be brought in by rail and barges as is now done for Wagner further north. In such case, either or both railroads could provide the service as is now done at Wagner. Second, BG&E could require the coal to be brought by rail (Chesapeake & Ohio or Norfolk & Western) to Hampton Roads and then transport it by deeper barges over the Chesapeake Bay to Baltimore. In such a case, local railroads may not be involved at all. Moreover, if present depths at Brandon Shores are similar to those currently at Wagner and permit only the docking of shallow draft barges, further changes at the site may be required to handle coal under this option. Deepening of the channel raises the issue of where to put the spoils. Third, coal could be shipped directly by rail to the plant over existing B&O tracks in the vicinity of the plant. This trackage already goes to Wagner and some adjustment and rehabilitation would be required to make it operational for Brandon Shores. Additional property might be required because, at present, there is only a single track and a need to provide space for coal dumpers.

(3) <u>Crane Plant</u>

BG&E's Crane number 1 plant, located northeast of Baltimore on the Middle River is expected to convert to coal in 1983. Some shipments of coal may be required before that time to make tests for the type of coal they intend to burn. Since the Crane plant is served by both Amtrak and Conrail lines, Conrail can serve this plant. Conrail can deliver coal directly to the plant by using road crews on diesel trains or, if electrified trains are used, it can stop the train at Bayview and then change to diesel to make the delivery. The latter is more time consuming, costly and could exacerbate present congestion problems that already exist at Conrail's Bayview yards.

The Crane station has cyclone units that require low fusion temperatures. Normally, such temperatures are obtained from coal with a high sulfur content. Kentucky low fusion ash coal is the only type of coal that can be used in these units and at the same time, meet the government's low sulfur content requirements. The railroad that serves the mines producing this type of coal is the Louisville and Nashville (L&N) which has just been merged with the Chesapeake and Ohio as part of the Family System. The requirements, however, are small enough to require only a single or a few cars shipment.

(4) <u>Delmarva Plants</u>

The Delmarva Power and Light Company presently operates an oil-fired plant at Vienna, Maryland. A new 500 mgw coal-fired generating unit is being built adjacent to this plant and is expected to be in operation in either 1987 or 1988. The utility has bought an abandoned railroad in Dorchester County that extends 10.2 miles from Vienna to Hurlock where it connects to a short line railroad operated by Maryland Delaware Railroad Company and leased by the State of Maryland from the reorganized Penn Central Corporation (PENNCO). This line eventually connects with Conrail's Eastern Shore Branch, travelling further north. Three alternatives are being considered to supply this plant. An all rail routing from Wilmington directly to the plant would not affect the Port of Baltimore. Another alternative would be for Conrail to barge the coal from Baltimore across the Chesapeake Bay to rail connection from the shore to the plant. A third option would be to use a combination of the two previous alternatives. A new Indian River plant built by Delmarva in Delaware is scheduled to open in September 1980, requiring over 1,000,000 tons of coal. One third of its supply of coal will come from West Virginia and be shipped from the South via Norfolk, with the rest coming from Pennsylvania via Conrail from the north through Wilmington. Neither route would affect the port of Baltimore.

(5) Morgantown and Chalkpoint

Potomac Electric and Power Company (PEPCO) owns two plants at Morgantown and Chalkpoint. In 1979, the Chalkpoint plant required 1,00,200 tons of coal and the Morgantown plant required 2,431,000 tons of coal handled as traffic going through Baltimore. Train crews carrying this traffic are relieved at Bayview yard and the train then goes on through the Union and B&P tunnels over Conrail lines to Bowie, Maryland. In peak months, there are as many as 60 train movements or an average of two trains per day, but most of the traffic is routed to Bowie at night. Congestion potential at Bayview yards is aggravated when crews are changed. Sharp curvatures at the tunnels limit operating capacity of the line, exacerbating congestion at Bayview (see later section). In the past, this traffic averaged two to three million tons a year. Conrail is hopeful that traffic will stabilize at the 1979 level of about three and one-half million tons.

(6) Intercoastal Shipments of Steam Coal

As indicated previously, the shipment of coal from Baltimore to other Atlantic coast ports is relatively insignificant. However, with Baltimore's proximity to coal mines producing steam coal, and considering the rail access problems at other Atlantic coast ports such as New York and Boston, it is not unlikely that prospects for increase in intercoastal shipment of coal will occur as utilities in these large Atlantic coast cities build or convert to coal-powered plants. Some traffic already exists to New York. In 1980, for the first time, the B&O began shipping coal through Baltimore destined for a generating station in New England. The Chessie system expects such shipments to increase as more utilities convert to coal.27/

6. Future Domestic Demand for Coal at Baltimore-A Summary

Domestic demand is expected under optimistic conditions to about double by 1988 (see Table No. II-9). Present domestic consumption includes the curent coal demands of Wagner No. 3 and Mercer as well as the estimate of about 2,620,000 tons of local demand for Bethlehem Steel. The current three and one-half million tons of domestic demand is expected to increase to about seven million tons in 1988. The local demand for metallurgical coal is expected to decline slightly as sluggish trends in the nation's steel industry continue. On the other hand, based on present estimates of coal conversions, the local

---

27/Carole Shifrin, "Chessie RR Reports Glowing Outlook", Washington Post, April 22, 1980.

demand for steam coal on the part of utilities is expected to increase more than four times to about 5 million tons. No estimate has been made of the amount of intercoastal shipment of steam coal that is likely to occur. Nevertheless, such shipments are likely to increase and in this respect, the total estimate may be considered conservative.

Most discussion centers around the future magnitude of export coal, but substantial gains are expected in Baltimore local coal traffic based on the demands of local industries and utilities. Most of the waterborne traffic necessary to accommodate such demands will be on barges either from Baltimore or Hampton Roads. Most of Bethlehem's coal will likely be shipped directly to its piers, from Hampton Roads and as such, have a minimal impact on the port and rail facilities. On the land side, railroads will experience substantial increases in volume of traffic, which when added to potential increases in export demand may tax the capacity of existing facilities.

## D. SUPPLY OF COAL: SOURCES AND FACILITIES

### 1. Introduction

This section explains how coal is supplied to Baltimore; the origin of coal; the routes by which coal is transported; the capacity of transportation and port facilities to accommodate coal. The previous section on demand expected moderate sustained demand for export coal during the coming decade. Additionally, local demand for coal going through the port may double by 1988. The exact quantities of demand projected are not crucial because the degree to which these projections will be achieved will depend upon the operating capacity and condition of local transportation and port facilities. Indications are that the present physical capacity of the port and its supporting transportation facilities will not, in their present condition, be able to accommodate the future demand projected. It is expected, for example, that under conditions of future moderate sustained growth, demand will be sufficient to allow the port of Baltimore to more than double its exports to levels of 20 to 24 million tons per year.

The present capacity of the port is deficient by more than half this level. Whereas the doubling of local demand could possibly be accommodated at existing port facilities, indications are that railroad lines and yard facilities may be strained beyond their present capacity. Railroad and yards supplying coal to the port of Baltimore will have to accommodate a quadrupling of demand, including both export and local demand.

As noted previously, if the port succeeds in solving its capacity problems it will help create conditions for cheaper U.S. export coal, which will, itself, promote future growth in this type of traffic. Additionally, the port will preclude the possibility of any diversion of coal traffic that might result from the actions of other competitive ports on the Atlantic coast. Additional piers will reduce delays and lower demurrage fees. Deepening channels will allow larger ships to call on the port, reducing unit transportation costs. The market has already begun to respond to strong demand and deficient facilities. Numerous proposals have been made by firms to improve waterside

TABLE NO. II-9

Estimate of Future Domestic Coal Demand at Baltimore, 1980-1988

| Year | Steam Coal1/ | Metallurgical Coal | Total |
|---|---|---|---|
| 1980 | 960,000 | 2,620,000 | 3,580,000 |
| 1982 | 1,995,000 | 2,000,000 | 3,995,000 |
| 1983 | 3,326,000 | 2,000,000 | 5,326,000 |
| 1985 | 4,139,000 | 2,000,000 | 6,139,000 |
| 1988 | 5,001,000 | 2,000,000 | 7,001,000 |

Source: ICF estimates.

facilities: the Island Creek proposal for coal storage and possibly, another pier in Curtis Bay; Consolidated Coal's proposal for conversion of the Canton Railroad Company's ore pier and other properties for coal use. Other possible proposals have been in the study stage: conversion of the Curtis Bay ore pier for coal; the re-activation or improvement of the Port Covington Coal pier; the Boston Metals Company proposal; etc.

The following are the expected impacts of these proposals:

- The Island Creek project when completed will help the Curtis Bay export pier achieve close to its theoretical or nominal capacity in handling about 14 million tons of coal per year.

- The Consolidated Coal project for converting the Cottman Canton Ore Pier to coal will add a significant amount of capacity for export of coal from the port: 10 million tons of coal per year.

- These two projects alone could be enough to satisfy the moderate growth in export demand projected over the next decade: 20 to 24 million tons of coal per year.

- Any further major capital investments should be evaluated carefully in view of the limits on export demand projected above, such investments have the potential of reducing the full utilization of existing facilities and may require major infrastructure investments in railroad transportation.

Most consideration has been given to improvements related to water side facilities. Increased capacity constraints on railroads and their inability to solve them, however, could nullify the benefits of such water side improvements. Improvement of line capacity will result in increased ability to handle the larger unit trains anticipated with strong demand. Improved or expanded yard and storage facilities will reduce railroad car demurrage fees, help keep the line clear of non-productive empty cars, aid the railroad in more promptly meeting shipping schedules and reduce handling and terminal costs, in general. Failure to address such railroad problems could increase handling, terminal and transportation costs, making the port and U.S. coal less competitive for export. The analysis shows that transportation costs from mine to port are in many ways more critical than water side shipping costs and Baltimore's chief advantage as a coal exporter is in the area of railroad transportation costs which is reflected in its proximity to coal mines.

The following is expected to be the chief impact of increases of exports and domestic shipments and port-related investment on the transportation infrastructure, particularly the railroad:

- Increased serving yard capacity will be necessary if any further expansion of export facilities occur at Curtis Bay, given the fact that there is not much room for such expansion, because of built up adjacent residential areas.

- The capacity of B&O rail lines serving Curtis Bay may be strained. The degree to which this occurs is related to serving yard capacity and operation in Curtis Bay. Also, the increased capacity on this segment of the line may dampen projected industrial growth further south in Fairfield and Marley Neck. This requires further monitoring and evaluation on the part of the city.

- Railroad line improvements will be needed to serve coal burning power plants coming on line in Wagner Plant and Brandon Shores. Such improvements should be made cognizant of the need for railroad access to Fairfield and Marley Neck.

- Diversion of Conrail's export traffic from Baltimore and Philadelphia should help alleviate mainline tunnel problems and some of the capacity problems of Bayview yards.

- Conrail may not be able to fully share in the growth demand for steam coal from local utilities because of congestion and capacity problems at Bayview yards, and their Canton Coal Pier. Major investments and operational improvements will be required.

2. <u>Origin and Routing of Coal</u>

Most of Baltimore's coal comes from the regions served by its two railroads: Conrail and the B&O.

a. <u>Conrail</u>

Conrail serves what is known as northern Appalachia, in particular the Bureau of Mines' coal regions known as Eastern and Western Pennsylvania (see Table No. II-10). The names for these regions are somewhat misleading. Eastern Pennsylvania consists of most of what is geographically known as central Pennsylvania. In actual fact, most of Baltimore's coal comes from the geographic central and western portions of the state. Almost 60 percent of the coal shipped to Maryland comes from Pennsylvania, not all of it shipped by Conrail. Although this region has some low sulfur coal, it is mostly characterized by deposits of coal with medium to high sulfur content. It also is a substantial source of metallurgical coal for Bethlehem Steel in Baltimore. Bethlehem receives most of its "Northern Low" (northern low sulfur coal) via Conrail and B&O from this area. Most of this coal comes from Bethlehem's own captive mines in Pennsylvania. These mines are in Cresson and Ebensburg, Pennsylvania via the Cambria and Indiana Railroad just west of Altoona, Pennsylvania. Cresson coal usually moves separately and is not consolidated with shipments of other coal from other locations. Coal is also obtained from the Fawn mines via the Bechinger and Lake Erie railroad interchanging with Conrail north of Pittsburgh at Butler and Kiski junctions.

The B&O serves some of the same areas in Pennsylvania served by Conrail. For example, the Monongahela railroad interchanges with both B&O and Conrail

Table No. II-10

Origin of Coal Shipped to Maryland, 1977

Coal Shipments (Net Tons)

| Bureau of Mines Supply Region | Total | | Rail | | Other | |
|---|---|---|---|---|---|---|
| | Number | Percent of Total | Number | Percent of Total | Number | Percent of Total |
| Eastern Pensylvania | 4,854 | 58.8 | 3,653 | 84.9 | 1,201 | 32.4 |
| Western Pensylvania | 252 | 3.1 | -- | -- | -- | |
| Northern West Virginia and Panhandle | 1,332 | 16.1 | 579 | 13.5 | 753 | 20.4 |
| Southern No. 1 | 374 | 4.5 | 19 | 0.4 | 355 | 9.6 |
| Southern No. 2 | 1,437 | 17.4 | 48 | 1.1 | 1,389 | 37.6 |
| Total | 8,249 | 100.0 | 4,249 | 100.0 | 3,698 | 100.0 |

Source: National Coal Association, Coal Traffic Annual, 1979.

south of Pittsburgh. Both have equal rates. At Punxsutawney, in central Pennsylvania, both Conrail and B&O service the same locations.

Conrail routes its coal from the mines through Altoona, Harrisburg, Columbia, Pa., Perryville to Bayview yards at Baltimore. Once at Bayview, depending upon the destination of the coal, it can go to the port via two routes.

At Bayview, most of the coal trains destined to Bethlehem Steel or other local customers have their crews changed and their electric locomotive replaced by a diesel locomotive so that the coal can proceed on the President's Branch line to Conrail's Canton Coal pier. Here the coal is dumped and loaded at Conrail yards near the pier on to barges to proceed to Bethlehem Steel's coal pier at Sparrows Point. The coal is yarded twice: once at Bayview and once at its terminus in Canton Bay. Theoretically, the coal going to Canton from Harrisburg should go via the President's Branch line without stopping and be "yarded" only at Conrail's loading yard at Canton Coal pier. Since the main line is electrified and the President's line is not, a time consuming, inefficient and costly double yarding process occurs. Bayview classification yard at the south end has 32 tracks with a capacity for 1,216 cars. Its north end used for receiving, departure and storage has a capacity for 1,320 cars. Despite this, Bayview yards lack capacity to receive, store, classify and dispatch trains and therefore often cause congestion on the main AMTRAK line when its receiving tracks are full. Such double yarding only exacerbates this problem. Another indication of such congestion at Bayview is that the B&O handles empty coal cars as far north as Perryville, Maryland to avoid further congestion of Conrail's facilities in Baltimore.

Conrail coal destined for export at B&O's Curtis Bay actually exceeded in tonnage its levels of domestic coal in the years from 1975 to 1977, but declined somewhat thereafter. This Conrail export traffic is "triple" yarded. At Bayview, the train crews and locomotives are changed. The diesel train goes on to interchange with the B&O at Mount Vernon yards in north central Baltimore. B&O moves the Conrail cars from the Mount Vernon yard through the B&O Howard Street tunnel to eventually join its line to Curtis Bay where the coal is dumped and loaded from its yards near Curtis Bay Coal pier.

Normally, Conrail's interchange with B&O would be accomplished at Bayview yards since the B&O also has a Bayview yard in close proximity. Due to congestion, however, the interchange is accomplished at the much smaller Mount Vernon yard which has 14 tracks and capacity of 730 cars. The interchange with the B&O is awkward since Conrail's cars must be backed into the interchange, but this does not appear to be a major problem. Track condition has not been good and this problem has been intensified with use by loaded coal cars. Triple yarding is even more time consuming, inefficient and costly than double yarding. The Howard Street tunnel is old, single-tracked and trains are subject to vandalism, but the trains that use the tunnel have been well within the operating capacity of the tunnel.

b. Baltimore and Ohio

The Baltimore and Ohio railroad routes coal traffic in the Baltimore terminal area from the south, west and northeast via main and branch lines. It serves about 70 mines in central and southern West Virginia and portions of northwestern West Virginia, Pennsylvania and Maryland. It competes directly with Conrail in segments of central Pennsylvania. The northern West Virginia and Panhandle area Bureau of Mines' district served by the B&O shipped 16.1 percent of all the coal coming into Maryland (see Table No. II-10). This area has medium to high sulfur coal as well as substantial metallurgical coal.

The principal dispatching center from West Virginia, particularly central and northwestern West Virginia is Grafton, West Virginia. Smaller satellite rail centers such as Parkersburg and Fairmount, West Virginia also feed into Grafton. From Grafton, all coal feeds into Baltimore via the Cumberland, Maryland gateway. On the other hand, the principal dispatch center for Pennsylvania is Somerset, Pennsylvania. Thereafter the coal goes directly into the Cumberland gateway. Before entering the Baltimore terminal area, two grades exist on the main line between Grafton and Cumberland: the lesser grade occurs after Grafton and the steeper grade is near Altamont. Four diesel unit helper trains are needed to assist coal trains up the grades. This slows down delivery times, but a tunnel is not feasible.

East of Cumberland the grades are better and B&O can haul twice the number of cars with its four diesel units. The B&O recently constructed a $4.7 million new Brunswick coal yard that can handle 3,300 cars and one to one and one-half unit trains of up to 100 cars. The yard is able to hold additional coal cars when storage capacity at the Curtis Bay Coal pier is limited. The yard has increased the capacity of the whole system to move its coal. From 9.7 million tons of coal moved annually in 1977, the B&O now has the capacity to move 12 to 15 million tons annually. After the Brunswick yard, the coal moves directly to join the B&O mainline in the Baltimore area, proceeding on to the yards at Curtis Bay where coal is blended, dumped and loaded onto ships.

c. Southern Route

Hampton Roads is the main port serving the so-called southern Appalachian mines. The Bureau of Mines' districts Southern Number 1 and 2 cover this area. Southern number 1 district covers portions of West Virginia and Virginia and comprises only about five percent of all the coal traffic destined to Maryland (see Table II-10). Southern number 2 covers West Virginia, Virginia, Kentucky, Tennessee and North Carolina and comprises about 17 percent of all coal traffic destined to Maryland. The Norfolk and Western (N&W) and the Chesapeake and Ohio (C&O) operate out of Hampton Roads serving mines in these areas. The N&W handles West Virginia and a portion of southwest Virginia coal. The C&O covers some of the same territory and penetrates Kentucky. Bethlehem receives its "Southern Low" (low sulfur) coal from the N&W and its "Southern High" (high sulfur) coal through the C&O from West Virginia and Kentucky. Almost all the coal from Southern No. 2 district is shipped to Maryland from Hampton Roads via large barges through the Chesapeake Bay to Sparrows Point at Bethlehem Steel. It has little direct impact on the port.

d. Through Traffic

Much of Conrail's through traffic destined to PEPCO's plants at Morgantown and Chalkpoint (see previous discussion) is routed by Conrail through the Bayview yards. Trains make a stop there to change crews, thereby using up some of the capacity of this yard. The train must then proceed uphill through the Union and B&P tunnels in Baltimore before it goes to Potomac yards near Washington, D.C. Another reason that cars are held in Bayview is that the limited size and capacity of the tunnels limit the size of through trains that can traverse the tunnel. The Union tunnel is located just prior to entering Pennsylvania Station and the B&P tunnel begins immediately west of Penn Station proceeding to Fulton Junction whre the system meets the Western & Maryland. Two sharp curvatures in the B&P tunnel, one of 8° at Pennsylvania Avenue and one of 5° at John Street require the use of a gauntlet track in the middle of the tunnel. Large freight trains cannot use the double track and must use the gauntlet track. As a result, special switching is required and only one train can use this portion of the track while the train is clearing the curvature. One study estimated that the total passenger and freight operation passing through this segment of the main line to be between an average of 105-110 trains per day. Current traffic volumes on the Amtrak/Conrail line are handled without much delay, but if Amtrak rescheduled Corridor service to operate trains every half hour in each direction and increased intercity and local commuter service, the amount of freight traffic that could be handled on this main Corridor would be severely constrained. Four alternative basic solutions have been proposed, but none has been adopted:28/

- continuation of operations as they are now with several capacity improvements to eliminate interference problems.
- separation of freight and passenger service by shifting all through freight traffic to the B&O main line from Winans to Bayview.
- shifting of passenger service to the B&O line to take advantage of its proximity to the center of Baltimore.
- diversion of through freight from the corridor to tunnels under Baltimore harbor to bypass the center of Baltimore.

3. Terminal and Support Facilities

This section discusses the size and capacity of existing and potential terminal facilities such as piers and railroad serving yards for handling coal traffic.

---

28/Peat, Marwick, Mitchell & Co., Study of the Rail System of the Baltimore Region, Final Report, Prepared by the Maryland Department of Transportation, September 30, 1976.

a. Conrail

(1) The Canton Coal Pier

The Canton Coal pier is 925 feet long and 66 feet wide. The nominal capacity of the pier has been variously cited at 833,[29] 900[30] and 1,000[31] per hour. During 1979 in warm weather the pier handled 100 cars per day with one shift. This amounts to 8,000 tons per day or 800 tons per hour, assuming an 8 hour day. Assuming 900 tons per hour nominal capacity, the operation has been fairly close to capacity. The pier is operated by Baltimore Contracting Company. The company dumps the coal out to the dock for loading on barges by using a rotary dumper. A conveyor belt of four-ton cars receives the coal and takes it to the barge where they are dumped and come back empty for reloading. The pier is generally old and obsolete and has been designated a National Historic Landmark. At one time, the pier accommodated smaller ocean-going vessels and Conrail exported from the facility. Export has been discontinued, however, because of the fear that ships would hit the pier abutments and pull the pier into the water.

Conrail has made a study for reinforcement of some of the steelwork of the pier but this is not considered an expansion. At the present rate of operation the pier can handle almost two million tons per year. The volume of activity could be increased with extra shifts. Conrail expects to share in the increase in the coal traffic coming from future conversions of utility plants to coal. Under such circumstances it would be likely to increase the shifts in the pier and increase its capacity. Conrail could not deepen the channel in the vicinity of the pier to handle larger coal ships for export because the pier pilings do not go deep enough. Because of this, the equalization of Baltimore rail rates with that of Philadelphia--and other factors, Conrail has made a decision to expand its export facilities in Philadelphia. This will diminish some of the present problems associated with Bayview and the routing of its export freight traffic through Howard Street tunnel to Curtis Bay. Even with extra shifts, Conrail may be limited from accommodating the full potential of traffic in the future local steam coal traffic generated by conversion of utility plants.

(2) Conrail Coal Yards

The Conrail coal yards near the Canton pier consist of both loaded and empty yards. The "loaded" car yard has been rebuilt at the cost of $21,000,000 (mostly federal funds) as a result of the construction of I-95. When the work is finished, the yard will be bigger and more efficient than the

---

[29]/1978 Keystone Coal Industrial Manual.

[30]/Interview with F. Miles Day, Conrail Nov. 7, 1979.

[31]/Port of Baltimore Handbook, 1978-1979, Maryland Department of Transportation.

old yard. At one time, the yard had a total of 41 tracks. In January 1976 the number of tracks were reduced to 18; 12 for the loaded yard and six for the empty yard. The rebuilt yards will have a total of 22 tracks: 17 for the loaded yard and five for the empty yard. The new loaded yard is located further north on what was previously empty land. Separate empty car tracks are located further south. Some empty land remains further north and has not been evaluated for new uses.

b. Baltimore and Ohio

(1) Curtis Bay Coal Pier

The Curtis Bay Coal pier is 900 feet long and has a tandem and a single coal dumper. One is located on the north side for loading barges and the other is on the south side for loading vessels. The pier has the capacity for loading one vessel and five barges simultaneously. The tandem dumper is capable of handling two cars or 200 tons at a time. Much of the equipment is either new or modernized as of 1966. The pier has traditionally loaded about 2,500 tons per hour which approximates 7.2 million tons a year. Nominal capacity for ships has variously been cited at 6,000 tons per hour[32/] and 35,000 per day.[33/] The formal estimate of 6,000 tons per hour translates into 17.3 million tons per year. The estimate of 35,000 per day translates into 12.6 million tons per year.

It has been cited that Curtis Bay in 1979 handled 8,153,048 long tons of coal or almost 10 million short tons. In April 1980,[34/] it was estimated that one million tons were shipped through Curtis Bay and that it is expected to generate 12 to 14 million tons of coal in 1980.

It is entirely conceivable that Curtis Bay could approach the lower ranges of nominal capacity in 1980. Assuming it takes one to one and one-half days[35/] to load a 60,000 ton ship at Curtis Bay and working a full month (30 days) including extra shifts, then 20 ships can load coal per month, handling 14.4 million tons per year. This is in consonance with the Chesapeake & Ohio's estimate that the New Brunswick yard expansion allows the Chessie to move 12-15 million tons annually.[36/] Aside from a few problems with thawing coal, Curtis Bay has been operating satisfactorily. It is doubtful, however, that Curtis Bay would achieve its formal nominal capacity of 17.3 million tons.

---

[32/] Ibid.

[33/] Interview, Waterman.

[34/] 1978 Keystone Coal Industry Manual, p. 106.

[35/] Interview, Albert J. Knighton, May 21, 1980.

(2) Curtis Bay Coal Yards

The Curtis Bay Yards service both the coal and ore piers at Curtis Bay. In 1975, the entire classification yard at Curtis Bay had 83 tracks and a car capacity of 2,900. A 1975 inventory indicated that the coal yard had 23 tracks and a capacity of 847 cars. A more current estimate cites 1,100 cars capacity at Curtis Bay feeding yards, with main holding yard at Brunswick having space for 3,300 cars. The feeding yard is more crucial for efficient pier loading. Assuming that on an average a 60,000 ton ship uses coal from 950 rail cars, and assuming, as before, that 20 ships can be loaded in a month at Curtis Bay, then 19,000 cars per month or 633 cars per day can be loaded at Curtis Bay, operating at capacity. If, on the other hand, it is assumed that a rail car accommodates 70 long tons, then 857 cars would be required per ship which translates into 17,140 cars per month or about 570 cars per day at operating capacity. Both estimates are well within the present capacity of the yard. Although there appears to be sufficient feeding yard capacity to handle the nominal capacity of 14 million tons, loading may still be tight. The calculation is simplified and does not include estimates of the distribution of empty coal cars. These estimates are based on peak loading times. It has been estimated[37] that doubling the feeding yard capacity would allow uninterrupted loading to occur and presumably decrease loading times and increase Curtis Bay capacity.

(3) Island Creek Proposal

Related to problems and capacity of serving yards discussed above is a proposal by Island Creek Coal Sales Company, a subsidiary of Occidental Petroleum Corporation, to build a 25-acre coal stocking yard at Curtis Bay on land leased from the Chesapeake and Ohio railroad. They expect to store 300,000 to 500,000 tons on the ground, depending on how many different grades of coal are stored. About $20 million will be spent on tracks, dumping machinery, scales, conveyor belts and other equipment. One advantage of using coal stored on the ground is that the freezing problem that occurs in railroad cars is avoided. Also, such storage can help assure more continuous and prompt loading, since cargo will always be available. It will feed loading much faster than a railroad car dumper. It eliminates the high demurrage fees that can arise when coal in loaded rail cars waits for unloading because of delay of ships or misscheduling. It alleviates some of the tight scheduling problems in getting the cars to meet the ships at the right time. It may aid in keeping miners and mines working more continuously. It does, however, pre-empt the land from being used for increasing the feeding yard capacity at Curtis Bay which is another way of achieving continuous loading and increased capacity at Curtis Bay.

---

36/Ibid.

37/Interview, Knighton, May 21, 1980.

(4) Port Covington Coal Pier

Port Covington Coal pier discontinued operation in 1974. It has a nominal capacity of 3,500 tons per hour. The Chesapeake & Ohio felt that this was a redundant facility and that Curtis Bay was sufficient to handle its needs. Port Covington is a fixed loader pier. The coal dumper is on a concrete foundation, only 450 feet from the bulkhead. It can, therefore, load only the first three hatches on a 970-foot ship. The ship has to go out, swing around and come back three or four times because it can not load all the hatches at one time. The yard at Port Covington can accommodate only 300 rail cars compared to a ship capacity of 700 to 1,000 rail cars. A considerable capital investment would be required to make the pier operational according to modern demands and there is no room for expansion of feeding yard capacity even if such an investment were made.

(5) Curtis Bay Ore Pier

The Curtis Bay Ore Pier is 650 feet long and has two electrically operated traveling bridge cranes of 15 ton and nine ton capacities. It is understood that conversion of this pier for use as a coal pier is being considered. It has been cited that this pier could attract an additional seven million tons of coal through Baltimore.38/ There is no exact identification of what portion of the 2,400 car capacity in the vicinity of Curtis Bay could be assigned to the converted ore pier. The main problem with this proposal will be finding sufficient feeding yard capacity. A pier is only as good as its feeding yard.

C. Canton Railroad Company Ore Pier

Canton Pier No. 2, operated by the Cottman Company for the Canton Railroad switching company is 1,418 feet long on the east side and 690 feet long on the west side; it is geared for discharging of cargo or import. It has a very strong foundation and has ample area for ground storage and rail service. The Canton Railroad has previously filed for bankruptcy and the parent company wishes to dispose of some of the property, particularly the railroad. The American Smelting and Refining Company had a plant adjacent to the ore pier. It has since been closed and the land is available for backup storage. Conrail and other railroads could serve the pier.

The pier presently has two electrically operated bridge cranes at 90 ton capacity and the conveying system operates full pier length. It is designed to handle crates of cargo from the holds to the conveyor to the railroad cars or dump trucks to stock. The process needs to be reversed for coal export. It would be ideal to be able to both export and import.

---

38/Interview, Albert J. Knighton, May 21, 1980.

The City has recently authorized $100 million in revenue bonds to help Consolidation Coal Company convert the Canton Ore pier to a coal pier. The plan calls for 570,000 ton storage capacity on the ground and its planned capacity is 10 million tons per year. Railroad tracks will be built and tandem rotary car dumpers will be used. Modification to the pier itself will be minimal.

This facility will result in a major increase in the port's ability to export coal. It will help the port meet the expected potential export demand for coal from Baltimore. However, some of its effective capacity will be limited by the congestion occurring at Bayview (see later discussion in E-3). Moreover, the B&O, one of the railroads serving the facility, doesn't have as direct access as Conrail. The Penn Mary yards have been known to suffer from lack of capacity to meet delivery schedules at General Motors. The success of the Coal pier will ultimately depend on the ability to provide a large feeding yard for both loaded and empty cars in the vicinity of the pier from the vacated properties of the Canton railroad. No such plans have been officially disclosed.

## E. IMPACT OF PORT COAL TRAFFIC

This section briefly describes the impact of coal traffic on the local economy, the environment and policies of local government.

### 1. Economic Impact

Coal as a bulk commodity requires far less handling in the port than general cargo. Coal is often handled in large scale by conveyors and other labor saving devices. It can be stored in open-piles, can be treated roughly, loaded easily, and inventoried by estimates rather than count. As mentioned in the overview of this report, over four-fifths of coal traffic comes in by rail and almost all of this involves some transhipment. A local economic study categorizes bulk cargo in several classes, one of which is bulk transshipment,[39] which most closely approximates the impact of coal.

The direct impact of coal can be calculated by tracing coal when it first arrives by rail, comes into the port, out of the railroad car, across the pier, into ship or barge, to other local customers or for foreign export. Services provided at each step in the process have an impact on the local economy. In the process there are expenditures associated with the vessel: inspection, stevedores, checking, clerking, cleaning, supplies, bunkering. There also are: purchases by the crew while the ship is in port; port-related transportation costs; banking and service insurance, and miscellaneous port services such as port managers, freight forwarders, etc.

The local impact study of the Port of Baltimore computed the average amount expended for coal bulk transhipment for the various categories of service listed above. The study found that each additional ton of coal would add

---

[39]/Hill, et al., The Economic Impact of the Port of Baltimore on the Maryland Economy-1973, University of Maryland.

$6.12 to the local economy. The service relevant to coal with the most monetary impact ($2.52 per ton) is railroad transportation. The least impact ($0.41 per ton) occurs in crew expenditures, insurance and banking. A doubling of coal exports as indicated in this report, would, for example, add about 61 million dollars to the local economy. The trucking expenses were included in the bulk transhipment impact. This is not important for coal and may overstate the coal impact. However, the impact is somewhat understated since no adjustment was made for inflation. No estimate was made of indirect impact, induced impacts or employment impact. It is assumed that employment impacts would be less than for general cargo. Impact is based on operations and no estimate is given of the impact of direct investment in the port.

2. Land Use Impact

The most apparent land use impact of the expansion of coal facilities involves the coal pier and loading facilities on valuable waterfront land, but this is not the only or necessarily the most important impact of such activity on land use. A successful coal operation will depend on extensive supporting storage areas near the pier to facilitate the loading of ships. Also, extensive transportation uses will be required in the form of a railroad serving yard or coal yard near the pier to help assure that trains get in and out quickly. The requirement for extensive coal storage and transportation space on or near valuable waterfront land raises the issue of whether this is the "best" use of such land. Use of large amounts of equivalent land for more intensive industries that employ more people and need waterfront access would provide more economic and social value to the city. Although extensive coal supporting facilities by preempting such valuable land may preclude the possibility of such development, no competing pressures for such major development have occurred as yet in the port.

3. Railroad Impact

The impact of the expansion of coal facilities on railroads will be major. In order for the pier to be efficiently utilized at maximum potential capacity, they will be required to accept the loading and unloading of large unit trains composed of 100 to 150 cars. Time consuming inefficiencies associated with the break up of such large trains and their subsequent maneuvering in yards should be avoided. Yards near the pier must be long to efficiently accommodate such trains and separate space should be alloted loaded and empty cars. It's doubtful whether sufficient space exists for such a yard configuration near the new proposed Canton coal pier. The Canton railroad yards and the former American Refining Company property are available to be used for such yards but no detailed engineering plans have been presented. Also, yards will be competing with coal storage for the same space and both are necessary for efficient operation. The new coal pier may result in cessation of operations at Conrail's old Canton coal pier, rendering the newly built coal yards unutilized. Further study would be necessary to determine whether yards at such distant location could be used to support the new coal pier.

Unit trains operating over Conrail main lines using electric locomotives would be required to stop at Bayview to change crews in order to put on diesel trains that are required over the President Branch line serving the new coal pier. Given the existing congestion problems at Bayview documented in this and other reports it is unlikely that large numbers of unit trains could be handled at Bayview. This may have negative impacts on other industries in the Canton area served by the President Branch line and the Canton railroad. Part of the problem is the high density of freight and passenger traffic on the Conrail-Amtrak main line near Bayview. Unit trains in large numbers will impede grade crossings in the Canton area exacerbating vehicle congestion. Increased Amtrak passenger service planned for the Northeast Corridor by providing only 10 to 15 minute "windows" on the crossover of lines at Bayview combined with large volumes of unit trains, could paralyze service in the whole Canton area. All diesel routing could provide some relief to Bayview congestion, but a major rerouting of Conrail trains over parallel B&O lines offers the most promise for relief of congestion.

4. Environmental Impact

The principal impact of the movement and storage of coal in the port of Baltimore would be in the emission of fugitive particulate matter. Dust can arise from coal where it is stored and more commonly when it is transmitted and loaded by conveyor belts. Also, storage of coal in large quantities can result in spot fires caused by spontaneous combustion. The Maryland State Department of Health and Mental Hygiene Regulations[40] state that "a person may not cause or permit emissions from an unconfirmed source without taking reasonable precautions to prevent particulate matter from becoming airborne." These regulations do not apply to iron and steel production or grain operations.

Illinois Air Pollution Control Regulations effective as of January 1980 provide an example of more strict and specific regulations relative to fugitive particulate matter. "Storage piles of materials with uncontrolled emissions of fugitive particulate matter in excess of 50 tons a year which are located within a facility whose particulate emissions from all sources exceed 100 tons per year shall be protected by a cover or spray with surfactant solution or water as needed. . . ." The same procedures would apply to conveyor loading operations to storage piles and to the traffic pattern access areas surrounding storage piles. The owner or operator is required to develop an operating program detailing the best management practices to achieve compliance with the regulations.

5. Coal Traffic in the Port and Policies of Government

Government's most direct and positive action that can influence coal traffic moving through the port is either direct investment in or direct operation of, facilities for the loading and transporting of coal. The Maryland Port Authority, a State agency operating in Baltimore is the most relevant government agency to undertake such actions. When strong market conditions exist for coal facilities, it is best for government to allow the private sector to take the initiative and make the investment, on the premise that sufficient demand exists to obtain a good return on investment. Operating under

---

[40]/Recodification of COMAR 10.18.01-10.18.07, adopted May 19, 1980 and effective July 18, 1980.

this assumption the Maryland Port Authority has properly declined the option to build and operate a coal facility on its own. Despite claims of strong market demand, uncertainty often exists on the long term stability of such market trends. When large sunk costs are involved in the capital investment, the risks can be high. Under such conditions the private sector seeks local government as a partner in providing funds for investment. The City of Baltimore has helped fund Consolidated Coal Corporation Company's investment for the conversion of the Canton Ore pier. In view of the limits to moderate growth outlined in this report and the fact that two current projects, the Island Creek and Consolidated Coal project may already meet most of projected demand for export coal. The costs, benefits and impacts of any future projects, especially as they relate to the City, should be examined very closely before the city commits any further investment.

Much of port investment opportunity and development is beyond the direct reach of the city. Many of the problems in making coal facilities work in the port of Baltimore involve significant amounts of concurrent investment from the railroads. The Chesapeake and Ohio has been enjoying peak earnings. Conrail is still struggling to put together the pieces of the bankrupt Penn Central and other rail lines. Railroad management, especially in the eastern half of the nation, has been notable for its conservatism. This is probably an out-growth of past problems and low growth. The city must find a way to seek partnership with or otherwise induce the railroads to make the following high priority investments to ensure that coal facilities operate at their intended capacity do not exacerbate local traffic problems, and hurt freight traffic or other industries:

- Increase serving yard capacity in the vicinity of Canton ore pier and Curtis Bay.
- Increase the line capacity to Curtis Bay, Wagner, Brandon Shores, Fairfield and Marley Neck.
- Implement operational improvements and encourage consolidation of or expansion of the railroads' facilities at their Bayview yards.

Other line capacity problems such as the Howard Street tunnel may be relieved by reduced export traffic from Conrail. The ultimate solution to the B&P tunnel capacity problem should be the result of initiatives of the Federal government in cooperation with the C&O and Conrail. Rerouting of Conrail traffic on the B&O main line as indicated in three alternatives posed, will relieve congestion at Bayview, allow for planned increases in Amtrak passenger service and will allow the converted Canton Ore pier to operate more effectively.

# CHAPTER III--PETROLEUM AND PETROLEUM PRODUCTS

## A. OVERVIEW

### 1. Introduction

The petroleum industry is complex and produces a great variety of end products. Crude petroleum obtained from underground reservoirs is refined or distilled to produce products with differences in viscosity, weight and impurity content. Each of these numerous characteristics affects how petroleum is used as a solvent, fuel or lubricant, etc. The industry generally classifies its products as clean or dirty. The products left as a residue from distillation are known as dirty or black products. Residual fuel oil and certain viscous asphalts are commonly referred to as dirty or black oils. Residual oil is often called fuel oil No. 6 or bunkering oil, and is used as fuel by utilities, ships, and industry. Clean oils are the main products from the distillation and/or refining process and include: gasoline, distillate comprised of home heating fuel (fuel oil No. 2) and industrial fuel (fuel oil No. 4); kerosene; jet fuel, and naphtha.

The difference between these two classes of products has important implications for transportation. Clean products are generally light and volatile, can be handled at ambient temperature and don't have to be heated. Black products have to be heated and are too viscous to be pumped. Clean products are therefore feasible for transport in pipelines while black products are largely transported by ship.

Residual oil destined to utility plants of the electric power industry and industry in general, must go by ship and heavy volumes are shipped through most Atlantic coast ports, particularly the large northeastern Atlantic cities such as New York, Hampton Roads, Boston and Baltimore. Also, these areas are more dependent on oil as a source for electric power than other portions of the nation. Distillate fuel oil consisting of home heating fuel, commonly called fuel oil No. 2, is the next largest in volume for most ports north of Hampton Roads. The volume in these ports is not only related to the amount of population located in the market area served by the ports but to the percentage of homes heated by oil. The volume of gasoline shipped to any port may depend on the location of major distributors, terminals or refineries. For example, the volume of crude petroleum imported into an area is generally related to the presence of a refinery in a local area. Baltimore has only small refinery operations located within the region and therefore, the volume of crude oil imported is relatively small.

Baltimore generally ranks fourth when compared to nine other Atlantic ports in regard to the amount of crude petroleum, distillate fuel oil and residual fuel oil shipped. Baltimore ranks sixth in the amount of gasoline shipped.

The analysis of the movement of petroleum and petroleum products through the Port of Baltimore indicates that:

- Pipelines provide for the largest volume of petroleum coming into Baltimore, transporting "clean" products.

- Waterborne movements accommodate the next largest volume of imports into the port, transporting mostly "dirty" products and smaller amounts of clean products that cannot be handled because of the limited capacity of the pipeline.

- Baltimore is a major net importer and consumer of refined petroleum and petroleum products. It has practically no refineries.

- Refineries in such cites as New York City and Philadelphia on the east coast, Puerto Rico and Virgin Islands in the Caribbean and Houston and Baton Rouge on the Gulf Coast are major suppliers of products for Baltimore.

- Baltimore has a small but important role as a distributor or transshipper of petroleum products via the inland waterway for a region extending from Virginia to New Jersey.

- A small, but significant amount of movement of petroleum products occurs entirely within Baltimore port on barges from oil company terminals to local consumers, primarily BG&E.

- The major portion of residual oil is consumed by utilities and manufacturing. Residential housing units consume the major portion of distillate oil as home heating fuel.

- Within the greater Baltimore region, the City of Baltimore and the areas surrounding the city within Baltimore County consumed the most petroleum products: the city ranked first in consumption of distillate and diesel oil; the surrounding county area ranked first in the consumption of residual and gasoline.

- In regard to waterborne movement of individual petroleum products, the following should be noted:

  - The small amount of crude petroleum imported into Baltimore reflects the small amount of refining done in the city.

  - Residual imports are largest in volume, generate a considerable amount of local movement within the port and are largely handled by two oil companies. The principal customer for residual is BG&E.

-- Distillate imported into Baltimore is second most important in terms of volume. Most goes to storage for distribution by truck, but some is shipped out again over inland waterways serving a sectional market.

-- Gasoline imported into Baltimore ranks third in importance and Baltimore plays an important role in redistributing gasoline over a wide sectional market to destinations located on inland waterways.

-- Although the import of asphalts was relatively small, it comprised a significant portion of all oil exported from Baltimore largely because of the presence of asphalt refineries in or near Baltimore.

-- The small volume of naphtha imported into Baltimore is handled by one company with a small amount consumed in the manufacture of SNG by BG&E.

2. Port of Baltimore and the Movement of Oil

Oil companies receive, store, and distribute various petroleum products. Before the sixties, when oil pipelines were not prevalent, water was the only economical way to move oil. Thus, most of the oil companies, attracted by the deep water draft in Baltimore, located next to the water close to one another. In the port of Baltimore there are two general locations where concentrations of oil companies are found: Curtis Bay and the Canton area. By far the largest concentration of oil companies is in the Fairfield-Curtis Bay area. Eleven oil companies are located here and have built storage facilities for petroleum products of various types. They occupy a total of about 370.29 acres. Canton Bay area of the port has a much smaller concentration of companies but one, Exxon, is a major importer with extensive facilities.

Several oil companies in Baltimore, Amoco, Exxon and Chevron, once processed oil and operated refineries. Only one, the Chevron Asphalt Company, remains. It is a small refinery that processes and refines viscous asphalt oils to produce asphalt products. Refineries are expensive to build, but it doesn't take much more money to operate a 100 million barrel refinery than a one million barrel refinery. The refineries currently in operation are therefore, large, servicing wide areas of the nation and requiring deeper draft ships to handle large volumes of their products. Baltimore refineries were uneconomic because they were small. The depth of the channel in Baltimore would not be deep enough to accommodate large ships even if such large refineries could be built.

Oil pipelines began to be built during the fifties. The introduction of pipelines on a large scale changed the oil industry's distribution pattern for clean oil in the sixties. Two pipelines serve the east Coast. The larger one, Colonial Pipeline Company, serves Baltimore directly through branches to both Curtis Bay and Canton area terminals. The smaller pipeline, Plantation Pipeline Company stops at Newington, Virginia near Washington, D.C. Today, most of the clean products entering Baltimore come via pipeline. Some clean products still come in by water but only because of the limited capacity of the existing pipeline serving Baltimore. Dirty oil still comes by ship. All oil companies in the port are served by pipeline. Some companies which don't handle dirty oil do not really need a port facility. However, heavy sunk costs in expensive storage facilities make it very unlikely that any of the major oil companies would move to inland locations near pipeline terminals or branches of pipelines, despite the fact that land is cheaper and there is less congestion in the suburbs.

Trucks play a role in transportation of petroleum and petroleum products. Although they carry a small share of total oil brought into Baltimore the biggest role for trucks is in the distribution of oil. Oil is supplied either directly by suppliers to their captive customers or from the oil company to middlemen who store the oil and redistribute it to independent suppliers and customers.

3. Dynamics of Movement of Petroleum Products Through the Port of Baltimore

It has been estimated that in 1978, 65 percent of the total volume of refined petroleum products coming into Baltimore came by pipeline, 30 percent by barge and tanker, and five percent by truck.1/ Very little other supporting data were available on the destination, distribution and volume of pipeline and oil. Although pipelines are common carriers, such information is considered proprietory in order to protect the confidentiality of the pipeline's customers. Most data are available for waterborne transportation which has the most direct impact on the port. The distribution of petroleum traffic between pipeline and water transportation, however, has important policy implications for the use of land near the water.

A one-time snapshot of the movement of petroleum in and out of Baltimore is particularly difficult to obtain because storage is a very important factor in the distribution of petroleum where it is not as important in coal. Between shipments, companies draw on their stored capacity--some of which may have originally came into the port in the year prior to which the snapshot is being taken. Thus a simple subtraction of the amount coming in during a year versus the amount going out may not be a completely valid indicator of what is being currently consumed locally for the year. However, despite such limitations a picture appears to be possible and reasonable from what is known about Baltimore from interviews and other sources.

In 1977 it was estimated that a total of 204 million barrels of oil came into Baltimore, of this, almost 143 million barrels or sixty-five percent of

---

1/Robert Burg, "With a Click and a Throb, Pipeline Carries City's Oil," Baltimore Sun, March 1979.

the flow came via pipeline and about seven million came via truck (see Table III-1).

Baltimore exported about seven million barrels of petroleum products which was only 3.5 percent of all petroleum and petroleum products coming into Baltimore. However, most of these exports were, in fact, transshipments of imports for redistribution over a wide sectional or local market in the mid-Atlantic region. About 11.7 percent of imports into Baltimore were transshipped in this manner to other nations, cities or to locations on the inland waterway. Of these exports, almost all or about ninety percent, was transshipped to points on the inland waterway. Baltimore, therefore, has a small but important role as a distributor of petroleum products for a region along the coast from Virginia to New Jersey.

Because Baltimore is not a producer of petroleum products and therefore, doesn't export in the usual sense of the word, it is important to know where its imports come from. Just over half (53.3 percent) come from refineries in other cities in the Gulf Coast, the Caribbean or New York City. These locations rather than Baltimore receive and process imports of crude oil in refineries to produce petroleum products. About one-fourth (24.7 percent) of Baltimore's imports are from foreign countries. No data are available as to exact country of origin but the volume may be an indication of the increasing competitive refining capability of producing countries, the lack of refining capacity in the United States, or both. Finally, about one-fifth of the petroleum products come from refineries located close to Baltimore in Virginia, Philadelphia and New Jersey, along the inland waterway.

Baltimore is largely a consumer of petroleum products. If the amount of petroleum and petroleum products going out of Baltimore is subtracted from the amount coming into Baltimore, about 179 million barrels of petroleum products are consumed locally. If water movements only are considered, waterborne trade accounts for about 54 million barrels consumed locally or about 27.5 percent of all petroleum consumed locally and 88.3 percent of waterborne trade coming into Baltimore. Most of waterborne imports are, therefore, consumed locally.

A small portion of the petroleum products destined for local consumption is transshipped by barge to local customers located entirely within the port of Baltimore. Such local water movements comprise about 7.6 percent of total consumption and about 27.6 percent of water consumption. The bulk, or 72.4 percent of this local water movement or transshipment, consists of movement of residual oil by barge to the Baltimore Gas & Electric utility plants, amounting to almost 11 million barrels in 1977. The small amount remaining, about four million barrels goes from importers to industrial users or other distributors with terminal and storage facilities in the port. The movements from suppliers to utilities within the confines of the port will be explained in more detail later.

The remaining amount of petroleum consumed locally, about 182 million barrels of oil, is held in storage for consumption and distribution between shipments or provides accruals necessary for peak seasonal demand for certain types of products such as home heating fuel. Thus, 89.1 percent of local consumption involves no further transshipment by water. Most of such storage

TABLE III-1

Petroleum And Petroleum Products Through The Port Of Baltimore

By Mode of Transportation And Type of Movement, 1977

| Mode of Transportation and Type of Traffic | In | | Out |
|---|---|---|---|
| Pipeline[1/] | 135,789,839 | | |
| Truck[1/] | 7,146,834 | | |
| Subtotal | 142,936,673 | | |
| Waterborne | | | |
| Import | 15,203,028 | Export | 229,503 |
| Coastwise Receipts | 32,681,124 | Coastwise Shipments | 432,987 |
| Internal Receipts | 13,374,340 | Internal Shipments | 6,480,084 |
| Subtotal | 61,258,492 | | 7,142,574 |
| Grand Total | 204,195,165 | | |

| | From Water | Total (Pipeline)[3/] |
|---|---|---|
| Consumed Locally[2/] (In-Out) | 54,115,918 | 197,052,591 |
| Local Water Movements | 14,981,522 | 14,981,522 |
| Utilities | 10,846,286 | 10,846,280 |
| Other | 4,135,242 | 4,135,242 |
| Other[5/]-Storage & Local Consumption | 39,134,396 | 182,071,069 |

---

[1/] ICF Estimates

[2/] Water movements in minus water movements out; total movements in minus water movements out

[3/] Includes in movements by truck and pipeline

[4/] F.E.R.C. Form 67

[5/] Amount consumed locally minus local water movements comes from the pipelines. Waterborne traffic contributes to about one-fifth (21.5 percent) or 39 million barrels of the local storage portion of consumption. Storage is depleted as petroleum is distributed to suppliers, independents or jobbers for direct consumption purposes. The velocity of the movement from storage to consumer cannot be determined from available data. Further discussion of the dynamics of storage will be outlined in a later section.

## B. DEMAND

### 1. Introduction

Petroleum products have varied and distinct uses catering to several segmented sub-markets with specialized needs. The sections on demand and supply will disaggregate the broad category petroleum and petroleum products into distinct products in order to understand the structure of demand unique to each. Such an understanding is necessary before an assessment can be made of the future potential of each product within the port and how the movement of the product within the port can best be accommodated.

The various sectors of demand are analyzed for the major petroleum products based on published data available in 1976: residential homes, institutions and government, and commerce and industry. The electric power industry, transportation and manufacturing are analyzed separately from commerce and industry category because of the significance of their special energy requirements. The significant petroleum products considered in the data are: distillate oil, residual oil, gasoline and diesel fuel. Demand for various petroleum products is further analyzed for the region by geographical subdivision: Baltimore City, Arundel County, Baltimore County, Carroll County, Harford County, and Howard County.

### 2. Sectors of Demand

Each of the petroleum products analyzed showed distinct concentrations in regard to sectors of consumption. Since distillate oil consists of No. 2 fuel oil which is used for general purpose home heating, over one-half or 52.6 percent of the distillate fuel is consumed in the residential home market (see Table III-2). However, distillate also includes No. 4 fuel which is extensively used in industrial plants and some commercial burners. Some of this fuel may be also consumed by large government and institutional establishments as well. Government and institutions consume one-quarter of the distillate whereas manufacturing consumes 17.8 percent.

Light diesel fuel is normally classified as distillate and is consumed largely by the transportation sector, especially trucks, buses, railroads, etc. Diesel is also used for low and medium speed engines and therefore, 21.5 percent is consumed by power plants.

Residual oil is a heavy oil obtained from residuals left in the refining process. About one-half (49.8 percent) of this heavy-type oil is consumed by utilities, while manufacturing establishments consume over one-third. Gasoline is consumed entirely by the transportation sector, specifically automobiles powered by the internal combustion engine.

TABLE III-2

Baltimore Region Fuel Consumption By Fuel

And Sector 1976, BTU's X$10^{12}$

| Fuel | Resident. | | Inst. & Gov. | | Comm. & Ind. | | Total | | Electric | | Transp. | | Mfg. | | Grand total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. |
| Coal | 116 | 0.62 | .06 | 0.23 | - | - | .22 | 0.85 | 16.73 | 64.9 | - | - | 8.79 | 34.1 | 25.75 | 100.0 |
| Disillate Oil | 24.32 | 52.6 | 11.69 | 25.3 | 2.28 | 4.9 | 38.29 | 82.8 | - | - | - | - | 7.94 | 17.2 | 46.23 | 100.0 |
| Residual Oil | 2.08 | 1.9 | 3.63 | 3.3 | 1.99 | 1.8 | 7.63 | 6.8 | 55.48 | 49.8 | 8.74 | 7.8 | 39.65 | 35.6 | 111.50 | 100.0 |
| Natural Gas | 36.21 | 44.6 | 9.75 | 12.0 | 3.57 | 4.4 | 49.53 | 60.9 | 2.34 | 2.9 | - | - | 29.34 | 36.1 | 81.2 | 100.0 |
| Gasoline | - | - | - | - | - | - | - | - | - | - | 114.54 | 100.0 | - | - | 114.54 | 100.0 |
| Diesel | - | - | - | - | - | - | - | - | 3.74 | 21.5 | 13.64 | 78.5 | - | - | 17.38 | 100.0 |
| Nuclear | - | - | - | - | - | - | - | - | 63.80 | 100.0 | - | - | - | - | 63.80 | 100.0 |
| Total | 62.70 | 13.6 | 25.13 | 5.5 | 7.84 | 1.7 | 95.67 | 20.8 | 142.09 | 30.8 | 136.92 | 29.7 | 83.72 | 18.6 | 460.61 | 100.0 |

Source: Maryland Bureau of Air Quality and Noise Control

Growth in the use of petroleum generally has been declining. As fuel becomes more expensive, the growth in energy consumption in homes and especially commercial and industrial plants slows down. Better efficiency in the construction of buildings, more use of energy conservation measures and practices in existing buildings, and the increasing of efficiency of some heating systems have been factors contributing to these trends, particularly in distillate oil and to some extent in residual oil. Declines in the growth of electricity, conversion of existing power plants to other fuels and construction of new power plants using other fuels have resulted in decline in the growth of demand for residual oil. Less driving and more fuel efficient cars have resulted in decline or slower growth in the consumption of gasoline.

As shown in a latter section, these trends are expected to continue and intensify in the future as oil prices continue to increase, more incentives are passed by Congress for residential conservation and greater fuel efficiency is achieved in automobiles.

3. Demand by Jurisdiction

The City of Baltimore with the largest population and the largest number of residential units consumes the largest proportion of distillate oil (35.8 percent) followed by the area immediately surrounding it within Baltimore County which consumes one-quarter of the total regional demand for distillate (see Table III-3). Baltimore County outside the City of Baltimore consumed the largest share of gasoline (36.4 percent) as might be expected considering the relatively large population and greater dependence on the automobile in this suburban area compared to Baltimore City. The city was second, consuming one-quarter (25.9 percent) of the region's gasoline and was second in amount consumed.

Baltimore County outside the city also consumed the greatest portion of residual oil (44.9 percent) in the region. The location of utility plants and industries in less congested areas located outside the city supports this trend. The city was second, accounting for one quarter of residual oil consumed, closely followed by Anne Arundel County.

The central city's concentration of heavy industries that use trucks and railroads and a population that uses public transportation results in Baltimore's relatively high share (38.5 percent) of regional consumption of diesel fuel oil.

Baltimore County and outlying suburban areas are expected to gain an increasing share of fuel oil as population and industry grow in the outer portions of the region, while decline or slower growth occurs in the center city.

## C. SUPPLY

1. Introduction

This section begins with an analysis of the movement of each key petroleum product through the port in regard to origin, destination and

TABLE III-3

Baltimore Region Fuel Consumption By Jurisdiction And Fuel 1976, BTU's X $10^{12}$

| JUSDICTION | Coal | | Distillate Oil | | Residual Oil | | Natural Gas | | Gasoline | | Diesel | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % Tot. | No. | % To |
| Baltimore City | .19 | 0.7 | 16.55 | 35.8 | 28.33 | 25.4 | 37.80 | 46.5 | 29.62 | 25.9 | 6.70 | 38.5 | 119.19 | 25. |
| Anne Arundel Co. | 15.74 | 61.2 | 8.57 | 18.5 | 26.65 | 23.9 | 19.94 | 24.5 | 21.50 | 18.8 | 2.60 | 14.9 | 86.01 | 18. |
| Baltimore Co. | 7.85 | 30.5 | 11.40 | 24.7 | 50.10 | 44.9 | 23.76 | 29.3 | 41.72 | 36.4 | 3.90 | 22.4 | 138.73 | 30. |
| Carroll Co. | 1.94 | 7.5 | 2.83 | 6.1 | 4.75 | 4.3 | 2.07 | 2.5 | 6.68 | 5.8 | 1.40 | 8.0 | 19.27 | 4. |
| Harford Co. | - | - | 4.79 | 10.4 | .81 | 0.7 | 2.92 | 3.6 | 8.31 | 7.3 | 1.73 | 9.9 | 18.56 | 4. |
| Howard Co. | - | - | 2.09 | 4.5 | .71 | 0.6 | 3.74 | 4.6 | 7.12 | 6.2 | 1.09 | 6.3 | 14.75 | 3. |
| Total | 25.72 | 100.0 | 46.23 | 100.0 | 111.35 | 100.0 | 81.21 | 100.0 | 114.55 | 100.0 | 17.42 | 100.0 | 460.31[1] | 100 |

[1] Includes nuclear not included elsewhere

Source: Maryland Bureau of Air Quality and Noise Control transshipment. It then discusses the supply of facilities for transportation, storage and shipment of petroleum and petroleum products.

## 2. Origin and Destination of Key Individual Petroleum Products

### a. Crude Petroleum

Crude petroleum is a mixture of hydrocarbons that exist in liquid phase in natural underground reservoirs and remain liquid at atmospheric pressure after passing through surface separating facilities. It includes crude oil liquids, condensate gases in liquid form at atmospheric pressure and non-hydrocarbons. Crude oil is the basic input into refinery operations. The import of crude oil into Baltimore is, therefore, an indication of the presence of small refinery operations (see Table III-4).

Baltimore imported about four million barrels of crude petroleum. This accounted for seven percent of all imports coming into the port (see Table III-4). About two-thirds of crude imports came to Baltimore from producers of oil outside the country. The next largest share of crude, 27.4 percent, came to Baltimore via inland waterways elsewhere along the coast and, in portions of the Chesapeake Bay, from places where crude petroleum is imported, stored and transshipped. Finally, almost seven percent of crude oil came from other ports in the domestic United States, principally St. Croix in the Virgin Islands (see Figure III-2). Although one refinery now exists in Baltimore, at the time of analysis two may have existed in Baltimore. In 1977, for example, Amoco imported all, or over two million barrels of the crude oil coming into Baltimore (see Table III-5). Crude oil comprises about 6.3 percent of all the oil shipped to private companies in the port.

### b. Residual Oil

Residual oil is topped crude oil obtained in refinery operations. It includes No. 5 diesel and a heavy residual fuel oil No. 6 sometimes referred to as bunker oil C used for generation of heat or power. It also includes acid sludge and pitch used for refinery fuels. Residual imports are largest in terms of volume, generate considerable amount of local movement within the port, and are largely handled by two oil companies. The principal customer is BG&E.

Residual oil is the largest product in terms of volume imported into the port and comprises 41.5 percent of all petroleum products entering Baltimore (see Table III-4). The largest proportion (42.5 percent) of residual oil comes from other ports on the coast to Baltimore. The second largest share (39.9 percent) comes from foreign countries and about 17.6 percent comes from internal shipments via refineries on inland waterways. Relating exports to the total amount imported, transshipment to other places on the inland waterway comprises 7.8 percent of all imports. Purely local movement within the port to customers such as BG&E is very important and is equivalent to almost one-half (49.9 percent) the volume imported.

Refineries in Puerto Rico, New York City and Houston in that order ship the most residual oil (see Figure III-5). Other important sources are the

Table III-4

Waterborne Movement Of Petroleum And Petroleum Products

Through Port Of Baltimore, 1977 (Barrels)

| Product | Foreign Import No. | Foreign Import % Tot.1/ | Foreign Export No. | Foreign Export % Tot.2/ | Coastwise Receipt No. | Coastwise Receipt % Tot. | Coastwise Shipment No. | Coastwise Shipment % Tot. | Internal Receipt No. | Internal Receipt % Tot. | Internal Shipment No. | Internal Shipment % Tot. | Local No. | Local % Tot. | Total In No. | Total In % Tot. | Total Out No. | Total Out % Tot. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crude Petroleum | 2,747,377 | 66.2 | - | - | 282,864 | 6.8 | - | - | 1,114,584 | 26.9 | - | - | - | - | 4,144,825 | 7.0 | - | - |
| Gasoline | 777,520 | 6.8 | - | - | 8,003,110 | 70.4 | 69,643 | 3.6 | 2,639,354 | 23.1 | 1,891,853 | 96.4 | 182,609 | 1.6 | 11,419,984 | 19.2 | 1,961,496 | 29.2 |
| Jet Fuel | - | - | - | - | 995,580 | 98.2 | - | - | 18,634 | 1.8 | - | - | - | - | 1,014,214 | 1.7 | - | - |
| Kerosene | 261,906 | 34.9 | - | - | 474,561 | 63.2 | - | - | 15,000 | 2.0 | 99,024 | 100.0 | 125,522 | 16.7 | 751,467 | 1.3 | 99,024 | 1.5 |
| Distillate Fuel Oil | 1,561,987 | 13.4 | - | - | 6,990,631 | 60.2 | 33,633 | 2.6 | 3,053,692 | 26.3 | 1,254,141 | 97.4 | 798,252 | 6.9 | 11,606,310 | 19.5 | 1,267,804 | 19.1 |
| Residual Fuel Oil | 9,844,372 | 39.9 | - | - | 10,493,153 | 42.5 | - | - | 4,345,236 | 17.6 | 1,946,577 | 7.8 | 12,335,196 | 50.0 | 24,682,761 | 41.6 | 1,946,577 | 28.5 |
| Lubricating Oils etc. | 3,194 | 0.02 | 126,015 | 61.5 | 71,400 | 21.2 | 15,885 | 7.8 | 262,563 | 77.9 | 62,849 | 30.7 | 17,930 | 5.3 | 337,157 | 0.6 | 204,749 | 3.0 |
| Naptha and Solvents | - | - | - | - | 882,773 | 97.4 | 16,453 | 100.0 | 23,310 | 2.6 | - | - | 1,736 | 0.2 | 906,083 | 1.5 | 16,453 | 0.2 |
| Asphalt, Tar Pitch | - | - | - | - | 3,934,896 | 99.2 | 264,507 | 24.8 | 32,503 | 0.8 | 802,447 | 75.2 | 40,231 | 1.0 | 3,967,399 | 6.7 | 1,086,954 | 15.9 |
| Other | 6,672 | 1.2 | 103,488 | 71.2 | 522,114 | 94.7 | 28,836 | 19.8 | 22,572 | 4.1 | 12,990 | 6.9 | 6,042 | 1.1 | 551,358 | 0.9 | 145,314 | 2.2 |
| Total | 15,203,028 | 25.6 | 229,503 | 3.4 | 32,651,082 | 55.0 | 428,987 | 6.4 | 11,527,448 | 19.4 | 6,069,881 | 90.2 | 13,507,518 | 17.0 | 59,381,558 | 74.6 | 6,728,371 | 8.4 |
| Grand Total | | | | | | | | | | | | | | | | | 79,617,447 | |

1/Percent of total Imports

2/Percent of Total Exports

3/Percent of Total Imports

Source: Tabulations of unpublished data, Waterborne Commerce of the United States, Calendar Year 1977, Part I Waterways and Harbors, Atlantic Coast, Department of Army, Corps of Engineers

Mississippi River and the Gulf ports of Corpus Christi and Baton Rouge. Most residual is shipped from locations on the inland waterways in the northern portion of Chesapeake Bay.

The three biggest importers of residual fuel oil are: Aremada Hess, Steuart Petroleum and Exxon (see Table III-5). In 1977, of the total residual oil imported by ship into Baltimore, Aremada and Steuart Petroleum each received about a third and Exxon was fourth with 15.3 percent. Texaco and New England Petroleum also had substantial imports. A considerable amount of Steuart Petroleum's oil is handled by oil companies on consignment and is transshipped by them elsewhere in the region which is not reflected in the data.

A considerable amount of transshipment of imports occurs to local consumers, mainly the utility plant of BG&E. Data for 1978 show that almost all the residual oil shipped to utilities was shipped by Aremada Hess (52.5 percent) and Exxon (45.3 percent). Texaco was the only other company involved with 2.5 percent (see Table III-6). Most residual fuel went to Wagner plant (40.4 percent) followed by Crane (31.2 percent) and Riverside (13.9 percent). Wagner and Crane are both one of BG&E's three baseload facilities.

(1) Wagner

Wagner is located at Marley Neck just outside the city on the bay and is accessible by scow or barge. Unit No. 3, a coal burning unit receives coal by barge. Units No. 1, 2 and 4, respectively 137Mgw, 134Mgw and 398Mgw, receive residual oil by barge (see Table III-7). A gas turbine unit of 14Mgw burns kerosene. Most of BG&E stations except Riverside also use No. 2 oil but much smaller amounts are consumed by gas turbines. Of the 4,308,200 barrels received at Wagner, two-thirds (54 percent) as supplied by Hess and the rest by Exxon (see Table III-6). Wagner has eight tanks with seven million gallons capacity each for a total of 60 million gallons. It stores both #2 and #6 oil separately. It also stores oil for BG&E's Gould Street and Westport stations. It has a coal wharf and oil pier to handle imports of coal and oil.

(2) Crane

Crane Power Plant is located on the Middle River on Carroll Island. Units No. 1 and 2 burn oil but Crane No. 2 is being converted to coal. Each unit is 128Mgw (see Table III-7). The plant is accessible by scow or barge, receiving oil and coal shipments by water. Crane has three storage tanks with five million gallons capacity each for a total storage of 15 million gallons. Of the 1,330,700 barrels supplied to Crane, 76.6 percent came from Exxon and 24.4 percent came from Hess (see Table III-6).

(3) Riverside

Riverside located in Baltimore County east of Dundalk on the Patapsco River has five steam combustion units with net dependable capacities ranging from 58 to 78Mgw (see Table III-7). It receives shipments by barge of 1,486,650 barrels of oil, of which 85.7 percent was supplied by Exxon (see Table III-6). The remainder was supplied by Hess. Data are not available for gas turbine units, but Riverside's No. 6 unit burns natural gas.

TABLE III-5

Petroleum Imports Through The Port Of Baltimore By Product And

Import Company, 1977, Percent Of Total

| | PRODUCT | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COMPANY | Crude Oil | Gaso-line | Unlead. Gas | Jet Fuel | Kero-sene | Fuel Oil No. 2 | Fuel Oil No. 4 | Distil-late | Distil-late Less 4 | Resi-dual | Lubri-crate | Naptha | Total |
| Amerada Hess Corp. | | 29.9 | 100.0 | - | 100.0 | 95.0 | - | - | - | 34.2 | - | 100.0 | 38.6 |
| AMOCO | 100.0 | - | - | - | - | 3.5 | - | - | - | - | - | - | 6.7 |
| Belcher Oil Co. | - | - | - | - | - | - | - | 54.2 | - | - | - | - | 0.6 |
| Exxon | - | - | - | 95.7 | - | - | 75.9 | 45.7 | 100.0 | 15.3 | - | - | 13.7 |
| Gulf Oil Corp. | - | - | - | - | - | - | - | - | - | 0.5 | - | - | 0.4 |
| Hudson Lubricarts | - | - | - | - | - | - | - | - | - | - | 91.9 | - | 0.00 |
| Interlube Corp. | - | - | - | - | - | - | - | - | - | - | 8.0 | - | 0.00 |
| Koch Industries, Inc. | - | 35.9 | - | - | - | - | - | - | - | - | - | - | 0.006 |
| MacMillian Ring Free | - | - | - | - | - | - | - | - | - | 1.9 | - | - | 1.4 |
| Mobil Oil Corp. | - | - | - | - | - | - | - | - | - | 0.8 | - | - | 0.7 |
| N.E. Petroleum | - | - | - | - | - | 1.4 | - | - | - | 5.5 | - | - | 4.4 |
| Shell Oil Co. | - | - | - | - | - | - | - | - | - | 0.6 | - | - | 0.4 |
| Standard Oil-Ohio | - | 30.04 | - | - | - | - | - | - | - | - | - | - | 0.5 |
| Stewart Petroleum | - | - | - | - | - | - | - | - | - | 33.0 | - | - | 25.5 |
| Texaco, Inc. | - | 4.0 | - | 2.5 | - | - | 22.6 | - | - | 6.9 | - | - | 5.6 |
| Walter Petroleum, Inc. | - | - | - | - | - | - | 1.5 | - | - | 1.4 | - | - | 1.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Sources: Special Tabulations
American Petroleum Institute

TABLE III-6

Local Water Movements Of Petroleum Products From Suppliers To Utilities In The Port Of Baltimore, 1978 (MmB13)

| Supplier and Product | Utility Plant | | | | | | | | Grand Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wagner | Crane | Riverside | Westport | Gould St. | Perryman | Philadel-phia Road | Delmarva Vienna | Number | % Total |
| Exxon | | | | | | | | | | |
| Residual | 1,545.24 | 1,018.66 | 1,274.55 | 537.16 | 437.73 | -- | -- | -- | 4,813.4 | 44.5 |
| Fuel Oil #2 | -- | -- | -- | -- | -- | 24.00 | -- | -- | 24.0 | 0.2 |
| Subtotal | 1,545.24 | 1018.66 | 1274.55 | 537.16 | 437.73 | 24.00 | -- | -- | 4,837.4 | 44.7 |
| Hess | | | | | | | | | | |
| Residual | 2,762.88 | 2,312.04 | 212.10 | 34.56 | 277.58 | -- | -- | -- | 5,599.16 | 51.6 |
| Fuel Oil #2 | 3.27 | 25.40 | -- | 22.21 | 3.12 | 1.00 | -- | -- | 55.00 | 0.5 |
| Subtotal | 2,766.15 | 2,337.44 | 212.10 | 56.77 | 280.70 | 1.00 | -- | -- | 5,654.16 | 52.1 |
| Texaco | | | | | | | | | | |
| Residual | -- | -- | -- | -- | -- | -- | -- | 256 | 256 | 2.4 |
| AMOCO | | | | | | | | | | |
| Fuel Oil #2 | 0.50 | -- | -- | 9.08 | -- | -- | -- | -- | 9.58 | 0.08 |
| GOLF | | | | | | | | | | |
| Fuel Oil #2 | 1.01 | 9.07 | -- | 13.12 | 2.08 | 51.00 | 13.0 | -- | 89.28 | 0.8 |
| Total Residual | 4,308.12 | 3,330.7 | 1486.65 | 571.72 | 715.31 | 24.00 | -- | 256 | 10,692.5 | 96.5 |
| % of Total | 99.8 | 98.9 | 100.00 | 92.80 | 99.30 | 31.6 | -- | 100.0 | -- | -- |
| Total Fuel Oil #2 | 4.78 | 25.40 | -- | 22.21 | 3.12 | 52.00 | -- | -- | 107.51 | 0.9 |
| % of Total | 0.1 | .8 | -- | 3.6 | 0.4 | 68.4 | -- | -- | | |
| Grand Total | 4,312.9 | 3,365.17 | 1,486.65 | 616.13 | 720.51 | 76 | 13 | 256 | 10,846.42 | -- |
| % of Total | 39.8 | 31.0 | 13.7 | 5.7 | 6.6 | 0.7 | 0.1 | 2.4 | | 100.0 |

Source: F.E.R.C. Forms 67

TABLE III-7

Baltimore Gas And Electric Generating Station Summary

| PLANT | UNIT | TYPE[1] | LOCATION | WATERACCESS | CAPACITY NAMEPLATE[2] | CAPACITY NETDEPEND | FUEL[3] | AMOUNT[4] CONSUMED (OIL-MMBBL, COAL-$10^3$T) | MODE[5] DELIVERY | SUPPLIER[6] | CHANGE IN CONSUMPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CALVERT CLIFFS | 1 | S.N. | CALVERT CO., MD | CHESAPEAKE BAY | | | NUC | | | | |
| | 2 | S.N. | | | | | | | | | |
| H.A. WAGNER | 1 | S.C. | MARLEY NECK, | CHESAPEAKE BAY | 132.8 | 137.0 | $FO_6$ | 184.02 | BARGE | $FO_6$ HESS-2762.88 | SWITCH TO LOW-SULFUR OIL, 1980 |
| | 2 | S.C. | ANNE ARUNDEL CO. | CHESAPEAKE BAY | 136.0 | 134.0 | $FO_6$ | 1167.21 | BARGE | EXXON- 1545.24 | SWITCH TO COAL 1965 |
| | 3 | S.C. | | | 359.0 | 319.0 | COAL/$FO_6$ | 460.85/ 12.06 | BARGE | $FO_2$-AMOCO- 0.50 | SWITCH TO COAL 1965 |
| | 4 | S.C. | | | 414.7 | 398.0 | $FO_6$ | 2349.61 | BARGE | GULF 1.01 | |
| | GTI | G.T. | | | 16.0 | 14.0 | $FO_2$ | 4.78 | BARGE/TRUCK | HESS 3.27<br>*COAL-BOMB- 460.85 | |
| BRANDON SHORES (84) | 1 | S.C. | MARLEY NECK, | CHESAPEAKE BAY | 610.0 | 610.0 | $FO_2$ | N/A | BARGE/RAIL? | N/A | UNIT 1 WILL CHANGE TO COAL JANUARY, 1984. |
| (83) | 2 | S.C. | ANNE ARUNDEL CO. | | 610.0 | 610.0 | $FO_6$ | N/A | | | |
| C.P. CRANE | 1 | S.C. | CARROLL ISLAND, | MIDDLE RIVER | 190.4 | 192.0 | $FO_6$ | 1835.52 | BARGE | $FO_6$ HESS- 312.04 | UNIT 1 TO BE CONVERTED TO |
| | 2 | S.C. | BALT. CO. | | 209.4 | 192.0 | $FO_6$ | 1529.65 | | EXXON-1018.66 | COAL WHEN TESTS |
| | GTI | G.T. | | | 16.0 | 14.0 | $FO_2$ | 34.47 | | $FO_2$ GULF- 9.07<br>HESS- 25.40 | ARE COMPLETED ON FUEL QUALITY |
| RIVERSIDE | 1 | S.C. | BALTIMORE | PATAPSCO RIVER | 60.0 | 58.0 | $FO_6$ | 231.11 | BARGE | $FO_6$ HESS- 212.10 | SWITCH TO LOW- |
| | 2 | S.C. | CO.,E. OF | | 60.0 | 59.0 | $FO_6$ | 1529.65 | | EXXON 1274.55 | SULFUR OIL, |
| | 3 | S.C. | DUNDALK | | 60.0 | 61.0 | $FO_6$ | 105.05 | | | 1980 |
| | 4 | S.C. | | | 72.3 | 78.0 | $FO_6$ | 438.82 | | | |
| | 5 | S.C. | | | 81.3 | 65.0 | $FO_6$ | 339.38 | | | |
| | 8 | G.T. | | | 25.0 | 22.0 | $FO_6$ | N/A | | | |
| | 6 | G.T. | | | 121.5 | 128.0 | $FO_6$ | N/A | | | |
| | 7 | G.T. | | | 25.0 | 22.0 | $FO_6$ | N/A | | | |

TABLE III-7 (continued)

Baltimore Gas And Electric Generating Station Summary

| PLANT | UNIT | TYPE[1] | LOCATION | WATERACCESS | CAPACITY NAMEPLATE[2] | CAPACITY NETDEPEND | FUEL[3] | AMOUNT[4] CONSUMED (OIL-MMBBL, COAL-$10^3$T) | MODE[5] DELIVERY | SUPPLIER[6] | CHANGE IN CONSUMPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible]STPORT | 1 | S.C. | BALTIMORE CITY | PATAPSCO RIVER | N/A | 58.0 | $FO_6$ | 119.19 | BARGE | $FO_6$-HESS 34.56 | SWITCH TO LOW-SULFUR OIL, 1980 |
| | 2 | S.C. | | | N/A | 58.0 | | | | EXXON 537.16 | |
| | 3 | S.C. | | | 60.0 | 58.0 | $FO_6$ | 278.57 | | $FO_2$-HESS 22.21 | |
| | 4 | S.C. | | | 69.0 | 68.0 | $FO_6$ | 226.37 | | AMOCO 9.08 | |
| | GT.15 | G.T. | | | 121.5 | 118.0 | $FO_2$/ GAS | 44.41 | | EXXON 437.73 | |
| [illegible]ULD ST. | 3 | S.C. | BALTIMORE CITY PT. COVINGTON | PATAPSCO RIVER | 103.5 | 103.0 | $FO_6$ $FO_2$ | 720.51 | BARGE | $FO_6$-HESS 277.58 EXXON 437.73 $FO_2$-HESS 3.12 GULF 2.08 | |
| [illegible]OTCH CLIFF | G.T.1 | | BALTIMORE CO., | N/A | 18.0 | 16.0 | NAT.GAS/ PROPANE | N/A | PIPELINE | N/A | |
| | G.T.2 | | | | 18.0 | 16.0 | | | | | |
| | G.T.3 | | | | 18.0 | 16.0 | | | | | |
| | G.T.4 | | | | 18.0 | 16.0 | | | | | |
| | G.T.5 | | | | 18.0 | 16.0 | | | | | |
| | G.T.6 | | | | 18.0 | 16.0 | | | | | |
| | G.T.7 | | | | 18.0 | 16.0 | | | | | |
| | G.T.8 | | | | 18.0 | 16.0 | | | | | |
| PERRYMAN | G.T.1 | | HARFORD CO. | BUSH RIVER | 53.1 | 51.0 | $FO_2$ | | BARGE | $FO_2$-HESS 1.00 | |
| | G.T.2 | | | | 53.1 | 51.0 | $FO_2$ | 76.00 | | EXXON 24.00 | |
| | G.T.3 | | | | 53.1 | 51.0 | $FO_2$ | | | GULF 51.00 | |
| | G.T.4 | | | | 53.1 | 51.0 | $FO_2$ | | | | |
| PHILADELPHIA ROAD | 4 | | BALTIMORE CITY, N. OF CANTON | N/A | 18.0 | 16.0 | $FO_2$ | | TRUCK | $FO_2$-GULF 13.00 | |
| | G.T.1 | | | | 18.0 | 16.0 | $FO_2$ | 13.00 | | | |
| | G.T.2 | | | | 18.0 | 16.0 | $FO_2$ | | | | |
| | G.T.3 | | | | 18.0 | 16.0 | $FO_2$ | | | | |

1 S.N. = STEAM NUCLEAR; S.C. = STEAM COMBUSTION; G.T. = GAS TURBINE.
2 Source: Generating Utility Reference File Printout 7/23/79
3 Source: Federal Energy Regulatory Commission, Form 67.
4 Source: F.E.R.C. Form 67.
5 Source: Interview, B. Goldberg/Robert Lowe, 11/1/79.
6 Source: F.E.R.C Form 67; Also Electrical Week, Monthly Reports Based on F.E.R.C. Data. FO - 2 = Fuel Oil No. 2 FO -6 = Fuel Oil No. 6 (Residual)
7 Source: Interview B-Goldberg/Robert Lowe, 11/1/79; Also F.E.R.C. Form 67.

(4) Westport

Westport is located in the city on the Patapsco River. It has a floating equipment barge and receives oil by water and by truck from Wagner storage tanks. Its 458-68Mgw steam combustion units burn residual oil. Of the 571,720 barrels delivered, 93.9 percent was supplied by barge.

(5) Others

Gould Street is located in the city in the Port Covington area. Of the 720,510 barrels of oil supplied to this plant, 60.7 percent was supplied by Exxon. The Philadelphia Road Plant, in the city north of Canton, and the Perryman Plant on the Bush River in Harford County, both use #2 oil.

c. Distillate Fuel Oil

Distillate fuel oil is a general category for one of the petroleum fractions which is produced by distillation operations. Included are products such as No. 1 and No. 2 heating oils, diesel oil and No. 4 industrial fuel oil. Because no major refineries exist in Baltimore to produce distillate, all of it is imported. Over 11.5 million tons or almost one-fifth of all the petroleum products is imported into Baltimore (see Table III-4). Other movements occur as outbound movements north and south along the inland waterway (11 percent) as transshipments entirely within the port (6.9 percent). They occur primarily to serve BG&E plants.

There is a great deal of seasonality and variation in demand for distillate fuel that often overloads the local transportation system in cold months. The most economical way to meet peak demand is by large storage near the market. About 20 percent of the tanks in Baltimore are needed to accommodate seasonal demand. Demand for No. 2 heating oil is generally thirty times greater in winter than in summer. There is a need to accrue large supplies to accommodate such peak demand.

Most (82.6 percent) of the imports of distillate are fuel oil No. 2, a distilled fuel for general purpose domestic heating (see Table III-5). Other distillate and industrial fuel oil #4 each comprise 8.4 percent and 8.8 percent respectively of the total imports coming in by water. Over half of the other distillate fuel oil not elsewhere classified was imported by Belcher Oil Company.

A small amount of fuel oil No. 2 was transshipped by companies to utilities in 1978. This was only 1.6 percent of all fuel products shipped to utilities and is used for special purposes. Most went to Perryman (68 percent) then Crane and Westport.

d. Gasoline

Gasoline is a complex mixture of relatively volatile hydrocarbons with or without small quantities of additives which have been blended to form a fuel suitable for internal combustion engines, including special grades for aviation engines. Gasoline has some seasonality, but not very much.

Specifications for gasoline in regard to vaporization pressure change with the season. As a result, it can't be stored more than two months. Needs for gas in the winter and the summer tend to be diffuse, but in the summer months travel by automobile tends to be greater due to better weather conditions. As a result, gasoline consumption tends to be higher in the summer.

Most gasoline is imported into Baltimore (see Table III-4). A significant portion of the amount imported goes out again or over internal waterways (16.5 percent) to such destinations as the New Jersey portion of the Delaware River, the Pennsylvania portion of the Delaware River, the Schuykill River near Philadelphia, but the bulk goes to southern destinations such as Chesapeake Bay, York River, Virginia, Chostack River, Maryland (see Figure III-12).

Gasoline (including unleaded gasoline) comprises 2.1 percent of all petroleum products shipped by water to private companies in the port of Baltimore (see Table III-5). The bulk of the shipments (39.6 percent) went to Koch Industries, Inc. While one-third each went to Amerada Hess Corporation and the Standard Oil Company of Ohio. Unleaded gas was imported by Hess.

e. Asphalt

Asphalt is a dark brown to black material which contains bitumens which occur in nature and are obtained in petroleum processing. Consistency varies from liquid to solvent. It is prepared as the residue from the distillation of an asphaltic crude oil. The definition includes crude asphalt as well as finished products such as: cements, fluxes, the asphalt contents of emulsions, and petroleum distillates blended with asphalt.

Asphalt, tars, and pitches moved in Baltimore comprised 9.6 percent of national waterborne movement of this product. Asphalt imports were small but not insignificant. Asphalt comprised about 6.7 percent of all petroleum imports entering the port. It should be noted that a significant portion of all exports of petroleum (15.8 percent) were asphalt products. The Chevron Asphalt Company has a small refinery in Baltimore that produces asphalt. Asphalt building materials are an important export from Baltimore. No data are available on the origins and destinations of individual shipments. It is probable that most of the imports are in the form of crude asphalts as an input into the asphalt refineries. Exxon has a small asphalt terminal in Richmond and asphalt is shipped there by barge from Baltimore. Almost all imports come from other domestic ports or the Caribbean Islands. Refined asphalt and its products are the chief exports, the largest amount (75.2 percent) is destined to big users on the inland waterway and the other one-quarter goes to other ports in the United States. It should be noted that some asphalt moves by rail.

f. Jet Fuel

Almost one million barrels or 1.7 percent of the total petroleum product imports was comprised of jet fuel, primarily destined for use at Baltimore International Airport. Jet fuel consists of naptha-type (jet B) used for turbo prop and turbo jet aircraft engines in the military and a kerosene-type (jet A) used for commercial turbo jet and turbo prop airplanes. Of course, there are no outbound movements. The number of operations, number of refueling stops, length of trips of commercial airlines will influence the amount of jet fuel consumed. Increasing traffic and use of the airport as a terminal stop-over for long distance flights will favor greater growth in shipment of jet fuel in the future. Most (97.5 percent) of the jet fuel oil imported by water was handled at Exxon's terminal. A small amount was imported by Texaco.

g. Naphtha

Naphtha is a generic term applied to refined, partly refined, or unrefined petroleum products and liquid products of natural gas. Special napthas are often used as paint thinners, cleaners, solvents, in the manufacture of paints and varnishes. In Baltimore, naphtha is an important input into the manufacture of synthetic natural gas (SNG) at BG&E's Sollers Point plant.

In 1977, just under a million barrels of naphtha as imported into Baltimore, about 1.5 percent of the total petroleum imported (see Table III-4). Most naphtha (97 percent) came via coast-wise shipments from refineries in Puerto Rico, New York City and Houston, Texas (see Figure III-18). A small amount came in from the north from the Delaware River in Pennsylvania and Delaware over inland waterways (see Figure III-19). Some transshipment of naphtha goes coastwise to other cities such as Philadelphia and New York City. Most of the naphtha imported into Baltimore in 1977 was handled by Amerada Hess (see Table III-5).

h. Kerosene

Kerosene is a petroleum distillate. It is a clean burning product suitable for use as an illuminant in lamps or as range oil used in space heaters, water heaters, cooking stoves, etc. Kerosene is also used as fuel in small peak shaving units or gas turbines used by BG&E in their power plants.

Almost two-thirds of the kerosene coming into the port of Baltimore comes via coastwise routes from Gulf refineries in Houston and Baton Rouge (see Table III-4 and Figure III-21). Most of the rest comes from refineries in foreign countries. A very small amount (1.9 percent) comes to the port over inland waterways from refineries on the Pennsylvania and Delaware portions of the Delaware River (see Figure III-22). A significant amount of imports (16.7 percent) is transshipped locally within the port of Baltimore primarily to such customers as BG&E. Kerosene is used in gas turbine units at Wagner and Westport plants of BG&E. However, there are no data showing the volume of shipments into these plants. Amerada Hess handles all the kerosene imported into Baltimore by ship.

i. Lubricating Oils and Greases

Lubricating oils include all grades of lubricating oils from spindle oil to cylinder oil and those used in greases. Lubricants comprised only about 1.5 percent of all petroleum products coming into Baltimore (see Table III-4). Most (11.9 percent) lubricating oils were received from refineries along the Pennsylvania and Delaware portions of the Delaware River (see

Figure III-25). Exxon has a large refinery in New Jersey which receives tankers, produces lubricating oils and ships lubricant oils by barge to Exxon's pier in the Canton area of Baltimore. About a fifth (21.2 percent) of all lubricating oils came from other ports, largely New York City (see Figure III-24).

In 1977 no totals were given for Exxon and almost all lubricant oils imported were on consignment to Hudson Lubricants and Interlube Corporation. Exxon handles packages of lubrication oils. It brings such packages from its refinery by barge. There is quite a large volume of packages and outgoing shipment is often handled by truck.

3. Transportation and Facilities

This section discusses in more detail the physical facilities that help transport, supply and store petroleum and petroleum products in the region.

a. Pipelines

As mentioned previously in the overview two pipelines run from the refineries in the Gulf Coast in Texas and Louisiana traveling 1500 miles to serve the eastern seaboard: The Plantation Pipeline Company and the Colonial Pipeline Company. The Plantation Pipeline with a 12" diameter is smaller and stops at the outskirts of Washington, D.C. at Newington, Virginia south of the beltway in Washington, D.C. Exxon, Shell, Amoco, City Services, Texaco, Gulf and Crown all have bulk storage or tank farms in that area. Since this pipeline does not directly serve Baltimore it will not be discussed to any length.

Construction of the Colonial Pipeline Company's pipeline along the eastern seaboard states was begun in 1963 and completed February 1965. Almost as soon as it was built it had reached its initial capacity of 800,000 barrels per day. Subsequent expansions were therefore undertaken in February and November of 1966. By the end of 1978 capacity had been expanded to 1,152,000 barrels per day. Subsequent expansions increased the capacity to 1,464,000 barrels per day by 1971. With further capacity expansions during 1976 and 1979, it is estimated that current capacity is about 2,300,000 barrels per day. During 1979, Colonial expected to handle 1,800,000 barrels per day.

Colonial has been operating near its full capacity since it was built. Colonial claims that this occurs because it competes effectively with other transportation modes for clean oil traffic. Coastal tankers from the Gulf and Caribbean ports are its principal competitors. Long haul movements comprise over half of Colonial's traffic. In 1978 for example, tankers charged an average of $1.29 per barrel for transporting products from Houston, Texas to New York as compared to Colonial's $.52 charge. Thus, average tanker rates were two and one-half times Colonial's. Colonial's initial tarriff rates in 1964 were almost the same as those of the coastal tanker. Since that time however, tanker rates have fluctuated widely from year to year, while Colonial rates have been relatively stable. As a result, the differential in rates has increased substantially over the years in favor of Colonial.

Rates in themselves, however, are only one component of the total transportation cost of a barrel of oil. For example, the pipeline rate does not take into account the cost of getting the products from a refinery into Colonial which can vary depending upon the distance of the refinery from Colonial. There is a substantial cost of truck transshipment from pipeline to final market which can vary depending upon a location of that market relative to the nearest pipeline terminal. There are similar costs in getting products from the nearest tanker terminal to the local market and from a refinery on board a tanker.

One study claims that variables affecting differentials in costs between pipelines and tankers can't be calculated very easily. It concluded that at times tankers have been a cheaper mode of transportation and that rarely has the added cost by tanker been as much as a major fraction of a cent per gallon. "Considering the fluctuation in the tanker rate and considering all the other variables, it would be difficult to demonstrate that there was any significant volume of tanker shipments at a total transportation cost significantly higher than by pipeline."2/

In Baltimore, however, pipeline transportation maintains a distinct advantage as a mode of transportation over tankers. It does not pass very far from the coast where most of the oil suppliers and tank farms are located. As a result of its proximity, it has been relatively easy to build branch lines to the major terminals in the port. There is no costly, time-consuming transfer from the pipeline tap to trucks in order to get oil to tank farms at the port.

Other general trends and characteristics make pipelines more competitive. The rise in fuel prices since 1978 has changed the competitive relationship between tankers and pipelines considerably. Fuel costs for shipping have escalated and rates have increased substantially. Moreover, factors other than rates and costs favor pipeline transportation. Pipelines consume very little energy in moving their product compared to other modes of transportation. Their energy costs are two cents per million Btu per 100 miles travelled compared to 3.5 cents for railroads. Pipelines are more reliable and are not affected by adverse weather. They operate twenty-four hours a day, making it easier to operate at the pipeline's theoretical capacity. There is no noise, water or air pollution associated with pipelines. Pipelines are safer than other modes of transportation.

Colonial claims that it regularly operates its main line at over 98 percent of its maximum continuous rated capacity. Demand for gas from oil company suppliers has consistently exceeded capacity. As a result of surplus demand, the company has had to prorate space on its system. Each regular shipper's allocation is based on its actual shipment during the previous 12 months in proportion to line capacity less new shipper allocations. After its most recent expansion, the entire pipeline system except portions between Richmond, Virginia and Linden, New Jersey will be off proration. Thus, customers in

---

2/Morris S. Livingston, Oil Pipelines: Industry Structure, prepared for the American Petroleum Institute, November 1978, p. 56.

Baltimore will still have to live with prorated allocations. Future expansions of the Colonial pipeline, however, are planned that will increase pipeline capacity in Baltimore. Colonial has announced plans to lay 140 miles of a 36-inch products pipeline between Mitchell Junction, Virginia and Dorsey, Maryland.[3] When such capacity is added in two or three years, it is expected that clean products now being shipped by water will be diverted to pipelines and that the waterborne transportation of clean products will become negligible.

As the Colonial pipeline approaches Baltimore from the south, its diameter is 32 inches. The main tap point on the pipeline for the Baltimore region, called Dorsey Junction, is located at Woodbine in Carroll County. From this point, a 12-inch branch pipeline takes the oil to tank farms and terminals located in Curtis Bay and South Baltimore. A second, smaller branch of six inches, goes to British Petroleum's storage facilities at the outskirts of Washington, D.C. Another short branch proceeds to an oil storage area in Finksburg, not far from the pipeline. Further north, an eight-inch branch comes south from Aberdeen in Harford County. It connects with a North Baltimore terminal area by means of a transmission right-of-way, and travels via a railroad right-of-way to service Exxon and Apex oil companies in the Canton Bay area of the port.

All products in a pipeline must be piped one after another in a certain sequence. A particular order is necessary in order to avoid mixing and contamination. Refined products travel in batches of about 75,000 barrels. Unleaded gasoline usually comes first. It is followed by leaded oils that tend to wash the pipeline, and finally by kerosene. It has been variously estimated that petroleum products move through the pipeline from five to seven miles per hour and it takes anywhere from 10 days to three weeks for products to come from Houston in the Gulf to Baltimore. Because of the allocation system, the special sequence of movements required and the long travel time, a great deal of planning and tight scheduling is required on the part of suppliers.

### 2. Water: Ships and Barges

#### a. Ships

The estimate by one company that 20 percent of its clean products come in by water appears to be a reasonable estimate for the port as a whole. All residual oil still comes in by ship. Black oils are handled in one class of ship or barge, and clean oils are handled in a different class. It is not very practical to clean black oil ships or barges to carry clean oil. Most oil company berths handling clean or black oils can accommodate ships of 30,000 to 80,000 tons capacity. The new large oil tankers are no longer used. At one time, big ships with clean fuel would arrive every nine to 10 days in Baltimore. Now, small ships, carrying clean products, come in

---

[3] "World Pipeline Projects Aiming for 62,376 Miles", <u>Oil and Gas Journal</u>, January 21, 1980, p. 29.

once a month. According to one company, unloading a ship takes an average of 18 to 24 hours. A hinge pipe is used for such loading to avoid spills and water pollution. Exxon has two berths, one capable of taking an 80,000 ton ship and another for black oil ships with a capacity of 30,000 tons or less.

The big importers of oil with facilities for berthing of ships, in order of their percentage of total imported oil shipped, are: Armerada Hess (38.6 percent), Exxon (13.7 percent), Amoco (6.7 percent), and Texaco (5.6 percent) (see Table III-5). Most of these port oriented suppliers import substantial volumes of residual oil, ranging from 34.2 percent (Hess) to 6.9 percent (Texaco) of the total imports. These companies have the flexibility to ship clean products either by pipeline or ship, in case for any reason pipeline access is restricted. Steuart Oil Company imports one-third of all the residual oil entering Baltimore. As noted previously, its imports are handled by consignment through local suppliers who transship to Steuart Petroleum's tank farms on the Anacostia River.

b. Barge

The previous section analyzing the movement of individual petroleum products showed that a significant proportion of movement of petroleum products occurs by barge. Most of this movement is a result of transshipment, both within the harbor itself and to points outside on the inland waterway. Barges in Baltimore harbor range in capacity from 15,000 to 70,000 barrels. The largest volume of barge movements occurs entirely within the bounds of the port and is destined for BG&E. Almost 11 million barrels of oil were shipped by barge in this manner in 1978 (see Table III-6). Hess, Exxon, and Amoco all participate in such shipments with the largest volumes carried by Hess and Exxon. The Exxon pier, for example, can accommodate four barges--two on each side.

Some clean products--for example, gasoline, heating oil, and diesel oil--are shipped by barge to storage and terminal areas on the Chesapeake Bay. There they are redistributed to customers. Some asphalt is shipped by barge to Amoco's refinery in Richmond, Virginia. Other barges load ships tied up in the port with bunkering fuel.

3. Storage

The bulk of an oil company's storage is for day-to-day operations, between one ship or pipeline shipment and the next. It has been estimated that 75 to 80 percent of the storage tanks that have been built are for this purpose. The seasonality of demand characteristic of heating oil and, to some extent, gasoline that was mentioned previously also creates the need for storage. About 20 percent of the storage tanks that have been built are necessary to accommodate such seasonal demand. The industry has found that it is uneconomical to provide expanded transportation to accommodate peak loads and that instead it is more economical to provide storage. The larger the tank, the cheaper the cost per barrel of oil because the volume of the tank goes up as the cube of a given dimension. Volume, therefore, increases faster than does area and the associated parameters that affect cost. It costs $10 per gallon just to build storage.

Oil has always been difficult to handle. Its flammability and volatility present safety problems. Before 1974 when oil was cheap, the cost of storage, handling and transportation was a large percentage of oil's delivered cost. The efficiency with which it was handled was, therefore, an important element in maintaining a competitive position of a company. Oil companies always, therefore, paid a relatively great amount for storage or handling. Efficiency of handling has a much bigger impact than in coal. Furthermore, the tax on oil inventory and the fact that the company has to finance the value in the tanks provide further incentives for efficiency in storage. Computers are used to keep track of oil and there is very little slack in the system. All storage capacity that is built is utilized to the highest extent possible. Nevertheless, as the price of oil goes up as it has recently, the cost of storage and handling becomes a smaller part of the whole picture.

The biggest tank in Baltimore has a capacity of 100,000 to 150,000 barrels of oil. With 42 gallons per barrel of oil, this is considered large by most industry standards. Nevertheless, Piney Point, Maryland has a tank that holds 500,000 barrels. A size of 100,000 to 150,000 barrels, however, appears to be standard on the east coast. Such tanks are 125 to 150 feet in diameter and 50 feet high. There are three storage or terminal areas in the city. The Gulf-Hoffenberg storage facility is located about two miles north of Canton, and this area has been called the north terminal area. In the port, the largest terminal area is in the Curtis Bay area where 10 companies have storage facilities comprising 370.29 acres. The largest in terms of area are Continental Oil (73.91 acres), Shell Eastern Petroleum Products (71.53 acres), Amoco (73.53 acres), and Hess Oil (28.57 acres). Although the Canton terminal area has only two firms, the area occupied by one, Exxon (110.85 acres) is the most extensive in the city. Exxon, for example, has hundreds of tanks of which 30 are large and many are small. The terminal handles forty products composed of different grades and quality of oil. All grades have to be segregated. Small tanks are for low-volume products. Because of environmental requirements, all oils of different grade in regard to sulfur content have to be segregated.

4. Trucks and Distribution

The two petroleum products with the largest volumes generated landside from the port are: home heating fuel and gasoline. Heating fuel is allocated to home heating distributors based on historical demand. Some oil companies such as Exxon used to be in the home heating oil distribution business themselves, but have divested themselves of that operation. Some distributors such as Hoffenberg have their own terminals and receive their allocation directly from the pipeline. Most, such as Marex, are supplied through oil companies either by truck or barge. The distributor then uses smaller trucks for distribution directly to the customer.

In Maryland, all service stations have been divested from oil companies. Most big oil companies operate their wholesale operations directly with service stations. In other areas oil companies deal with a distributor and they distribute to stations, especially in rural and outlying areas. Some distributors exist in Baltimore that deliver to small stations with small tanks and pumps. Big oil trucks from the oil supplier can't get into these service stations.

Exxon serves as a good example of how trucks are used for distribution. A large number of trucks averaging 450 every 24 hours visit the terminal. Volume can be as high as 500 in the winter and as low as 300 in the summer. Many trucks deliver gasoline directly to Exxon service stations. The market for Exxon extends from north of the District of Columbia to Cumberland, Maryland to Wilmington, Delaware and to the Eastern Shore of Maryland. Another large portion of trucks are heating oil distributors. Some big trucks go to distributors with their own bulk facilities and then the distributor delivers by small truck to individual customers. This often happens in the case of rural areas such as Hagerstown. It is generally more economical to send small trucks to the supplier's terminal in Baltimore.

The big volumes of truck traffic present problems for most oil companies especially during peak season. This is particularly important in the Curtis Bay area. Access of I-83 and I-95 under construction will help the companies located in the Canton terminal area. It will provide especially good access to the northeast. However, the building of a tunnel restricts the transport of oil to the west. Oil, for safety reasons, cannot travel in a tunnel. Extensive highway facilities are less prevalent in the Curtis Bay area.

5. Railroads

Shipment of petroleum products by rail is a very small movement compared to the 1,000 rail tank cars that used to carry oil products. Customers don't transport petroleum products by rail tank car anymore. Only railroads using fuel for their own purposes and asphalt companies ship by rail tank cars.

## D. IMPACT OF DEMAND AND SUPPLY ON THE USE OF LAND

### 1. Demand for Petroleum

#### a. National Trends

Since the oil embargo in 1973, national demand for electricity has been in slump. Growth in electrical consumption actually declined in 1974 and showed very little growth in 1975 because of the extended effects of the recession. Previous to 1974, annual rates of growth nationally were seven to eight percent. In 1976 the national growth rate rebounded to almost equal that of the pre-1974 rates. Nevertheless, the succeeding years have shown growth rates averaging three to four percent, well below those that prevailed prior to 1974.

#### b. Local Demand

BG&E, one of the chief customers for residual oil--the most important product shipped through the port in terms of volume--has mirrored the direction of national trends. For example, the sale of electricity increased only 4.8 percent in 1977 and 4.6 percent in 1978.

BG&E's peak demand is the amount of electricity it provides in its single busiest hour of the year. Utilities such as BG&E usually build facilities so that they can exceed the peak by a substantial amount. As a result a great deal of the capacity built remains unutilized during the remaining portions of the year. This results in less efficiency which is reflected in higher rates for the consumer. Moreover, the peak does not necessarily grow at the same rate as total electricity. In the late 1960s and early 1970s, BG&E's growth in peak demand was about seven percent a year, approximately the national average. Peak demand, however, dropped between 1975 and 1976 and again between 1977 and 1978.4/ In 1979, it grew modestly at a rate of 3.5 percent, slightly higher than other middle Atlantic states but lower than most utilities in the south and southwest.5/ Peaks in Baltimore have generally not been growing as fast as sales, indicating that BG&E does not have to build new plants. Its current capacity is about 38 percent greater than its peak.6/ A factor in this big reserve has been the Calvert Cliffs twin nuclear reactors.

2. Future Demand

Incentives for building new utility plants are diminishing. New generator plants are generally more efficient than old ones and they expand the rate base or total company's investment upon which the utility is allowed to earn a profit. Nevertheless, with inflation the cost of construction has generally equaled or exceeded the benefits of the revenue from the bigger rate base. In summary, the annual growth demand for electricity is expected to be half of what it was in the early 1970s at about four percent per year.7/ BG&E estimates optimistically that its peak demand will grow by 5 percent this year and about 4 percent per year through the 1980s.8/ The reasons for this slow growth are:

- a national, and to some extent, local economy that is growing at a slower rate;
- increasing conservation practices by customers;
- increasing use of more efficient appliances; and
- continuing rise in the price of electricity.

---

4/David Brown, "BG&E Again Slows Work on Arundel Plant", Baltimore Sun, November 27, 1979.

5/David Brown, "Utility Days a Tricky Game of Predicting Energy Needs," Baltimore Sun, December 2, 1979.

6/Ibid.

7/Ibid.

8/David Brown, Baltimore Sun, November 27, 1979.

Slow growth has resulted in the following:

- the postponement of the opening of the Brandon Shores plant from 1982 to 1984; the new unit will start on coal; and

- the decision of BG&E not to join with PEPCO in building the Dickerson plant in Montgomery County.

In addition to slow growth, the following plants will be converted to coal and will no longer require residual oil:

- Wagner units #1 and #2 are scheduled to be converted to coal in 1985; these plants consumed 1,628,000 barrels of oil in 1978 (see Table III-7); and

- Crane's unit #1 will be converted to coal in 1983; it consumed 1,835,620 barrels of oil in 1978.

These reductions will reduce Hess and Exxon's imports of residual oil and will reduce local barge movements of oil to utility plants.

The prospects are for diminished imports of residual oil during the next decade. Residual oil is one petroleum product that must come by water and has the largest volume of import compared to any petroleum product in the port.

Prospects are for stable or somewhat diminished demand for clean products for the following reasons:

- slower growth or possibly decline in the use of gasoline as it becomes more expensive and the consumer buys more gas-efficient cars; and

- more restricted travel and conservation on the part of the consumer.

Aside from utility demand, there will also be a lower demand for home heating fuel for the following reasons:

- slower industrial and population growth generally;

- practice of energy conservation on the part of customers as oil prices rise; and

- conversion by customers from oil to other fuels.

In addition to reduced demand for petroleum products, the Port of Baltimore will experience diminished waterborne traffic for clean oil through the port in the next two to three years because by that time, Colonial will have completed its addition of pipeline capacity between Mitchell Junction, Virginia and Dorsey, Maryland. This will allow the pipeline to satisfy most or all of the demand for movement of clean products. It will divert approximately 20 percent of clean product traffic that is currently going by water to the pipeline (see discussion above, under pipelines). If the port retains or expands its role as the focal point for redistribution of products to Chesapeake Bay and other locations along the inland waterway, it could counter-balance these trends somewhat.

3. Impacts

This section briefly discusses the impact of future trends in petroleum production shipped through the Port of Baltimore on land use, the environment, and the local economy.

a. Land Use and Facilities

Facilities for directly handling petroleum appear more than adequate. The chief problem may be, in fact, one of underutilization. The highway transportation infrastructure is congested and needs improvement. The decline in demand for petroleum products and the expansion of the pipeline is likely to result in underutilization of piers and facilities by major oil importers such Armada, Hess, and Exxon. Some consolidation or attrition may occur in the long term. Nevertheless, there will still be continued import of some residual oil by petroleum firms. Large storage facilities represented by tank farms are likely to remain. They are served by the pipeline and represent large capital investments. If oil companies were to start from scratch, they would most likely build on inexpensive land near the pipeline terminal in the interior. A port facility is no longer necessary or even desirable for most oil companies but oil companies had already made their investment decisions in an era when the port was important and now have a large capital investment in facilities which cannot readily be duplicated especially under today's inflation. Traffic generated by tank farms may remain a problem unless improvements to arterial roads and intersections are undertaken, especially in the Curtis Bay area.

The principal issue in regard to use of land in the port for handling petroleum is one of the highest and best use. One can claim that land at the port is unique because of its water access and that only those uses and activities that can capitalize on this unique attribute of the port should locate there. If one accepts this assumption, the current location of oil companies at or near the port is not the best and highest use of the land. Petroleum storage facilities will continue to occupy valuable port land even though they do not use the unique aspects of water access and their original reason for locating waterside is no longer in force. For reasons discussed above, it is unlikely that oil companies will pull up their roots and move elsewhere; nor is natural attrition likely to occur in the immediate future (10 years).

The paradox is that although space and facilities for coal storage and yards needing water access is at a premium, large amounts of port land are being pre-empted by petroleum uses that no longer demand water access. Even if policy tools did indeed exist at the local level to induce such activities to move, at present it would be far beyond the capacity of local government to implement them. Such policy tools would require a development agency to subsidize and build consolidated tank farms at pipeline terminals in the interior in order to induce firms to move. This seems unlikely and even if possible, it is not at all certain that it would work. Another alternative would be to buy or lease waterfront access and facilities from the oil companies for other port use. This is a more feasible long-term possibility but the use of such piers may be limited by the lack of existing railroad facilities or space for yards to serve such piers in their new function. In the long term, the city or port authority should adopt a policy of buying up available land and facilities used for petroleum for more intensive development that needs water access, if any attrition should occur.

b. Economic Impact

In Baltimore, petroleum products are transshipped bulk products. Their impact, therefore, is similar to that of coal explained in the previous chapter. Reduction in port petroleum traffic will undoubtedly result in some reduction of local port jobs and income in transportation services and ship repair. A pipeline is a less intensive employer of people than oil companies and will not make up for the loss of jobs and income. Nevertheless, the port may continue to function as an importer of residual oil and to the extent that it retains and expands its transshipment function in the the Chesapeake Bay and middle Atlantic region, it could minimize some of the effect of such losses.

c. Environmental Impact

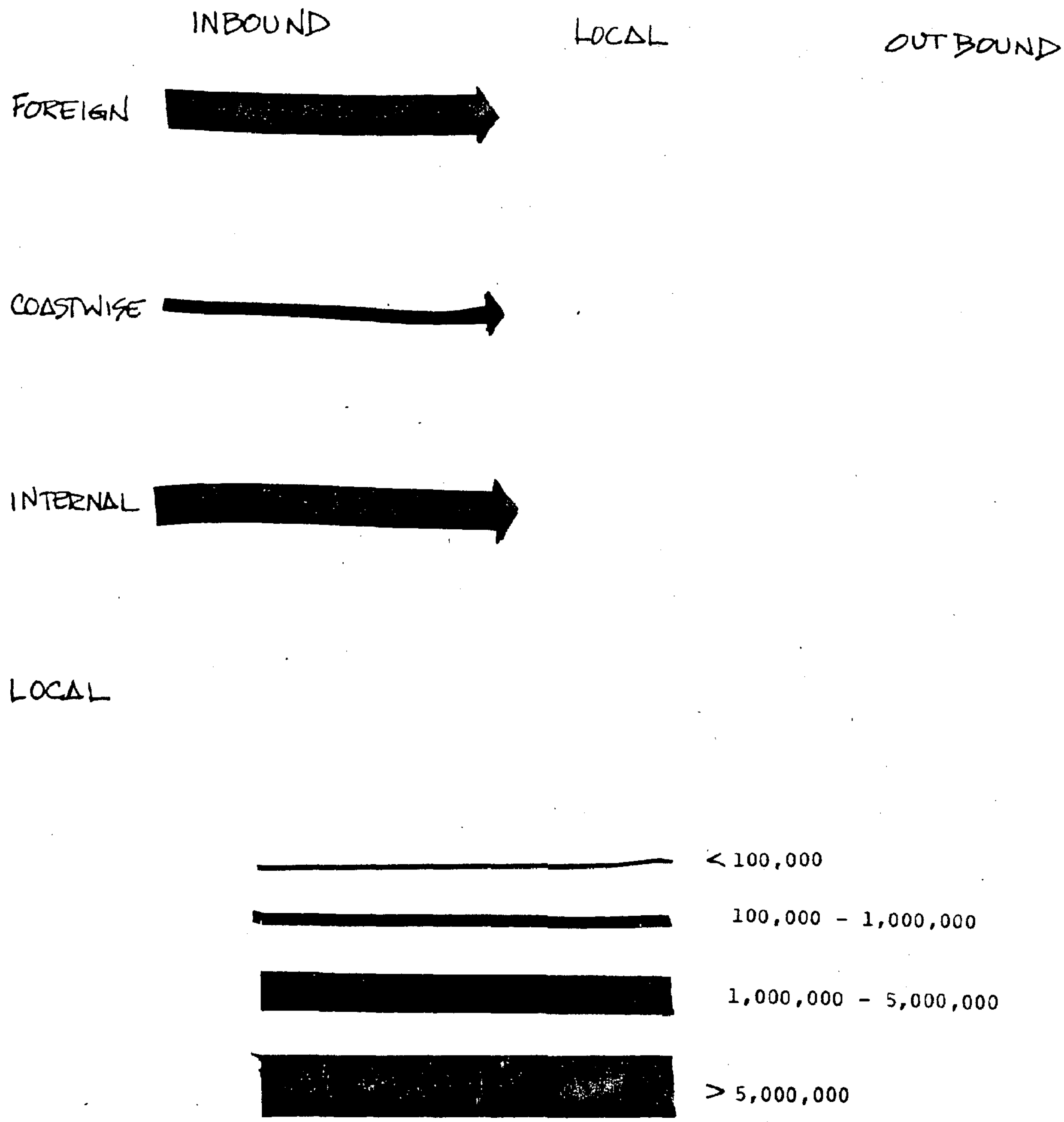
Environmental regulations impose limits on the sulfur content or black oils. Bunkering oil used for fueling ships contains a high sulfur content, but such fuel is burned at sea where there is no environmental problem. The sulfur grade (content) requirements for oil used in outlying areas and in Virginia is lower. Customers in the immediate Baltimore area are required to use even lower content sulfur oils. Some of BG&E's utility plants have had emergency permission to burn higher grade sulfur oil (fourth grade). Wagner and Riverside units, however, will switch to lower sulfur oil during 1980 (see Table III-7).

The decline in import activity will reduce the possibility of oil spills and leakages of oil that pollute the water as a result of loading and unloading. As has been explained previously, pipelines have practically no negative environmental impact and expansion of their use augurs well for environmental problems. There is some vaporization of hydrocarbons occurring from storage tanks and from tanks of ships as they unload from storage tanks in the terminal area. In general, environmental problems are not unmanageable and will be lessened somewhat in the future in view of the slow growth or decline in petroleum traffic.

FIGURE III-1

Movement By Type Through Baltimore Harbor

Crude Petroleum (Barrels)

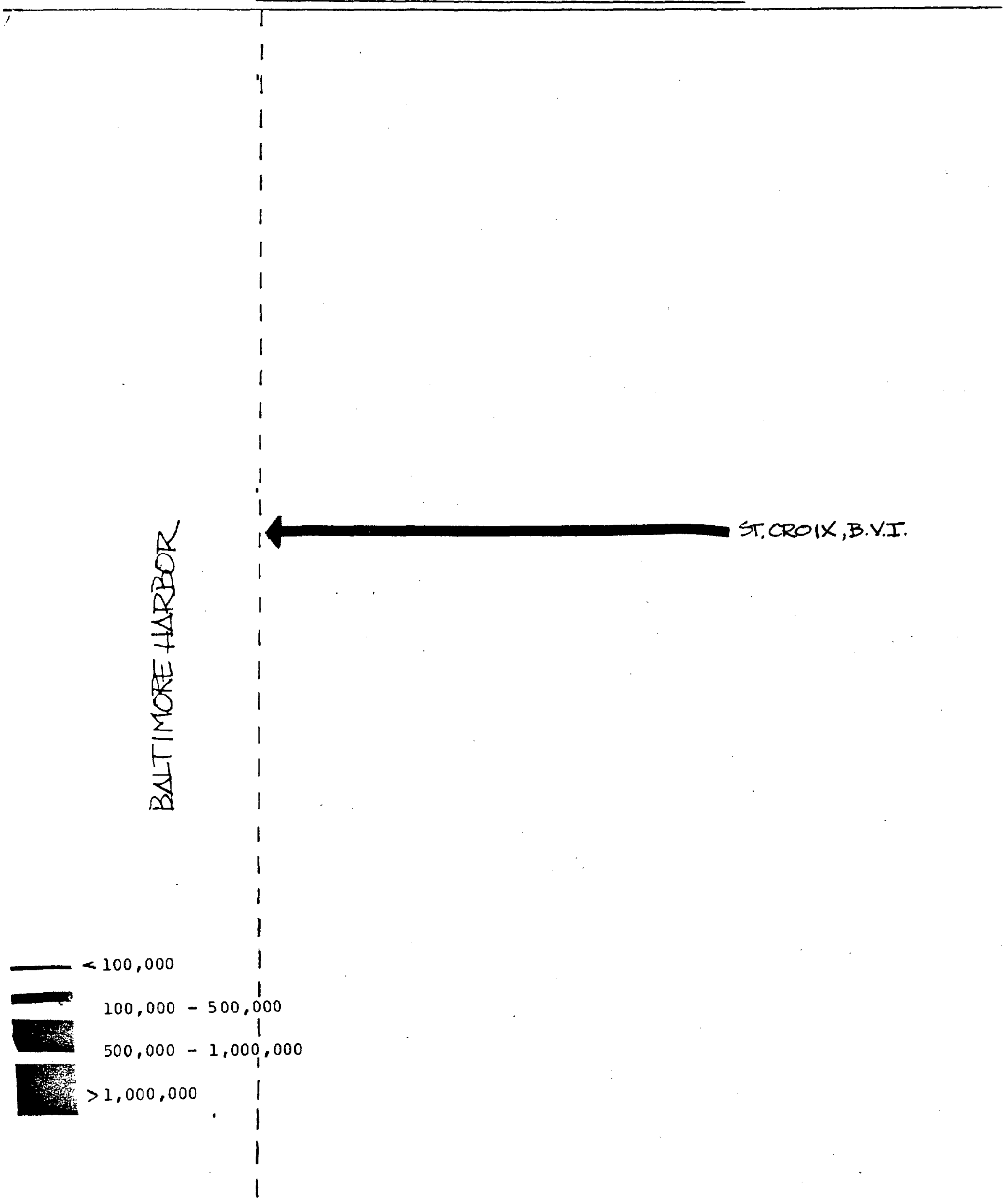



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977

FIGURE III-2

Coaswise Traffic Originating And Terminating

In Baltimore Harbor, Crude Petroleum (Barrels)

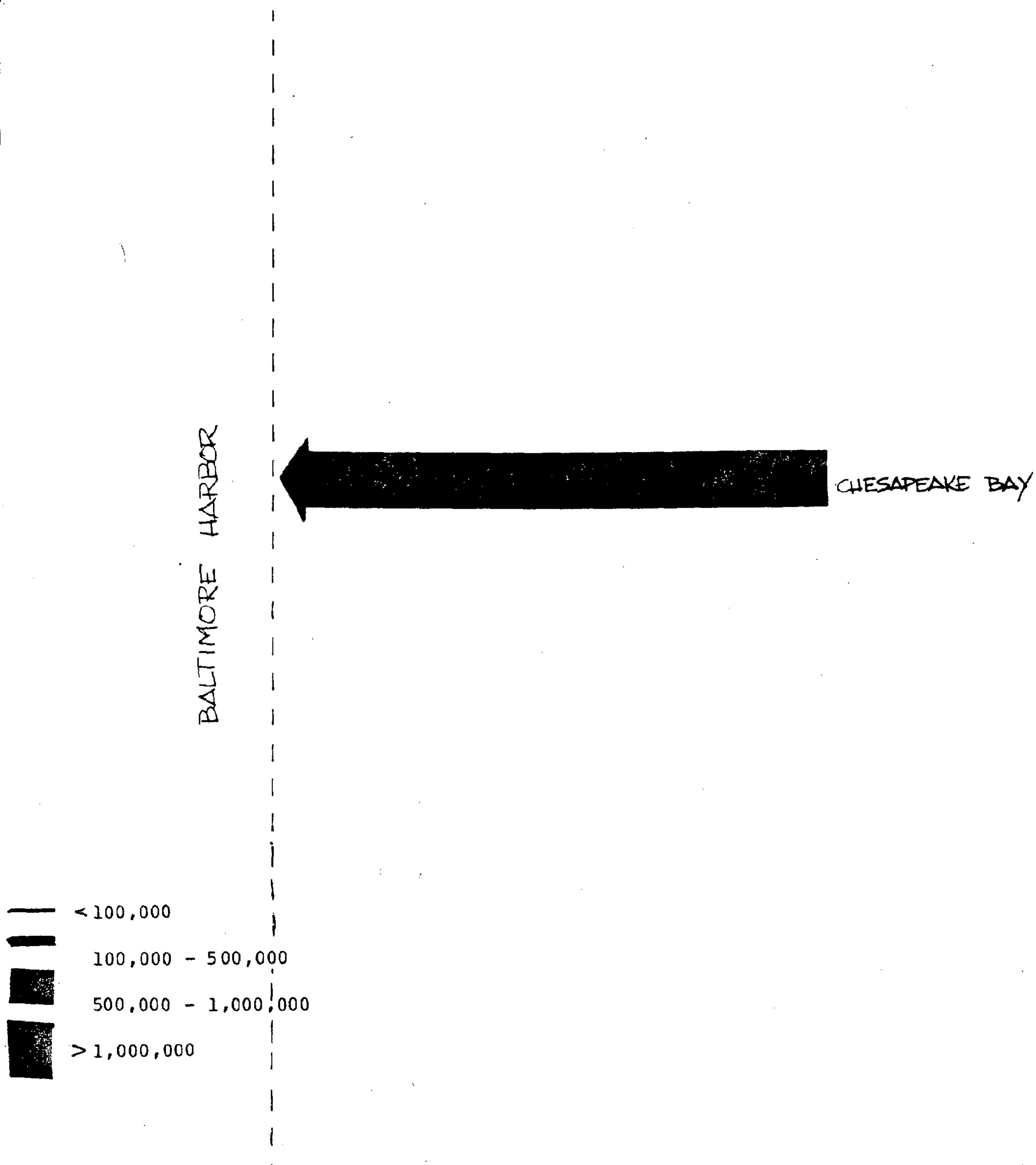



Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977

FIGURE III-3

Domestic Inland Traffic Originating And Terminating In

Baltimore Harbor, Crude Petroleum (Barrels)

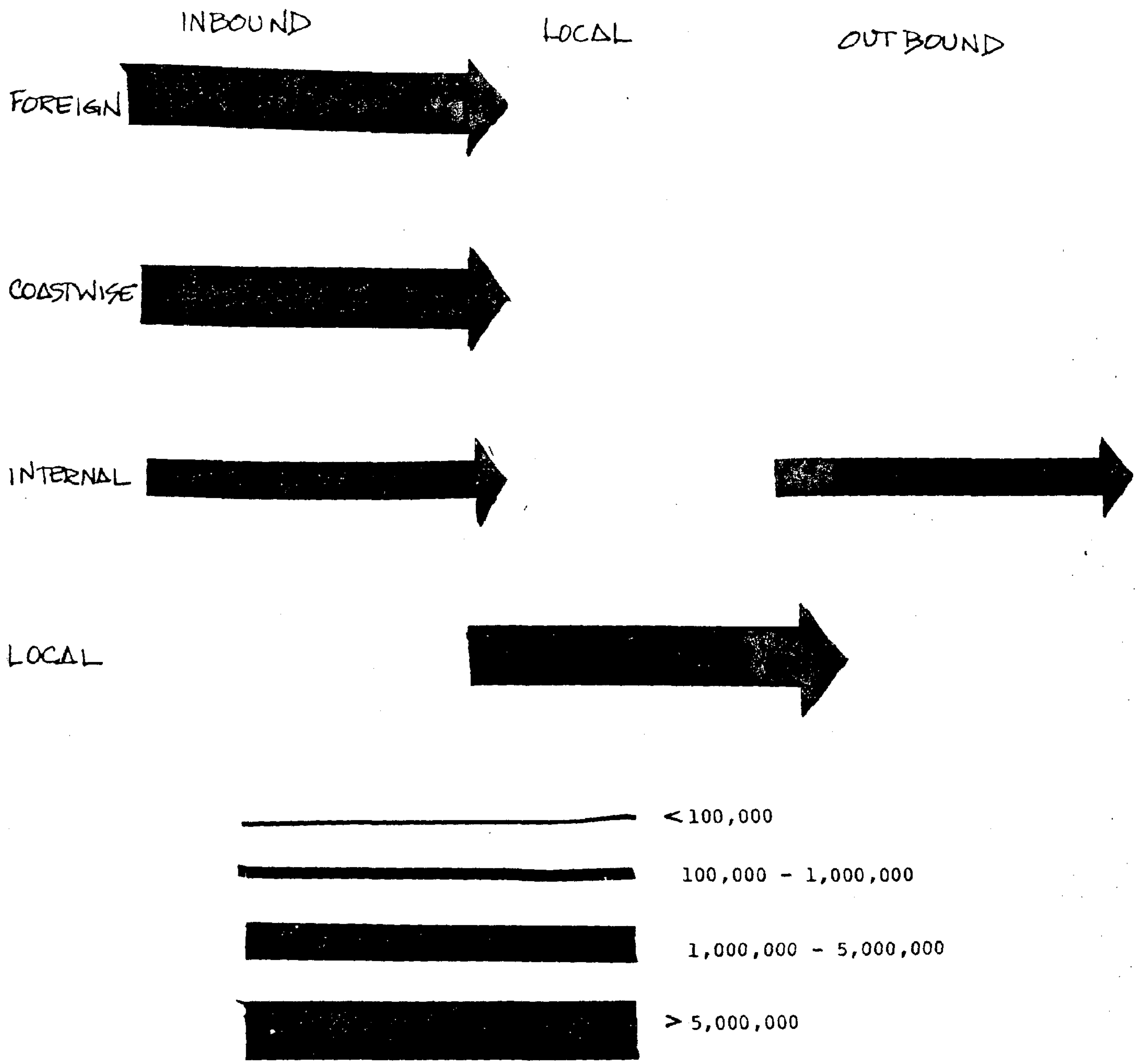



Source: Army Corps of Engineers, Waterborne commerce of the United

FIGURE III-4

Movement By Type Through Baltimore Harbor Residual

Fuel Oil (Barrels)

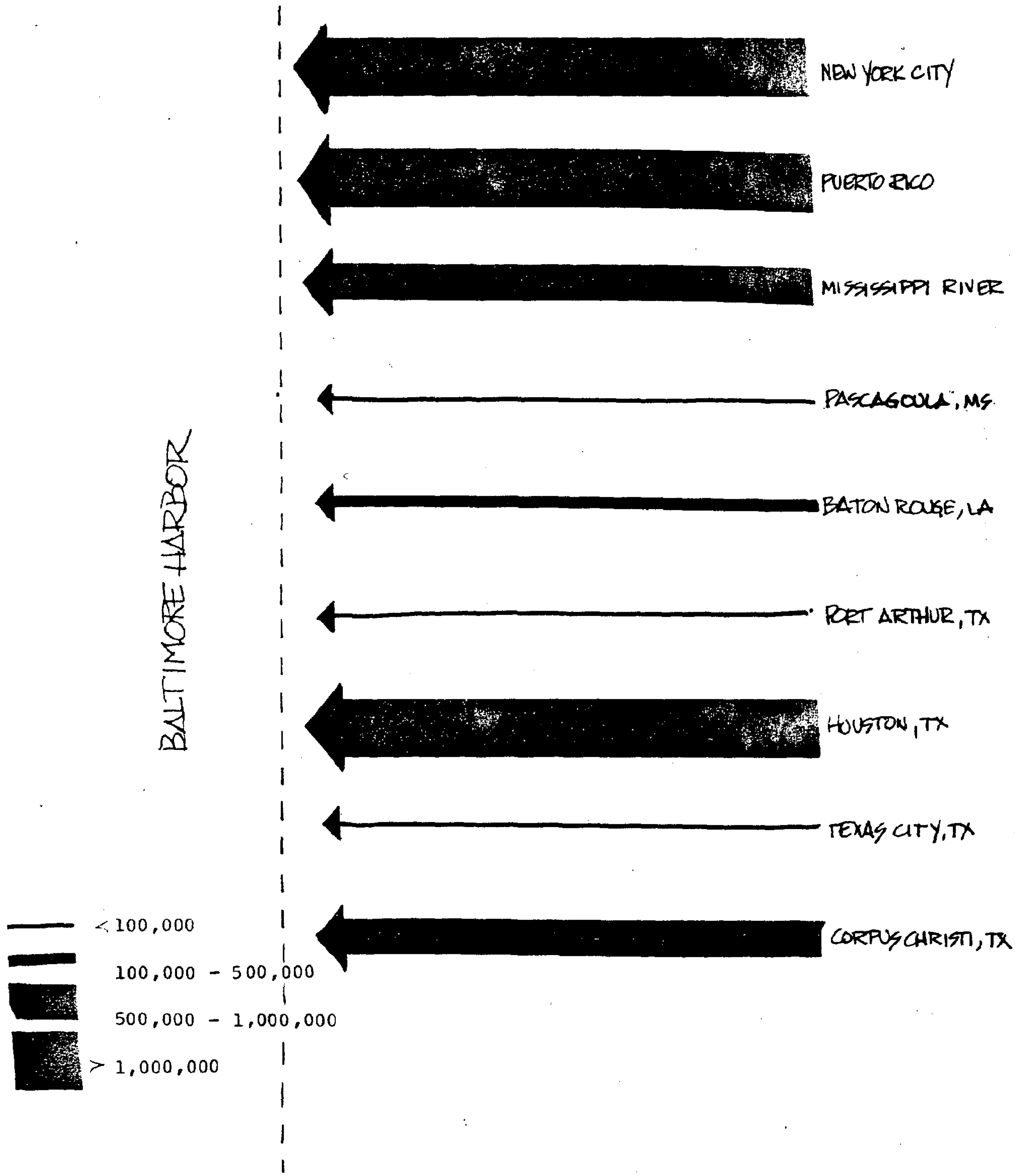



Source: Army Corps of Engineers, Waterborne commerce of the United States, Calendar Year 1977.

FIGURE III-5

Coastwise Traffic Originating And Terminating In

Baltimore Harbor, Residual Fuel Oil (Barrels)

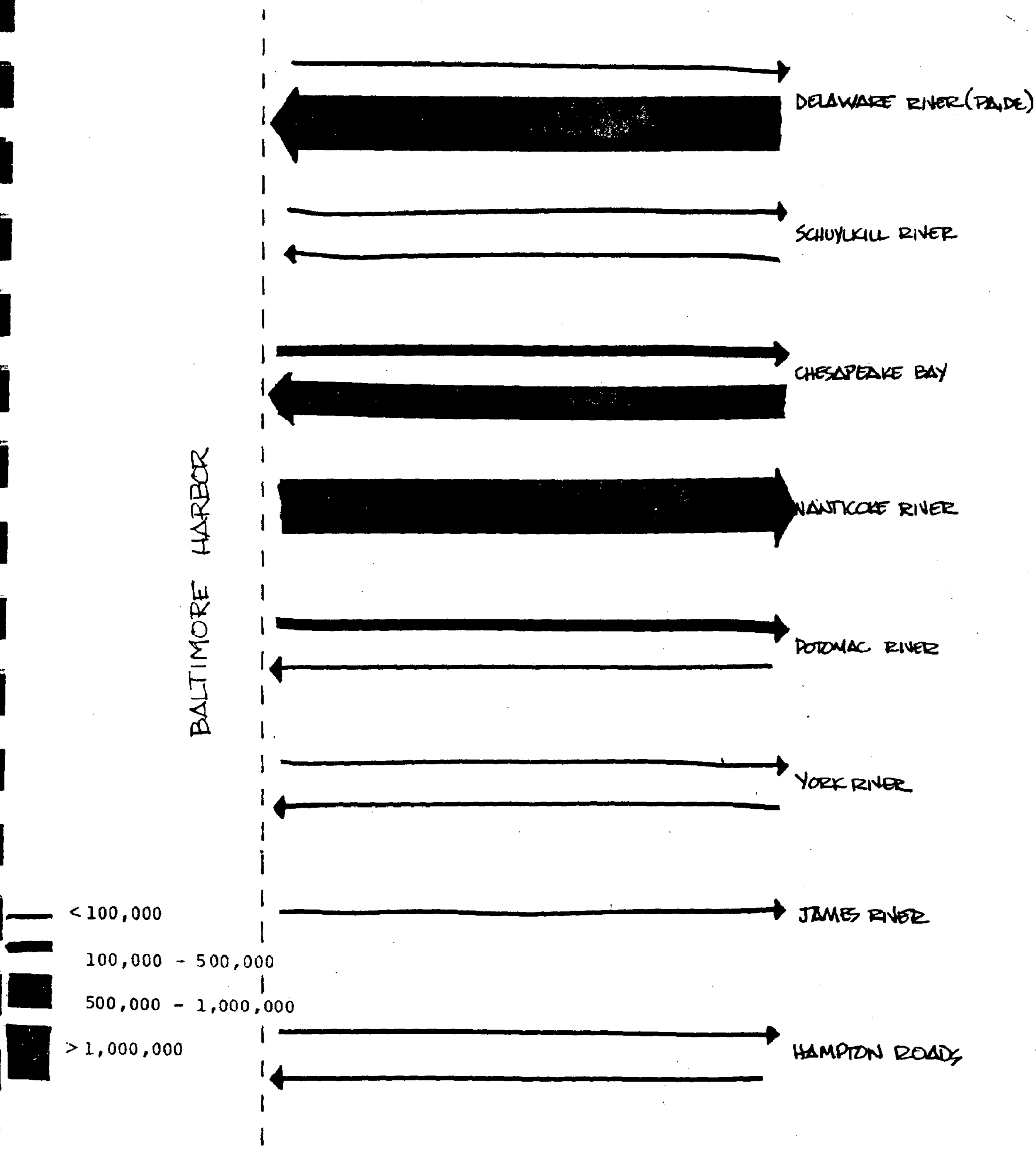



Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

FIGURE III-6

Domestic Inland Traffic Originating and Terminating

In Baltimore Harbor, Residual Fuel Oil (Barrels)

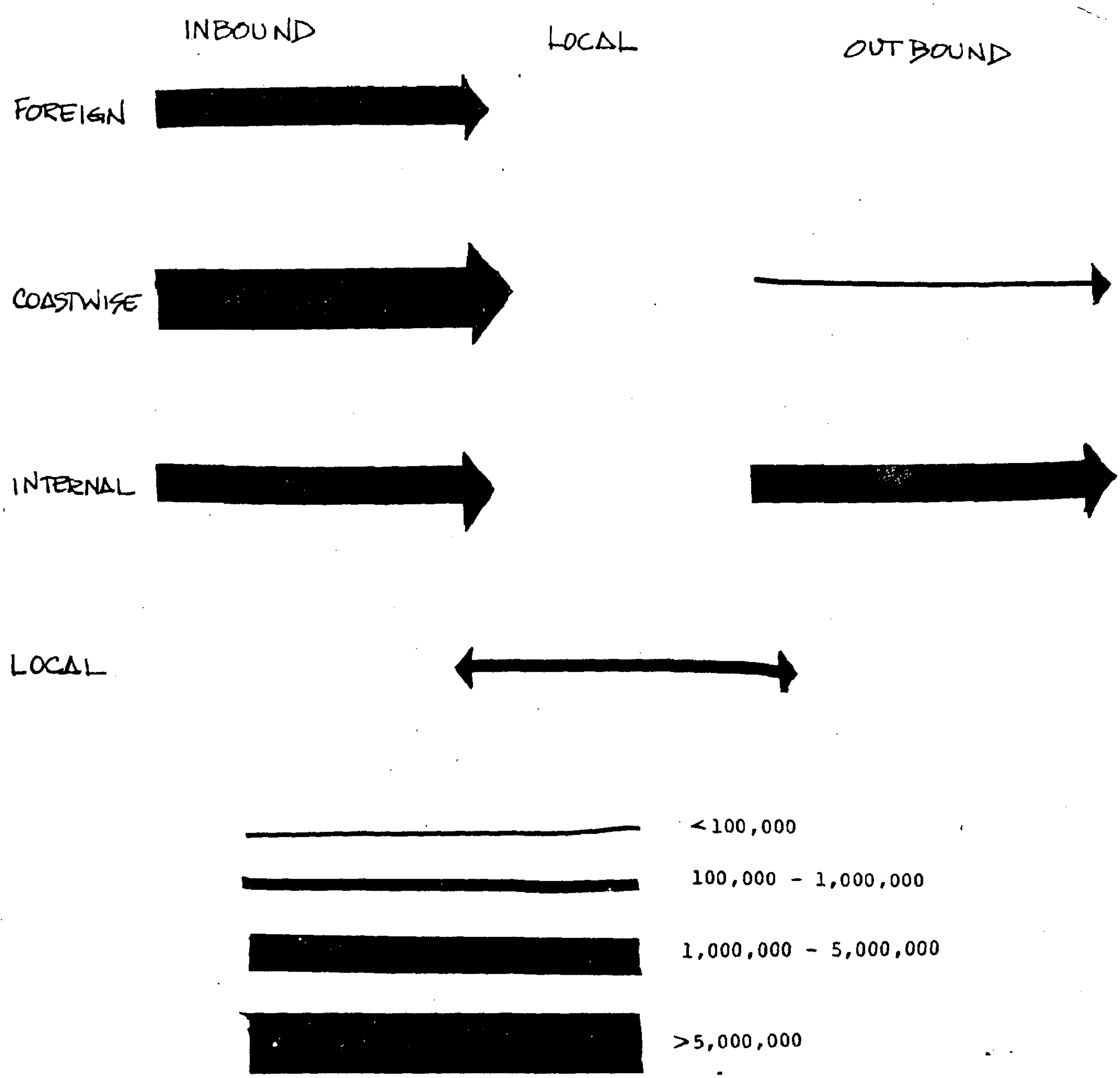



Source: Army Corps of Engineers, Waterborne Movements of the United

FIGURE III-7

Movement By Type Through Baltimore Harbor

Distillate Fuel Oil (Barrels)

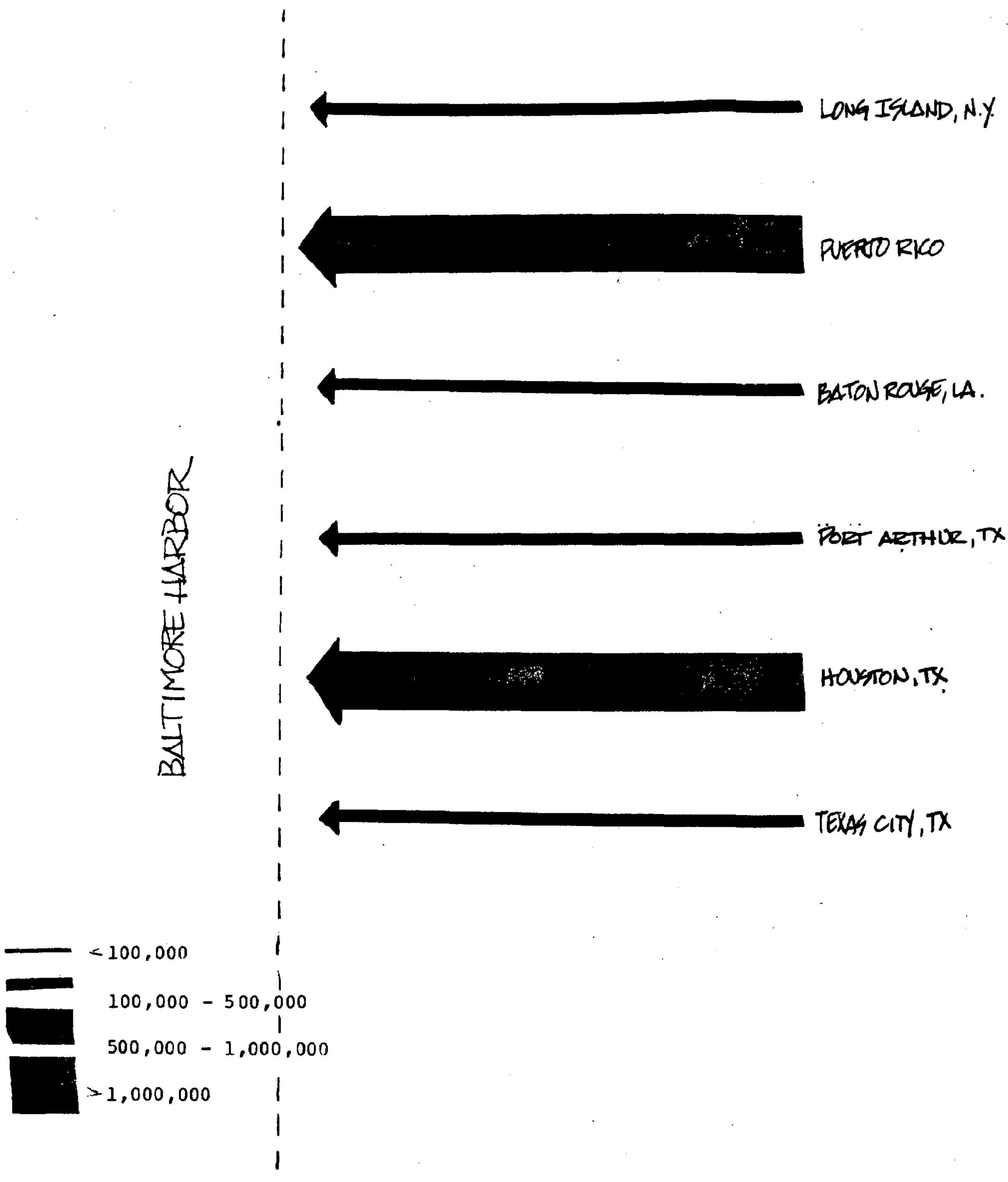



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-8

Coastwise Traffic Originating And Terminating In

Baltimore Harbor, Distillate Fuel Oil (Barrels)

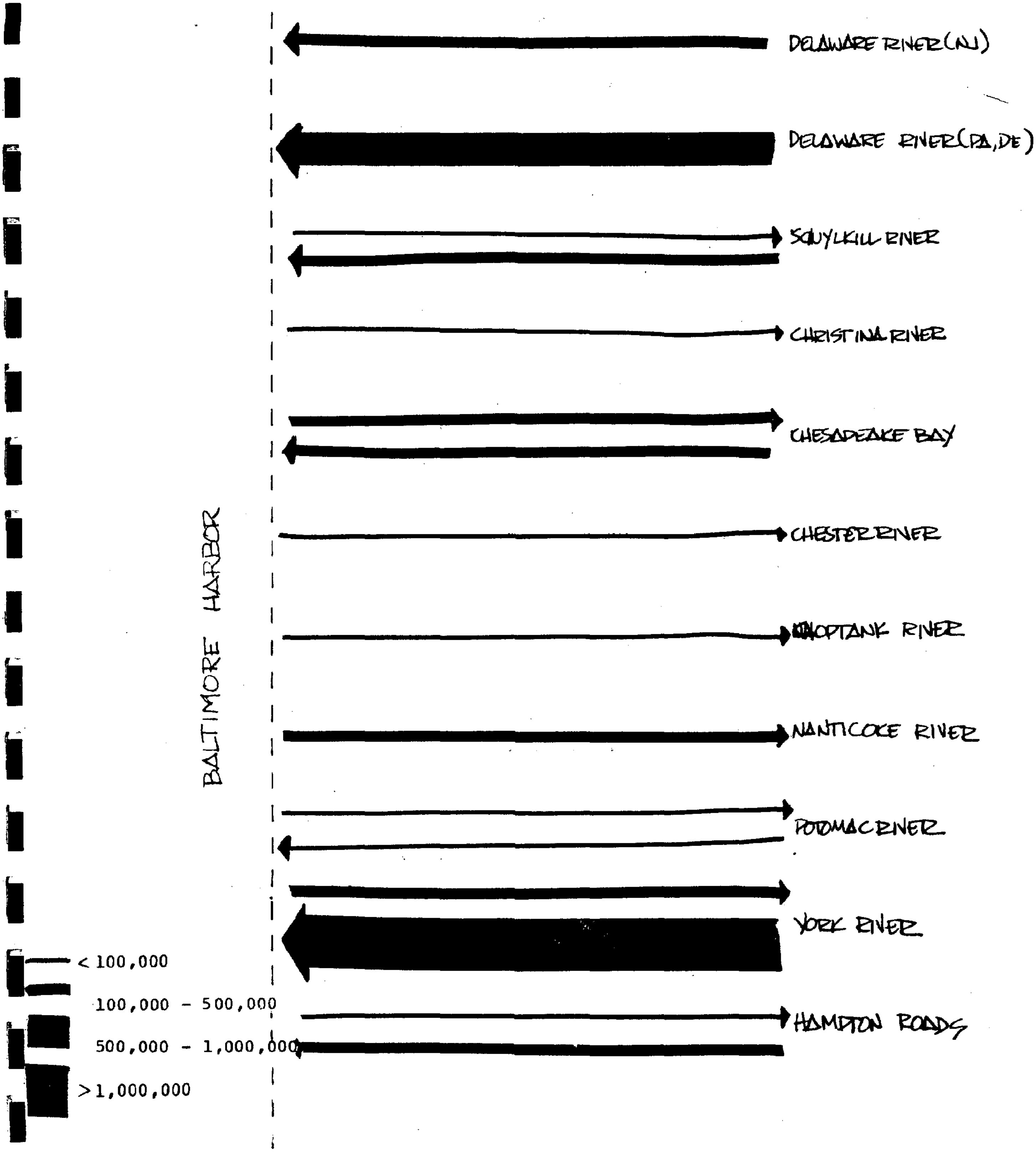



Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

FIGURE III-9

Domestic Inland Traffic Originating and Terminating In

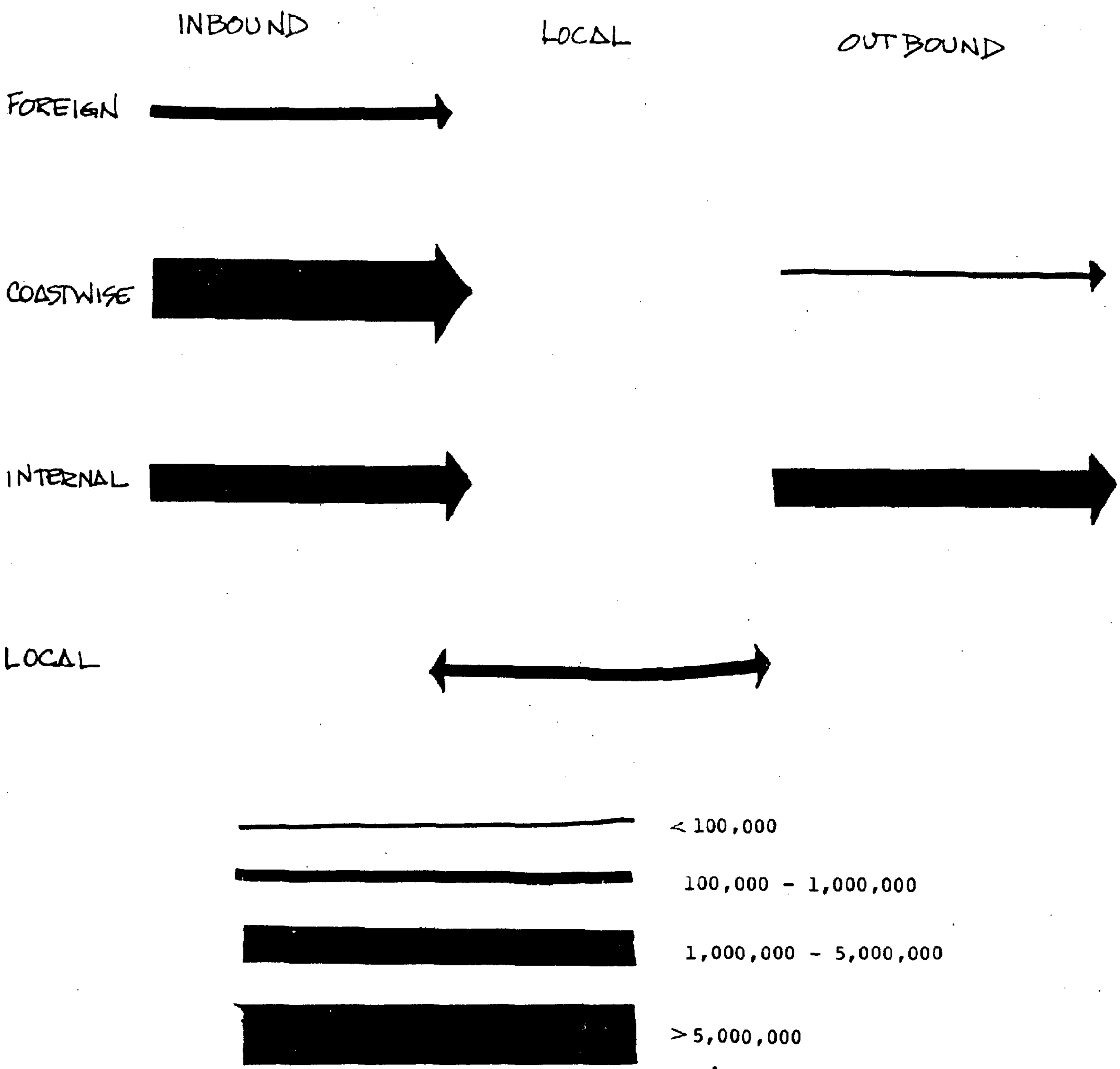
Baltimore Harbor, Distillate Fuel Oil (Barrels)




Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-10

Movement By Type Through Baltimore Harbor, Gasoline (Barrels)

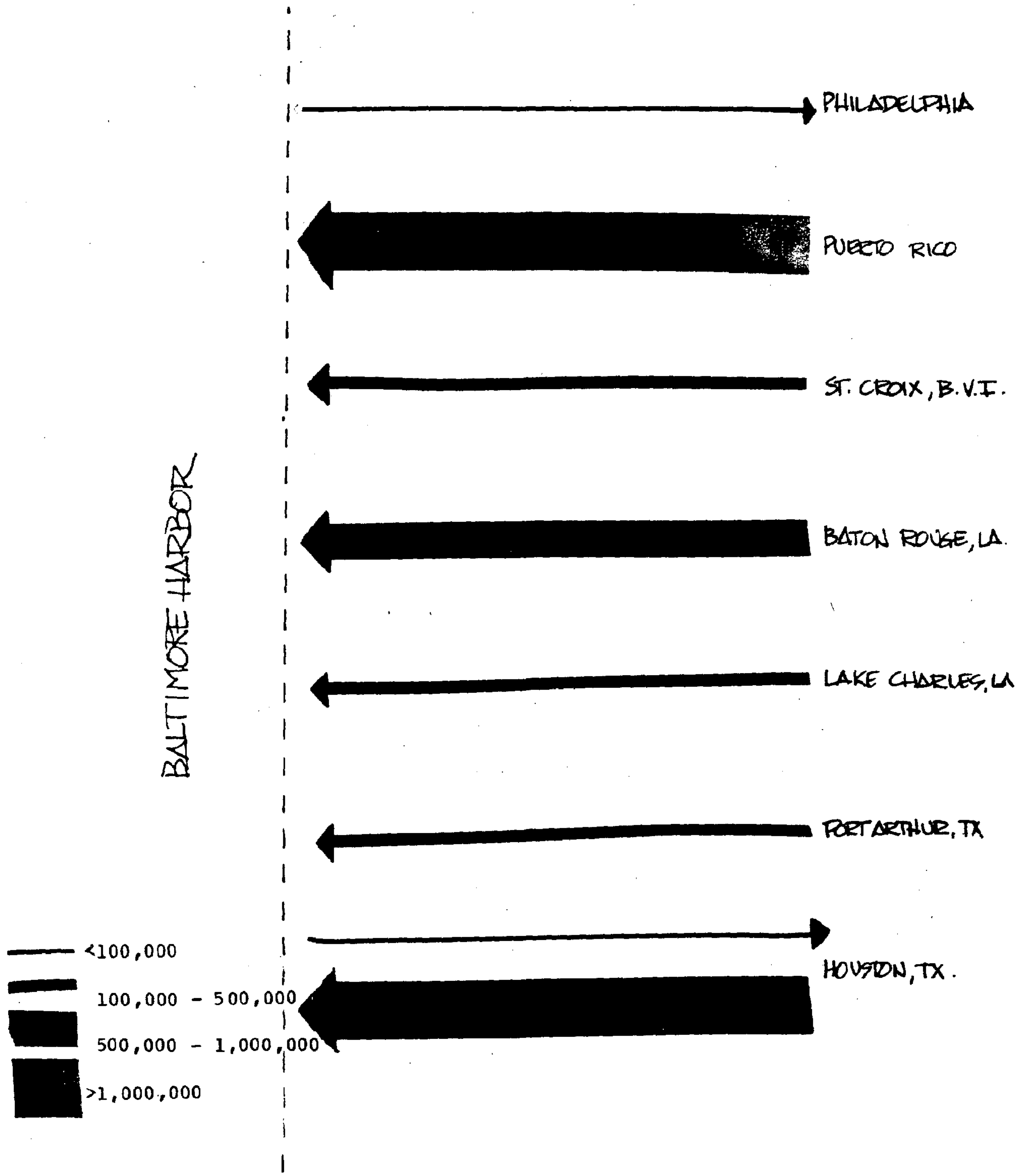



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-11

Coastwise Traffic Originating And Terminating In

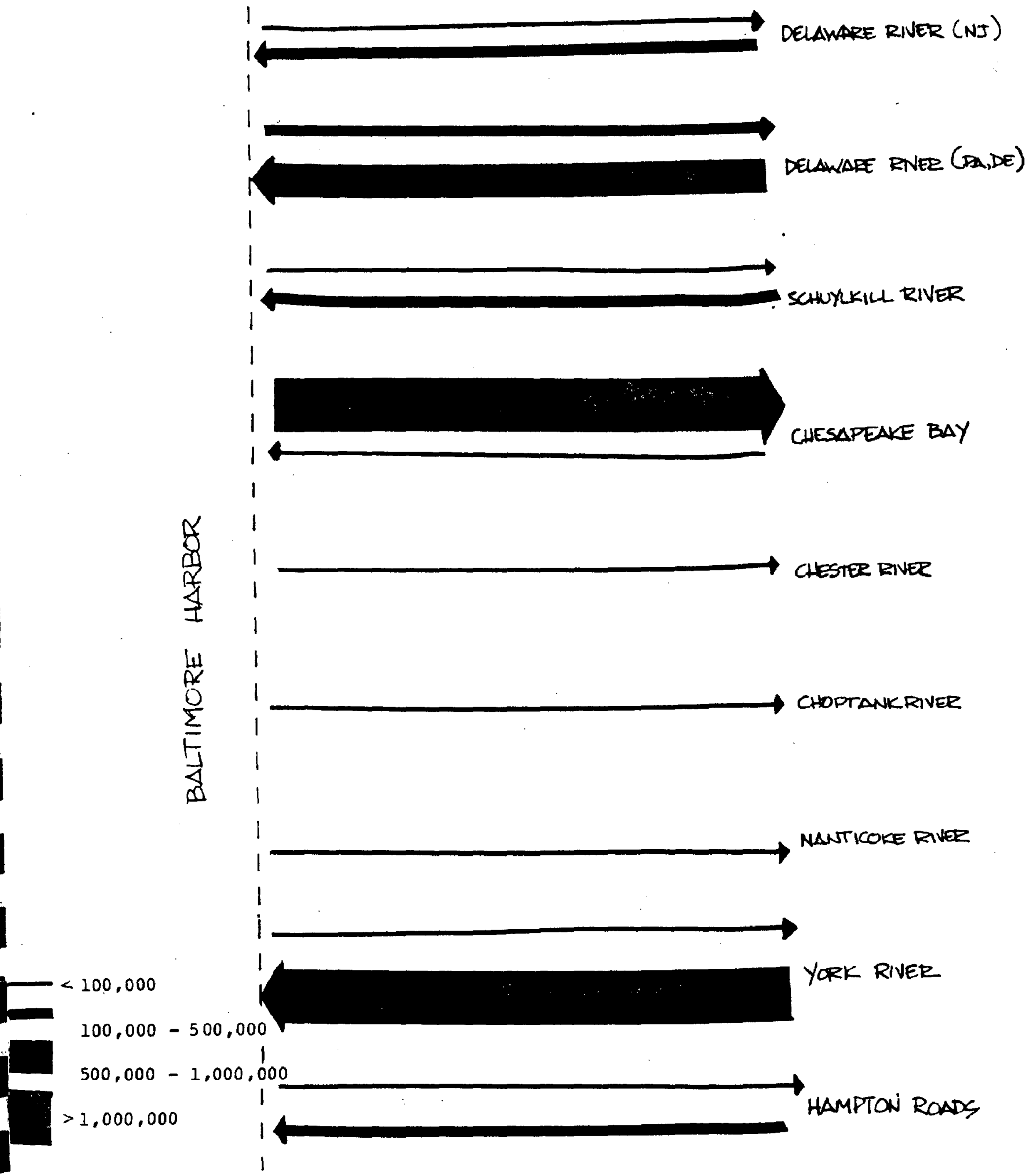
Baltimore Harbor, Gasoline (Barrels)




Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

Domestic Inland Traffic Originating and Terminating In

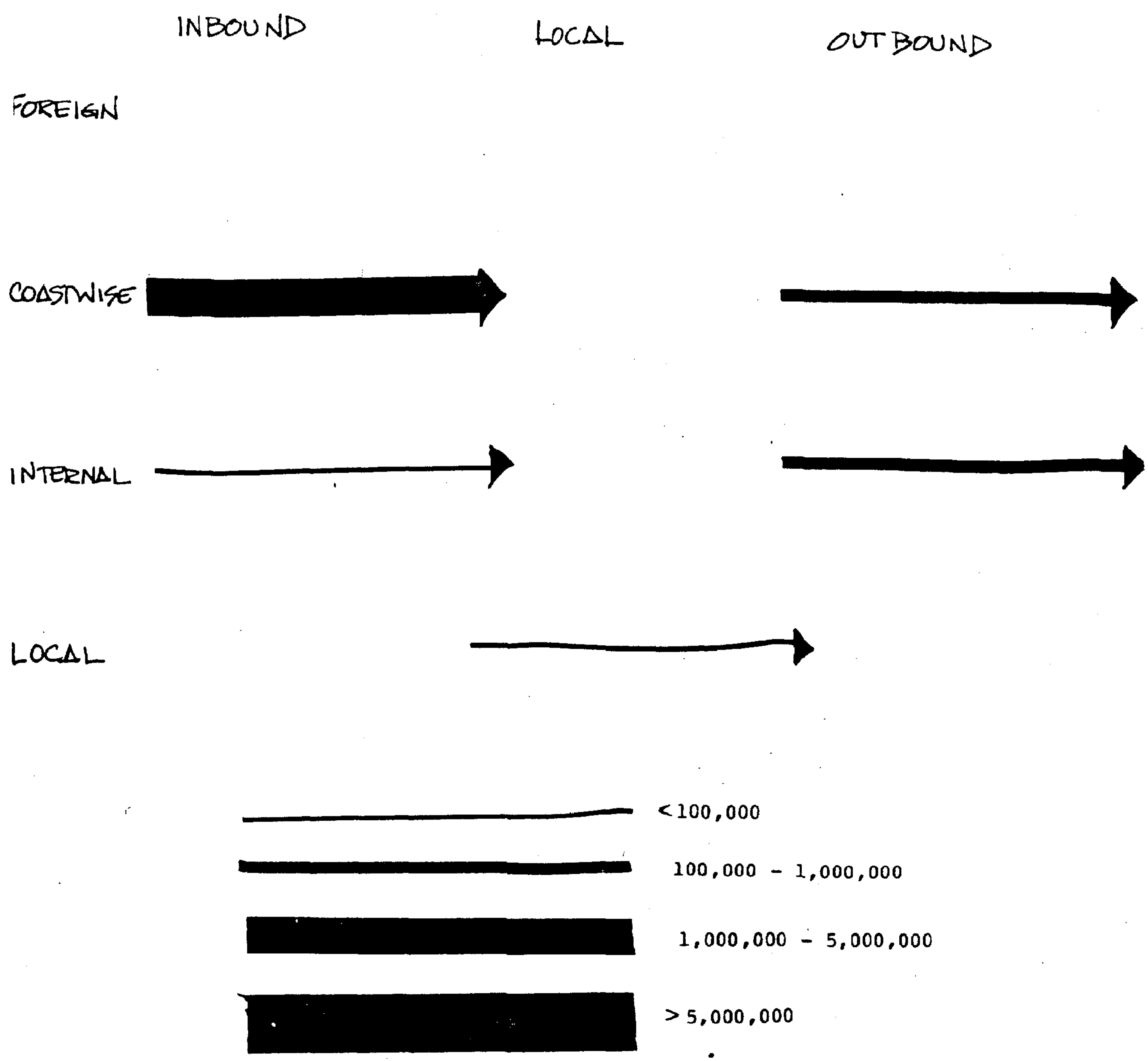
Baltimore Harbor, Gasoline (Barrels)




Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-13

Movement By Type Through Baltimore Harbor, Asphalt, Tars & Pitches (Barrels)

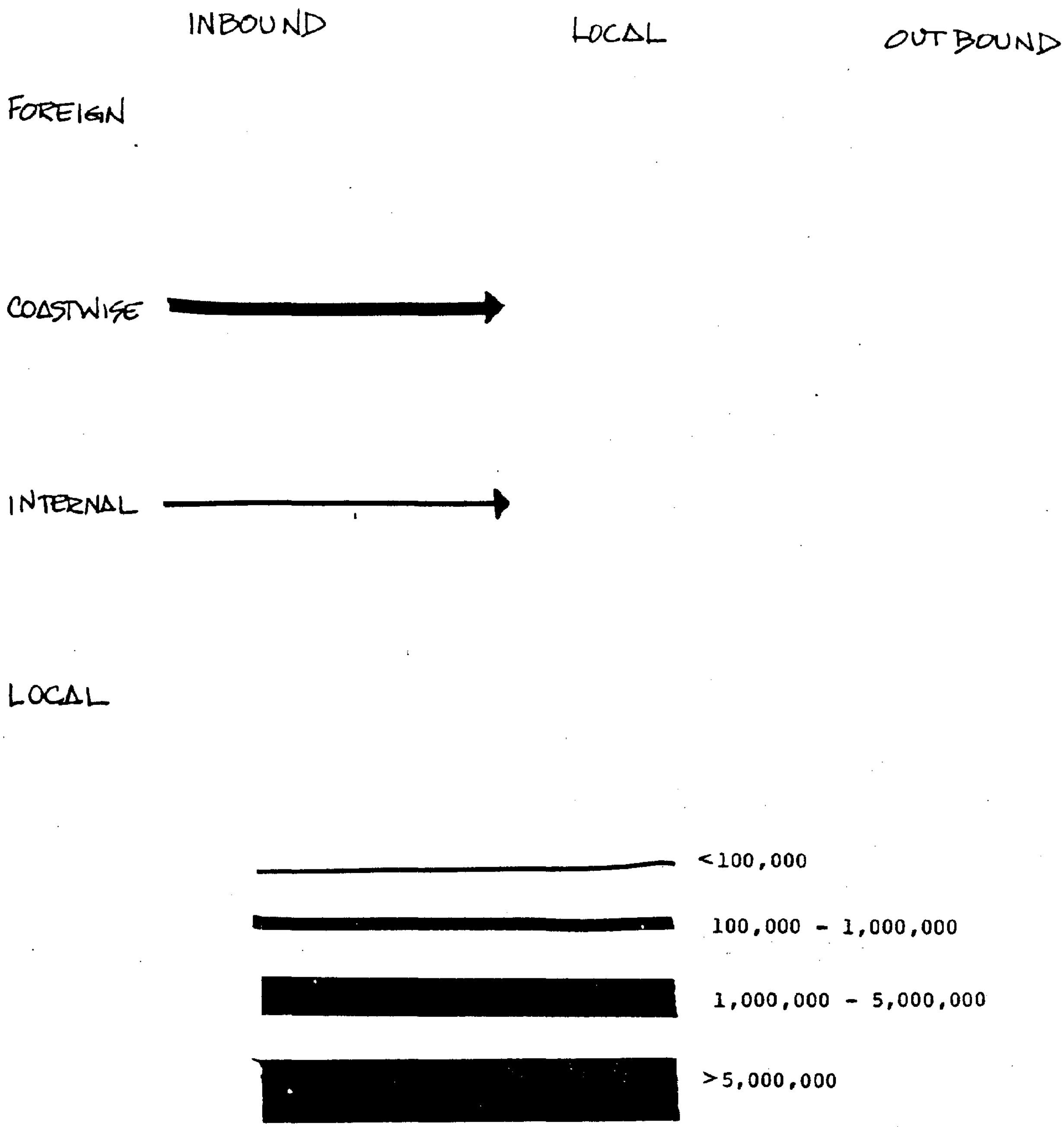



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-14

Coastwise Traffic Originating And Terminating In

Baltimore Harbor, Jet Fuel (Barrels)

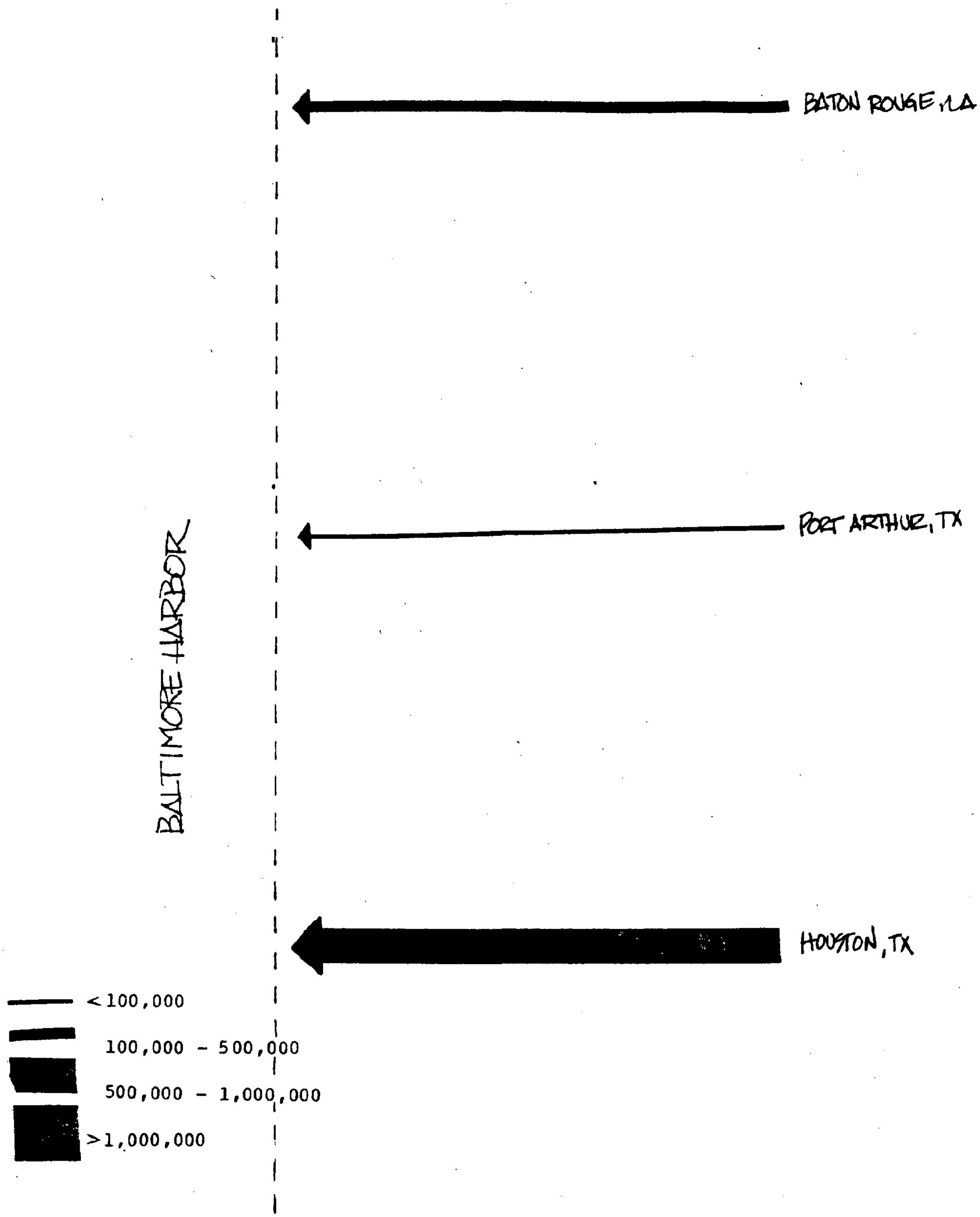



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-15

Domestic Inland Traffic Originating and Terminating In

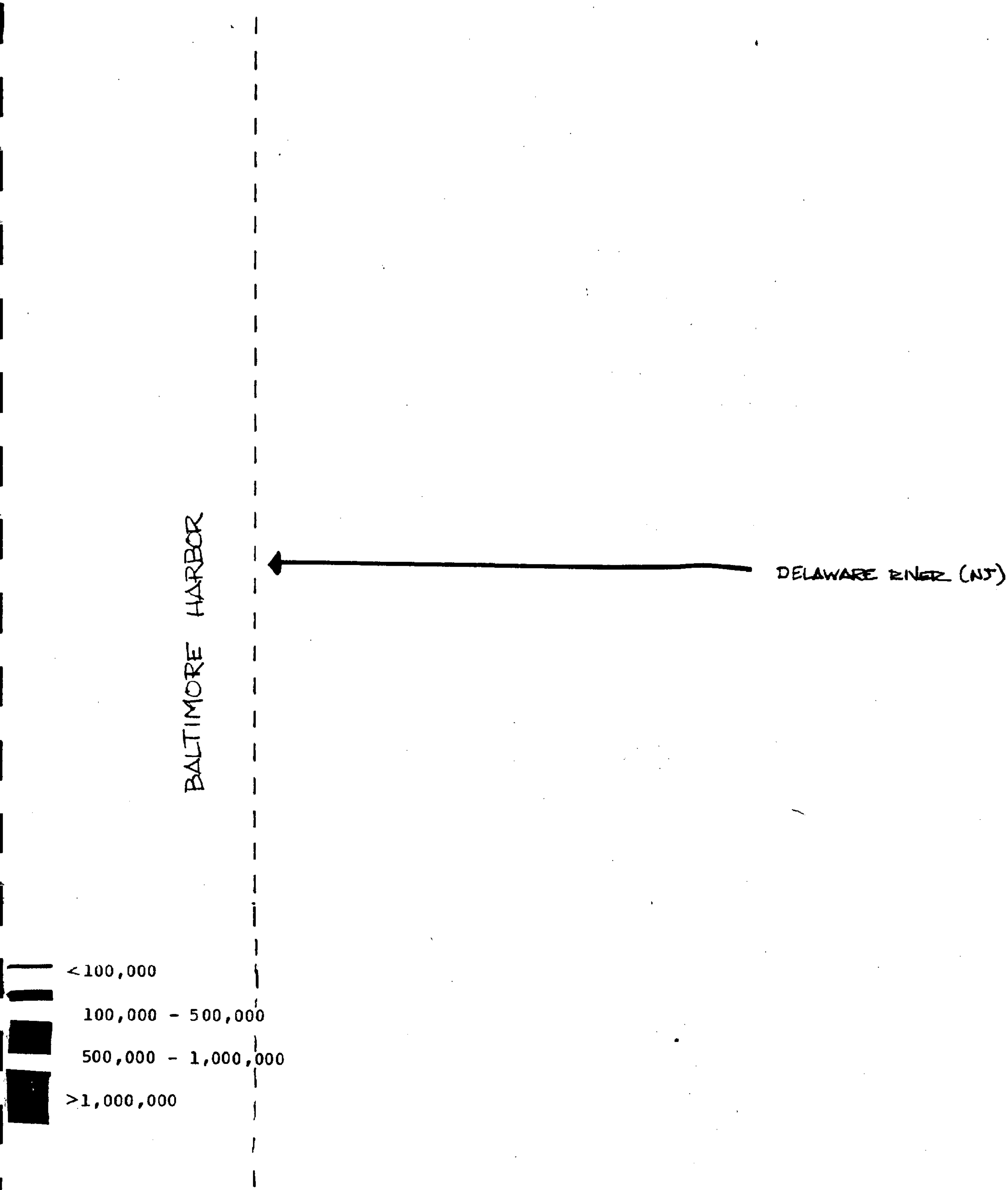
Baltimore Harbor, Jet Fuel (Barrels)




Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

FIGURE III-16

Movement By Type Through Baltimore Harbor, Jet Fuel (Barrels)

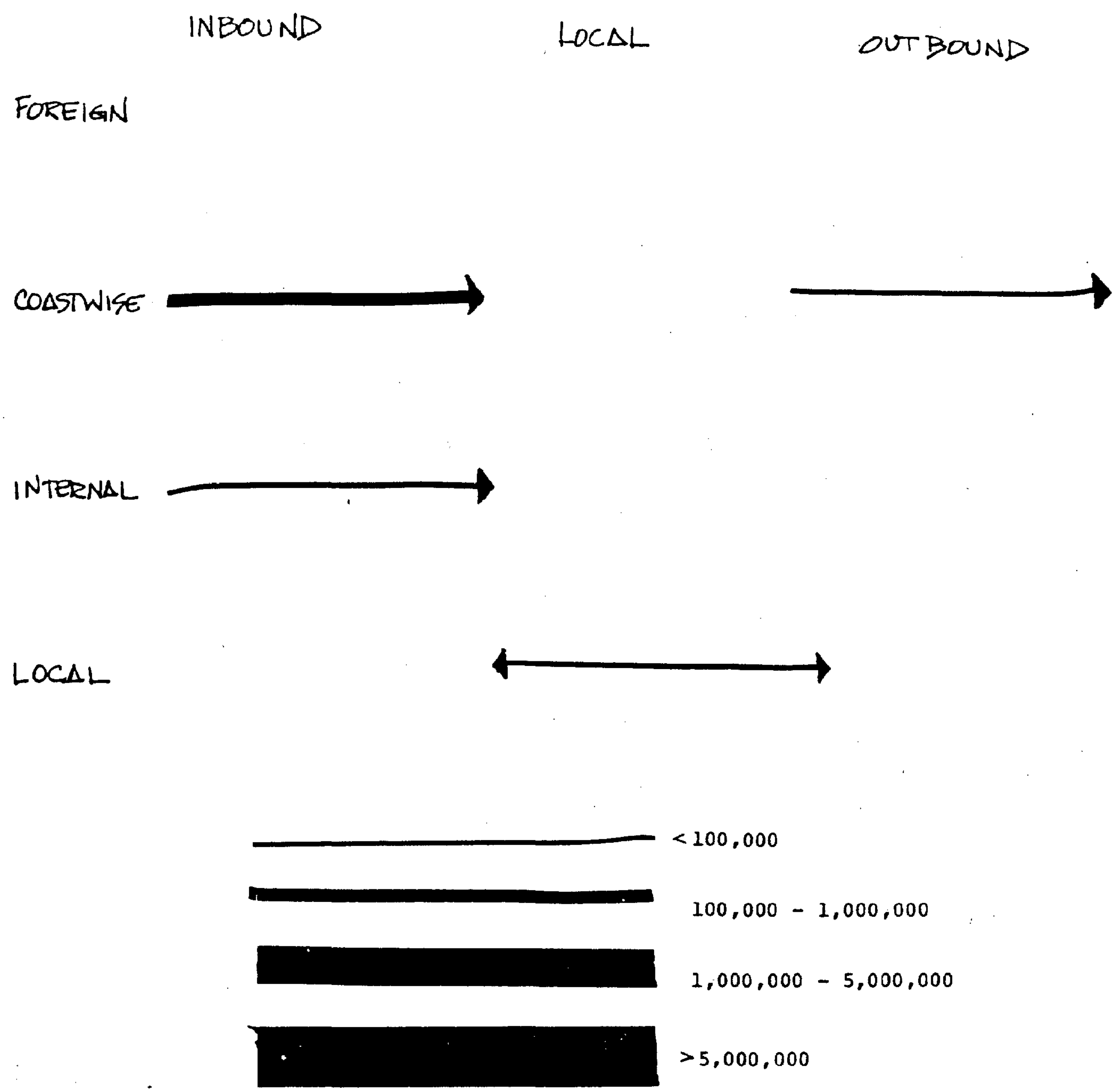



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977

FIGURE III-17

Coastwise Traffic Originating And Terminating In

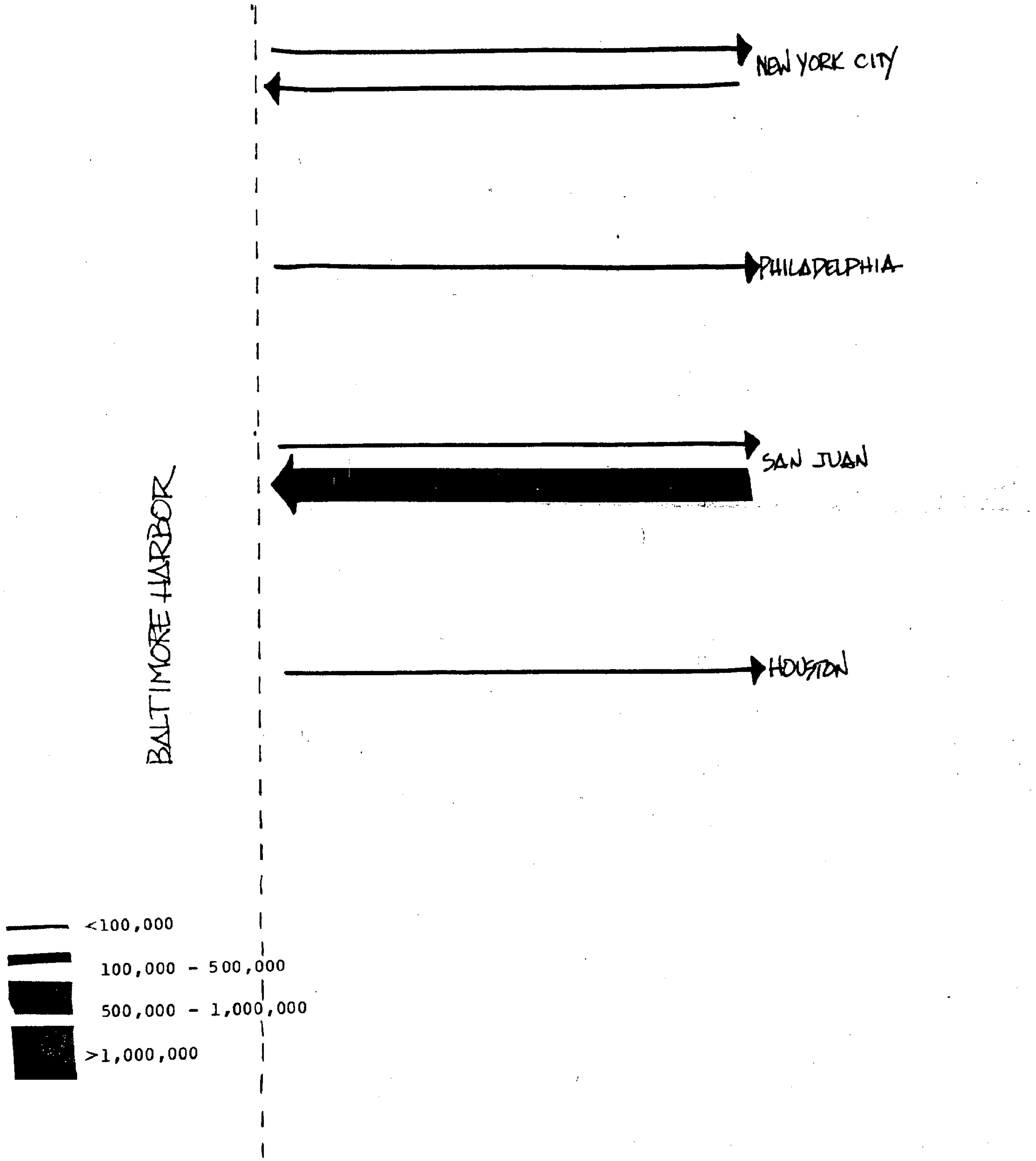
Baltimore Harbor, Naptha And Petroleum Solvents (Barrels)




Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-18

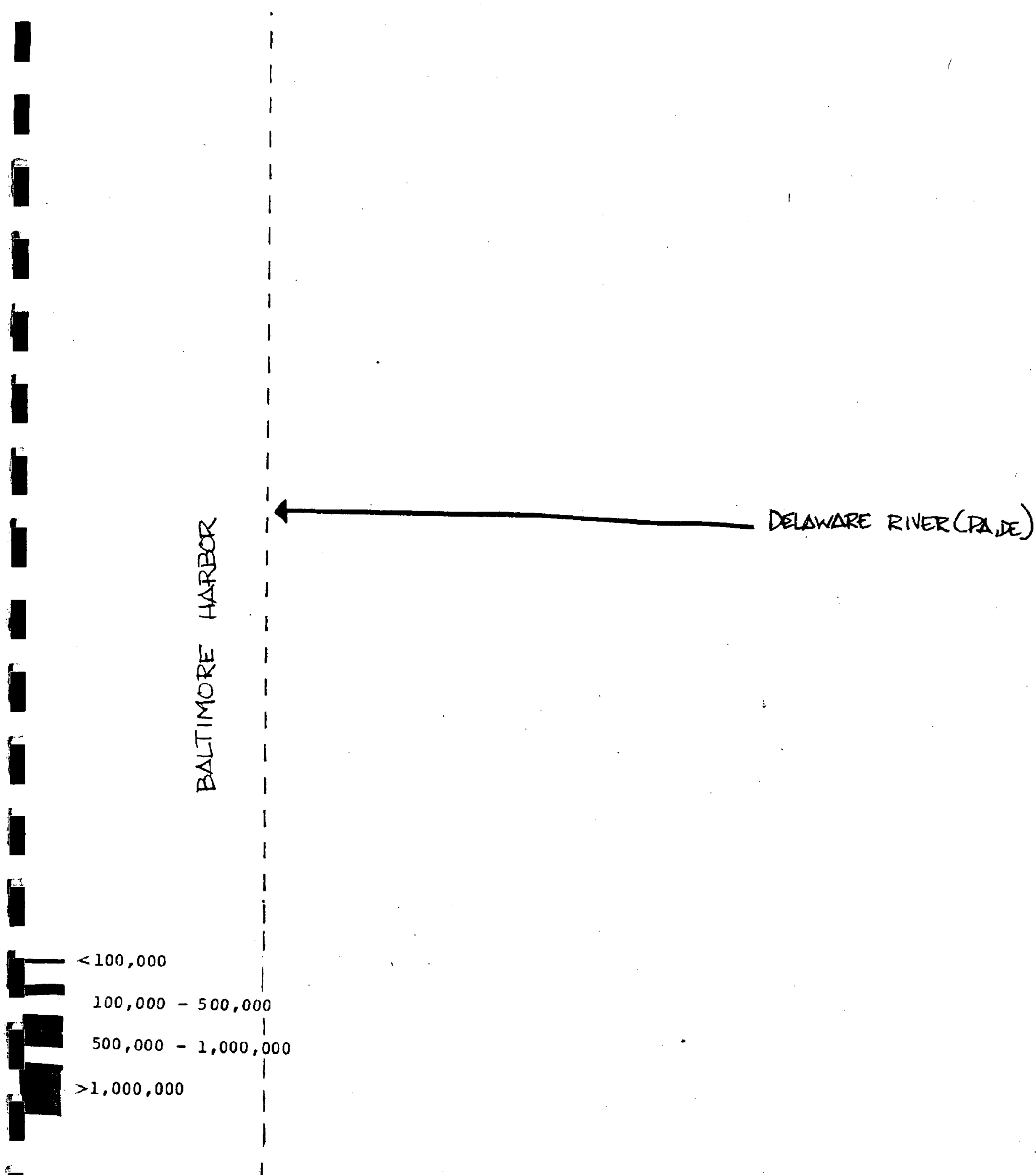
Domestic Inland Traffic Originating and Terminating In Baltimore Harbor, Naptha (Barrels)




Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

FIGURE III-19

Movement By Type Through Baltimore Harbor, Naptha (Barrels)

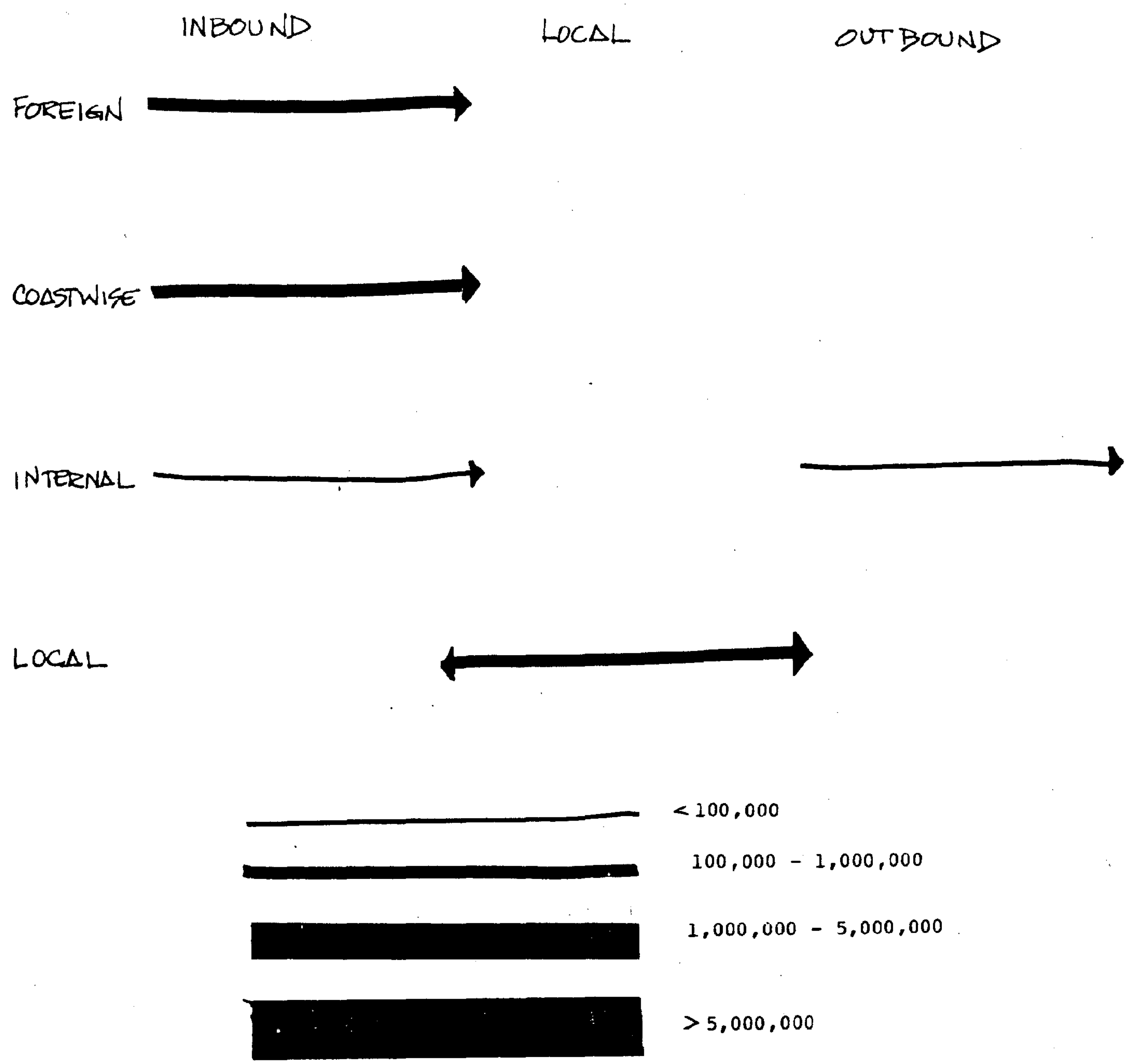



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-20

Coastwise Traffic Originating And Terminating In

Baltimore Harbor, Kerosene (Barrels)

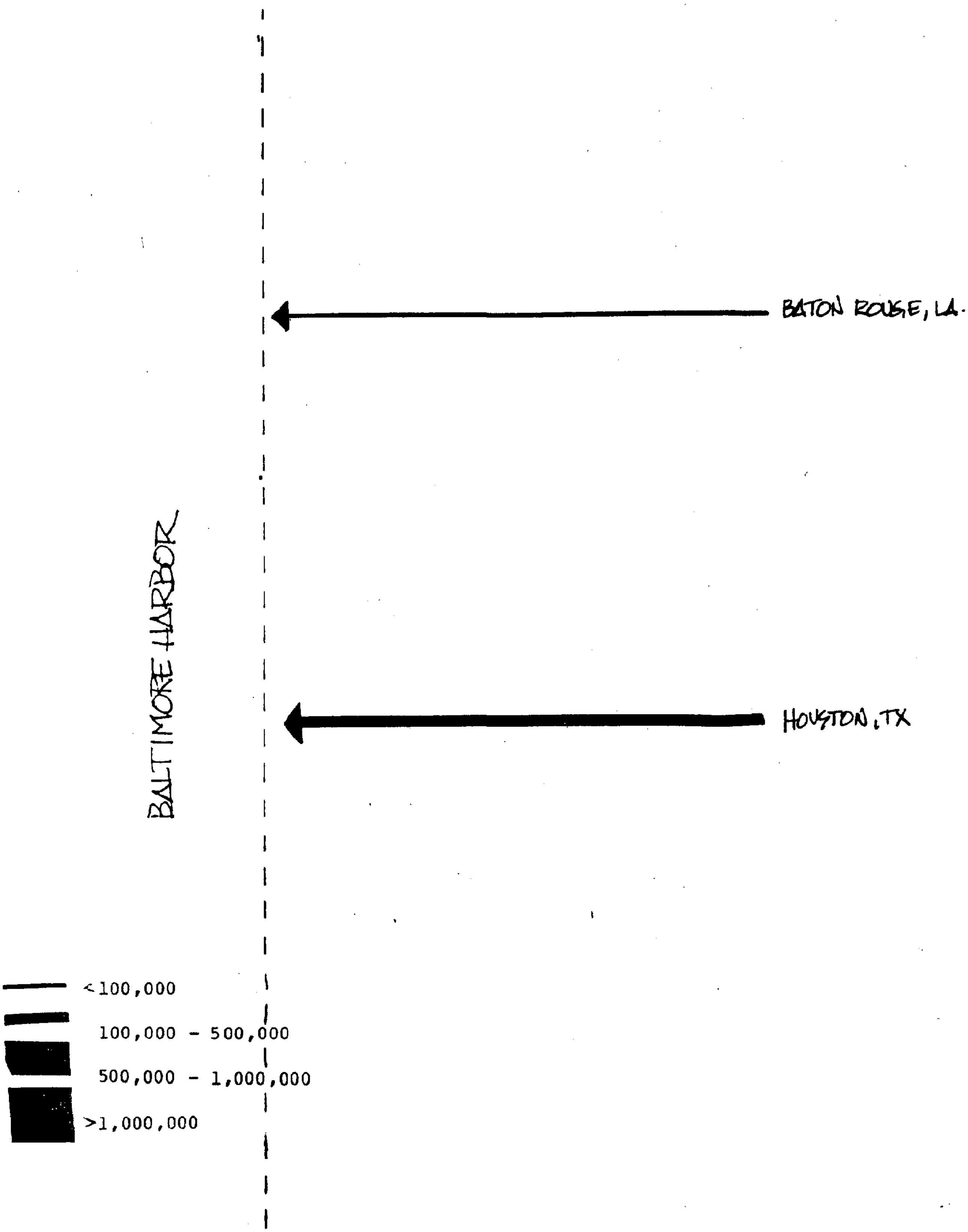



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-21

Domestic Inland Traffic Originating and Terminating In

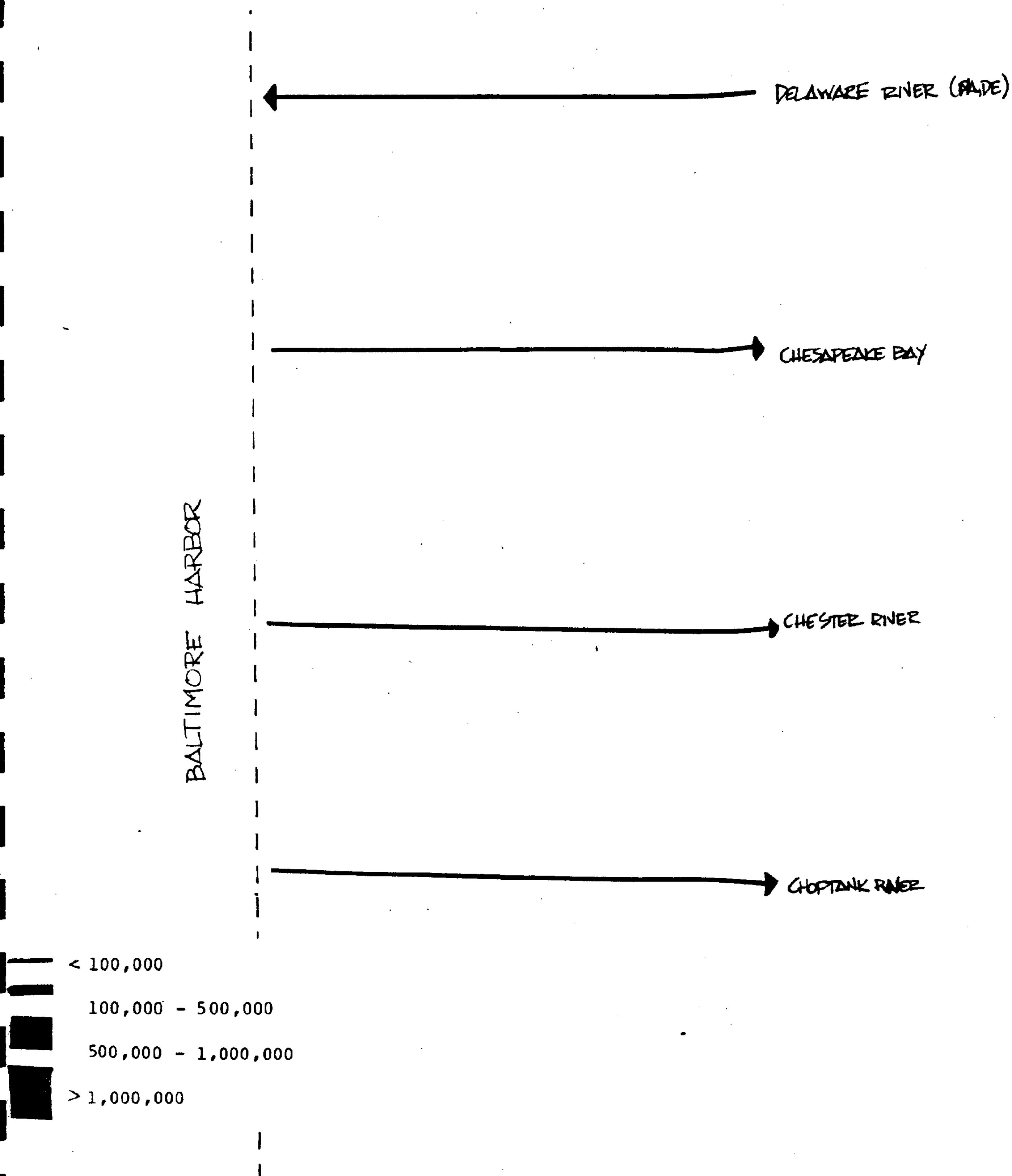
Baltimore Harbor, Kerosene (Barrels)




Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

FIGURE III-22

Movement By Type Through Baltimore Harbor, Kerosene (Barrels)

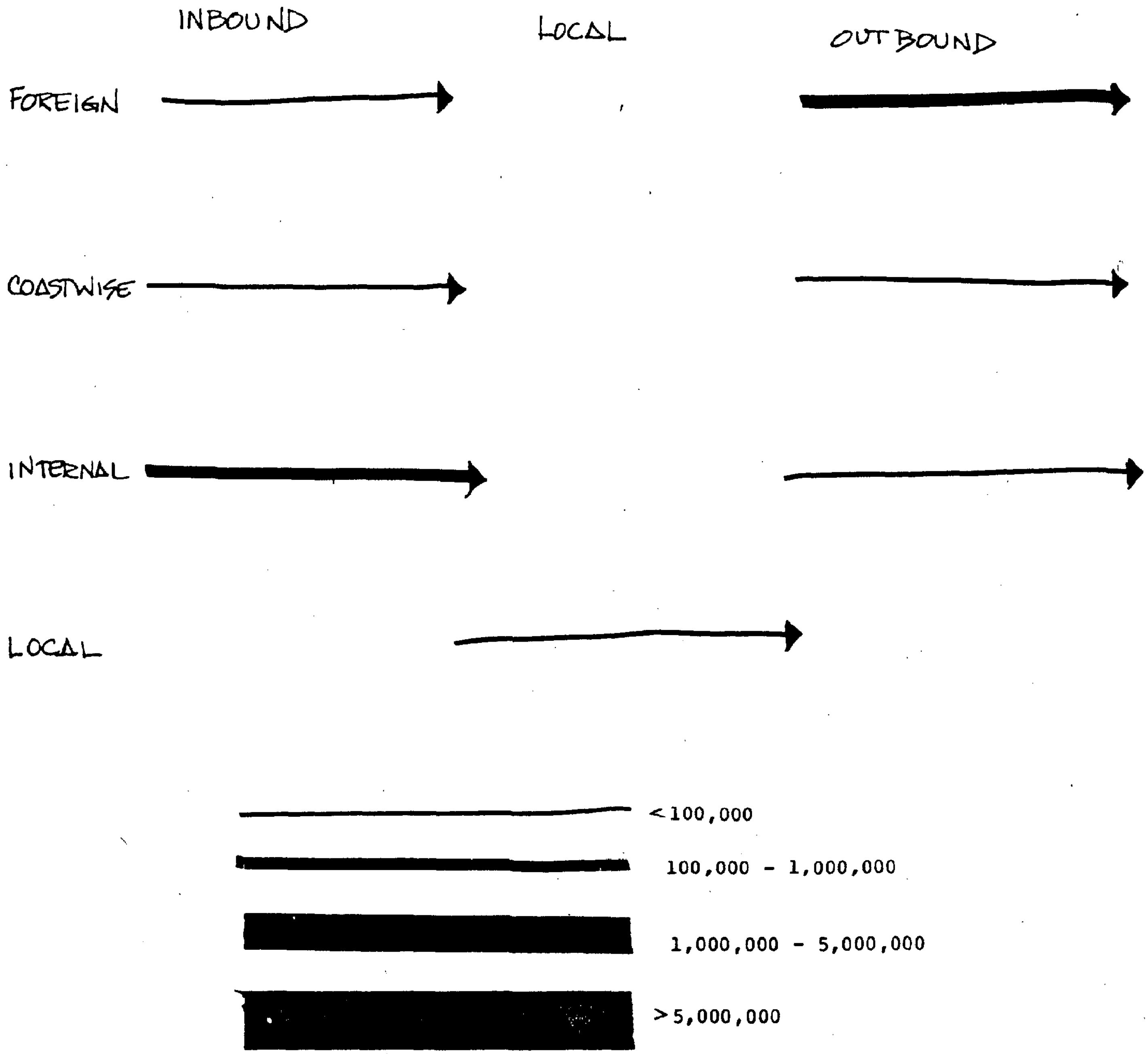



Source: Army Corps of Engineers, Waterborne Movements of the United

FIGURE III-23

Coastwise Traffic Originating And Terminating In

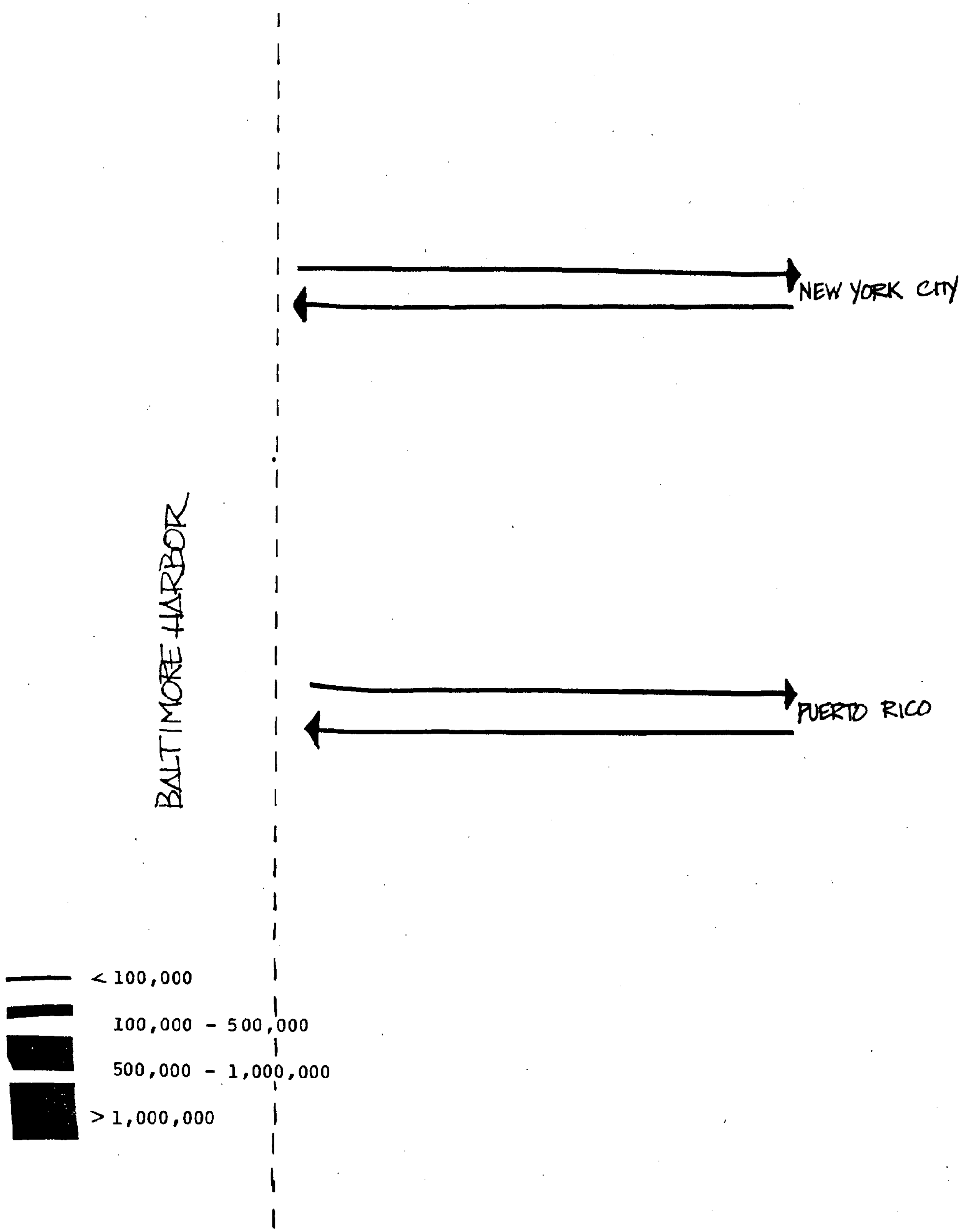
Baltimore Harbor, Lubricating Oils & Greases (Barrels)




Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-24

Domestic Inland Traffic Originating and Terminating In
Baltimore Harbor, Lubricating Oils & Greases (Barrels)

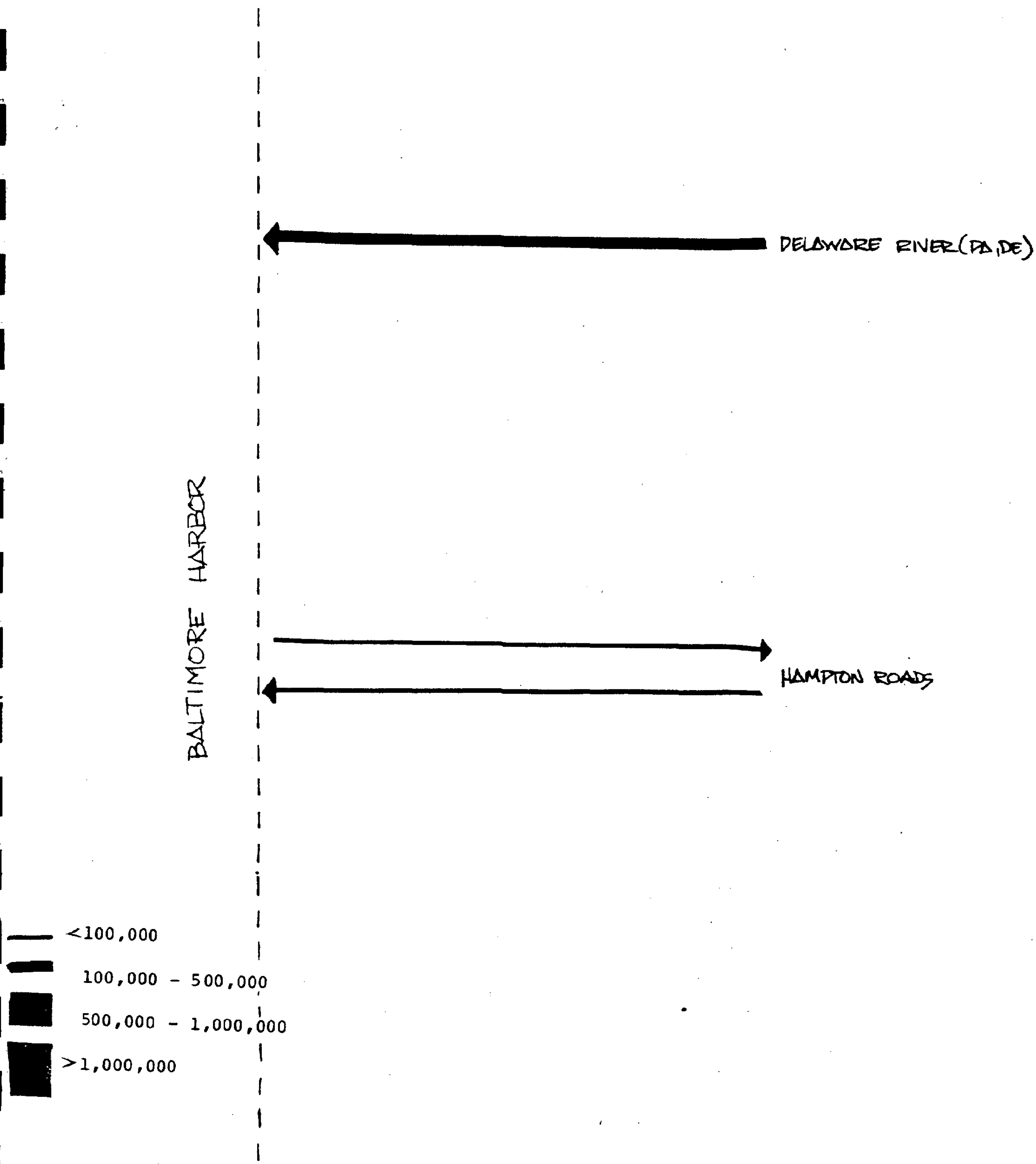



Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

FIGURE III-25

Movement By Type Through Baltimore Harbor,

Lubricating Oils & Greases

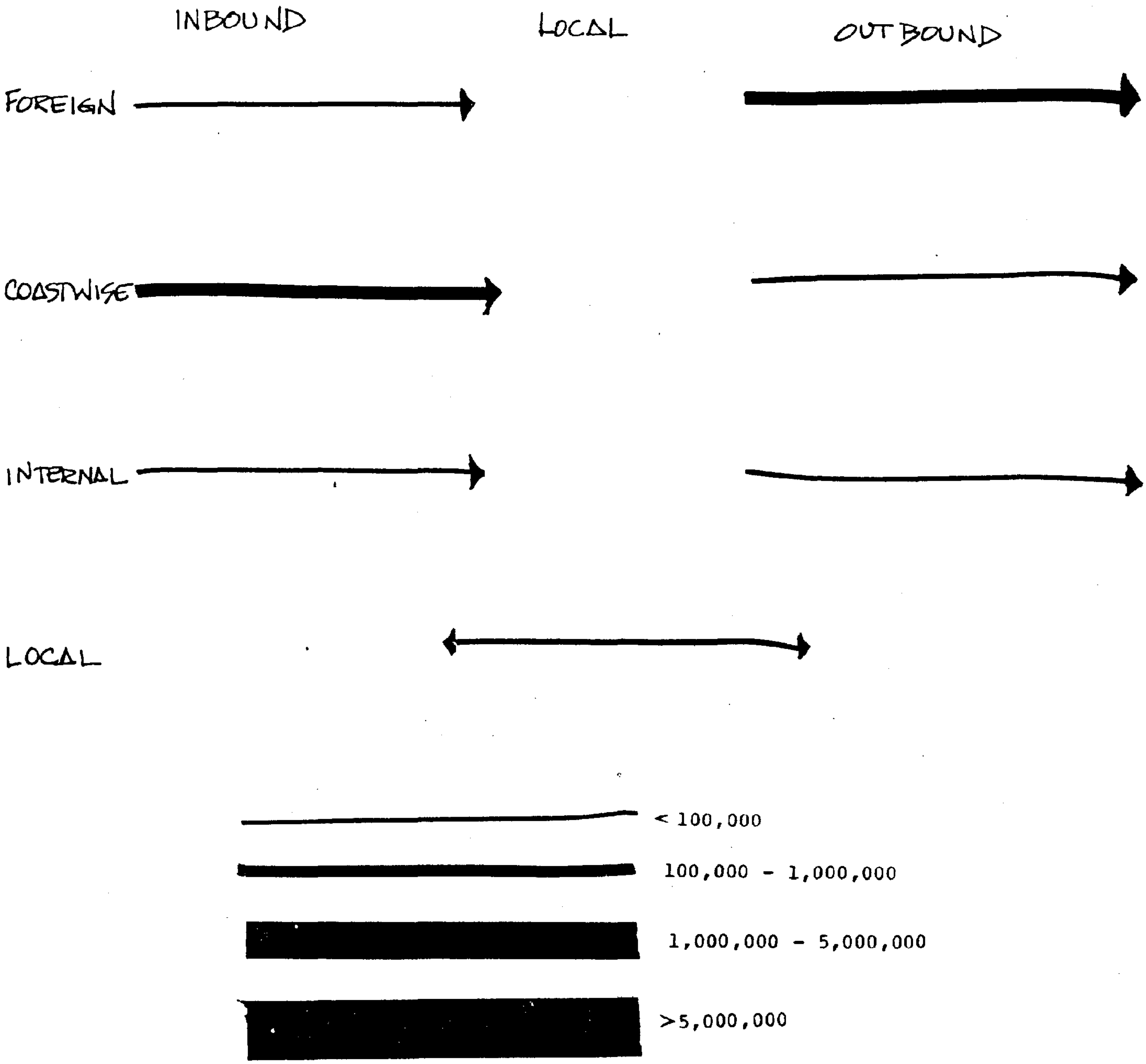



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-26

Coastwise Traffic Originating And Terminating In

Baltimore Harbor, Other Petroleum Products (Barrels)

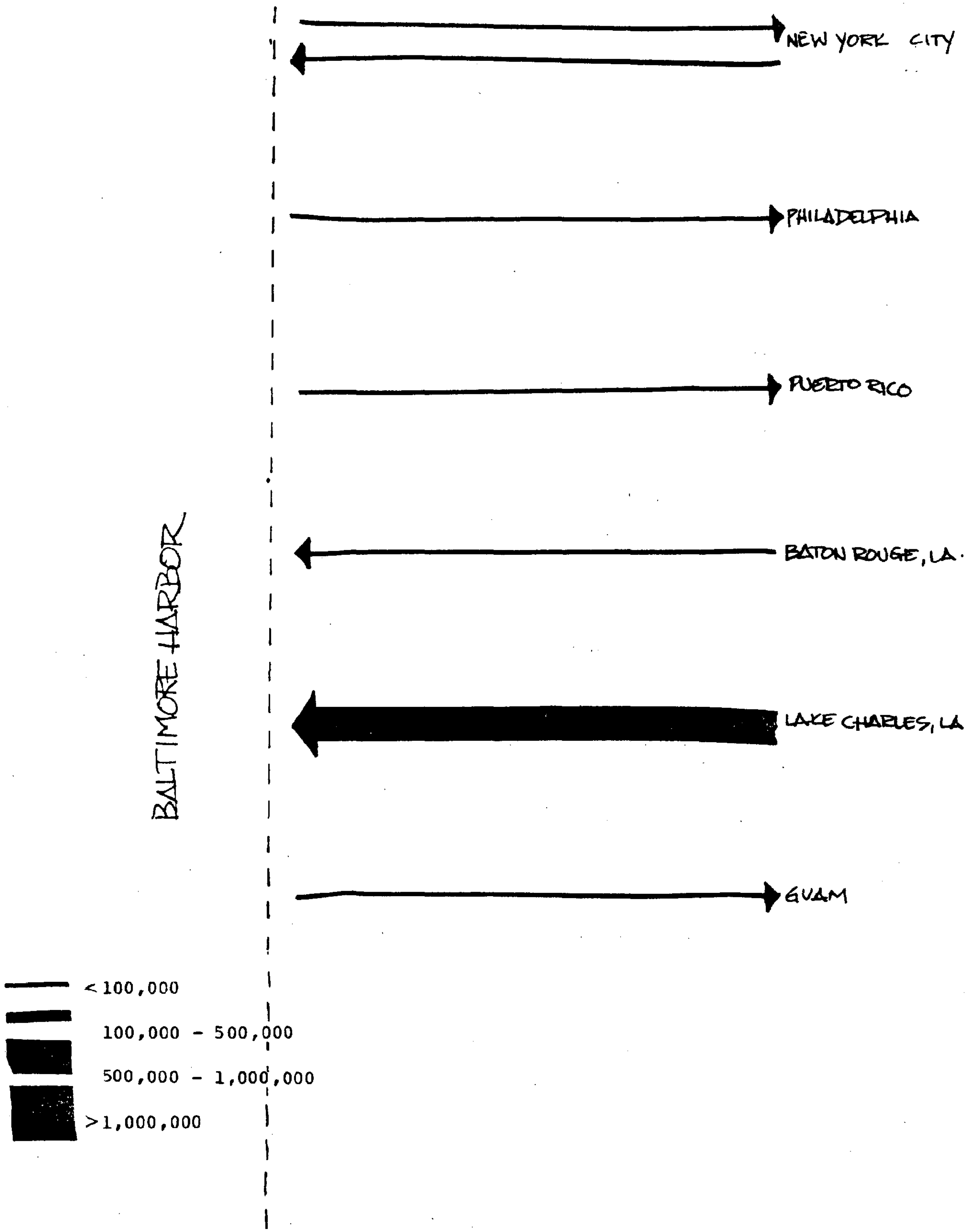



Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

FIGURE III-27

Domestic Inland Traffic Originating and Terminating In

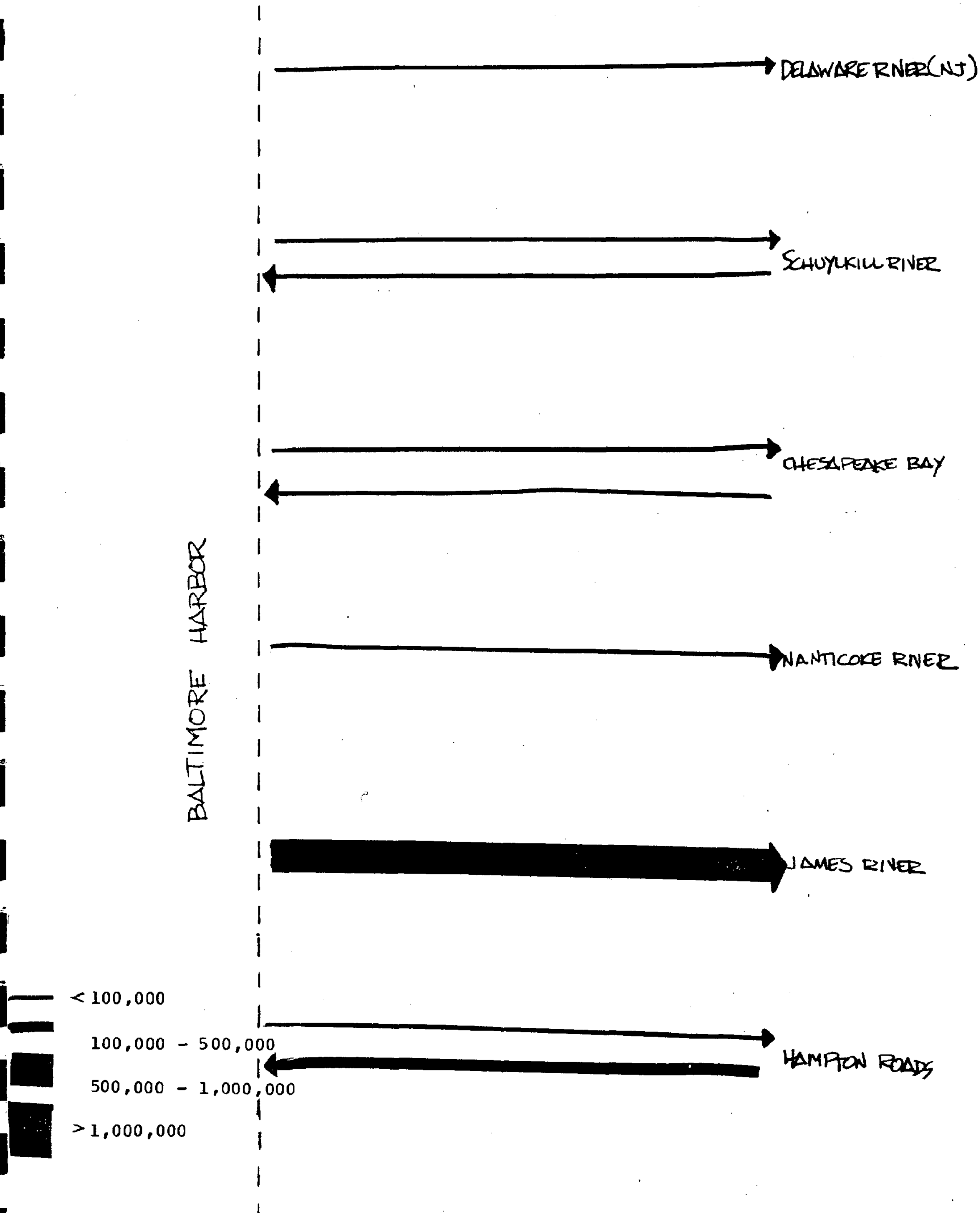
Baltimore Harbor, Other Petroleum Products




Source: Army Corps of Engineers, Unpublished Data for Calendar Year 1977.

FIGURE III-28

Movement By Type Through Baltimore Harbor, Other Petroleum Products




Source: Army Corps of Engineers, Waterborne Movements of the United States, Calendar Year 1977.

# CHAPTER IV--GAS

## A. OVERVIEW

Natural gas is the third most important fuel source consumed in the region after gasoline and residual oil. About 17.6 percent of all fuel consumption in the Baltimore region is natural gas (see Table III-2). Almost half or about 44.6 percent of the natural gas was consumed in residences. Almost one-third or 31.2 percent was consumed by manufacturing establishments. The greatest share (46.5 percent) of natural gas consumed in the region went to Baltimore City, and the immediate area around the city in Baltimore County consumed 29.3 percent (see Table III-3).

The Columbia Gas Transmission Corporation, the sole outside supplier of gas, contracts with BG&E for gas on a daily and annual basis. Columbia supplies BG&E from its traditional sources via pipeline from the southwestern portion of the United States and from special facilities producing SNG and LNG. The BG&E demand charge is based on average maximum daily requirements of 440 million cubic feet per day. This demand charge is paid whether BG&E uses the gas or not. The demand charge is based on an average, however, and the actual peak day in 1978 was 650 million cubic feet per day. It would be very costly to pay for this high peak demand that only occurs one-twentieth of a year. It is therefore economically advantageous for BG&E to have facilities to produce gas for use on those peak days that exceed the average. These facilities are called peak shaving plants.

The following are the key findings of the analysis:

- Traditional sources of supply from Columbia are unlikely to change. Gas will generally be more available. Growth in demand will slow partly because of BG&E policies. Priorities will not be used to allocate gas.

- Columbia's Cove Point LNG facility presents special safety requirements and requires special monitoring at the regional or state level.

- BG&E's present peak shaving plants are unlikely to expand because of slow growth in demand, economic factors and restricted sites.

  -- Spring Gardens LNG plant does not impact the port, has a limited size site, but could possibly expand its storage facilities.

- -- Notch Cliff Propane-Air plant does not directly impact the port. With a shift from oil to gas, expansion of production of this type of gas is possible, but the suburban site may be sensitive to any expansion requirements.

- -- Soller's Point SNG plant directly impacts the port requiring local movement of naphtha by barge. Economics do not now favor expansion, but if expansion should occur, it will be at another site.

## B. SUPPLY

### 1. Historic Supply--Pipeline

Columbia's traditional or "historic" sources of supply come via pipeline from Louisiana, Texas, and Oklahoma in the southwest. Other sources for gas come from offshore in the Gulf and the pipeline company is also exploring for gas at the foothills of the Rockies. Columbia imports gas from Canada and Mexico but most of these sources are tied in with other systems and do not affect Baltimore.

The Columbia gasline comes from Columbia to Loudoun, Virginia to Washington, D.C. and goes northeast passing north of Baltimore. At this point there are 10 gate stations that take gas off the Columbia pipeline into the Baltimore distribution system. The gas is maintained constantly under pressure. Pressure at the mainline gates and in the periphery is higher than in the older portions of the pipeline system toward the center of the city. At the mainline gate station pressure is 300 to 400 pounds per square inch (psi). The Baltimore system branch line cuts it down to 200 psi. The older system toward the center is composed of cast iron pipes and has lower pressure of 10 psi. For example, when a line comes into Spring Gardens located at the center of the system the pressure is considerably reduced. Generally in the city, gas is at a medium or low pressure. A complete new system would all be under high pressure. There would be less pipe in the ground for the same deliverability. All the lines are underground except on bridges. Currently, no physical constraints exist on the operation of the pipeline, and enough compression exists to push the gas. Nevertheless, Columbia may have to consider more compression and an additional pipeline five years hence.

### 2. Other Special Sources of Supply

Columbia has other sources of supply. These sources are not strictly incremental but are "rolled in" with gas along with other Columbia sources and they are not separately priced. At any one time there might be a mix of different sources of gas in the system and it would be very difficult to determine, if at all, the exact mix of gas from various sources at any one time.

#### a. SNG

Columbia has a synthetic gas plant at Greenspan, Ohio which accounts for about eight percent of the gas coming in by pipeline to Baltimore.

It is impossible to determine exactly how much Baltimore is getting from this source at any one time.

b. LNG--Cove Point, Maryland

In 1973 Columbia LNG Corporation, in cooperation with the Consolidated Natural Gas Company, began construction of a liquified natural gas facility (LNG) on a 1,022 acre tract at Cove Point in Calvert County, situated on the Chesapeake Bay. It was completed early in 1978 with the first tanker arriving in March. The El Paso LNG Company owned and operated the tanker carriers which supplied the facility and delivered the gas from Agew, Algeria to Maryland. Each carrier has a capacity of 125,000 cubic feet (33 million gallons) of LNG. LNG tankers are approximately 1,000 feet in length and 140 feet wide.

In 1977, the last year for which data were available, 5,260,000 of liquified gas were received by Baltimore from foreign sources. Another almost equal amount was shipped out to other ports on the coast.1/

At Cove Point, the land facility consists of storage sections with four tanks each, holding 62,000 cubic meters (370,000 barrels) of LNG, a regasification (vaporizer) facility, administrative control buildings, fire/water tanks, send-out pumps, and service buildings. The bay docking and offshore terminal is located about 5,300 feet off shore. It has two tanker berths along the 2,500-foot pier which is connected to the shore by an underground tunnel containing both LNG pipes and vapor return lines. As originally planned, it called for having two ships arriving every week. However, the Cove Point facility had start-up problems during the next year and a half. The problems had to do with the availability of ships and the schedule of Algerian production itself.

After the LNG is docked at the facility, pumps in the tanker discharge LNG into receiving tanks at each berth. From these vessels the liquid is relayed by booster pumps through the tunnel to onshore storage tanks. The liquid is withdrawn from short tanks, heated, and converted back to natural gas. After regasification, it is moved out through an 87-mile, 36-inch underground pipeline to Loudoun County, Virginia to join the Columbia main pipeline. It was originally expected that the facility would process 110 billion cubic feet of gas annually. In actual fact, however, the amount imported at Cove Point only provides eight percent of the Columbia total supply of gas to Baltimore.

Baltimore may at one time get a mix varying from 100 percent LNG to 100 percent historic gas and anywhere in between depending on the condition of the system. Some component of BG&E's gas may always be LNG. BG&E is the first customer--after it is discharged from Cove Point. In the summertime, it may be as much as 100 percent LNG, and in the winter, gas may be down to 50 percent LNG.

---

1/Waterborne Commerce of the United States, Calendar Year 1977, Part I, Waterways and Harbors, Atlantic Coast, Department of Army, Corps of Engineers.

3. Peak Shaving Plants

BG&E has three peak shaving plants, an LNG plant at Spring Gardens, a propane-air plant at Notch Cliff, and an SNG plant at Soller's Point near BG&E's Riverside plant.

a. Spring Gardens LNG Plant

At Spring Gardens, in the City of Baltimore, BG&E takes gas from the pipeline and liquifies it, stores it and eventually sends it out into the system during the winter. The facility has a storage capacity of 1 billion cubic feet and a send out capacity of 187 million cubic feet per day. If BG&E had to operate the plant for a sustained period, it would run out. Once this plant goes dry, it is out of business. It is generally not possible to liquify in the winter and BG&E must, therefore, wait for the summer. Pressure drops on the pipeline in the winter are higher, making liquification impractical. To liquify, BG&E has to remove certain contaminants such a carbon dioxide and heavy hydrocarbons such as propane and butane. The gas is then refrigerated at 263° F at which point it turns liquid. It is then stored in insulated tanks and withdrawn during the winter and vaporized as needed. The processing plant has three storage tanks and four pressure tanks.

Spring Gardens is located on the middle branch and used to get its oil by barge but barge access is not possible now. There is a rail siding at Spring Gardens but it is rarely used. It was refurbished when the plant was built. Spring Gardens used to be a coal- and oil-fired plant. During the last 20 years it has not been used as such. Highway access to the site is more dependable and is considered good, although the condition of the roads is another matter. Nothing that is needed at Spring Gardens requires it to be near the water. Nevertheless, BG&E prefers this present location at the heart of the distribution system.

This site was once the location for the oldest gas company in the world. A few years ago the oldest and largest gas manufacturing facility was located here. Bethlehem used to sell BG&E coke gas which was used here until 1950 before the advent of natural gas. As a result of these factors, all the older gas distribution lines center on Spring Gardens. Land for expansion at Spring Gardens is minimal but non-processing types of operation may increase at this location. LNG is the least expensive and most flexible of the gases. Atmosphere for LNG, however, is not very good now. Zoning hearings would present problems for any expansion.

Spring Gardens is also the location where steam is produced for the central business district. The other BG&E terminal plant at Camden Station also produces steam and is closer to the central business district. A 24-inch diameter pipeline branches from these plants into town in a couple of loops. Oil- or gas-fired burners produce steam that is distributed by underground pipes. When gas is available as fuel, BG&E uses gas because it is cheaper. Customers are billed so much for each hundred pounds of steam. The operation has been economically marginal. It is a question of efficiency of large boilers versus many small boilers. Deliverability is a factor in the system's favor because it avoids the congestion and inefficiencies of feeding each building by truck. No consideration has been given for expansion and there is a moratorium on steam sales. If BG&E took on any more load, it would have to invest significant capital and it will not do so until the market changes.

b. Notch Cliff--Propane-Air Plant

Propane-air is a process that vaporizes propane and blends it with air for proper heating value. Propane is again blended with natural gas to give it a burning character. The send-out facility is located at Notch Cliff in Baltimore County. The daily capacity of the plant is 90 million cubic feet per day. There is on-site storage for about 12 million gallons of propane which converts to one billion cubic feet of gas. It can be kept running as long as the supply is available.

Propane is transported to the site by truck or rail and is supplied by a vendor in New Jersey named Gettes Oil. It is a hydrocarbon allocated by the Department of Energy and the supplier and is assigned to BG&E based on a 1974-1974 base year volume.

When Gettes was out of propane, BG&E had to get it from Canada. It came by rail in 30,000-gallon rail cars. This is the only occasion that BG&E used rail. It took three to four weeks to get to Notch Cliff by rail. BG&E had to pay demurrage and rental fees for delivery and the return trip. If there were 300 rail cars, BG&E could have made the delivery in one trip, but not that many cars were available. It is more advantageous to use trucks on a short haul. The turnaround times are not too high on a short haul. One trailer can accommodate 20,000 gallons of propane. A 10,000-gallon trailer loads to 8,000 gallons because of weight reduction. Trucks normally make two-and-a-half trips per day.

All send-out mixing is done at Notch Cliff. The site has six million gallons of storage in an underground cavern. It sends its mixture by pipeline to another site eleven miles away on the middle branch in Baltimore where an above ground refrigeration facility exists for storage of six million gallons.

Propane is allocated and its price is going up, but not as fast as gas. If a shift from oil to gas should occur, it might eventually favor expansion of this type of gas. Since Notch Cliff is located in a good residential area, there may be limits to expansion that can occur at the site.

c. Soller's Point--SNG

The SNG process involves a catalytic reforming of naphtha which is a liquid-like gasoline. Naphtha is blended with steam and hydrogen at 90°F at 900 pounds pressure and run across a catalyst bed to convert it to methane, carbon dioxide, and water. The plant has a capacity of 60 million cubic feet per day. It has on-site storage for 24 million gallons of naphtha. Naphtha is provided by Aremada Hess from its terminal location in Curtis Bay where it has been brought in from Hess' refinery to its Curtis Bay Pier. It is then barged across the harbor to the SNG plant in Soller's Point near Dundalk, where it is pumped into storage. The Hess refinery is located in the Virgin Islands and the naphtha is transported by ship to the Hess terminal tanks in Curtis Bay.

There is not enough depth of water at Soller's Point to accommodate a ship even though it is next to Dundalk. The plant does not have channels of significant depth. Soller's Point has a dock and a water depth of 12 feet capable of accommodating 2 of the 8 barges provided by BG&E. It can accommodate one naphtha barge and one coal barge at a time. In 1977 a total of about 90,608.3 barrels of naphtha were imported, 97.4 percent of which was shipped up the coast, mainly from the Virgin Islands. Nevertheless, only about .2 percent was transferred internally within the harbor. Soller's Point is next to BG&E's Riverside plant whose dock is now used for fuel oil, although it used to be used for coal. There is railroad access but it is not active. The rail line was refurbished when the plant was constructed. The Riverside-Soller plant complex needs its present water frontage. Production of 60 million cubic feet per day means 12,000 barrels or 500,000 gallons per day. This would be very hard to truck in, considering the neighborhood and traffic on Dundalk Avenue.

There is no reason for increasing capacity at Riverside. If an increase would occur, it would occur at another site. Since naphtha is a petroleum product, any increase would be expensive.

## C. FUTURE DEMAND

The future of expansion of gas facilities is very uncertain. A moratorium on gas use was instituted in 1973-1974. BG&E's supplier, Columbia, could not provide full winter volume. Between Columbia and the Federal Power Commission, a schedule of priorities was determined for BG&E's various customers. Low priority customers were curtailed in their use of gas. These were large industrial users who had other fuel alternatives. All residential customers received a very high priority. Commercial activity with no alternatives was second in priority. The moratorium continued to April of 1980 when DOE and Columbia went to a zero curtailment policy, which is not quite abandonment of the moratorium. BG&E still has priorities but buys all it can use.

A great deal of attrition in gas use occurred from 1974 to 1979. During this period, the central business district was torn up and many businesses went out of business. BG&E feels that the annual gas requirement was reduced because of this attrition. Demand is not turning around due to increased availability and skyrocketing costs of oil. BG&E will have to get back to 1973-1974 levels before it will expand. BG&E estimates that would occur 10 years from now unless major changes in federal policy occur. Although distribution facilities could be expanded, no new peak shaving facilities are anticipated.

There will be only a gradual increase in demand. The only negative factor is the possibility of a two to three year gas bubble with great quantities of gas available. A new level of supply might be reached only to be limited again. The average daily consumption will increase only if people and industry increase. At the time of the oil embargo, industries were the first to get off the bandwagon and buy gas. Next were commercial firms driven by costs and pollution problems. There have not been a great many new buildings built. Demand is intermediate between no sales and wide open sales. It is BG&E's policy to sell if a potential customer is next to an existing line or will pay for a new line. This eliminates small customers. The nature of the growth will shift and industry investing in new development will generally be able to satisfy their demands for gas.

D. IMPACT

This section considers the impact of trends in future demand, the use of land, port activity, and the environment.

1. Use of Land

The use of land for further expansion at existing peak shaving plants is limited by safety and environmental considerations and by low demand for gas. Facilities at Cove Point and Spring Gardens are unlikely to be moved or duplicated elsewhere because of the large capital investment involved.

Spring Gardens does not propose to expand any of its processes but nonprocess activities such as storage could expand. The site is quite limited, however, and is located in a built-up, crowded residential section of south Baltimore. If a land storage tank for some reason should fail, it could endanger the lives of a large number of people. Even if there is not an immediate emission of an LNG, a vapor cloud may form. It could travel considerable distances before it becomes nonflammable. The same safety concerns exist for Cove Point, located in a more sparsely populated area. There is an additional concern for collision and spills in the heavily traveled Chesapeake Bay corridor and its location near BG&E's nuclear facility.

Soller's Point needs its present location on the water, but economics (see previous discussion) make expansion unlikely. It is presently located in a heavy industrialized area near a neighborhood that is sensitive to its environment. Concerns have been expressed at hearings on the initiation of operations at Sollers Point about air and noise pollution.

Notch Cliff may experience problems in expansion because of the suburban quality of the neighborhood in which it is located.

2. Port Activity

No major impact on the port is expected from the Spring Gardens facility because its water access is not active. It is not likely to use water because of the plant's central accessibility to the pipeline system. Notch Cliff is located inland and does not directly impact the port. It ships by pipeline to a facility on the Middle River.

Naphtha is likely to continue to be imported by Hess at its terminal in Curtis Bay at approximately the same volumes. Soller's Point will continue to generate local barge traffic for naphtha. The Cove Point facility will generate liquified gas imports but not at the volumes expected.

3. Environmental Impact

The danger of water spills exists at Cove Point. LNG could continuously spread on water until it evaporates. There is a high probability of immediate ignition in such cases. Air and water pollution remain a concern at Soller's Point (see discussion above).

4. Local Policy Impact

With heavy investment in capital facilities already in place and slow growth in demand, BG&E gas facilities are likely to remain at their present locations. There is little likelihood of expansion in the immediate future. The present location of some of the facilities is not optimal because of their potential safety problems and their proximity to built-up residential areas. Local policy may not be effective in removing these plants from their present locations. A local policy of careful monitoring and regulation is an option that appears feasible. Future expansions, if they should be proposed, should be reviewed in the light of the safety and environmental problems involved. In any event, the system of gas plants will generate very little impact on the port, above and beyond those already enumerated.