The environmental review, consultation, and other actions required by applicable federal environmental laws for these projects are being, or have been, carried out by ODOT pursuant to 23 U.S.C. 327 and a memorandum of understanding dated December 11, 2015, and executed by FHWA and ODOT.
**TABLE OF CONTENTS**

EXECUTIVE SUMMARY ............................................................................................................. 3

I. ECONOMIC IMPACTS OF MARINE CARGO ACTIVITY .......................................................... 7

1. IMPACT STRUCTURE ........................................................................................................... 9
   1.1 The Surface Transportation Sector ........................................................................... 9
   1.2 The Maritime Services Sector ................................................................................. 9
   1.3 The Shippers/Consignees Sector ............................................................................. 10
   1.4 Port Authorities ....................................................................................................... 11

2. SUMMARY OF METHODOLOGY ...................................................................................... 11
   2.1 Direct Impacts ............................................................................................................ 12
   2.2 Induced Impacts ......................................................................................................... 12
   2.3 Indirect Impacts ......................................................................................................... 13

3. COMMODITIES INCLUDED IN THE ANALYSIS .............................................................. 14

4. ESTIMATE OF TONNAGE AND THE COVERAGE OF THE STATE-WIDE PORT IMPACT .... 15

II. STATE-WIDE IMPACTS ......................................................................................................... 16

1. TOTAL ECONOMIC IMPACTS .......................................................................................... 16

2. JOB IMPACTS .................................................................................................................. 17
   2.1 Total Employment Impact ....................................................................................... 18
   2.2 Direct Job Impacts ..................................................................................................... 19
      2.2.1 Job Impacts by Sector and Job Category ......................................................... 19
      2.2.2 Direct Job Impacts by Commodity .................................................................... 19
   2.3 Induced Jobs ............................................................................................................. 21
   2.4 Indirect Jobs ............................................................................................................ 21
   2.5 Related Jobs ............................................................................................................ 21

3. REVENUE IMPACT—TOTAL ECONOMIC ACTIVITY ..................................................... 22
   3.1 Direct Revenue Impacts by Economic Sector .......................................................... 22
   3.2 Direct Revenue Impacts by Economic Sector and Job Category ............................. 23

4. PERSONAL EARNINGS IMPACT ................................................................................... 24

5. LOCAL PURCHASES ......................................................................................................... 24

6. TAX IMPACTS ................................................................................................................. 25

III. IMPACTS OF TERMINAL INVESTMENT .............................................................................. 26

IV. TRANSPORTATION COST SAVINGS .................................................................................. 27
EXECUTIVE SUMMARY

Ohio H.B. 62, requires The Ohio Department of Transportation (ODOT) to “Prepare a study of the “Ohio River’s economic impact” on Ohio, including determining the amount of steel, fertilizer, and coal, including the megawatt capacity generated by that coal, that is delivered by barges that travel on the river. Prepare a final report of the study’s findings with presentation materials to be presented to the Governor, the Speaker of the House of Representatives, and the President of the Senate within 180 days of Ohio Transportation Bill H.B. 62. Completion of task must be complete by December 2019.”

Martin Associates was retained by the Ohio Department of Transportation to estimate the economic impacts generated by marine cargo activity at the commercial docks within the state along the Ohio River, including marine terminals owned by public port authorities within the state; the privately owned dry bulk, liquid bulk and general cargo facilities; privately-owned power plant terminals and privately owned barge fleeting facilities. Also, the study quantifies the economic benefits of capital investment in the maritime cargo terminals as well as the transportation cost savings to Ohio shippers and consignees due to the availability of low-cost water transportation of the Ohio River.

The methodology used in this analysis has been developed by Martin Associates and has been used since 1986 to estimate the economic impacts of seaport activity at public and private marine terminals of more than 600 United States and Canadian ports, including Martin Associates’ recent 2017 update of the “Economic Impacts of Maritime Shipping in the Great Lakes St. Lawrence Region”. This state-wide Ohio River study follows the same methodology that Martin Associates has used on all of our previous port impact studies for the ports in Ohio as well as throughout the United States and Canada.

The state-wide impacts are measured for the calendar year 2018, using the latest U.S. Army Corps of Engineers data available at the time of this report. Detailed interviews were conducted with the marine terminal operators, barge lines, fleeting operators, maritime service providers, port tenants, etc. that operate along the Ohio River within the state boundaries, specifically Mile Marker 40-491. In total, more than 135 firms were identified, including 118 marine terminals and public port authorities - there are 11 Ohio Public Port Authorities with only two who own and operate facilities that handle cargo. The firms were contacted by telephone and interviewed to develop the direct impacts and data required to develop the state-wide impact model.

Four types of impacts are measured:

- Jobs;
- Employee earnings;
- Business revenue;
- State and local taxes.
With respect to jobs, four types of job impacts are measured. These are direct, induced, indirect and related jobs. The job impacts are defined as follows:

- **Direct jobs** are those jobs with local firms providing support services to the marine terminals. These jobs are dependent upon this activity and would suffer immediate dislocation if the terminal activity were to cease. Direct jobs include jobs with railroads and trucking companies moving cargo to and from marine terminals, barge and tow companies, dockworkers, freight forwarders, maritime service providers, barge fleeting companies, direct shippers and consignees, etc.

- **Induced jobs** are jobs created locally and throughout the regional economy due to purchases of goods and services by those directly employed. These jobs are with grocery stores, the local construction industry, retail stores, health care providers, local transportation services, etc., and would also be discontinued if terminal activity were to cease.

- **Indirect jobs** are those jobs generated in the local economy as the result of local purchases by the firms directly dependent upon port activity. These jobs include jobs in local office supply firms, equipment and parts suppliers, maintenance and repair services, etc.

- **Related user employment impact** are jobs with firms using the marine terminals to ship and receive cargo. While the facilities and services provided at the ports and marine terminals are a crucial part of the infrastructure allowing these jobs to exist, they would not necessarily be immediately displaced if marine activity were to cease. The related users include the shippers/consignees who do not have operations on port terminal property, and therefore could and do use other modes to ship and receive cargo and raw materials.

The **employee earnings** consist of wages and salaries and include a re-spending effect (local purchases of goods and services by those directly employed), while **business revenue** consists of total business receipts by firms providing services in support of the marine activity. **State and local taxes** include taxes paid by individuals, as well as firms dependent upon the terminal activity.

In 2018, 41.2 million tons of cargo were handled by the ports and marine terminals located within the boundaries of the state of Ohio (Mile Markers 40-491). The impacts of this activity are summarized in Exhibit E-1.
Exhibit E-1

Economic Impacts of the State of Ohio Maritime Cargo Activity along the Ohio River, 2018

<table>
<thead>
<tr>
<th>IMPACT CATEGORY</th>
<th>JOBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRECT</td>
<td>10,896</td>
</tr>
<tr>
<td>INDUCED</td>
<td>10,542</td>
</tr>
<tr>
<td>INDIRECT</td>
<td>15,743</td>
</tr>
<tr>
<td>RELATED USER JOBS</td>
<td>64,201</td>
</tr>
<tr>
<td>TOTAL JOBS</td>
<td>101,382</td>
</tr>
</tbody>
</table>

PERSONAL INCOME (thousand $)
- DIRECT: $589,208
- INDUCED/CONSUMPTION: $1,271,629
- INDIRECT: $742,839
- RELATED USER INCOME: $3,899,621
- TOTAL PERSONAL INCOME: $6,503,298

VALUE OF ECONOMIC REVENUE (thousand $)
- BUSINESS SERVICES REVENUE: $5,236,891
- RELATED USER OUTPUT: $20,002,000
- TOTAL VALUE OF ECONOMIC REVENUE: $25,238,891

LOCAL PURCHASES (thousand $) $1,434,029

STATE & LOCAL TAXES (thousand $)
- DIRECT, INDUCED AND INDIRECT: $255,160
- RELATED USER TAXES: $382,163
- TOTAL STATE AND LOCAL TAXES: $637,323

TOTAL ECONOMIC VALUE (thousand $)
- BUSINESS SERVICES REVENUE: $5,236,891
- INDUCED/CONSUMPTION: $1,271,629
- RELATED USER OUTPUT: $20,002,000
- TOTAL ECONOMIC VALUE: $26,510,520

Note: Totals may not add due to rounding

The 41.2 million tons of cargo moving via the Ohio River terminals located within the state of Ohio generated the following economic impacts in the state:

101,382 jobs in Ohio are in some way related to the cargo moving via the marine terminals located on the Ohio River within the state:

- Of the 101,382 jobs, 10,896 jobs are directly generated by the marine cargo and barge activity at the river marine terminals in the state of Ohio.

- As the result of the local and regional purchases by those 10,896 individuals holding the direct jobs, an additional 10,542 induced jobs are supported in the state economy.
• **15,743 indirect jobs** were supported by $1.4 billion of regional purchases by businesses supplying services at the Ohio River marine terminals.

• The balance, **64,201 jobs** are classified as related jobs and are with importers and exporters and supporting firms using the marine terminals in 2018.

  *In 2018, marine cargo activity at the Ohio River marine terminals located in the state of Ohio generated a total of $26.5 billion of total economic value in the state of Ohio:*

• Of the $26.5 billion total economic value, $5.2 billion is the direct business revenue received by the firms directly dependent upon the marine terminals and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the barges calling the terminals, as well as fleeting, cleaning and barge repair and maintenance services. An additional $1.3 billion represents the re-spending of the direct income, which is used for in-state purchases of goods and services by those directly employed. The remaining $20 billion represents the value of the output to the state of Ohio that is created due to the cargo moving via the public and privately-owned marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. It is important to emphasize that these three components of total economic value are additive, and do not represent any double counting of monetary impacts. In contrast, direct income, local purchases by firms and taxes generated are all paid from the direct and related user revenue.

• Marine activity at the terminals supported $6.5 billion of total personal wage and salary income and local consumption expenditures for Ohio residents. This includes $2.6 billion of direct, indirect, induced and local consumption expenditures, while the remaining $3.9 billion was received as income by the employees of the related port users.

  *A total of $255.2 million of direct, induced and indirect state and local tax revenue were generated by maritime activity at the Ohio River marine terminals located in Ohio. In addition, $382.2 million of state and local taxes were created due to the economic activity of the related users of the cargo moving via the Ohio River marine terminals.*
I. ECONOMIC IMPACTS OF MARINE CARGO ACTIVITY

Waterborne cargo activity at a marine terminal in the state of Ohio contributes to the local, state, and national economies by generating business revenue to local and national firms providing barge and cargo handling services at the marine terminals. These firms, in turn, provide employment and income to individuals, and pay taxes to federal, state and local governments. Exhibit I-1 shows how activity at marine terminals generates impacts throughout the local, state, and national economies. As this exhibit indicates, the impact of a port cannot be reduced to a single number, but instead, the port activity creates several impacts. These are the revenue impact, employment impact, personal income impact, and tax impact. These impacts are non-additive. For example, the income impact is a part of the revenue impact, and adding these impacts together would result in double counting. Exhibit I-1 shows graphically how marine cargo moving via the marine terminals within the state generates the four impacts.

Exhibit I-1
Flow of Economic Impacts Generated by Marine Activity

At the outset, activity at the port generates business revenue for firms which provide services. This business revenue impact is dispersed throughout the economy in several ways. It is used to hire people to provide the services, to purchase goods and services, and to make federal, state and local tax payments. The remainder is used to pay stockholders, retire debt, make investments, or is held as retained earnings. It is to be emphasized that the only portions of the revenue impact that can be definitely identified as remaining in the local economy are those portions paid out in salaries to local employees, for local purchases by individuals and businesses directly dependent on the marine terminals, in contributions to federal, state and local taxes, in lease payments to the port authorities by tenants, wharfage charges, and dockage fees paid by the steamship lines to the individual port authorities.

The movement of marine cargo also supports regional exporters and importers using the public and privately-owned marine terminals. These impacts are classified as related user
impacts in that the exporters and importers using the marine terminals can and do use other ports for the shipment and receipt of cargo. The related user impacts are the jobs, income, revenue and state and local taxes related to the value and tonnage of the cargo exported and imported via the state’s river marine terminals in 2018. It is to be emphasized that the related impacts do not include the total employment, revenue and taxes with the importers and exporters, but only that portion associated with the cargo moved via the state’s river marine terminals. The related impacts measure the impact, or influence, of the state’s marine terminals at a given point in time, and if the terminals were no longer used by these importers and exporters, these influenced users would use ports in other states to export and import cargo. Unlike the direct, induced, and indirect impacts, the related impacts would not necessarily be dislocated from the economy - instead, the impacts would no longer be related to the specific port, but to another port through which this cargo would be routed.

The study is based on interviews with more than 135 firms providing services to the cargo and barges handled at the marine terminals in the state of Ohio. Furthermore, the impacts can be traced back to the individual firm. The data collected from the interviews was then used to develop an operational model of the public and private marine terminals.

The employment impact of the state’s port activity consists of four levels of job impacts:

- **Direct employment impact** -- jobs directly generated by marine terminal activity. Direct jobs generated by marine cargo include jobs with railroads and trucking companies moving cargo between inland origins and destinations and the marine terminals, dockworkers, stevedores, barge cleaning and repair, towing companies, etc. It is to be emphasized that these are classified as directly generated in the sense that these jobs would experience near term dislocation if the activity at the marine terminals were to be discontinued.

- **Induced employment impact** -- jobs created throughout the local, regional and national economies because individuals directly employed due to port activity spend their wages locally on goods and services such as food, housing and clothing. These jobs are held by residents located throughout the region, since they are estimated based on local and regional purchases.

- **Indirect employment impact** -- jobs created within the region due to purchases of goods and services by firms, not individuals. These jobs are estimated directly from local purchases data supplied to Martin Associates by the companies interviewed as part of this study, and include jobs with maintenance and repair firms, parts and equipment suppliers, etc. It is to be emphasized that special care was taken to avoid double counting, since the current study counts certain jobs as direct (i.e., trucking jobs and towing jobs, etc.) which are often classified as indirect by other approaches, notably the input/output model approach.

- **Related user employment impact** -- jobs with firms using the marine terminals to ship and receive cargo. While the facilities and services provided at the ports and marine terminals are a crucial part of the infrastructure allowing these jobs to exist, these jobs would not necessarily be immediately displaced if marine activity were to cease. The related users include the shippers/consignees who do not have operations on terminal property, and therefore could and do use other modes to ship and receive cargo and raw materials. Shippers/consignees that have on-dock facilities or marine terminals that are serving production facilities are counted as directly dependent.
The personal earnings impact is the measure of employee wages and salaries (excluding benefits) received by individuals directly employed due to port activity. Re-spending of these earnings throughout the state economy for purchases of goods and services is also estimated. This, in turn, generates additional jobs -- the induced employment impact. This re-spending throughout the state is estimated using a state personal earnings multiplier, which reflects the percentage of purchases by individuals that are made within the state in which the terminal is located. The re-spending effect varies by state -- a larger re-spending effect occurs in states that produce a relatively large proportion of the goods and services consumed by residents, while lower re-spending effects are associated with states that import a relatively large share of consumer goods and services (since personal earnings “leak out” of the state for these out-of-state purchases).

Tax impacts are tax payments to the state and local governments by firms and by individuals whose jobs are directly dependent upon and supported (induced and indirect jobs) by activity at the marine terminals.

1. IMPACT STRUCTURE

The four types of economic impacts are created throughout various business sectors of the local, state, national and regional economies. Specifically, four distinct economic sectors are impacted as a result of activity at the marine terminals. These are the:

- Surface transportation sector;
- Maritime services sector;
- Shippers/consignees using the port; and
- Port authorities.

Within each sector, various participants are involved. Separate impacts are estimated for each of the participants. A discussion of each of the economic impact sectors is provided below, including a description of the major participants in each sector.

1.1 The Surface Transportation Sector

The surface transportation sector consists of both the railroad and trucking industries, as well as pipelines. The trucking firms and railroads are responsible for moving the various cargoes between the marine terminals and the inland origins and destinations.

1.2 The Maritime Services Sector

Waterborne cargoes handled by each marine terminal generate economic activity in various business sectors of the local economy. Specifically, these impacts occur in the following categories:

- **Cargo Handling** - This category involves the physical handling of the cargo at the port, from land-to-barge or vice-versa. Included in this category are:
  - Private terminal operators who operate the marine terminals.
• Stevedoring firms hire the labor to load and off-load barges and are often terminal operators as well, handling the cargo after it is off-loaded from the barge or prior to barge loading.

• Warehouse operators operate the warehouses usually on-dock or near dock where cargo is stored prior to loading the barge and after discharge. Warehouse operations can also be conducted by terminal operators and are sometimes classified as terminal operators.

• **Barge Operations** - This category consists of line haul barge operators that carry cargo to fleeting areas, fleeting operators, local/regional towing companies that deliver the barges to the terminal docks, and tug/barge maintenance and repair companies.

• **Arranging Marine Transportation** - Firms in this category are primarily involved with making arrangements for inland and water transportation of export or import freight. Freight forwarders are the major participants in this category.

• **Government Agencies** - This sector includes those federal and local government agencies that perform services related to cargo handling and barge operations including the U.S. Army Corps of Engineers, U.S. Customs and Border Protection, the U.S. Coast Guard, and Department of Agriculture.

1.3 The Shippers/Consignees Sector

This sector includes those firms that ship or receive cargo via the specific terminal. For the analysis, shippers/consignees will be divided into two categories. The first category will consist of those users (1) dependent upon the terminal and usually located within the terminal’s immediate hinterland; or (2). Exhibit a high degree of dependency on the cargo moving over the terminal. These direct impacts are included in the terminal operators and dependent shippers/consignees category.

The second category of shippers/consignees consists of those users that could easily use competing ports or terminals. For example, if the Ohio River terminals were not available, members of the first category would likely be driven out of business in the near term, while members of the second category will shift to another port. These impacts are classified as related user impacts in that the exporters and importers using the marine terminals can and do use other ports for the shipment and receipt of cargo. The related impacts measure the impact, or influence, of the marine terminals at a given point in time, and if the Ohio River terminals were no longer used, these influenced users would use other ports to export and import cargo. Unlike the direct, induced, and indirect impacts, the related impacts would not necessarily be dislocated from the economy - instead, the impacts would no longer be influenced by the state’s ports, but by another out-of-state port. It is emphasized that only the portion of jobs, income taxes and revenue related to the actual cargo moving via the marine terminals within the state are counted in the related user impacts.

Finally, the direct, induced, and indirect port sector job, income, revenue and tax impacts associated with each of the cargoes for which related shipper/consignee impacts were estimated were subtracted from the total related impacts (by commodity and cargo type). This was done to avoid double counting, as the related shipper/consignee impacts include impacts...
at each logistical stage of handling the imported and exported cargo, such as the port activity and the trucking and rail activity to move the cargo to and from each terminal and the induced and indirect jobs associated with the direct terminal activity.

1.4 Port Authorities

This sector includes the employees of public port authorities (there are 11 Ohio Public Port Authorities with only two who own and operate facilities that move cargo), the income received by these employees and the revenue received by the port authorities from leases and terminal and cargo charges.

2. SUMMARY OF METHODOLOGY

The cornerstone of the Martin Associates’ approach is the collection of detailed baseline impact data from firms providing services at the ports and terminals. To ensure accuracy and defensibility, the baseline impact data were collected from interviews with more than 135 firms providing services to the barge and cargo activity moving via the state’s Ohio River marine terminals. In some cases, multiple interviews were conducted with several persons in each firm. Detailed interviews were conducted with the marine terminal operators, service providers, railroads, port tenants, etc. at each of these ports. The firms included in the interview process were identified from:

- U.S. Army Corps of Engineers Dock and Terminal database;
- Ohio Department of Transportation databases;
- Proprietary data bases developed and maintained by Martin Associates based on our on-going economic impact consulting services that we provide for the majority of the Ohio ports and regional Ohio River studies;
- Individual company websites; and
- Interviews with county representatives and Ohio River freight stakeholder organizations such as Central Ohio River Business Association (CORBA).

In total, more than 135 firms were identified from these sources. All firms were contacted by telephone and interviewed to develop the direct impacts and data required to develop the individual port models. These firms provided data regarding:

- Jobs;
- Income;
- Revenue;
- Local purchases;
- Capital expenditures; and
- Terminal operational specifics:
  - Modal splits;
  - Hinterland distribution patterns; and
  - Rail and truck rates.

The port model allows for the testing of the sensitivity of the impacts due to changes in such activity as tonnage levels by commodity, labor productivity, barge call levels, inland modal distribution patterns by commodity, towing requirements, and changes in inland transportation
technologies. The terminal sensitivity model can also be used in assessing alternative terminal development scenarios, as well as for annual updates. Finally, a key use of the model system will be to show the economic impact of potential state and national policies that could impact port activity within the state. Such policies include the impacts of trade restrictions and free trade agreements, infrastructure investment programs, channel maintenance and dredging, surface transportation infrastructure, private sector development, and the development of a state and/or national port plan.

2.1 Direct Impacts

The results of these interviews were then used to develop the baseline direct job, revenue and income impacts for the economic sectors and job categories associated with the cargo activity at the marine terminals located within state boundaries.

The direct tax impacts are estimated at a state and local level based on actual per capita income levels as published by the Tax Foundation, as well as data from the U.S. Bureau of the Census, State and Local Government Finances.

2.2 Induced Impacts

Induced impacts are those generated by the purchases of the individuals directly employed as a result of terminal activity. For example, a portion of the personal earnings received by those directly employed due to activity at the marine terminals is used for purchases of goods and services, both regionally, as well as out-of-the region. These purchases, in turn, create additional jobs in the region which are classified as induced. To estimate these induced jobs, a state personal earnings multiplier was developed from data provided by the Bureau of Economic Analysis, Regional Income Division, for the state of Ohio. This personal earnings multiplier is used to estimate the total personal earnings generated in the state as a result of the maritime activity. A portion of this total personal earnings impact is next allocated to specific local purchases (as determined from consumption data for the relevant state residents), as developed from the U.S. Bureau of Labor Statistics, Consumer Expenditure Survey. These purchases are next converted into retail and wholesale induced jobs in the state economy by combining the purchases with the jobs to sales ratios in the supplying industries. A portion of the retail purchases were allocated to wholesale purchases, based on industry specific data developed from the U.S. Bureau of Census, Economic Census. These wholesale purchases were again combined with the relevant jobs to sales ratios for the wholesale industries associated with the local purchases. These ratios were again developed at the state level.

To estimate the non-consumption induced impacts with such sectors as state and local governments, education, and other social services, and finance and real estate, a ratio of state employment in these key service industries to total state employment was developed. This ratio is then used with the direct and induced consumption jobs to estimate induced jobs with business/financial services, legal, educational and other social services, not directly estimated from the consumption effect.

The re-spending impact includes not only the wage and salary income received by those employed to provide the goods and services to the direct job holders, but also the value of the purchases. Therefore, the re-spending/local consumption impact cannot be divided by the induced jobs to estimate the induced income, as this would overestimate the induced personal
wage/salary impact per induced job.

2.3 Indirect Impacts

Indirect impacts are generated in the local economy as the result of purchases by firms that are directly dependent upon cargo and barge activity at the marine terminals. These purchases are for goods and services such as office supplies and equipment, maintenance and repair services, communications and utilities, transportation services and other professional services. To estimate the indirect economic impact, local purchases, by type of purchase, were collected from each of the 135 firms interviewed. These local purchases were then combined with employment to sales ratios in local supplying industries, developed from the U.S. Bureau of Economic Analysis Regional Input-Output Modeling System. The indirect job ratios also account for the in-state spin-off effects from multiple rounds of supply chains that are required to provide the purchased goods and services. Indirect income, local purchases and taxes are also estimated.

2.4 Related Impacts

Related impacts measure the jobs, income, revenue and state and local taxes with shippers and consignees moving cargo through the marine terminals. These jobs are classified as related jobs, since the firms using the marine terminals for the movement of cargo can, and do, use other seaports and marine terminals. For example, firms importing steel or exporters of break bulk cargo often use freight forwarders, who in turn choose the port of export. Importers of break bulk cargo often use several ports for the import of cargo, based on market locations. Because of the proximity of other ports and the associated steamship service at these ports, such as Cleveland, as well as Philadelphia, break bulk cargo have some flexibility in port choice. As a result, jobs with these exporters and importers cannot be counted as dependent upon the Ohio River marine terminals.

These jobs are estimated based on the value-per-ton of the commodities exported and imported at each specific port and the associated jobs to value of output ratios for the respective producing and consuming industries located in the state. The value-per-ton of each of the key commodities moving via the marine terminals within the state was developed from data supplied by the U.S. Army Corps of Engineers. The average value-per-ton for each commodity moving over the Ohio River marine terminals was then multiplied by the respective tonnage moved in 2018. Ratios of jobs-to-value of output for the corresponding consuming and producing industries were developed by Martin Associates from the U.S. Bureau of Economic Analysis, Regional Input-Output Modeling System for the state of Ohio. These jobs to value coefficients include the in-state, spin-off impacts that would occur in order to produce the export commodity or use the import commodity in production. The percent of each commodity that is produced or consumed in the state of Ohio was next developed from the interviews, and the value of each commodity remaining in the state of Ohio was calculated. The ratios of jobs to value of export or import cargo were then combined with the in-state value of the respective commodities moving via the public and private terminals to estimate related jobs and the spin-off jobs in-state to support the export and import industries. Similarly, the respective income and output multipliers were used to estimate the related personal income impact and the total value of economic output and taxes generated by the state’s Ohio River marine terminals. It is to be emphasized that care was taken to control for double counting of the direct, induced and indirect impacts.
3. COMMODITIES INCLUDED IN THE ANALYSIS

A major use of an economic impact analysis is to provide a tool for port development planning. As a port grows, available land and other resources for port facilities become scarce, and decisions must be made as how to develop the land and utilize the resources in the most efficient manner. Various types of facility configurations are associated with different commodities. For example, containers require a large amount of paved, open storage space, while certain types of dry bulk cargo require covered storage and special dust removing equipment.

An understanding of the commodity's relative economic value in terms of employment and income to the local community, the cost of providing the facilities, and the relative demand for the different commodities is essential in making future port development plans. Because of this need for understanding relative commodity impacts, economic impacts are estimated for the following commodities handled at the state’s marine terminals.

- Coal;
- Aggregates/Stone;
- Grain;
- Iron/Steel Products;
- Petroleum Products;
- Fertilizers/Chemicals;
- Ores/Minerals/Other Dry Bulk; and
- Other.

It should be emphasized that commodity-specific impacts are not estimated for each of the economic sectors described in the last section. Specific impacts by commodity could not be allocated to individual commodities with any degree of accuracy for the government sector and barge repair/marine construction sector. In addition, taxes have not been displayed by specific commodity since these tax impacts will reflect the same distribution over commodities as the employment impact.
4. ESTIMATE OF TONNAGE AND THE COVERAGE OF THE STATE-WIDE PORT IMPACT

In 2018, a total of 41.2 million short tons of cargo was handled at all Ohio River terminals within the state of Ohio as reported by the U.S. Army Corps of Engineers. Exhibit I-2 details tonnage and value by key commodity group.

Exhibit I-2
Tonnage and Value by Commodity Group

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Tons (Thousands)</th>
<th>Value (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>23,272.3</td>
<td>$1,207.5</td>
</tr>
<tr>
<td>Aggregates</td>
<td>5,343.5</td>
<td>$42.5</td>
</tr>
<tr>
<td>Fertilizer/Chemicals</td>
<td>2,530.9</td>
<td>$1,031.2</td>
</tr>
<tr>
<td>Petroleum Products</td>
<td>2,506.9</td>
<td>$1,274.7</td>
</tr>
<tr>
<td>Crude Petroleum</td>
<td>1,779.9</td>
<td>$752.0</td>
</tr>
<tr>
<td>Other</td>
<td>1,717.7</td>
<td>$242.0</td>
</tr>
<tr>
<td>Iron/Steel Products</td>
<td>1,515.2</td>
<td>$621.3</td>
</tr>
<tr>
<td>Grains</td>
<td>1,489.6</td>
<td>$349.3</td>
</tr>
<tr>
<td>Ores/Minerals</td>
<td>1,025.7</td>
<td>$139.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41,181.7</strong></td>
<td><strong>$5,659.9</strong></td>
</tr>
</tbody>
</table>

Source: U.S. Army Corps of Engineers (USACE) Waterborne Commerce Statistics; Values estimated by USACE from 2019 NDSU UGPTI Commodity Valuation Study, Indexed to 2018 price level.
II. STATE-WIDE IMPACTS

This chapter presents the results of the economic impact analysis of the marine cargo and barge activity at Ohio River terminals located within the state of Ohio on the local and state economies. The impacts are presented in terms of total economic impacts at the state level.

1. TOTAL ECONOMIC IMPACTS

In 2018, 41.2 million tons of cargo were handled by the public and private Ohio River marine terminals located within the state of Ohio. The impacts are summarized in Exhibit II-1.

Exhibit II-1
Economic Impacts of the State of Ohio Maritime Cargo Activity along the Ohio River, 2018

<table>
<thead>
<tr>
<th>IMPACT CATEGORY</th>
<th>JOBS</th>
<th>PERSONAL INCOME (thousand $)</th>
<th>VALUE OF ECONOMIC REVENUE (thousand $)</th>
<th>LOCAL PURCHASES (thousand $)</th>
<th>STATE &amp; LOCAL TAXES (thousand $)</th>
<th>TOTAL ECONOMIC VALUE (thousand $)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DIRECT</td>
<td>DIRECT</td>
<td>BUSINESS SERVICES REVENUE</td>
<td>$1,434,029</td>
<td>$837,323</td>
<td>$26,510,520</td>
</tr>
<tr>
<td></td>
<td>INDUCED</td>
<td>$589,208</td>
<td>RELATED USER OUTPUT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INDIRECT</td>
<td>$1,271,629</td>
<td>TOTAL VALUE OF ECONOMIC REVENUE</td>
<td>$20,002,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RELATED USER JOBS</td>
<td>$742,839</td>
<td>TOTAL PERSONAL INCOME</td>
<td>$25,238,891</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL JOBS</td>
<td>$3,899,621</td>
<td>TOTAL VALUE OF ECONOMIC REVENUE</td>
<td>$20,002,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Totals may not add due to rounding

The 41.2 million tons of cargo moving via the Ohio River terminals located within the state of Ohio generated the following economic impacts in the state:

101,382 jobs in Ohio are in some way related to the cargo moving via the marine terminals located on the Ohio River within the state:
• Of the 101,382 jobs, 10,896 jobs are directly generated by the marine cargo and barge activity at the river marine terminals in the state of Ohio.

• As the result of the local and regional purchases by those 10,896 individuals holding the direct jobs, an additional 10,542 induced jobs are supported in the state economy.

• 15,743 indirect jobs were supported by $1.4 billion of regional purchases by businesses supplying services at the Ohio River marine terminals.

• The balance, 64,201 jobs are classified as related jobs and are with importers and exporters and supporting firms using the marine terminals in 2018.

In 2018, marine cargo activity at the Ohio River marine terminals located in the state of Ohio generated a total of $26.5 billion of total economic value in the state of Ohio:

• Of the $26.5 billion total economic value, $5.2 billion is the direct business revenue received by the firms directly dependent upon the marine terminals and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the barges calling the terminals, as well as fleeting, cleaning and barge repair and maintenance services. An additional $1.3 billion represents the re-spending of the direct income, which is used for in-state purchases of goods and services by those directly employed. The remaining $20 billion represents the value of the output to the state of Ohio that is created due to the cargo moving via the public and privately-owned marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. It is important to emphasize that these three components of total economic value are additive, and do not represent any double counting of monetary impacts. In contrast, direct income, local purchases by firms and taxes generated are all paid from the direct and related user revenue.

• Marine activity at the terminals supported $6.5 billion of total personal wage and salary income and local consumption expenditures for Ohio residents. This includes $2.6 billion of direct, indirect, induced and local consumption expenditures, while the remaining $3.9 billion was received as income by the employees of the related port users.

A total of $255.2 million of direct, induced and indirect state and local tax revenue were generated by maritime activity at the Ohio River marine terminals located in Ohio. In addition, $382.2 million of state and local taxes were created due to the economic activity of the related users of the cargo moving via the Ohio River marine terminals.

2. JOB IMPACTS

In this section, the employment generated by maritime activity at the Ohio River marine terminals in Ohio is discussed, and is organized as follows:

• First, the total employment that is in some way related to the activities at the Ohio River marine terminals is estimated.
Second, the subset of total employment that is judged to be totally dependent (i.e., direct jobs) on port activity is analyzed as follows:

- The direct job impact is estimated in terms of key economic sectors, i.e., surface transportation sector, maritime services sector, shipper/consignees sector, and Port Authority sector.

- The direct job impact is estimated by detailed job category, i.e., trucking, dockworkers, warehousemen, stevedores and terminal operators, dependent shipper/consignees, maritime services, and tug and barge operations, etc.

- The direct job impact is estimated for each of the key commodities/commodity groups.

- Induced and indirect jobs are estimated.

Finally, jobs in Ohio that are related to the marine activity at the marine terminals are described.

2.1. Total Employment Impact

It is estimated that 101,382 Ohio jobs are in some way related to port activities at the marine terminals in Ohio; of these jobs:

- 10,896 jobs are directly generated by activities at the marine terminals and if such activities should cease, these jobs would be discontinued or impacted over the short term.

- 10,542 jobs (induced jobs) are supported by the local purchases of the 10,896 individuals directly generated by port activity at the marine terminals. An additional 15,743 indirect jobs were generated due to $1.4 billion of purchases in the state economy by firms providing direct cargo handling and barge services and by the directly dependent shippers/consignees located within state.

- An additional 64,201 Ohio jobs are with related exporters and importers located in Ohio that ship cargo via the Ohio River public and private marine terminals. These jobs are estimated based on the actual volume and value of the break bulk cargo and dry and liquid bulk cargo moving via the individual marine terminals. These jobs are considered to be related to activities at the state's marine terminals, but the degree of dependence on these terminals is difficult to estimate. It is to be emphasized that the level of employment with these exporters and importers is based on the demand for the final product, i.e., imported commodities such as steel, not by the actual use of the marine terminals located in Ohio. However, if other ports were used, it is likely that the costs of importing and exporting would increase, which could have long run implications on the level of employment with the related shippers/consignees. Finally, it is to be emphasized that there is no double counting of the directly dependent shippers/consignees in this related job estimate.
2.2 Direct Job Impacts

In 2018, 41.2 million tons of domestic and foreign waterborne cargo moved via the Ohio River marine terminals. As a result of this activity, 10,896 full-time jobs were directly created.¹ In this section the jobs are analyzed in terms of:

- Distribution by economic sector;
- Distribution by job category; and
- Distribution by commodity group.

2.2.1 Job Impacts by Sector and Job Category

Exhibit II-2 presents the distribution of the 10,896 direct jobs by sector and job category. As this exhibit shows, the largest job impacts are with dependent shippers/consignees including utility companies, steel processors and polymer manufacturers, followed by terminal operators. Jobs generated with the trucking industry serving the ports is the third largest employment impact category, followed by jobs with maritime services.

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>DIRECT JOBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURFACE TRANSPORTATION</td>
<td></td>
</tr>
<tr>
<td>RAIL</td>
<td>98</td>
</tr>
<tr>
<td>TRUCK</td>
<td>2,157</td>
</tr>
<tr>
<td>MARITIME SERVICES</td>
<td></td>
</tr>
<tr>
<td>TERMINAL EMPLOYEES</td>
<td>2,593</td>
</tr>
<tr>
<td>MARITIME SERVICES</td>
<td>409</td>
</tr>
<tr>
<td>GOVERNMENT</td>
<td>56</td>
</tr>
<tr>
<td>REPAIR/MARINE CONSTRUCTION</td>
<td>73</td>
</tr>
<tr>
<td>LINE HAUL BARGE/TOWING</td>
<td>374</td>
</tr>
<tr>
<td>DEPENDENT SHIPPER/CONSIGNEE</td>
<td>5,136</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10,896</td>
</tr>
</tbody>
</table>

2.2.2 Direct Job Impacts by Commodity

Most of the 10,896 jobs considered to be generated by port activity can be related to the handling of specific commodities or commodity groups. Certain employment categories such as government employees, employees with marine construction and ship repair, and the miscellaneous maritime services firms cannot be identified with a specific commodity. As a result, employment in these groups (which totaled 189) was not allocated to commodity groups.

¹ Jobs are measured in terms of full-time worker equivalents. If a worker is employed only 50 percent of the time by activity at the State’s public and private marine terminals, then this worker is counted as .5 jobs.
Exhibit II-3 presents the direct employment impacts in terms of commodity groups. This exhibit indicates that in 2018, fertilizer and chemicals generated the largest number of direct jobs, (which includes jobs with dependent polymer companies) 3,022 jobs, followed by 1,847 jobs generated by coal.

Despite accounting for 57% of the total Ohio tonnage handled, coal created the second largest direct job impact, accounting for 1,874 direct jobs. The majority of the jobs are with employees of the individual power plants as well as barge and towing operators. Furthermore, since the inbound coal is consumed on-site for power generation, related job impacts do not exist in the same sense as steel or chemicals, where further production occurs in the state. However, the importance of coal movements is emphasized by the fact that the six coal-fired operating power plants located along the Ohio River within the state generate 9,991 MW in the state of Ohio, or 39.7% of the state’s total generation capacity as shown in Exhibit II-4.

Exhibit II-4
Ohio River Coal-Fired Power Plant Capacity

<table>
<thead>
<tr>
<th>MM</th>
<th>Name</th>
<th>Location</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.1</td>
<td>W. H. Sammis Power Plant</td>
<td>Stratton</td>
<td>2,233</td>
</tr>
<tr>
<td>76.6</td>
<td>Cardinal Power Plant</td>
<td>Brilliant</td>
<td>1,790</td>
</tr>
<tr>
<td>258.2</td>
<td>Gavin Power Plant</td>
<td>Cheshire</td>
<td>2,680</td>
</tr>
<tr>
<td>259.8</td>
<td>Kyger Creek Power Plant</td>
<td>Cheshire</td>
<td>963</td>
</tr>
<tr>
<td>443.2</td>
<td>William H. Zimmer Power Station</td>
<td>Moscow</td>
<td>1,305</td>
</tr>
<tr>
<td>490.1</td>
<td>Miami Fort Power Station</td>
<td>North Bend</td>
<td>1,020</td>
</tr>
<tr>
<td></td>
<td>River Coal-Fired Subtotal</td>
<td></td>
<td>9,991</td>
</tr>
<tr>
<td></td>
<td>Other Facilities Subtotal</td>
<td></td>
<td>15,138</td>
</tr>
<tr>
<td></td>
<td>State Total Capacity</td>
<td></td>
<td>25,128</td>
</tr>
</tbody>
</table>

Source: EIA; Individual company websites

The ability of these power plants to receive coal by barge have allowed for continued low-cost power generation. However, as more companies close coal-fired utilities or shift feedstock to natural gas the use of coal and coal shipments on the Ohio River will continue to decline.
2.3. Induced Jobs

The 10,896 directly employed individuals due to activity at marine terminals received wages and salaries, a part of which were used to purchase local goods and services such as food, housing, clothing, transportation services, etc. As a result of these local purchases, 10,542 jobs in the regional economy were supported. The majority of the induced jobs are with state and local government agencies providing school, health care, police and fire protection, other community and social services, as well as firms providing business and personal services. The next largest induced job impact occurs in the local food (restaurant and groceries) industry sector.

2.4. Indirect Jobs

In addition to the induced jobs generated by the purchases of the directly employed individuals, the firms providing the direct services and employing the 10,896 direct jobs make local purchases for goods and services. These local purchases by the firms dependent upon the public and private marine facilities generate additional local jobs - indirect jobs. Based on interviews with the port service providers and terminal operators, these firms made more than $1.4 billion of local purchases in 2018. These direct local purchases created an additional 15,743 indirect jobs in the local economy. These purchases include expenditures for equipment and parts, maintenance and repair services, office supplies, raw materials, fuel, utilities and insurance. Care is taken to avoid any double counting of jobs already included in direct jobs.

2.5. Related Jobs

It is estimated that about 64,201 jobs with Ohio companies using the ports to ship and receive waterborne cargo are classified as related to the Ohio River marine terminals. These jobs are with importers of steel, producers and consumers of break bulk cargo, petroleum product manufacturing and distribution, producers and consumers of the liquid and dry bulk cargoes (polymer manufacturers) moving through the public and private marine terminals and farmers producing grain for export.

To estimate the related user jobs with shippers/consignees and those industries supporting the inbound/outbound cargoes, the following methodology was used. First, the average value-per-ton of each commodity group was developed from data provided by the USACE. Next, the value of each commodity via the Ohio terminals that is estimated to remain in Ohio (determined through terminal interviews) is identified. Using the Bureau of Economic Analysis, RIMS II model for the state of Ohio, jobs-to-value of output coefficient ratios were developed for the relevant export producing and import consuming sectors. Finally, corresponding income and output ratios are also developed.

It is to be emphasized that these are related jobs and would not likely disappear if the terminals were to close to marine cargo activity. Given a level of demand for the steel, containerized cargo, export grain and break bulk commodities (mostly manufactured cargo), the cargo would be shipped through another port such as Cleveland, Toledo or Philadelphia. The directly dependent shipper/consignee impacts, as well as direct, induced and indirect jobs are not included in these related job estimates.

It is to be further emphasized that when the impact models are used for planning purposes, related jobs should not be used to judge the economic benefits of a particular
project. Related jobs are not estimated with the same degree of defensibility as are the direct, induced and indirect jobs. Therefore, these three types of job impacts should be used in evaluating port/terminal investments. The purpose of the related jobs estimates is to provide a proxy for the magnitude of the more general economic development impact of the port facilities at a given point in time.

The 41.2 million tons of cargo at the Ohio River marine terminals generated revenue for firms in each of the economic sectors. For example, revenue is received by the railroads and the trucking companies within the surface transportation sector as a result of moving export cargo to the marine terminals and distributing the imported commodities inland after receipt at the marine terminals. The firms in the maritime services sector receive revenue from cargo handling, providing services to barges and tugs in port and repairs to barges calling the port facilities. In addition, revenue is received by shippers/consignees from the sales of cargo shipped or received via the marine cargo terminals and from the sales of products made with raw materials received through the terminals. Since this chapter is concerned with the revenue generated from providing maritime services, the shipper/consignee revenue (i.e., the value of the cargo shipped or received through the marine terminals) will be excluded from the remaining discussion.

3. REVENUE IMPACT—TOTAL ECONOMIC ACTIVITY

The revenue impact is a measure of the total economic activity in the state that is generated by the cargo and barge activity at the Ohio River marine terminals within the state of Ohio. In 2018, it is estimated that the total economic value of the Ohio ports is $26.5 billion. Of this total economic value, $5.2 billion is the direct business revenue received by the firms directly dependent upon the marine terminals and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the tugs/barges calling the port, as well as tug & barge repair and maintenance services. An additional $1.3 billion represents the re-spending of the direct income, which is used for in-state purchases of goods and services by those directly employed. The remaining nearly $20 billion represents the value of the output to the state of Ohio that is created due to the cargo moving via the public and privately-owned marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. It is important to emphasize that these three components of total economic value are additive, and do not represent any double counting of monetary impacts. In contrast, direct income, local purchases by firms and taxes generated are all paid from the direct and related user revenue.

The remainder of this section focuses only on the $5.2 billion revenue impact generated from the provision of transportation services in support of the cargo and barge activity at the state’s Ohio River marine terminals. It is important to emphasize that the direct business revenue does not include the value of the cargo moving via the marine facilities.

3.1 Direct Revenue Impacts by Economic Sector

In 2018, the cargo and barge activity at the state of Ohio’s public and private marine terminals located along the Ohio River generated $5.2 billion of business revenue to the firms providing cargo handling and barge services and supporting the firms directly dependent upon the marine terminals.
3.2 Direct Revenue Impacts by Economic Sector and Job Category

Exhibit II-5 presents the distribution of the $5.2 billion of directly generated revenue across the various port sectors and job categories. This revenue includes the revenue received by firms providing services to the cargo and barge activity at the Ohio River terminals, and includes revenue received by trucking firms, stevedores, the port authorities, line haul barge operators, local towing & fleeting operators, etc.

### Exhibit II-5
Revenue by Sector and Category

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>REVENUE (thousand $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURFACE TRANSPORTATION</td>
<td></td>
</tr>
<tr>
<td>RAIL</td>
<td>$111,248</td>
</tr>
<tr>
<td>TRUCK</td>
<td>$364,315</td>
</tr>
<tr>
<td>MARITIME SERVICES</td>
<td></td>
</tr>
<tr>
<td>TERMINAL OPERATIONS</td>
<td>$1,472,759</td>
</tr>
<tr>
<td>GOVERNMENT</td>
<td>NA</td>
</tr>
<tr>
<td>REPAIR/MARINE CONSTRUCTION</td>
<td>$10,322</td>
</tr>
<tr>
<td>LINE HAUL BARGE</td>
<td>$398,480</td>
</tr>
<tr>
<td>DEPENDENT SHIPPER/CONSIGNEES</td>
<td>$2,863,813</td>
</tr>
<tr>
<td>NOT ALLOCATED</td>
<td>$15,952</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$5,236,891</strong></td>
</tr>
</tbody>
</table>

Totals may not add due to rounding

The majority of the direct revenue is received by the dependent shippers/consignees, followed by terminal operations, and line haul barge operations. Within the surface transportation sector, truck transportation accounted for $364.3 million, followed by about $111.2 million received by rail operations serving the public and private marine terminals.

3.3 Direct Revenue by Commodity

Exhibit II-6 shows the total revenue impact by commodity. The exhibit shows that in terms of total revenue, fertilizer/chemicals followed by coal and steel products create the largest revenue impacts.

### Exhibit II-6
Revenue Impacts by Commodity

<table>
<thead>
<tr>
<th>COMMODITY</th>
<th>REVENUE (thousand $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGGREGATES</td>
<td>$409,206</td>
</tr>
<tr>
<td>COAL</td>
<td>$923,743</td>
</tr>
<tr>
<td>GRAIN</td>
<td>$76,735</td>
</tr>
<tr>
<td>FERTILIZER/CHEMICALS</td>
<td>$1,606,170</td>
</tr>
<tr>
<td>PETROLEUM PROD</td>
<td>$321,084</td>
</tr>
<tr>
<td>STEEL</td>
<td>$905,503</td>
</tr>
<tr>
<td>OTHER DRY BULK</td>
<td>$728,220</td>
</tr>
<tr>
<td>OTHER</td>
<td>$239,955</td>
</tr>
<tr>
<td>NOT ALLOCATED</td>
<td>$26,275</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$5,236,891</strong></td>
</tr>
</tbody>
</table>
4. PERSONAL EARNINGS IMPACT

In the previous section of this chapter, the total revenue generated by port activity was identified. As described earlier, the personal income received by those directly dependent upon port activity is paid from the business revenue received by the firms supplying direct services at the marine terminals.

The income impact is estimated by multiplying the average annual earnings (excluding benefits) of each port participant, i.e., terminal employees, truckers, towing firm employees, warehousemen etc., by the corresponding number of direct jobs in each category. The individual annual earnings in each category multiplied by the corresponding job impact resulted in the $589.2 million direct personal income (wage and salary earnings) impact. This results in an average annual salary of $54,080 per direct employee. In comparison, the mean annual salary in the state of Ohio for all occupations (May 2018), as reported by the U.S. Bureau of Labor Statistics, is $48,220.

The impact of the re-spending of this direct income for local purchases is estimated using a personal earnings multiplier. The personal earnings multiplier is based on data supplied by the Bureau of Economic Analysis (BEA). The BEA estimates that for every one dollar earned by direct employees generated by activity at the marine terminals, an additional $2.16 of personal income and consumption expenditures would be created as a result of re-spending the income for purchases of goods and services produced in-state. Hence, a personal earnings multiplier of 3.16 was used to estimate the additional consumption and income impact due to re-spending - $1.3 billion. This additional re-spending of the direct income generates the 10,542 induced jobs, described in the previous section.2

In addition to the direct and induced personal income and consumption impact, wages and salaries were received by the 15,743 indirect employees. Using wage and salary data for these indirect employees as reported by the U.S. Bureau of Economic Analysis, RIMS II, it is estimated that $742.8 million of indirect wages and salaries were created by port activity. Therefore, in 2018, the maritime activity at the Ohio River terminals located in the state of Ohio created a total of $2.6 billion of direct, induced and indirect wages and salaries.

In addition, the related job holders received $3.9 billion of personal wages and salaries.

5. LOCAL PURCHASES

Each of the firms surveyed were asked to provide a breakdown of local expenditures for equipment, parts, office supplies, business services, utilities, raw materials, maintenance and repair, new construction, etc. Based on the reported expenditures, it is estimated that $1.4 billion of local purchases were made by the firms directly dependent upon maritime cargo activity at the public and private marine terminals. These firms also include the refineries and petrochemical firms that ship and receive cargo by barge. These $1.4 billion of local purchases in turn supported the 15,743 indirect jobs in the state of Ohio.

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2 Re-spending impact of $1.3B does not represent the earnings of the 10,542 induced jobs. It does include the direct earnings received by the employees holding the induced jobs, but also includes the revenue received by the firms providing goods & services to those directly employed.
6. TAX IMPACTS

State and local tax impacts are based on state and local per capita income tax burdens developed by the Tax Foundation, as well as state and local taxes collected by type of tax, as reported by the U.S. Bureau of Census, State and Local Government Finances. The taxes include all state and local taxes collected divided by personal income in the state of Ohio. Multiplying the tax/capita income burden to the total direct, induced and indirect personal income impact, it is estimated that activity at the marine terminals within the state generated $255.2 million of state, county and local taxes. Of the $255.2 million impact, the state of Ohio received $120 million, while the local governments received $135.2 million. In addition, $382.2 million of state and local taxes were generated by the users of the public and private marine terminals, of which the state of Ohio received nearly $179.6 million and local governments received $202.5 million.
III. IMPACTS OF TERMINAL INVESTMENT

In addition to impacts generated by the movement of the cargo at the maritime terminals within the state detailed throughout this report, significant impacts are also generated by the construction activity associated with capital improvements (CAPEX) to the maritime facilities. Through interviews with the terminal operators, it is estimated that terminal improvement projects have totaled $956 million. These improvements include equipment upgrades, barge loading/discharge upgrades, new terminal areas, and energy generation construction projects. Over the next five years, respondents indicated they plan on spending another $650 million on similar projects. Table III-1 below estimates the economic benefits to the state for both the previous and future CAPEX investments. It is to be noted that these impacts occur one-time only and are not additive. Therefore, careful consideration should be used while expressing these impacts.

Table III-1
Economic Impact of CAPEX Improvements to Marine Terminal Facilities

<table>
<thead>
<tr>
<th>Category</th>
<th>Previous 5-year Investment $956 million</th>
<th>Estimated 5-Year Future Investment $650 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL PERSON-HOURS</td>
<td>12,504,762</td>
<td>8,532,641</td>
</tr>
<tr>
<td>PERSONAL INCOME (1,000)</td>
<td>$280,576</td>
<td>$191,451</td>
</tr>
<tr>
<td>STATE &amp; LOCAL TAXES (1,000)</td>
<td>$26,094</td>
<td>$17,805</td>
</tr>
</tbody>
</table>

As shown, capital expenditures from 2015 through 2019 generated over 12.5 million man-hours and $280.6 million in personal income. State and local taxes generated by this construction activity are estimated at nearly $26.1 million.

The anticipated $650 million worth of capital projects through 2024 is expected to generate 8.5 million man-hours and nearly $191.5 million in income. State and local taxes generated by the construction activity are expected to reach $17.8 million.
IV. TRANSPORTATION COST SAVINGS

Shippers and consignees using the Ohio River for shipment and receipt of cargo realize low-cost transportation benefits over other modes. However, if the Ohio River was closed to navigation due to a catastrophic event, such as a lock failure, shippers and consignees would need to realign supply chains to ship or receive materials or finished product - undoubtedly at a higher cost. The following analysis estimates the annual transportation cost savings that Ohio River terminals, shippers and consignees achieve.

To determine the transportation cost savings of using barge on the Ohio River versus rail or truck, Martin Associates developed transportation cost models for each of the terminals along the Ohio River located within the state. The barge transportation cost model includes the key origin and destinations, transit time, cost per ton and hourly operating costs. Interviews with terminal operators, line haul barge companies, local towing/fleeting companies, and customers provided data for all inputs. In addition, published data was used where available. The barge costs for all terminals and commodities are calculated to identify the total cost of shipment and receipt via the Ohio River.

Next rail rates from key origins and destinations by commodity were obtained from interviews with terminal operators, customers, railroads as well as published data by commodity and rates in Martin Associates’ proprietary in-house database. Rates were applied to each terminal by commodity and key origin/destinations to develop a total cost for those commodities that could potentially be served via rail.

To determine the truck cost component, the distance between the river terminals and inland market destinations was computed, along with the distance from competing ports that would potentially handle the imports. Interviews with terminal operators indicated their key markets and market reach from the docks. Next, Martin Associates’ proprietary in-house truck cost model was calibrated with 2019 daily and hourly operating cost data developed from interviews with major trucking companies, as well as the most recent truck operating cost data presented in the American Transportation Research Institute (ATRI), An Analysis of the Operational Costs of Trucking, 2018. Finally, total truck costs were developed by commodity to key consumption areas in Ohio less the current drayage cost from the current Ohio River terminals handling the cargo.

Finally, the cost of most likely alternative modes - rail and truck is compared to the total barge cost to identify the state-wide transportation cost savings. Using the methodology, the cost savings of barge transportation over truck and rail for the 41.2 million tons of cargo shipped/received via the Ohio River in 2018 is estimated at $545.1 million annually.