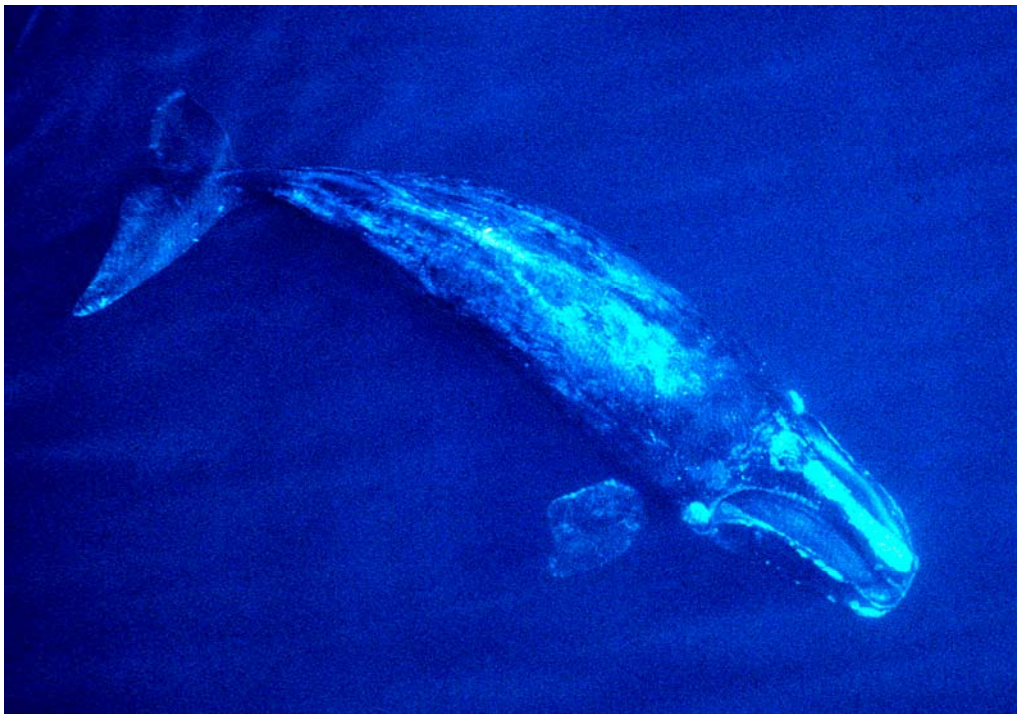
FEIS Report

Economic Analysis for the Final Environmental Impact Statement of the North Atlantic Right Whale Ship Strike Reduction Strategy



PREPARED FOR
National Oceanic & Atmospheric Administration (NOAA)
National Marine Fisheries (NMFS)
Office of Protected Resources

SUBMITTED TO
Earth Tech Inc.
Alexandria, VA

PREPARED BY
Nathan Associates Inc.
Arlington, Virginia

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NATHAN
ASSOCIATES INC.

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1. Introduction

The National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA) is considering regulations to reduce mortalities to North Atlantic right whales as a result of vessel collisions. On June 22, 2005 NOAA issued a notice of intent (70 FR 3612) to prepare a Environmental Impact Statement (EIS) to analyze the potential impacts of implementing the operational measures in NOAA's North Atlantic Right Whale Ship Strike Reduction Strategy[1]and the proposed rule was issued on June 26, 2006 (71 FR 36299). Operational measures include seasonal speed restrictions for specific U.S. East Coast port areas during particularly sensitive periods when whales are typically present. The final rule proposes to include speed restrictions of 10 knots and would be in effect for a distance generally between 20-30 nautical miles from the shoreline.[2] During periods outside of the seasonal speed restrictions, all areas along the Atlantic seaboard within the U.S. Exclusive Economic Zone[3] (EEZ) would be subject to dynamic management area (DMA) measures if certain concentrations of right whales were sighted. The measures also allow for the establishment of recommended routes that provide the greatest possibility of reducing the risk of collisions between vessels and whales. If the routes are not used routinely, consideration will be given to making them mandatory through regulation. All of the proposed provisions would apply to non-sovereign vessels with a length of 65 feet and above.

Nathan Associates Inc. was retained by Earth Tech, a NMFS contractor, to conduct the economic analysis for the final EIS (FEIS) of the proposed North Atlantic right whale ship strike reduction operational measures. The FEIS updates and expands the economic analysis that Nathan Associates conducted in 2004-2005 for the draft Environmental Assessment[4] and in 2006 for the draft EIS (DEIS).[5] The FEIS will also evaluate a range of alternatives to reduce mortality to right whales due to ship strikes based on a suite of possible mitigation measures.

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[1] The advance notice of proposed rulemaking (ANPR) issued by NOAA on June 1, 2004 calls for the establishment of new operational measures for the shipping industry including consideration of routing and speed restrictions.
[2] Comments were also requested on alternative speed restrictions of 12 knots and 14 knots.
[3] The US EEZ extends to a distance 200 nautical miles from the baseline from which the breadth of the territorial sea is measured (www.archives.gov/federal_register/codification/proclamations/05030.html).
[4] Nathan Associates Inc., Economic Analysis for the Environmental Assessment of the North Atlantic Right Whale Ship Strike Reduction Strategy, April 14, 2005.
[5] Nathan Associates Inc., Economic Analysis for the Environmental Impact Statement of the North Atlantic Right Whale Ship Strike Reduction Strategy, May 23, 2006. The Notice of Availability (NOA) for the DEIS was published on July 7, 2006.

Scope of Proposed Operational Measures

This Economic Impact Report analyzes the operational measures proposed in the final rule. The proactive operational measures are designed to reduce the likelihood and threat of collisions between vessels and endangered North Atlantic right whales. It also aims to minimize the geographical overlap of shipping lanes and whale habitat to reduce the likelihood of ship strikes in a manner that minimizes adverse effects on the shipping industry and maritime commerce. The operational measures are customized for each region to accommodate for differences in (1) oceanography, (2) commercial ship traffic patterns, (3) navigational concerns, and (4) right whale migration patterns and behavior.

The area covered by this study corresponds to the geographic regions delineated by NOAA in the final rule. The area covered range from the northernmost U.S. jurisdiction areas in the Gulf of Maine to an area just south of Port Canaveral Florida.[6] Proposed right whale ship strike reduction measures were specified for three broad regions of the U.S. East Coast (southeastern Atlantic Coast, the Mid-Atlantic, and the northeastern U.S) that contained 14 port regions (Figure 1-1).

- The southeastern US (SEUS) Atlantic Coast area, bounded to the north by latitude 31°27'N, to the south by latitude 29°45'N, to the east by longitude 80° 51.6'W, and the west by the US shoreline .
- The mid-Atlantic US (MAUS) region, extending from the northernmost boundary of the SEUS to the southernmost boundary of the third region, the northeastern US Atlantic Coast (NEUS).
- The northeastern US (NEUS) Atlantic Coast region, north and east of Block Island up to Canada.

The operational measures are intended to supplement existing conservation plans and include the following components:

- Continue ongoing conservation and research activities to reduce the threat of ship strikes
- Develop and implement additional mariner education and outreach programs.
- Conduct ESA Section 7 consultations, as appropriate, with Federal agencies that operate or authorize the use of vessels in waters inhabited by right whales.
- Develop a Right Whale Conservation Agreement with the Government of Canada.
- Establish new operational measures for commercial and recreational mariners.

Only the last component (operational measures) is addressed in the EIS.

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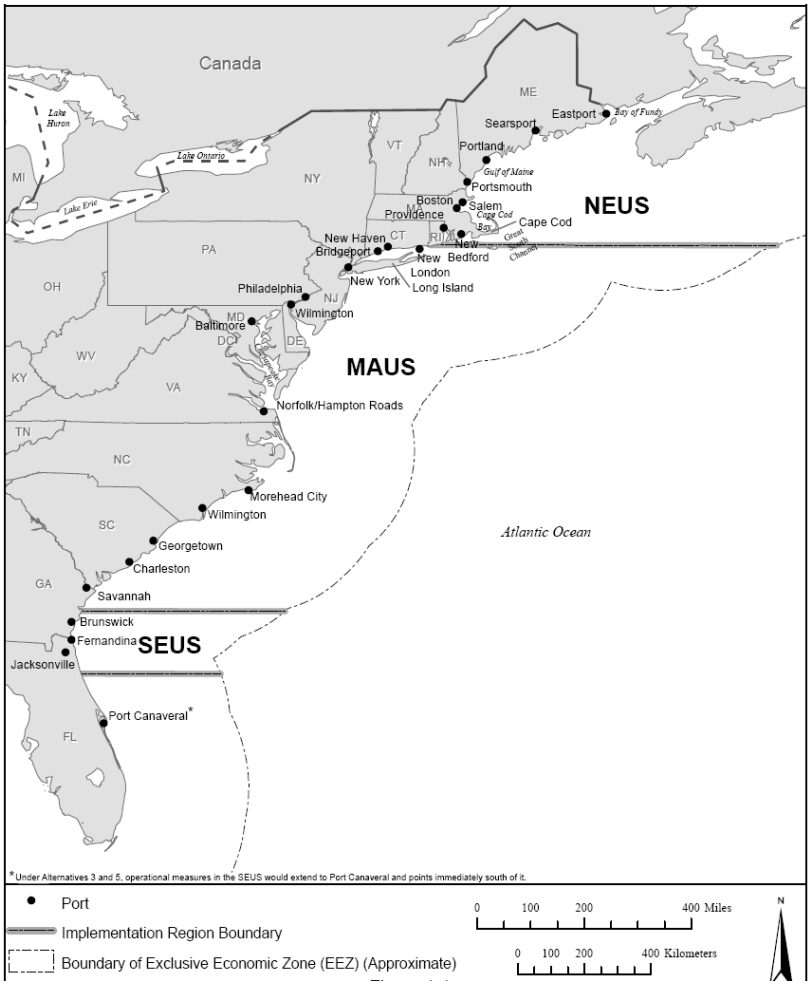
[6] Accordingly, this study does not include U.S. East Coast ports south of Port Canaveral such as Miami, Palm Beach, Fort Lauderdale and other smaller ports.

Figure 1-1. Port Areas for Proposed Operational Measures



Operational Measures

The proposed operational measures vary (mostly by specific times and affected areas) based on ship traffic patterns and locations of right whale habitat and migratory corridors in the three regions of implementation along the US East Coast. The proposed measures would include the following:

- **Dynamic Management Areas (DMAs).** DMAs would impose temporary restrictions on vessels in areas where right whales are detected and no specific measure(s) are in place or in force at this time.
- **Seasonal Management Areas (SMAs).** SMAs would create seasonal speed restrictions in (a) a 20 - 30 nm (37-56 km) radius around specified ports in the MAUS or a continuous 20 nm (area from the coast, except for the 25 to 30-nautical mile rectangular area off of Block Island (see Figure 1-1); (b) in specified areas in Cape Cod Bay, Off Race Point, and Great South Channel; and (c) in specified areas in the waters off the coasts of Georgia and Florida.

- **Vessel Routing Measures.** Routing measures include recommended shipping routes (also referred to as shipping lanes) that have been implemented by NMFS in the NEUS and SEUS. If the routes are not used routinely, consideration will be given to making them mandatory through regulation.

Alternatives Considered

Each of the alternatives considered in the EIS implements a subset of the operational measures described above from none (Alternative 1) to all (Alternative 5). In some cases, the measures proposed for implementation under a given alternatives have been modified to ensure that the alternative is a reasonable and feasible option to meet NMFS' purpose and need. For all alternatives that include speed restrictions, the FEIS evaluates the impact for the proposed restricted speed of 10 knots (base case) and for alternative restricted speeds of 12 knots and 14 knots. Table 1-1 summarizes the alternatives considered in the FEIS.

Table 1-1. Summary of Alternatives Considered in the FEIS

Operational Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Recommended Routes	No	No	No	Yes, in the SEUS and NEUS regions.	Yes, in SEUS and NEUS regions.	Yes, in SEUS and NEUS regions.
DMAs	No	Yes, in US Territorial waters and the EEZ.	No	No	Yes, in US Territorial waters and the EEZ.	Yes, in US Territorial waters and the EEZ.
SMAs	No	No	Yes	No	Yes	Yes, in SEUS, MAUS and NEUS regions
Speed restrictions	No	Yes, associated with DMAs.	Yes, within the SMAs: year- round in NEUS region, and seasonal in MAUS and SEUS regions.	No	Yes, associated with DMAs, and SMAs defined for Alternative 3.	Yes, associated with DMAs (voluntary), and all SMAs.

ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Under the No Action Alternative, none of the operational measures would be implemented. Mariners would not be subject to new regulations to reduce right whale ship strikes. NMFS would continue to implement existing measures and programs to reduce the likelihood of right whale mortalities from ship strikes. Research would continue and existing technologies would be used to determine whale locations and pass this information on to mariners. Other ongoing activities would include the use of aerial surveys to notify mariners of right whale sighting locations, the operation of the Mandatory Ship Reporting System (MSRS), support of Recovery Plan Implementation Teams, education and outreach programs for mariners, and ongoing research on technological solutions. Other components may be implemented, and existing conservation measures would remain active. Alternative 1 provides a baseline against which to assess the impacts of the action alternatives.

ALTERNATIVE 2 – DYNAMIC MANAGEMENT AREAS

Alternative 2 would incorporate the elements of Alternative 1 plus the DMA component of the proposed operational measures. DMAs would be defined, as warranted by right whale sightings, in all areas within the Atlantic Ocean EEZ. Compliance with DMAs would be mandatory under Alternative 2. Successful implementation of this alternative would depend on maintaining survey efforts and ensuring that efforts are made to make, record, and make available the specific sighting locations. Therefore, it would require a commitment to continuing aircraft surveillance coverage and expanding coverage in the mid-Atlantic, as necessary.

ALTERNATIVE 3 – SPEED RESTRICTIONS IN DESIGNATED AREAS

This alternative includes the elements of Alternative 1 plus certain speed restrictions in designated areas. Since speed restrictions would be the only measure implemented under this alternative, the areas and times applied to these restrictions would be different from the areas and times for similar restrictions proposed as part of the entire set of measures. Specifically, the proposed restrictions would apply as follows:

- In the NEUS region, year-round within all waters in the Seasonal Area Management (SAM) zones identified in the Atlantic Large Whale Take Reduction Plan (ALWTRP) and within the Cape Cod Bay critical habitat. There are currently two expanded SAM zones in the Northeast: "SAM West," in effect from March 1 to April 30; and "SAM East," in effect from May 1 to July 31. The adjoining line between SAM West and SAM East is 69°24'W longitude (NMFS, 2005a). Therefore, SAM West and SAM East essentially have the same boundaries as the Off Race Point and Great South Channel SMAs, the only difference being the overlap in the SAM areas.

- In the MAUS region, restrictions from October 1 to April 30. The restricted area would include all waters 25 nm out from the US coastline between Providence, RI and New London, CT (Block Island Sound), and Savannah, GA.

- In the SEUS region, restrictions from November 15 to April 15. The restricted area would include all waters within the MSRS WHALESSOUTH reporting area and the presently designated right whale critical habitat.

ALTERNATIVE 4 – RECOMMENDED SHIPPING ROUTES

This alternative includes all the elements of Alternative 1 plus the recommended shipping routes component of the proposed operational measures for the SEUS region. These include use of the northeast and southeast port access routes to each of the port areas of Brunswick, Fernandina and Jacksonville. The port access routes will be in effect year-round. Alternative 4 does not propose speed restrictions in these shipping lanes. No measures would apply to the MAUS region. Recommended shipping lanes in Cape Cod Bay have been established year-round. NMFS will monitor use of the recommended routes, and if they are not used routinely, consideration will be given to making them mandatory through regulation.

ALTERNATIVE 5 – COMBINATION OF ALTERNATIVES

This alternative would include all elements of Alternatives 1 to 4 as previously described. Therefore, it would implement all the proposed operational measures.

ALTERNATIVE 6 – PREFERRED ALTERNATIVE

Alternative 6 of the FEIS has several changes from those analyzed in Alternative 6 of the DEIS. The revised alternative has the same revised trigger mentioned in Section 2.3.2 for DMAs; however, in Alternative 6, DMAs are voluntary. The recommended routes are in place year-round instead of seasonally. The MAUS ports of Wilmington, Georgetown, Charleston, and Savannah are now included in a continuous 20 (37 km) nm SMA. The SMAs for the ports of Block Island, New York/New Jersey, Delaware Bay, Chesapeake Bay, Morehead City, and Beaufort, North Carolina have been changed as described below. The operational measures for Alternative 6 are as follows:

- Seasonal speed restriction for the Southeast SMA will be implemented from November 15-April 15
- The shipping lanes into Brunswick, Fernandina, and Jacksonville extend out to longitude 80° 51.6 W (eastern boundary of the MSRS system).
- Monitoring of recommended routes as in Alternative 4 for the port areas of Brunswick, Fernandina and Jacksonville and Cape Cod Bay.
- SMAs for port areas in the mid-Atlantic US region will be implemented from November 1-April 30. Except for Block Island Sound, which will have a rectangular SMA of 30 nm, the port areas north of Wilmington, NC will have a radius of 20 nm. A continuous 20-nautical mile buffer will be implemented from Wilmington, NC through Savannah, GA to the northern boundary of the Southeastern SMA.
- Seasonal speed restrictions for Cape Cod Bay SMA will be implemented from January 1-May 15.
- An expanded Off Race Point Seasonal Management Area as proposed in the ALWTRP will be implemented from March 1-April 30.
- The Great South Channel Seasonal Management Area has also been expanded (west) and will be implemented from April 1-July 31.
- The trigger and duration for voluntary DMAs are those described under Alternative 2.

The operational measures proposed under Alternative 6 will expire five years after their date of effectiveness.

2. Existing U.S. East Coast Maritime Activity

In this section we will discuss existing maritime activity in the sections of the U.S. East Coast subject to the final rule. The discussion focuses on the identification of the number, type and size of vessels that call at U.S. East Coast ports and the value of U.S. imports and exports by port area. We also present estimates of the ocean freight component of the imported goods. All data sources and the methodology employed are described fully with further detail presented in the accompanying appendices.

While the final rule applies to vessels of 65 LOA or greater, we also analyzed vessel arrivals by deadweight tons (DWT) and/or gross registered tons (GRT) which are the customary units in the shipping industry for classifying vessels by size category to estimate vessel operating costs

Vessel Arrivals at U.S. East Coast Ports

The principal data source used is the U.S. Coast Guard Vessel Arrival Database. This database includes all vessel arrivals at US ports of 150 GRT and above.[7] We obtained data for 2002, 2003, and 2004.[8] The database corresponding to the 2002 and 2003 data includes 48 fields of information, and the database corresponding to 2004 includes 38 fields. Key information relevant for this study includes date/time of arrival; port; vessel type, size and flag; product type; and cargo amount. (Appendix A, Attachment 1).

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[7] The USCG data includes 64 vessels (362 arrivals) with gross tonnage of less than 150 but greater than 65 feet in length; we have kept these in the dataset.

[8] Vessel arrival data for 2005 through 2007 only became available only after the preponderance of work on the economic analysis had been completed, and funding and time were not sufficient to conduct further updates for the EIS. Nonetheless, vessel arrivals for 2003 and 2004 provide a suitable basis for identifying the level of economic impacts for later years, as annual variations in the composition and volume of vessel traffic are relatively modest. For example, while new and larger vessels come into service each year, these new vessels would not significantly alter the average vessel operating costs used in this analysis by type and size of vessel. Similarly, the annual growth in overall traffic would affect all of the alternatives analyzed and pales in significance when compared to the large differences amongst the alternatives analyzed.

The 2002 and 2003 data was provided by the USCG in three data files[9] corresponding to:

- Vessel arrivals (245,910 records)
- Vessel characteristics and ownership (725,526 records)
- Arrival port codes (7,672 records)

The 2004 data was provided by the USCG in three data files corresponding to:

- Vessel arrivals (95,452 records)
- Vessel characteristics and ownership (798,611 records)
- Arrival port codes (7,672 records)

For purposes of analysis we have divided the port regions into defined 26 specific port areas[10] (Table 2-1).

Table 2-1. U.S East Coast Regions and Port Areas Used in the Study

Northeastern U.S.	Mid-Atlantic	Southeastern U.S.
Eastport, ME	New Bedford, MA	Brunswick, GA
Searsport, ME	Providence , RI	Fernandina, FL
Portland, ME	New London, CT	Jacksonville, FL
Portsmouth, NH	New Haven, CT	Port Canaveral, FL
Salem, MA	Bridgeport, CT	
Boston, MA	Long Island, NY	
Cape Cod	New York City, NY	
	Philadelphia, PA	
	Baltimore, MD	
	Hampton Roads, VA	
	Morehead City, NC	
	Wilmington, NC	
	Georgetown, SC	
	Charleston, SC	
	Savannah, GA	

Source: Prepared by Nathan Associates.

[9] This database also contains arrival records from January through October 2004, but all 2004 data was derived from the second database, which contains data for all 12 months for 2004.

[10] We use the term "port area" because they may include smaller ports within the general vicinity of a larger port but not formally included within the boundaries of a single port authority.

USCG Vessel Arrival Data Reconciliation

Our initial review of the USCG vessel arrival data determined that while it appeared comprehensive and complete in terms of vessel arrivals; there were numerous inconsistencies and data entry errors, particularly concerning the port designation. However, it was possible to correct these inconsistencies and errors using information contained in other data fields. In all, Nathan Associates reconciled port codes for 43,782 records, (Appendix A, Attachment 2) and reconciled port code and state designations for 1,531 records. (Appendix A, Attachment 3).

In terms of geographic coverage, we first reduced the database of vessel arrivals to ports located in states along the U.S. East Coast based on the state designation included in the file. We then conducted a separate analysis to exclude ports located along the Gulf Coast of Florida, ports on the East Coast of Florida below Port Canaveral, and New York Great Lake ports. The result was 83,611 vessel arrival records for U.S. East Coast ports during 2002 through 2004 pertaining to 7,344 vessels. Vessel arrivals by USCG port codes were then matched with study port areas. (Appendix A, Attachment 4).

Information on the size of the vessel will be used later in the economic impact analysis to prepare estimates of the value of vessel time. However the USCG vessel characteristics and ownership database was missing the DWT for 1,100 vessels (15 percent of all vessels included in the U.S. East Coast arrivals), but did contain GRT. For these vessels we estimated DWT using regression analysis by 15 vessel type on the remaining 85 percent of vessels that reported both DWT and GRT. We modeled DWT as a function of the vessel type and gross tons including the interactive term "gross tons*vessel type." Regressions were based on 6,044 vessels with both DWT and GRT. The regression results included an R-squared of 93.4 percent; parameter estimates were statistically significant at the five percent level for 11 vessel types that account for 97.5 percent of total vessel arrivals (Appendix A, Attachment 5). This provided an estimated value of DWT for vessels records that lacked that information.

Conversations with USCG following the publication of our April 2005 report revealed that there are likely to be duplicate arrival records in the data. In this update we removed records if there were multiple arrivals by a vessel at the same port on the same day. Applying this filter resulted in the removal of 1,327 arrivals from the 2003 data. We also removed 24 arrivals made by vessels owned by the federal government. Additionally, certain arrival records to the ports of Boston, MA and Georgetown, SC contained the incorrect port code in the USCG data. These arrivals were incorrectly attributed to foreign ports with the same names. Correcting these errors resulted in the addition of 66 arrivals in 2003. A review of the USCG data with Massport officials identified 97 additional arrivals in Boston in 2003. Similarly, the USCG data for 2004 appeared to under represent a significant number of arrivals for Boston. For this report we have assumed that Boston 2004 arrivals were equal to those recorded by Massport in 2003. We found two additional instances where the USCG data contained the incorrect port code. Many vessel arrivals to the port of Portland, OR were being incorrectly attributed to the port of Portland, ME. As a result, we removed 821 arrivals from the 2003 Portland, ME data. We also found a number of arrivals attributed to the Portsmouth, NH port area that were actually arrivals made to the port of Portsmouth, VA. To correct this, we reallocated 61 arrivals from Portsmouth, NH port area

to the Hampton Roads, VA port area. Appendix A, Attachment 7 shows a comparison of the 2003 arrivals by port region and vessel classification in the April 2005 report and after making these corrections.

Vessel Arrivals by Port Area

Based on the US Coast Guard data, there were 25,532 vessel arrivals at U.S. East Coast ports in 2003 (Table 2-2). For 2004, vessel arrivals increased by 7.3 percent to 27,385 vessel arrivals. For both years, the largest number of vessel arrivals was recorded in the port region of mid-Atlantic-Ports of New York/New Jersey with 5,426 vessel arrivals and 5,550 vessel arrivals in 2003 and 2004, respectively.

The mid-Atlantic-Chesapeake Bay is the next most important port region in terms of vessel arrivals with 4,486 and 4,875 in 2003 and 2004, respectively. The ports of Baltimore, Norfolk and Hampton Roads are included in this port region. Other significant port regions with more than 2,000 vessel arrivals in 2004 include Southeastern U.S. (4,315 vessel arrivals), mid-Atlantic Delaware Bay (2,661 vessel arrivals), mid-Atlantic Block Island Sound (2,563 vessel arrivals), mid-Atlantic Savannah GA (2,474 vessel arrivals), and mid-Atlantic-Charleston (2,473 vessel arrivals).

In terms of port areas, New York City had the most vessel arrivals (5,550 arrivals) in 2004, followed by Hampton Roads (2,834 arrivals), Philadelphia (2,661 arrivals), Jacksonville (2,517 arrivals), Savannah, GA (2,474 arrivals), Charleston (2,473 arrivals), Baltimore (2,041 arrivals) and Port Canaveral (1,062 arrivals).

Table 2-2. Vessel Arrivals by Port Area, 2003 and 2004

Port Area	2003	2004
Northeastern US - Gulf of Maine		
Eastport, ME	40	43
Searsport, ME	196	196
Portland, ME	620	641
Portsmouth, NH	199	173
Northeastern US - Off Race Point		
Salem, MA	9	15
Boston, MA	483	483
Northeastern US - Cape Cod Bay		
Cape Cod, MA	22	36
Mid-Atlantic Block Island Sound		
New Bedford, MA	110	99
Providence, RI	350	322
New London, CT	135	180
New Haven, CT	547	701
Bridgeport, CT	319	392
Long Island, NY	780	869
Mid-Atlantic Ports of New York/New Jersey		
New York City, NY	5,426	5,550
Mid-Atlantic Delaware Bay		
Philadelphia, PA	2,479	2,661
Mid-Atlantic Chesapeake Bay		
Baltimore, MD	1,820	2,041
Hampton Roads, VA	2,666	2,834
Mid-Atlantic Morehead City and Beaufort, NC		
Morehead City, NC	123	151
Mid-Atlantic Wilmington, NC		
Wilmington, NC	628	667
Mid-Atlantic Georgetown, SC		
Georgetown, SC	63	69
Mid-Atlantic Charleston, SC		
Charleston, SC	2,277	2,473
Mid-Atlantic Savannah, GA		
Savannah, GA	2,398	2,474
Southeastern US		
Brunswick, GA	458	452
Fernandina, FL	255	284
Jacksonville, FL	2,240	2,517
Port Canaveral, FL	889	1,062
All Port Areas	25,532	27,385

Source: Prepared by Nathan Associates based on analysis of USCG data on vessel calls at U.S. ports, 2003-2004.

U.S. East Coast Vessel Arrivals by Vessel Type

There is a great diversity in the type of vessels that call at U.S. East Coast ports. The USCG vessel characteristics file contains four fields that help identify vessel type: vessel class, vessel type, vessel subtype, vessel service. The USCG database includes 16 vessel classes, 48 vessel types, 35 vessel sub-types, and 21 vessel services. Table 2-3 presents the set of 12 summary vessel type categories that we defined for this study based on the information provided in the four USCG vessel description fields.

Table 2-3. Vessel Types Used

Bulk Carriers
Combination Carriers
Containerships
Freight Barges
General Cargo Vessels
Passenger Vessels
Refrigerated Cargo Vessels
Ro-Ro Cargo Vessels
Tank Barges
Tank Ship
Towing Vessels
Other a/

a/ Includes fishing vessels, industrial vessels, research vessels and school ships.

Source: Appendix A, Attachment 6.

Containerships accounted for the largest number of U.S. East Coast vessel arrivals with 8,623 arrivals in 2003 and 8,886 arrivals in 2004 (Tables 2-4 & 2-5). Tank ship was the next most frequent vessel type with 5,439 arrivals in 2003 and 5,513 in 2004. Other significant vessel types in 2004 include bulk carriers (3,149 arrivals), ro-ro cargo vessels (3,054 arrivals), and general cargo vessels (1,843 arrivals). These top 5 vessel types accounted for 82 percent of total vessel arrivals in 2004.

A detailed set of tables on vessel arrivals by type of vessel for each port area is presented in Appendix B.

Table 2-4. U.S. East Coast Vessel Arrivals by Port Area and Vessel Type, 2003

	Vessel Type												
Port Area	Bulk Carrier	Combination Carrier	Containe r Ship	Freight Barge	General Dry Cargo Ship	Passenger Ship	Refrigerated Cargo Ship	Ro-Ro Cargo Ship	Tank Barge	Tanker	Towing Vessel	Other a/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	16	-	5	-	19	-	-	-	-	-	-	-	40
Searsport, ME	14	1	-	-	-	66	-	1	23	89	2	-	196
Portland, ME	66	14	9	1	38	19	-	58	6	396	11	2	620
Portsmouth, NH	63	3	-	-	10	1	-	-	2	117	1	2	199
Northeastern US - Off Race Point													
Salem, MA	7	-	-	-	-	1	-	-	-	1	-	-	9
Boston, MA	34	1	77	2	8	94	4	33	-	225	1	4	483
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	9	-	-	-	13	-	-	22
Subtotal	0	0	0	0	0	9	0	0	0	13	0	0	22
Mid-Atlantic Block Island Sound													
New Bedford, MA	58	-	1	-	25	0	11	-	4	11	-	-	110
Providence, RI	77	2	2	-	24	35	4	77	3	122	3	1	350
New London, CT	20	-	2	-	10	32	-	-	61	8	1	1	135
New Haven, CT	54	2	1	5	33	5	-	-	236	195	15	1	547
Bridgeport, CT	28	-	1	5	2	4	54	-	176	49	-	-	319
Long Island, NY	-	2	-	2	-	32	-	-	521	218	3	2	780
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	366	39	2,400	1	65	226	19	696	28	1,558	20	8	5,426
Mid-Atlantic Delaware Bay													
Philadelphia, PA	312	19	467	16	195	26	401	148	12	864	17	2	2,479
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	304	8	368	-	204	40	6	653	6	192	16	23	1,820
Hampton Roads, VA	320	30	1,748	1	138	31	1	174	2	202	6	13	2,666
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	29	-	14	-	32	-	2	2	-	42	-	2	123
Mid-Atlantic Wilmington, NC													
Wilmington, NC	111	7	92	-	118	-	1	23	17	257	1	1	628
Mid-Atlantic Georgetown, SC													
Georgetown, SC	43	-	1	-	18	-	-	-	-	-	-	1	63
Mid-Atlantic Charleston, SC													
Charleston, SC	162	2	1,503	-	92	40	7	223	14	214	15	5	2,277
Mid-Atlantic Savannah, GA													
Savannah, GA	289	14	1,332	-	234	6	9	170	4	331	6	3	2,398
Southeastern US													
Brunswick, GA	86	-	27	-	54	1	13	273	-	4	-	-	458
Fernandina, FL	9	-	80	2	111	2	37	2	-	2	10	-	255
Jacksonville, FL	166	4	476	195	245	12	11	537	9	302	274	9	2,240
Port Canaveral, FL	109	2	17	13	77	547	41	37	3	27	14	2	889
All Port Regions	2,743	150	8,623	243	1,752	1,229	621	3,107	1,127	5,439	416	82	25,532

a/ Other includes fishing vessels, industrial vessels, research vessels, school ships.

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Table 2-5. U.S. East Coast Vessel Arrivals by Port Area and Vessel Type, 2004

Port Area	Vessel Type												
	Bulk Carrier	Combination Carrier	Container Ship	Freight Barge	General Dry Cargo Ship	Passenger Ship	Refrigerated Cargo Ship	Ro-Ro Cargo Ship	Tank Barge	Tanker	Towing Vessel	Other a/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	22	-	4	-	17	-	-	-	-	-	-	-	43
Searsport, ME	10	-	2	2	3	81	-	1	11	78	8	-	196
Portland, ME	71	4	4	1	28	26	-	37	26	395	47	2	641
Portsmouth, NH	51	3	1	-	16	1	-	-	1	87	9	4	173
Northeastern US - Off Race Point													
Salem, MA	9	-	-	-	-	6	-	-	-	-	-	-	15
Boston, MA	34	1	77	2	8	94	4	33	-	225	1	4	483
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	13	-	-	1	21	1	-	36
Subtotal	0	0	0	0	0	13	0	0	1	21	1	0	36
Mid-Atlantic Block Island Sound													
New Bedford, MA	54	-	-	-	24	2	8	1	-	10	-	-	99
Providence, RI	86	2	-	-	21	43	-	62	5	94	6	3	322
New London, CT	17	-	8	-	26	57	-	-	58	11	3	-	180
New Haven, CT	41	-	6	5	34	-	-	-	442	151	22	-	701
Bridgeport, CT	69	-	-	1	2	4	24	-	258	33	-	1	392
Long Island, NY	-	-	-	8	-	38	-	-	597	225	-	1	869
Subtotal	267	2	14	14	107	144	32	63	1,360	524	31	5	2,563
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	380	27	2,499	-	68	307	26	683	23	1,485	47	5	5,550
Mid-Atlantic Delaware Bay													
Philadelphia, PA	360	8	450	24	270	33	364	147	3	944	54	4	2,661
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	387	6	402	-	212	75	9	651	5	270	13	11	2,041
Hampton Roads, VA	439	25	1,725	5	147	64	10	152	7	222	22	16	2,834
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	49	1	14	-	22	7	-	-	-	56	-	2	151
Mid-Atlantic Wilmington, NC													
Wilmington, NC	135	4	84	1	123	6	1	29	9	266	6	3	667
Mid-Atlantic Georgetown, SC													
Georgetown, SC	45	3	4	-	16	1	-	-	-	-	-	-	69
Mid-Atlantic Charleston, SC													
Charleston, SC	145	3	1,649	6	123	64	5	211	11	210	39	7	2,473
Mid-Atlantic Savannah, GA													
Savannah, GA	302	12	1,317	1	200	49	18	186	3	376	8	2	2,474
Southeastern US													
Brunswick, GA	92	-	11	-	63	8	12	262	-	1	-	3	452
Fernandina, FL	28	-	75	2	117	19	18	1	-	-	24	-	284
Jacksonville, FL	187	7	541	183	220	89	13	547	17	307	369	37	2,517
Port Canaveral, FL	136	-	13	33	83	579	36	51	15	46	66	4	1,062
All Port Regions	3,149	106	8,886	274	1,843	1,666	548	3,054	1,492	5,513	745	109	27,385

a/ Other includes fishing vessels, industrial vessels, research vessels, school ships.

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

U.S. East Coast Vessel Arrivals by Size of Vessel

The size of vessels calling at U.S. East Coast ports can vary considerably depending on a number of factors including cargo and vessel type, length of ocean voyage, port and channel draft limitations at the loading or unloading port, customers preferred consignment size, and vessel routing considerations.

VESSEL SIZE BY PORT AREA

Table 2-6 presents U.S. East Coast vessel arrivals by port region, port area and DWT size ranges for 2003 and 2004. For the U.S. East Coast as a whole, about 38 percent of the vessel arrivals are of vessels below 20,000 DWT, approximately 24 percent of vessel arrivals are between 20,000 and 40,000 DWT; 25 percent between 40,000 and 60,000 DWT; and 13 percent over 60,000 DWT.

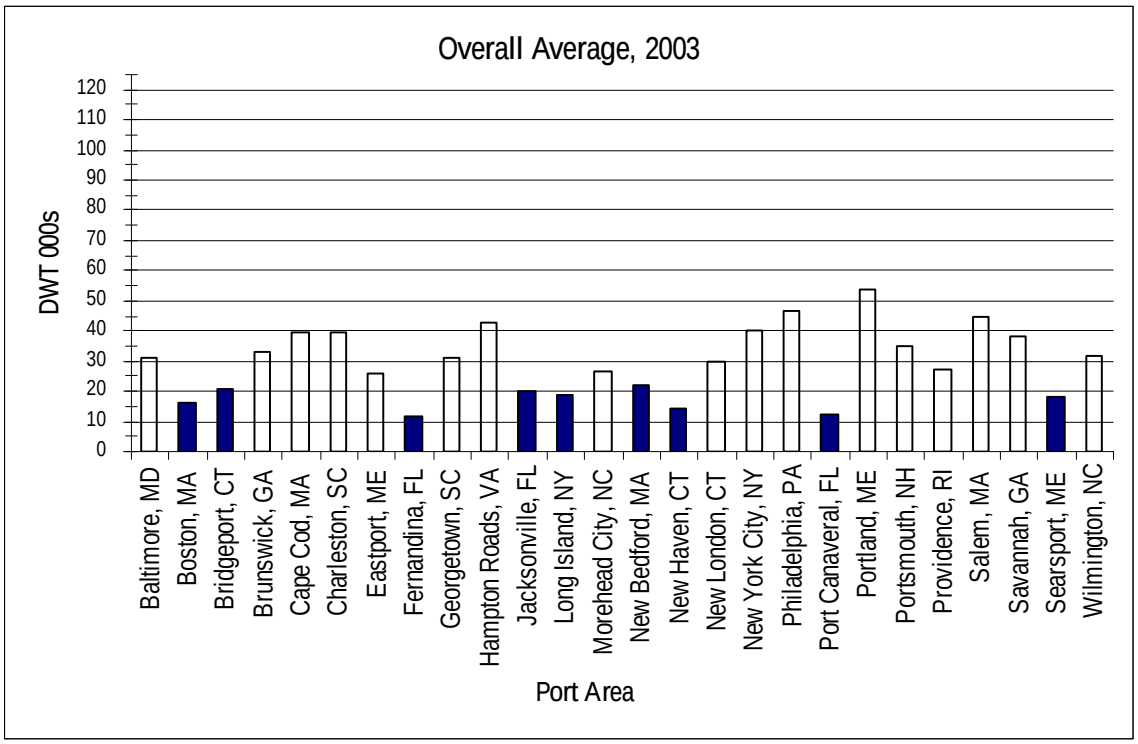
Table 2-6. Vessel Arrivals by Port Area and DWT, 2003-2004

	2003					2004				
	DWT					DWT				
Port Area	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total
Northeastern US - Gulf of Maine										
Eastport, ME	23	4	13	-	40	17	-	26	-	43
Searsport, ME	132	43	18	3	196	117	46	31	2	196
Portland, ME	209	111	83	217	620	201	103	104	233	641
Portsmouth, NH	32	91	74	2	199	33	48	91	1	173
Northeastern US - Off Race Point										
Salem, MA	1	1	5	2	9	6	6	-	3	15
Boston, MA	237	109	127	10	483	237	109	127	10	483
Northeastern US - Cape Cod Bay										
Cape Cod, MA	9	-	3	10	22	15	1	8	12	36
Mid-Atlantic Block Island Sound										
New Bedford, MA	46	33	12	19	110	41	28	8	22	99
Providence, RI	172	74	92	12	350	157	89	72	4	322
New London, CT	96	19	20		135	118	25	36	1	180
New Haven, CT	309	116	117	5	547	520	81	94	6	701
Bridgeport, CT	278	4	15	22	319	349	2	14	27	392
Long Island, NY	624	59	9	88	780	691	77	17	84	869
Mid-Atlantic Ports of New York/New Jersey										
New York City, NY	1,353	1,311	1,830	932	5,426	1,324	1,548	1,774	904	5,550
Mid-Atlantic Delaware Bay										
Philadelphia, PA	1,117	472	296	594	2,479	1,153	556	327	625	2,661
Mid-Atlantic Chesapeake Bay										
Baltimore, MD	754	483	415	168	1,820	759	588	443	251	2,041
Hampton Roads, VA	429	763	950	524	2,666	472	855	871	636	2,834
Mid-Atlantic Morehead City and Beaufort, NC										
Morehead City, NC	30	74	15	4	123	37	77	33	4	151
Mid-Atlantic Wilmington, NC										
Wilmington, NC	196	168	238	26	628	221	176	240	30	667
Mid-Atlantic Georgetown, SC										
Georgetown, SC	19	18	26	-	63	27	28	14	-	69
Mid-Atlantic Charleston, SC										
Charleston, SC	371	692	986	228	2,277	406	817	1,045	205	2,473
Mid-Atlantic Savannah, GA										
Savannah, GA	507	667	908	316	2,398	496	739	823	416	2,474
Southeastern US										
Brunswick, GA	282	126	46	4	458	271	149	28	4	452
Fernandina, FL	225	4	26	-	255	247	2	35	-	284
Jacksonville, FL	1,376	457	358	49	2,240	1,562	514	389	52	2,517
Port Canaveral, FL	763	70	46	10	889	878	84	85	15	1,062
All Port Areas	9,590	5,969	6,728	3,245	25,532	10,355	6,748	6,735	3,547	27,385

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

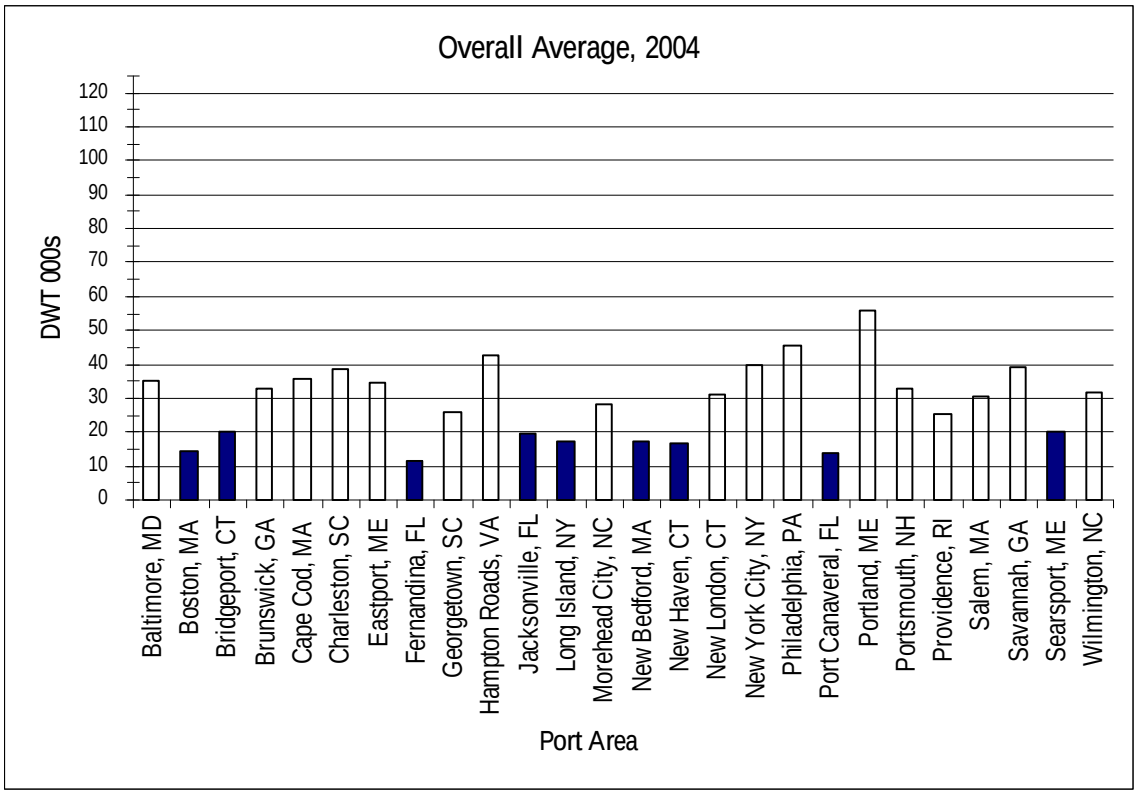
In 2003, the port area of Portland had the highest average vessel DWT on the U.S. East Coast with an average of 53,810 DWT (Figure 2-1). The port area of Philadelphia was second with an average of 46,371. Large tankers bringing principally fuel oil for local power plants account for more than 50 percent of the arrivals for both of these port areas. High average vessel DWT are also reported for the port area of Salem, MA (44,738 DWT in 2003) and Hampton Roads (42,749 DWT). The average vessel DWT by port area was similar for 2004 (Figure 2-2).

Figure 2-1. Average Vessel DWT by Port Area, 2003



Source: Prepared by Nathan Associates Inc. as described in text from USCG Vessel Arrival Database.

Figure 2-2. Average Vessel DWT by Port Area, 2004



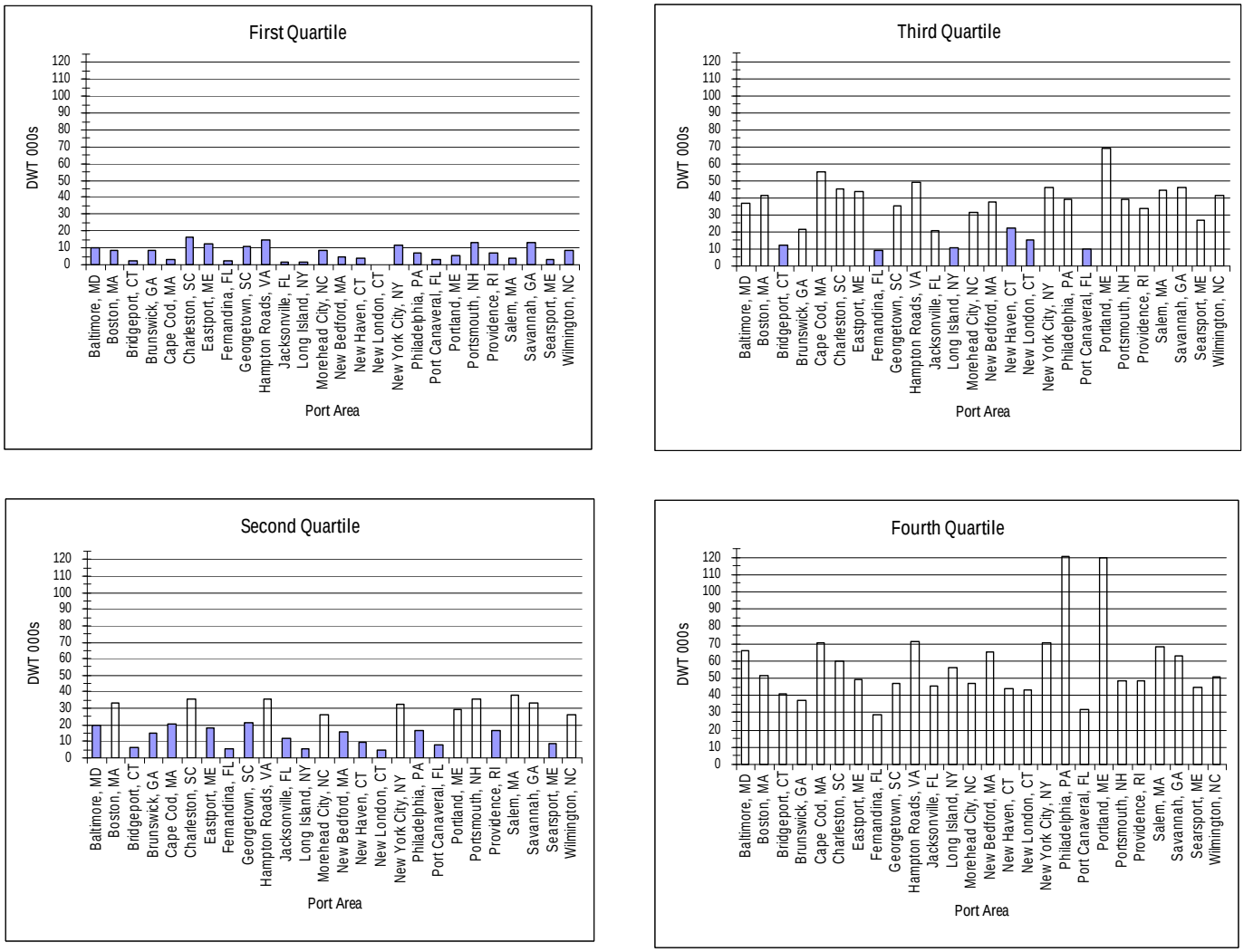
Source: Prepared by Nathan Associates Inc. as described in text from USCG Vessel Arrival Database.

The overall average vessel DWT by port area can sometimes mask a significant size difference of smaller and larger vessels calling at port. For this reason, we have analyzed average vessel size by DWT quartile for each of the port areas. Thus the average DWT for the smallest 25 percent of vessels calling at each port area in 2003-2004 is presented in Figure 2-3, quartile 1. The second smallest 25 percent of vessels is presented as quartile 2, etc.

For most port areas, there appears to be an orderly and graduated increase in the average vessel DWT by DWT quartile. In the second quartile, the port areas of Boston, Portland, Hampton Roads, Portsmouth and Salem exhibit large jumps in average vessel DWT. For Boston, this is due to the importance of containerships and tankers in the second quartile. In the case of Hampton Roads, it is an indication of the importance of bulk cargoes handled at the port and the predominance of large vessels even within the second DWT quartile. For Salem, it is the combination of a small number of overall vessel arrivals and the use of dry bulk vessels at the port.

In the fourth quartile, the port areas of Philadelphia, PA and Portland, ME demonstrate dramatic increases. For Philadelphia this is due to the very large liquid tank ships in excess of 160,000 DWT that call at the port area which includes Delaware Bay. For Portland this is due to the 120,000 DWT tankers that provide fuel oil to local power plants.

Figure 2-3. Average Vessel DWT by Quartile and Port Area, 2003-2004

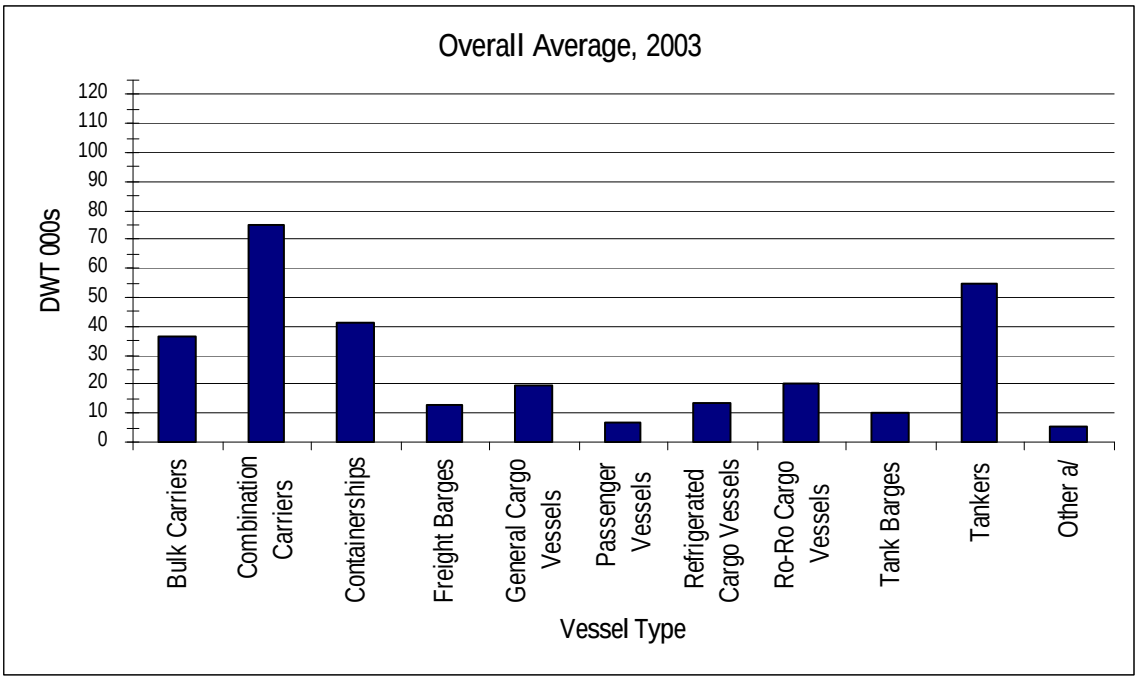


Source: Prepared by Nathan Associates Inc. as described in text from USCG Vessel Arrival Database

VESSEL SIZE BY VESSEL TYPE

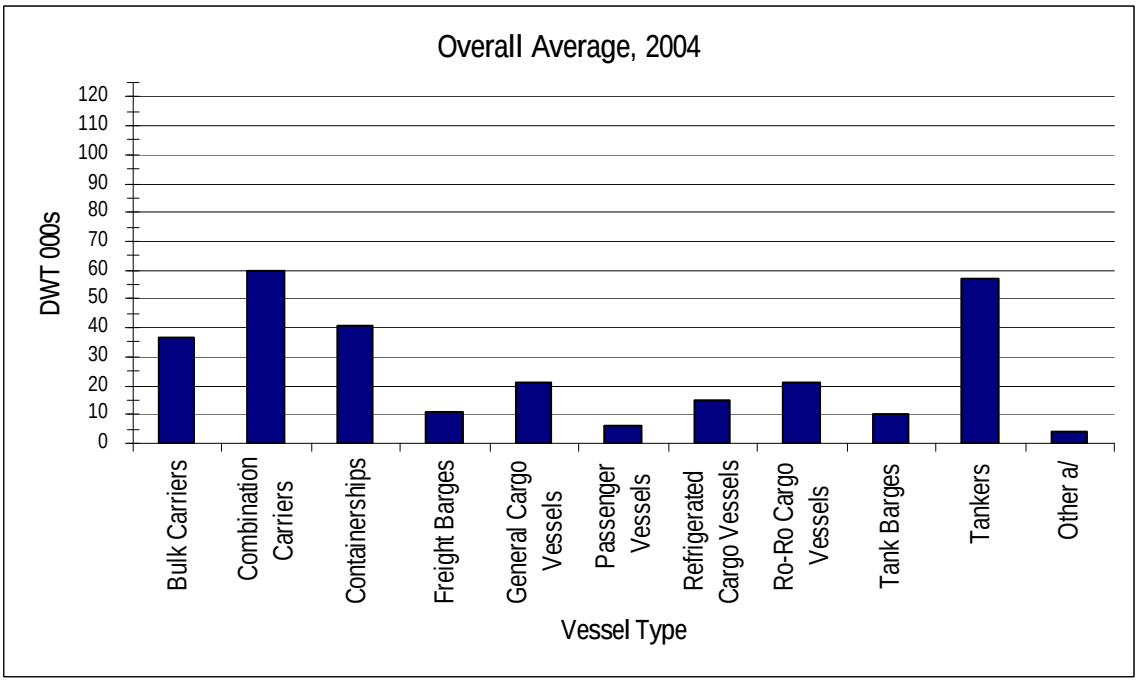
It is also interesting to review average vessel size by type of vessel. The overall average DWT by vessel type for U.S. East Coast ports for 2003 and 2004 are presented in Figure 2-4 and Figure 2-5, respectively. In terms of overall average size, combination carriers are the largest with an average of 74,697 DWT in 2003 and 59,777 DWT in 2004. Tank ships are next with an average of 54,513 DWT in 2003 and 57,060 DWT in 2004. The average containership was 40,895 DWT in 2003 and 40,760 DWT in 2004. Dry bulk carriers were the only other vessel type with an average DWT in excess of 30,000 DWT registering 36,193 DWT in 2003 and 36,620 DWT in 2004.

Figure 2-4. U.S. East Coast Ports: Average Vessel DWT by Vessel Type, 2003



Source: Prepared by Nathan Associates Inc. as described in text from USCG Vessel Arrival Database
a/ Includes fishing vessels, industrial vessels, research vessels and school ships.

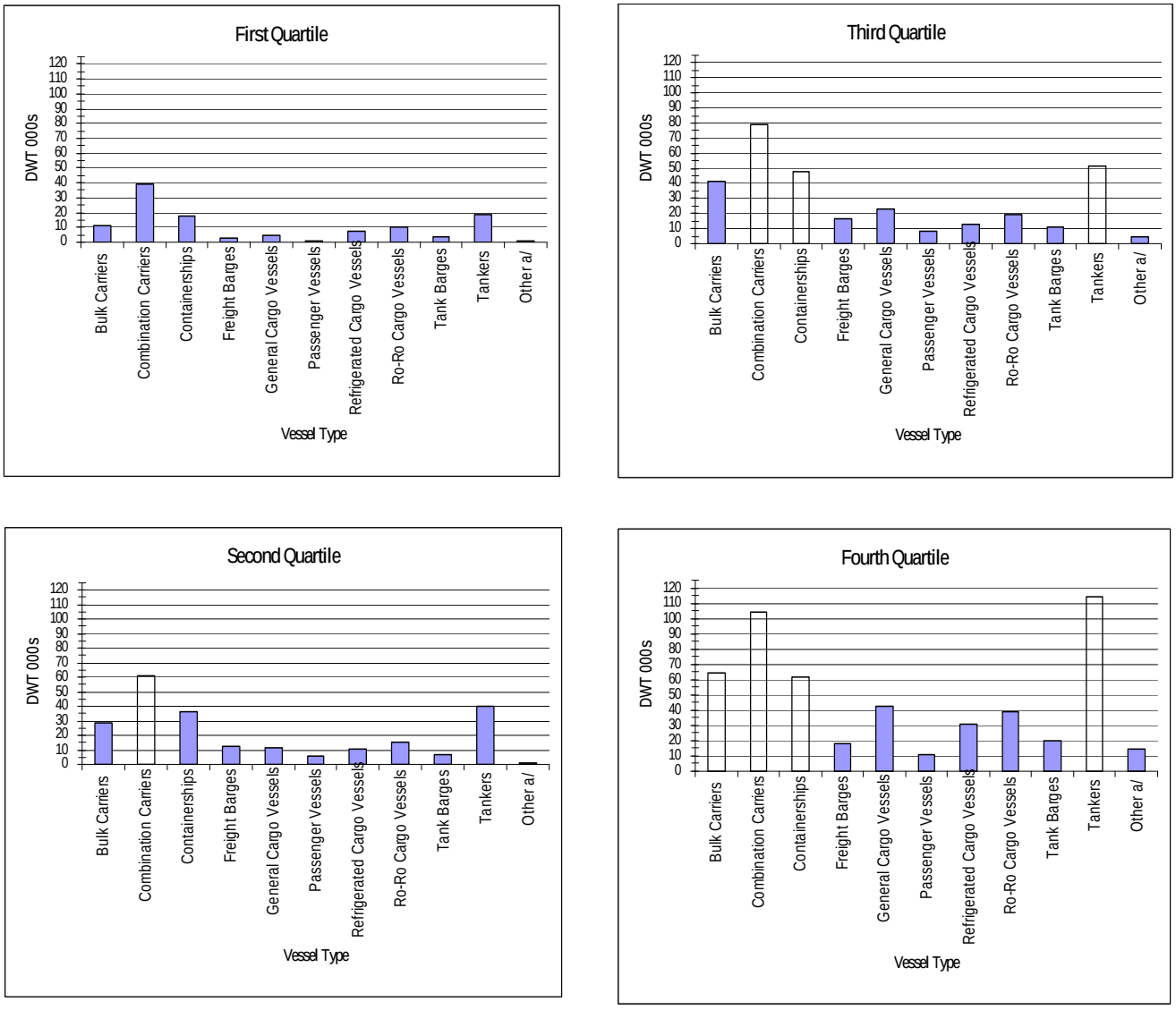
Figure 2-5. U.S. East Coast Ports: Average Vessel DWT by Vessel Type, 2004



Source: Prepared by Nathan Associates Inc. as described in text from USCG Vessel Arrival Database
a/ Includes fishing vessels, industrial vessels, research vessels and school ships.

Figure 2-6 presents average vessel DWT by quartile for each vessel type during 2003-2004. Even in the first quartile, the average DWT for combination carriers is nearly 40,000 DWT; more than double that of any other vessel type. In the second quartile, the average DWT of tank ships, containerships and bulk carriers show significant increases. The increases in average vessel DWT by vessel type in the third quartile appear moderate and orderly. In the fourth quartile, the substantial jump in the average DWT of tank ships to over 110,000 DWT is noteworthy.

Figure 2-6. U.S. East Coast: Average Vessel DWT by Quartiles and Vessel Type, 2003-2004



Source: Prepared by Nathan Associates Inc. as described in text from USCG Vessel Arrival Database

a/ Includes fishing vessels, industrial vessels, research vessels and school ships

PASSENGER VESSELS

In 2003, there were 1,229 passenger vessel arrivals at U.S. East Coast ports and in 2004 there were 1,666 arrivals[11] (Table 2-7). Passenger vessels consist principally of cruise ships and ferries.

The Southeastern U.S. region with 562 arrivals accounted for 46 percent of U.S. East Coast passenger vessel arrivals in 2003; in 2004 the Southeastern U.S. region had 695 passenger vessel arrivals, 42 percent of the total U.S. East Coast. By far the most important port area for passenger vessel arrivals is Port Canaveral, FL with 547 passenger vessel arrivals in 2003 and 579 arrivals in 2004. In 2004, over 95 percent of the passenger vessel arrivals in Port Canaveral were of vessels greater than 60,000 GRT, an indication of the importance of the cruise industry in that port area. Disney Cruise Line uses Port Canaveral as the home port for its 83,000 GRT Disney Magic and Disney Wonder vessels.

New York City is the port area with the second most passenger vessel arrivals with 226 arrivals in 2003 and 307 arrivals in 2004. More than 50 percent of the passenger vessel arrivals are greater than 60,000 GRT.

[11] These figures exclude the ports of Miami and Fort Lauderdale and other smaller ports south of Port Canaveral that are outside the scope of the proposed rulemaking.

Table 2-7. Passenger Ship Arrivals by Port Region, Port Area and GRT, 2003-2004

	2003					2004				
	Gross Registered Tonnage					Gross Registered Tonnage				
Port Area	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total
Northeastern US - Gulf of Maine										
Eastport, ME	-	-	-	-	0	-	-	-	-	0
Searsport, ME	3	14	28	21	66	21	16	27	17	81
Portland, ME	-	2	6	11	19	5	3	10	8	26
Portsmouth, NH	1	-	-	-	1	1	-	-	-	1
Northeastern US - Off Race Point										
Salem, MA	-	1	-	-	1	3	-	3	-	6
Boston, MA	8	16	46	24	94	8	16	46	24	94
Northeastern US - Cape Cod Bay										
Cape Cod, MA	1	2	5	1	9	3	2	8	-	13
Mid-Atlantic Block Island Sound										
New Bedford, MA	-	-	-	-	0	2	-	-	-	2
Providence, RI	6	4	11	14	35	15	4	9	15	43
New London, CT	32	-	-	-	32	54	-	3	-	57
New Haven, CT	5	-	-	-	5	-	-	-	-	0
Bridgeport, CT	4	-	-	-	4	4	-	-	-	4
Long Island, NY	32	-	-	-	32	38	-	-	-	38
Mid-Atlantic Ports of New York/New Jersey										
New York City, NY	8	22	82	114	226	28	45	65	169	307
Mid-Atlantic Delaware Bay										
Philadelphia, PA	3	5	11	7	26	3	15	15	-	33
Mid-Atlantic Chesapeake Bay										
Baltimore, MD	3	7	1	29	40	9	16	3	47	75
Hampton Roads, VA	5	12	2	12	31	13	17	28	6	64
Mid-Atlantic Morehead City and Beaufort, NC										
Morehead City, NC	-	-	-	-	0	7	-	-	-	7
Mid-Atlantic Wilmington, NC										
Wilmington, NC	-	-	-	-	0	4	2	-	-	6
Mid-Atlantic Georgetown, SC										
Georgetown, SC	-	-	-	-	0	1	-	-	-	1
Mid-Atlantic Charleston, SC										
Charleston, SC	6	5	10	19	40	17	11	25	11	64
Mid-Atlantic Savannah, GA										
Savannah, GA	4	1	-	1	6	45	4	-	-	49
Southeastern US										
Brunswick, GA	1	-	-	-	1	8	-	-	-	8
Fernandina, FL	1	1	-	-	2	17	2	-	-	19
Jacksonville, FL	7	-	5	-	12	19	1	56	13	89
Port Canaveral, FL	104	4	2	437	547	18	9	1	551	579
All Port Regions	234	96	209	690	1,229	343	163	299	861	1,666

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Table 2-8 presents information on the number of cruise passenger embarkations at selected U.S. East Coast ports from 2000 through 2005. The North American cruise industry is defined as those cruise lines that primarily market their cruises in North America. Throughout this period, the Port of Miami was the leader in terms of embarkations with nearly 1.8 million passengers in 2005. However, strong growth at Port Everglades moved it from the third-ranked port with 0.8 million passengers in 2000 to the second-ranked port with 1.3 million passengers in 2005. Port Canaveral also grew from 0.9 million passengers in 2000 to 1.2 million passengers in 2005. It is important to note that the timing and duration of the proposed seasonal speed restrictions will be well-known and that vessel itineraries will be developed taking the speed restrictions into account.

Table 2-8. Embarkations of the North American Cruise Industry for Selected U.S. East Coast Ports, 2000-2005 (passengers in 000s)

Port	2000	2001	2002	2003	2004	2005
Miami	1,682	1,700	1,804	1,965	1,682	1,771
Port Everglades	798	1,046	1,202	1,213	1,324	1,283
Port Canaveral	941	870	1,028	1,089	1,220	1,234
New York	309	238	326	438	547	370
Jacksonville	n.a.	n.a.	n.a.	6	113	137
Norfolk	8.	27	39	48	47	45
Baltimore	n.a.	n.a.	57	57	105	67
Boston	n.a.	n.a.	69	69	100	80
Charleston	n.a.	n.a.	n.a.	31	39	41
Philadelphia	48	60	1.5	24	29	50

Source: Business Research & Economic Advisors, The Contribution of the North American Cruise Industry to the U.S. Economy in 2005, prepared for the International Council of Cruise Lines, August 2006. Jacksonville, Norfolk and Charleston data from U.S. Maritime Administration.

As mentioned earlier, the USCG vessel arrival data does not include information on vessels less than 150 GRT. As the majority of passenger and car ferries fall below this threshold, the USCG cannot be used as a reliable basis for analyzing movements of passenger and car ferry vessels at U.S. East Coast port areas.

We have obtained information on ferry vessels and ferry routes from the National Ferry Database published on-line by U.S. Department of Transportation, Bureau of Transportation Statistics. The National Ferry Database is a comprehensive inventory of existing ferry operations in the United States and its possessions. This data was collected as part of a survey conducted by the U.S. Department of Transportation, Federal Highway Administration (FHWA). The survey period extended from March 1, 2000 to September 30, 2000. The universe of 224 ferry operators provides ferry service on 487 nonstop ferry route segments, comprising 352 ferry routes, and serving 578 ferry terminal locations with 677 ferry vessels.

Using the National Ferry Database, we identified 261 ferry vessels operating on the U.S. East Coast in 2000 (Table 2-9). A complete inventory of ferry vessels operating in each state including the type of service

(passenger, ro-ro or rail), typical speed, vessel length and gross tonnage is presented in Appendix C. New York State had 65 ferry vessels in operation, followed by Massachusetts (36 ferry vessels), North Carolina (35 ferry vessels) and Maine (23 ferry vessels). More than 64 percent (168 ferry vessels) had an overall length of 65 feet or greater. Generally the ferry vessels are characterized as *conventional* with typical speeds of 8-16 knots, and *high speed* with typical speeds in excess of 25 knots.

Table 2-9. Ferry Vessels Operating on the U.S. East Coast by State, 2000

State	Number of Ferry Vessels	Ferry Vessels with LOA of 65 feet or greater	
		Number	Average speed (knots)
Maine	23	11	11.5
New Hampshire	2	2	n.a.
Massachussetts	36	37	16.5
Rhode Island	7	1	n.a.
Connecticut	17	14	19.3
New York	65	45	10.6
New Jersey	20	16	n.a.
Pennsylvania	3	1	n.a.
Delaware	10	7	16.4
Maryland	10	2	n.a.
Virginia	13	6	9.2
North Carolina	35	23	10.1
South Carolina	10	0	0.0
Georgia	4	1	10.0
Florida	6	2	6.0
Total	261	168	n.a.

Source: Prepared by Nathan Associates Inc. from U.S. Department of Transportation, Bureau of Transportation Statistics, National Ferry Database as presented in Appendix C.

The National Ferry Database contained information on 172 ferry routes operating on the U.S. East Coast in 2000 (Table 2-10). Once again New York State had the most ferry routes with 46 routes in service in 2000. Massachusetts was next with 36 ferry routes followed by Maine (23 routes) and North Carolina (16 routes). Most of the ferry routes involve crossing rivers, harbors, sounds or bays and only 10 routes of the 172 routes identified involved crossing segments of the Atlantic Ocean. Hence, most ferry operations on the U.S. East Coast will not be affected by the proposed regulations as they operate within the COLREGS lines.[12]

Further information on each of the ferry routes including the metro area served, water body crossed, type of service, number of passengers and vehicles served, and beginning and end of season service is presented in Appendix C.

[12] The COLREGS demarcation lines, which were developed by the Convention on International Regulations for Preventing Collisions at Sea 1972 (72 COLREGS), demarcate harbor entrances and provide the baseline for the 30 nm (56 km) zones around the ports in the MAUS. These lines have been established to delineate the waters where mariners must comply with the 72 COLREGS and the Inland Navigational Rules Act of 1980 (Inland Rules). The waters inside of the lines are Inland Rules Waters and the waters outside of these lines are COLREGS Waters. The proposed speed restrictions or other proposed operational measures would not apply to vessels transiting in waters inside these lines (Inland Rules Waters). Vessels transiting seaward of the COLREGS lines would be required to adhere to speed restrictions and other operational measures in the 30 nm (56 km) designated zones.

Table 2-10. Ferry Routes Operating on the U.S. East Coast by State, 2000

State	Number of Routes	Routes via Atlantic Ocean
Maine	23	5
New Hampshire	1	1
Massachussetts	36	4
Rhode Island	7	0
Connecticut	5	0
New York	46	0
Pennsylvania	1	0
Delaware	4	0
Maryland	7	0
Virginia	12	0
North Carolina	16	0
South Carolina	6	0
Georgia	4	0
Florida	4	0
Total	172	10

Source: Prepared by Nathan Associates Inc. from U.S. Department of Transportation, Bureau of Transportation Statistics, National Ferry Database as presented in Appendix C.

COMMERCIAL FISHING

Commercial fishing is a multimillion dollar industry along the U.S. East Coast. In 2005, commercial fish landings at U.S. East Coast ports totaled $801 million (Table 2-11). The port of New Bedford, MA is the leading U.S. port in terms of value of commercial fish landings with $282.5 million in 2005.

Table 2-11. U.S. East Coast Commercial Fishery Landings by Port, 2002 through 2005 (millions of dollars)

Port	2002	2003	2004	2005
New Bedford, MA	168.6	176.2	206.5	282.5
Hampton Roads, VA	69.5	79.6	100.6	85.2
Cape May-Wildwood, NJ	35.3	42.8	68.1	68.4
Gloucetser, MA	41.2	37.8	42.7	45.9
Point Judith, RI	31.3	32.4	31.5	38.3
Portland,ME	40.4	28.7	24.2	34.6
Stonington, ME	21.7	20.5	7.5	32.3
Reedville, VA	24.2	24.2	26.1	27.1
Long Beach-Barnegat, NJ	14.6	16.4	20.6	26.7
Point Pleasnat, NJ	19.7	22.8	19.2	21.6
Provincetown-Chatham, MA	15.2	13.5	14.1	19.8
Wanchese-Stumpy Point, NC	23.2	21.0	20.6	19.6
Atlantic City, NJ	22.4	20.8	17.7	18.5
Montauk, NY	11.1	11.0	13.0	16.5
Charleston -Mt. Pleasant, SC	9.3	13.0	8.5	12.2
Boston,MA	8.6	8.9	8.8	10.6
Beaufort- Morehead City, NC	19.1	15.0	16.9	9.7
Hampton Bay-Shinnicock, NY	8.3	6.5	6.6	8.1
Rockland, ME	4.3	4.1	2.7	7.4
Cape Canveral, FL	6.2	6.8	9.3	6.1
Engelhard-Swanquarter, NC	11.1	8.0	7.8	5.3
Oriental-Vandemere, NC	8.5	5.0	7.2	4.7
Beaufort, SC	n.a.	7.0	n.a.	n.a.
Ocean City, MD	8.1	6.6	n.a.	n.a.
Georgetown, SC	5.2	6.0	n.a.	n.a.
Belhaven- Washington, NC	6.2	5.0	3.7	n.a.
Sneads Ferry-Swansboro, NC	6.4	5.0	n.a.	n.a.
Darien-Belville, GA	6.9	6.0	5.0	n.a.
Total	646.6	650.6	688.9	801.1

Source: NOAA Fisheries.

The operational measures apply to vessels with a length of 65 feet and above. Our analysis of commercial fishing permits issued on the U.S. East Coast shows that the vast majority of commercial fishing vessels that are 65 feet and above have a GRT of less than 150 tons and hence are not captured in the U.S. Coast Guard vessel arrival database, which necessitated evaluating commercial fishing permits, rather than relying on just the USCG database. Table 2-12 shows that for the Southeast region approximately 84 percent of the fishing vessels over 65 feet are less than 150 tons. For the Northeast region, nearly 67 percent of the fishing vessels over 65 feet are less than 150 tons.

Table 2-12. Fishing Vessel Permits Issued to Vessels 65 Feet and Above in LOA by Region, 2003

	Southeast Region				Northeast Region	
Vessel gross registered tons	Fishing perrmits	%	Unique vessels	%	Fishing perrmits	%
All vessels	557	100.0%	347	100.0%	856	100.0%
Vessels less than 150 GRT	482	86.5%	290	83.6%	572	66.8%
Vessels 150 GRT and above	75	13.5%	57	16.4%	284	33.2%

Note: For the Northeast Region fishing permit data provided was for unique vessels only.

Source: Prepared by Nathan Associates Inc. from data provided by National Marine Fisheries Service, Sustainable Fisheries Division, Southeast Fisheries Science Center and NOAA Fisheries, Northeast Fisheries Science Center.

WHALE WATCHING

In 2000, there were 36 whale watching operations permitted and registered in New England (Table 2-13).[13] It is estimated that more than 1.2 million passengers participated in whale-watching tours in 2000, generating more than $30 million in revenues. Massachusetts accounted for nearly 80 percent of the New England totals for both passengers and revenues.

Table 2-13. Characteristics of the New England Whale Watching Industry, 2000

State	Number of Operations	Number of Vessels	Annual Ridership	Annual Revenue ($ millions)
Massachusetts	17	30-35	1,000,000	$24.0
New Hampshire	4	6-10	80,000	$1.9
Maine	14	18-24	137,500	$4.4
Rhode Island	1	1	12,500	$0.3
Total	36	55-70	1,230,000	$30.6

Source: Hoyt, Erich Whale Watching 2000: Worldwide Tourism Numbers, Expenditures and Expanding Socioeconomic Benefits, 2000.

U.S. East Coast Trade

The volume and value of goods carried by vessels calling at U.S East Coast ports are other indicators of the economic significance of maritime activity that may be affected by the final rule. We have analyzed the foreign trade statistics for 2003 and 2004 published by U.S. Census Bureau at a Custom District and port level. We have conducted further investigations to reconcile the reported volume and value of U.S. imports and exports by Customs District and port with USCG vessel arrivals by port region and port area (Table 2-14).

[13] Although whale watching operations exist in the mid and South Atlantic states, the degree of activity is smaller cannot be reliably distinguished from tours to view other species such as dolphins.

Table 2-14. Reconciliation of U.S. Customs Districts and Ports with Port Region and Port Area

U.S.Customs District and Port	Port Region	Port Area
01 Portland, ME		
0101 Portland, ME	Northeast- Gulf of Maine	Portland
0102 Bangor, ME	Northeast- Gulf of Maine	Searsport
0103 Eastport, ME	Northeast- Gulf of Maine	Eastport
0111 Bath, ME	Northeast- Gulf of Maine	Portland
0112 Bar Harbor, ME	Northeast- Gulf of Maine	Searsport
0121 Rockland, ME	Northeast- Gulf of Maine	Searsport
0122 Jonesport, ME	Northeast- Gulf of Maine	Searsport
0131 Portsmouth, NH	Northeast- Gulf of Maine	Portsmouth
0132 Belfast, ME	Northeast- Gulf of Maine	Searsport
0152 Searsport, ME	Northeast- Gulf of Maine	Searsport
04 Boston, MA		
0401 Boston, MA	Northeast- Off Race Point	Boston
0404 Gloucester, MA	Northeast- Off Race Point	Salem
0405 New Bedford, MA	Mid-Atlantic - Block Island Sound	New Bedford
0406 Plymouth, MA	Northeast- Off Race Point	Boston
0407 Fall RIver, MA	Mid-Atlantic - Block Island Sound	New Bedford
0408 Salem, MA	Northeast- Off Race Point	Salem
0409 Provincetown, MA	Northeast- Cape Cod	Cape Cod
0410 Bridgeport,CT	Mid-Atlantic - Block Island Sound	Bridgeport
0412 New Haven,CT	Mid-Atlantic - Block Island Sound	New Haven
0413 New London, CT	Mid-Atlantic - Block Island Sound	New London
05 Providence, RI		
0501 Newport, RI	Mid-Atlantic - Block Island Sound	Providence
0502 Providence, RI	Mid-Atlantic - Block Island Sound	Providence
0503 Melville, RI	Mid-Atlantic - Block Island Sound	Providence
10 New York City, NY		
1001 New York, NY	Mid-Atlantic - New York and New Jesrsy	New York City
1002 Albany, NY	Mid-Atlantic - New York and New Jesrsy	New York City
11 Philadelphia, PA		
1101 Philadelphia, PA	Mid-Altantic Delaware Bay	Philadelphia
1102 Chester, PA	Mid-Altantic Delaware Bay	Philadelphia
1103 Wilmington, DE	Mid-Altantic Delaware Bay	Philadelphia
1105 PAulsboro, NJ	Mid-Altantic Delaware Bay	Philadelphia
1107 Camden, NJ	Mid-Altantic Delaware Bay	Philadelphia
1113 Gloucester City, NJ	Mid-Altantic Delaware Bay	Philadelphia
1195 UPS, Philadelphia, PA	Mid-Altantic Delaware Bay	Philadelphia
13 Baltimore, MD		
1301 Annapolis, MD	Mid-Atlantic - Chesapeake Bay	Baltimnore
1302 Cambridge, MD	Mid-Atlantic - Chesapeake Bay	Baltimnore
1303 Baltimore, MD	Mid-Atlantic - Chesapeake Bay	Baltimnore
1304 Crisfield, MD	Mid-Atlantic - Chesapeake Bay	Baltimnore
14 Norfolk, VA		
1401 Norfolk, VA	Mid-Atlantic - Chesapeake Bay	Hampton Roads
1402 Newport News, VA	Mid-Atlantic - Chesapeake Bay	Hampton Roads
1404 RIchmond-Petersburg, VA	Mid-Atlantic - Chesapeake Bay	Hampton Roads
1408 Hopewell VA	Mid-Atlantic - Chesapeake Bay	Hampton Roads
15 Charlotte, NC		
1501 Wilmington, NC	Mid-Atlantic - Wilmington, NC	Wilmington
1511 Beaufort-Morehead Cty,NC	Mid-Atlantic - Morehead City	Morehead City
16 Charleston, SC		
1601 Charleston, SC	Mid-Atlantic - Charleston	Charleston
1602 Georgetown, SC	Mid-Atlantic- Georgetown	Georgetown
17 Savannah, GA		
1701 Brunswick, GA	Southeastern US	Brunswick
1703 Savannah, GA	Mid-Atlantic Savannah	Savannah
18 Tampa, FL		
1803 Jacksonville, FL	Southeastern US	Jacksonville
1805 Fernandina Beach, FL	Southeastern US	Fernandina Beach
1816 Port Canaveral, FL	Southeastern US	Port Canaveral

Source: Prepared by Nathan Associates Inc.

The U.S. Census Bureau data on U.S. imports of merchandise is compiled primarily from automated data submitted through the U.S. Customs' Automated Commercial System.[14] Data are compiled also from import entry summary forms, warehouse withdrawal forms and Foreign Trade Zone documents as required by law to be filed with the U.S. Customs Service. Information on U.S. exports of merchandise is compiled from copies of Shipper's Export Declarations (SEDs) and data from qualified exporters, forwarders or carriers. Copies of SEDs are required to be filed with Customs officials at the port of export.

For this study, the following data items have been used from the U.S. Census Bureau Foreign Trade Statistics:

- **Customs import value –** the value of imports appraised by the U.S. Customs Services in accordance with the legal requirements of the Tariff Act of 1930, as amended. This value is generally defined as the price actually paid or payable for merchandise when sold for exportation to the U.S. excluding U.S. import duties, freight, insurance and other charges incurred in bringing the merchandise to the U.S.

- **Import charges** – the aggregate cost of all freight, insurance and other charges (excluding U.S. import duties) incurred in bringing the merchandise from alongside the carrier at the port of exportation and placing it alongside the carrier at the first port of entry in the U.S.

- **F.A.S. export value** – the free alongside ship value of exports at the U.S. seaport based on the transaction price, including inland freight, insurance and other charges incurred in placing the merchandise alongside the carrier at the U.S. port of exportation. The value, as defined, excludes the cost of loading the merchandise aboard the exporting carrier and also excludes freight, insurance and any other charges or transportation costs beyond the port of exportation.

- **Shipping weight** – the gross weight in metric tons including the weight of moisture content, wrappings, crates, boxes and containers.

- **District of exportation** – the customs district in which the merchandise is loaded on the vessel which takes the merchandise out of the country.

- **Import district of unlading**- the district where merchandise is unloaded from the importing vessel.

Table 2-15 and Table 2-16 present U.S. East Coast maritime imports and exports by port region and port area for 2003 and 2004, respectively.[15]

[14] The description and definition of information from the U.S Census Bureau Foreign Trade Statistics is based on the Guide to Foreign Trade Statistics: Description of the Foreign Trade Statistical Program available on the U.S. census Bureau website.
[15] Maritime trade refers to the method of transportation by which the merchandise arrived in or departed from the U.S.

Table 2-15. U.S. East Coast Maritime Trade by Port Region and Port Area, 2003

ANPR Port Region and Port Area	Imports		Exports		Total Trade	
	Custom import value ($ millions)	Shipping Weight (m.t. 000s)	F.A.S. export value ($ millions)	Shipping Weight (m.t. 000s)	Merchandise Value ($ millions)	Shipping Weight (m.t. 000s)
Gulf of Maine						
Eastport, ME	0.0	0.0	133.3	309.7	133.3	309.7
Searsport, ME	295.4	1,342.7	5.6	2.0	301.0	1,344.7
Portland, ME	892.6	3,330.4	122.9	187.4	1,015.4	3,517.8
Portsmouth, NH	576.9	4,329.3	74.6	149.5	651.5	4,478.9
Subtotal	1,764.9	9,002.5	336.3	648.6	2,101.2	9,651.1
Racepoint, MA						
Salem, MA	29.4	790.9	9.4	4.2	38.8	795.1
Boston, MA	5,126.5	15,893.1	798.8	821.1	5,925.3	16,714.3
Subtotal	5,155.8	16,684.1	808.2	825.3	5,964.1	17,509.4
Cape Cod, MA						
Cape Cod, MA	0.0	0.0	0.1	0.0	0.1	0.0
Subtotal	0.0	0.0	0.1	0.0	0.1	0.0
Block Island Sound						
New Bedford, MA	135.9	2,087.1	7.9	5.2	143.8	2,092.3
Providence , RI	2,665.2	4,522.9	61.3	296.4	2,726.5	4,819.3
New London, CT	149.5	193.3	11.3	56.2	160.9	249.5
New Haven, CT	961.6	2,764.0	35.3	234.7	996.9	2,998.7
Bridgeport, CT	146.0	1,677.8	2.0	6.5	148.0	1,684.4
Subtotal	4,058.4	11,245.1	117.7	599.0	4,176.1	11,844.0
New York						
New York City, NY	78,601.0	68,879.8	21,760.0	9,585.8	100,361.0	78,465.5
Subtotal	78,601.0	68,879.8	21,760.0	9,585.8	100,361.0	78,465.5
Delaware Bay						
Philadelphia, PA	21,817.7	71,221.2	2,080.8	1,768.0	23,898.5	72,989.2
Subtotal	21,817.7	71,221.2	2,080.8	1,768.0	23,898.5	72,989.2
Chesapeake Bay						
Hampton Roads, VA	20,885.7	11,357.2	12,245.2	17,242.8	33,130.9	28,600.0
Baltimore, MD	20,412.1	17,726.0	5,753.1	4,708.8	26,165.2	22,434.8
Subtotal	41,297.8	29,083.2	17,998.3	21,951.7	59,296.1	51,034.8
Morehead City, NC						
Morehead City, NC	226.7	463.8	359.6	40.2	586.4	504.1
Subtotal	226.7	463.8	359.6	40.2	586.4	504.1
Wilmington, NC						
Wilmington, NC	1,250.7	3,337.1	953.2	730.1	2,203.9	4,067.2
Subtotal	1,250.7	3,337.1	953.2	730.1	2,203.9	4,067.2
Georgetown, SC						
Georgetown, SC	37.1	610.7	24.3	47.3	61.3	658.0
Subtotal	37.1	610.7	24.3	47.3	61.3	658.0
Charleston, SC						
Charleston, SC	26,063.4	11,886.0	13,483.2	5,399.4	39,546.7	17,285.3
Subtotal	26,063.4	11,886.0	13,483.2	5,399.4	39,546.7	17,285.3
Savannah, GA						
Savannah, GA	13,630.7	11,888.7	7,634.1	8,134.9	21,264.8	20,023.6
Subtotal	13,630.7	11,888.7	7,634.1	8,134.9	21,264.8	20,023.6
Southeastern U.S.						
Brunswick, GA	4,679.6	1,138.3	657.5	689.5	5,337.1	1,827.8
Fernandina, FL	79.4	92.8	194.6	239.7	274.0	332.5
Jacksonville, FL	8,884.0	8,826.5	3,475.7	942.9	12,359.7	9,769.5
Port Canaveral, FL	355.4	2,647.4	127.8	131.1	483.2	2,778.5
Subtotal	13,998.3	12,705.1	4,455.6	2,003.2	18,454.0	14,708.3
All Port Areas	207,902.6	247,007.2	70,011.5	51,733.4	277,914.1	298,740.7

Source: Prepared by Nathan Associates from U.S Census Bureau Foreign Trade Statistics for 2003 as described in text.

Table 2-16. U.S. East Coast Maritime Trade by Port Region and Port Area, 2004

Port Region and Port Area	Imports		Exports		Total Trade	
	Custom import value ($ millions)	Shipping Weight (m.t. 000s)	F.A.S. export value ($ millions)	Shipping Weight (m.t. 000s)	Merchandise Value ($ millions)	Shipping Weight (m.t. 000s)
Gulf of Maine						
Eastport, ME	0.0	0.0	115.7	260.9	115.7	260.9
Searsport, ME	394.4	1,554.0	1.6	0.8	396.0	1,554.8
Portland, ME	1,126.0	3,331.7	339.2	177.6	1,465.2	3,509.3
Portsmouth, NH	625.7	3,640.4	105.6	239.7	731.2	3,880.1
Subtotal	2,146.0	8,526.0	562.0	679.1	2,708.0	9,205.2
Racepoint, MA						
Salem, MA	23.5	543.6	10.2	3.1	33.7	546.7
Boston, MA	6,102.0	16,508.9	850.4	986.2	6,952.4	17,495.2
Subtotal	6,125.5	17,052.6	860.6	989.3	6,986.1	18,041.9
Cape Cod, MA						
Cape Cod, MA	0.4	0.0	0.0	0.0	0.4	0.0
Subtotal	0.4	0.0	0.0	0.0	0.4	0.0
Block Island Sound						
New Bedford, MA	128.7	2,114.7	9.4	12.2	138.0	2,126.9
Providence , RI	2,835.4	4,549.4	63.7	256.8	2,899.1	4,806.3
New London, CT	276.6	241.7	1.9	5.9	278.6	247.6
New Haven, CT	976.7	2,426.0	47.1	239.8	1,023.8	2,665.8
Bridgeport, CT	83.5	1,555.2	1.1	0.4	84.5	1,555.6
Subtotal	4,300.8	10,887.1	123.2	515.1	4,424.0	11,402.2
New York						
New York City, NY	90,968.3	70,340.7	23,567.1	10,303.3	114,535.4	80,644.0
Subtotal	90,968.3	70,340.7	23,567.1	10,303.3	114,535.4	80,644.0
Delaware Bay						
Philadelphia, PA	27,164.9	74,650.0	3,334.5	1,887.0	30,499.4	76,537.0
Subtotal	27,164.9	74,650.0	3,334.5	1,887.0	30,499.4	76,537.0
Chesapeake Bay						
Hampton Roads, VA	24,713.9	12,047.4	13,260.7	18,550.2	37,974.6	30,597.7
Baltimore, MD	24,410.9	22,589.5	6,905.5	6,273.8	31,316.5	28,863.3
Subtotal	49,124.8	34,636.9	20,166.3	24,824.0	69,291.1	59,461.0
Morehead City, NC						
Morehead City, NC	307.8	404.8	282.7	67.4	590.5	472.2
Subtotal	307.8	404.8	282.7	67.4	590.5	472.2
Wilmington, NC						
Wilmington, NC	1,516.1	4,206.4	1,109.9	856.4	2,626.1	5,062.8
Subtotal	1,516.1	4,206.4	1,109.9	856.4	2,626.1	5,062.8
Georgetown, SC						
Georgetown, SC	82.2	661.8	17.6	20.7	99.8	682.5
Subtotal	82.2	661.8	17.6	20.7	99.8	682.5
Charleston, SC						
Charleston, SC	31,103.0	12,823.8	15,341.5	5,778.6	46,444.5	18,602.3
Subtotal	31,103.0	12,823.8	15,341.5	5,778.6	46,444.5	18,602.3
Savannah, GA						
Savannah, GA	16,540.5	15,701.7	9,661.9	8,609.1	26,202.4	24,310.8
Subtotal	16,540.5	15,701.7	9,661.9	8,609.1	26,202.4	24,310.8
Southeastern U.S.						
Brunswick, GA	5,349.2	1,249.9	761.3	678.4	6,110.5	1,928.3
Fernandina, FL	92.9	116.7	199.9	239.7	292.7	356.4
Jacksonville, FL	9,165.5	9,490.9	4,541.1	1,168.2	13,706.6	10,659.1
Port Canaveral, FL	406.1	2,835.1	127.1	138.7	533.2	2,973.7
Subtotal	15,013.6	13,692.5	5,629.4	2,225.0	20,643.0	15,917.6
All Port Areas	244,393.8	263,584.2	80,656.8	56,755.1	325,050.6	320,339.3

Source: Prepared by Nathan Associates from U.S Census Bureau Foreign Trade Statistics for 2004 as described in text.

In 2003, the custom import value of merchandise imported by vessel on the U.S. East Coast was $207.9 billion nearly triple the $70 billion value of exports. [16] The total value of trade on the U.S. East Coast in 2003 was $277.9 billion. The port area of New York City was the largest in terms of the value of imports ($78.6 billion) and exports ($21.8 billion). This port area accounted for 38 percent of the value of U.S. East Coast imports and 31 percent of exports.

The port areas of Charleston, Philadelphia, Hampton Roads and Baltimore constitute the next tier of port areas with value of imports ranging from $20.4 billion and $26.1 billion. For exports, the port area of Charleston recorded exports of $13.5 billion in 2003, followed by the port areas of Hampton Roads and Savannah with exports of $12.2 billion and $7.6 billion, respectively.

For 2004, the value of imports on the U.S. East Coast increased by 17.6 percent to $244.4 billion and the value of exports increased by 15.2 percent to $80.7 billion. In 2004, the value of total trade increased by 17.0 percent to $325.1 billion

The shipping weight of U.S maritime trade by port region and port area for 2003 and 2004 are also presented in Table 2-15 and Table 2-16. The total shipping weight of U.S East Coast imports was 247.0 million tons in 2003 with export shipments of 51.7 million tons. The port area of Philadelphia was the largest in terms of shipping weight of imports with 71.2 million tons in 2003 followed by New York City with 68.9 million tons. These two port areas account for 57 percent of the total U.S. East Coast import shipments by weight. For exports, Hampton Roads is first with 17.2 million tons followed by New York City with 9.6 million tons and Savannah with 8.1 million tons. The relative rankings by port area for 2004 are similar in terms of export tonnages.

The U.S. Census Bureau reports vessel import charges associated with import of merchandise by customs district.[17] Vessel import charges represent the aggregate cost of all freight, insurance and other charges (excluding U.S. import duties) incurred in bringing the merchandise from alongside the carrier at the port of exportation and placing it alongside the carrier at the first port of entry.

In 2003, vessel import charges at U.S. East Coast customs districts totaled $11.1 billion or 5.3 percent of the vessel import value (Table 2-17).[18] In 2004, vessel import charges increased by 18.5 percent to $13.2 billion, representing 5.3 percent of the vessel import value. In 2004, vessel import charges ranged from a high of 11.9 percent of vessel import value for the customs district of Charlotte, NC to a low of 2.8 percent for the customs district of Providence. Factors such as composition and volume of cargo, value of the merchandise per ton, distance of ocean voyage, size and type of vessel used, and port charges affect the relative importance of vessel import charges at a customs district level.

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[16] Please note that for purposes of this study, ports south of Port Canaveral, FL are excluded from the data presented.

[17] As vessel import charges at not reported by the U.S. Census Bureau at the port level, we have analyzed these charges only at the customs district level. The data presented does not precisely correspond to the vessel import values shown in Table 2-15 and Table 2-16 by port area as we had excluded in those tables ports included in custom district that are outside the scope of this study.

[18] Vessel import value is equivalent to custom import value for merchandise transported by vessels.

Table 2-17. U.S. East Coast: Vessel Import Charges as a Percent of Vessel Import Value by Customs District of Unlading, 2003 and 2004

	2003			2004		
Custom District of Unlading	Vessel Import Value (Millions of Dollars)	Vessel Import Charges (Millions of Dollars)	Percent of Vessel Import Value	Vessel Import Value (Millions of Dollars)	Vessel Import Charges (Millions of Dollars)	Percent of Vessel Import Value
1 Portland, ME	$1,765	$86	4.9%	$2,146	$103	4.8%
4 Boston, MA	$6,549	$341	5.2%	$7,591	$407	5.4%
5 Providence, RI	$2,665	$68	2.6%	$2,835	$78	2.8%
10 New York City, NY	$78,601	$4,046	5.1%	$90,968	$4,711	5.2%
11 Philadelphia, PA	$21,818	$1,507	6.9%	$27,165	$1,797	6.6%
13 Baltimore, MD	$20,412	$735	3.6%	$24,411	$944	3.9%
14 Norfolk, VA	$20,886	$1,143	5.5%	$24,714	$1,386	5.6%
15 Charlotte, NC	$1,477	$165	11.1%	$1,824	$217	11.9%
16 Charleston, SC	$26,101	$1,231	4.7%	$31,185	$1,483	4.8%
17 Savannah, GA	$18,310	$1,222	6.7%	$21,890	$1,433	6.5%
18 Tampa, FL	$11,357	$566	5.0%	$12,197	$612	5.0%
Total	$209,941	$11,112	5.3%	$246,927	$13,170	5.3%

Source: Prepared by Nathan Associates Inc. from U.S. Census Bureau, Foreign Trade Statistics for 2003 and 2004.

3. Socioeconomic Conditions

The National Environmental Policy Act (NEPA) is the primary legal authority necessitating development of a Social Impact Assessment for Federal management actions, including those of the proposed operational measures for Right Whale Ship Strike Reduction. According to Section 40 CFR 1508.14, "[if] economic or social and natural and physical environmental effects are interrelated, then the environmental impact statement will discuss all these effects on the human environment." In addition, Executive Order 12898 requires that Federal agencies examine social and economic impacts when minority or low-income populations are likely to be affected by a policy measure.

In this chapter we present an overview of baseline demographic and socioeconomic data for the 26 U.S. East Coast port areas. A more comprehensive socioeconomic profile of each port area is provided in Appendix D.

We have used the U.S. Office of Management and Budget definitions for metropolitan and micropolitan statistical areas based on 2000 standards.[19] The general concept of a metropolitan or micropolitan statistical area is that of a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core. Each metropolitan statistical area must have at least one urbanized area of 50,000 or more inhabitants. Each micropolitan statistical area must have at least one urban cluster of at least 10,000 but less than 50,000 population. Counties are used as the geographic "building blocks" for metropolitan and micropolitan statistical areas. The socioeconomic study areas included in this analysis are presented in Figure 3-1. The counties included in each metropolitan or micropolitan statistical area are listed in Table 3-1.

[19] Further information on the metropolitan and micropolitan statistical areas can be found at http://www.census.gov/population/www/estimates/aboutmetro.html

Figure 3-1. Socioeconomic Study Areas

Table 3-1. U.S. East Coast Port Areas: Counties included in Metropolitan or Micropolitan Statistical Areas

Port Area	Classification	Counties
Northeastern US- Gulf of Maine		
Eastport, ME		Washington County, ME
Searsport, ME		Waldo County, ME
		Knox County, ME
		Hancock County, ME
Portland, ME	Portland-South Portland-Biddeford, ME Metr. MSA	Cumberland County, ME
		Sagadahoc County, ME
		York County, ME
Portsmouth, NH	Rockingham County-Strafford County, NH Metropolitan Division: *(Part of Boston-Cambridge-Quincy, MA-NH Met. SA)*	Rockingham County, NH
		Strafford County, NH
Northeastern US- Off Race Point		
Boston, MA	Boston-Cambridge-Quincy, MA-NH Metropolitan Statistical Area	Norfolk County, MA
		Plymouth County, MA
		Suffolk County, MA
		Middlesex County
Salem, MA	Essex County, MA Met Division : *(Boston-Cambridge-Quincy, MA-NH Metropolitan Statistical Area)*	Essex County
Northeastern US- Cape Cod Bay	Barnstable Town, MA Metropolitan Statistical Area	Barnstable County, MA
Mid-Atlantic Block Island Sound		
New Bedford, MA	Providence-New Bedford-Fall River, RI-MA Met SA, Part of	Bristol County, MA
Providence, RI	Providence-New Bedford-Fall River, RI-MA Met SA,	Bristol County, RI
		Kent County, RI
		Newport County, RI
		Providence County, RI
		Washington, RI
New London, CT	Norwich-New London CT Met SA	New London County
New Haven, CT	New Haven-Milford, CT Met SA	New Haven County
Bridgeport, CT	Bridgeport-Stamford-Norwalk, CT Met SA	Fairfield County
Long Island, NY	Nassau-Suffolk, NY Metropolitan Division *(Part of New York-Northern New Jersey-Long Island, NY-NJ-PA Met SA)*	Nassau County
		Suffolk County
Mid-Atlantic Ports of New York/New Jersey	New York-Northern New Jersey-Long Island, NY-NJ-PA Met SA	Middlesex County, NJ
		Monmouth County, NJ
		Ocean County, NJ
		Somerset County, NJ
		Bergen County, NJ
		Hudson County, NJ
		Passaic County, NJ
		Bronx County, NY
		Kings County, NY
		New York County, NY
		Putnam County, NY
		Queens County, NY
		Richmond County, NY
		Rockland County, NY
		Westchester County, NY
		Essex County, NJ
		Hunterdon County, NJ
		Morris County, NJ
		Sussex County, NJ
		Union County, NJ
		Pike County, PA

Table 3-1. continued

Port Area	Classification	Counties
Mid-Atlantic Delaware Bay	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area	Burlington County, NJ
		Camden County, NJ
		Gloucester County, NJ
		Bucks County, PA
		Chester County, PA
		Delaware County, PA
		Montgomery County, PA
		Philadelphia County, PA
		New Castle County, DE
		Cecil County, MD
		Salem County, NJ
Mid-Atlantic Chesapeake Bay		
Baltimore, MD	Baltimore-Towson, MD Met SA	Anne Arundel County, MD
		Baltimore County, MD
		Caroll County, MD
		Harford County, MD
		Howard Cunty, MD
		Queen Anne's County, MD
		Baltimore City, MD
Hampton Roads, VA	Virginia Beach-Norfolk-Newport News, VA-NC Metropolitan Statistical Area	Currituck County, NC
		Gloucester County, VA
		Isle of Wight County, VA
		James City County, VA
		Mathews County, VA
		Surry County, VA
		York County, VA
		Chesapeake city, VA
		Hampton city, VA
		Newport News city, VA
		Norfolk city, VA
		Poquoson city, VA
		Portsmouth city, VA
		Suffolk city, VA
		Virginia Beach city, VA
		Williamsburg city, VA
Mid-Atlantic Morehead City and Beaufort, NC	Morehead City, NC Micropolitan Statistical Area	Carteret County, NC
	Washington, NC Micropolitan Statistical Area	Beaufort County, NC
Mid-Atlantic Wilmington, NC	Wilmington, NC Metropolitan Statistical Area	Brunswick County, NC
		New Hanover County, NC
		Pender County, NC
Mid-Atlantic Georgetown, SC	Georgetown, SC Micropolitan Statistical Area	Georgetown County, SC
Mid-Atlantic Charleston, SC	Charleston-North Charleston, SC Metropolitan Statistical Area	Berkeley County, SC
		Charleston County, SC
		Dorchester County, SC
Mid-Atlantic Savannah, GA	Savannah, GA Metropolitan Statistical Area	Bryan County, GA
		Chatham County, GA
		Effingham County, GA
Southeastern US		
Brunswick, GA	Brunswick, GA Metropolitan Statistical Area	Brantley County, GA
		Glynn County, GA
		McIntosh County, GA
Fernandina, FL	Jacksonville, FL Metropolitan Statistical Area, Part of	Nassau County
Jacksonville, FL	Jacksonville, FL Metropolitan Statistical Area	Baker County, FL
		Clay County, FL
		Duval County, FL
		St. Johns County, FL
Port Canaveral, FL	Palm Bay-Melbourne-Titusville, FL Metropolitan Statistical Area	Brevard County, FL

Source:U.S. Census Bureau, Population Division, Metropolitan and Micropolitan Statistical Areas and Components, November 2004.

Demographic Characteristics

The most comprehensive and accurate source for demographic information on the U.S. East Coast port areas is the 2000 U.S. Census. Table 3-2 presents data on population, racial distribution and ethnicity structure for each of the 26 U.S. East Coast port areas. As expected, the New York City port area possesses the largest population with nearly 15.6 million inhabitants in 2000. Seven other U.S. East Coast port areas have more than one million inhabitants; namely, Philadelphia (5.7 million), Boston (3.3 million), Long Island (2.8 million), Baltimore (2.6 million), Hampton Roads (1.6 million), Jacksonville (1.1million) and Providence (1.0 million). Eastport, ME is the smallest port area in terms of population with 34 thousand inhabitants in 2000.

Table 3-2. U.S. East Coast Port Areas: Demographic Characteristics, 2000

Port Area	Population 2000	Racial Distribution (Percentage)				Percentage of Population that is Hispanic or Latino b/
		White alone	Black or African American alone	Asian alone	Other a/	
Eastport, ME	33,941	93.4	0.3	0.5	5.8	0.9
Searsport, ME	127,689	97.8	0.2	0.3	1.7	0.6
Portland, ME	487,568	96.6	0.7	0.9	1.7	0.9
Portsmouth, NH	389,592	96.7	0.6	1.1	1.6	1.2
Boston, MA	3,278,333	81.8	7.3	5.5	6.2	6.0
Salem, MA	723,419	86.4	2.5	2.4	8.8	11.0
Cape Cod, MA	222,230	94.3	1.5	0.6	3.5	1.3
New Bedford, MA	534,678	91.0	2.0	1.4	5.6	3.6
Providence, RI	1,048,319	85.0	4.3	2.3	8.4	8.6
New London, CT	259,088	86.9	5.1	1.9	6.2	5.2
New Haven, CT	824,008	79.3	11.2	2.4	7.1	5.0
Bridgeport, CT	882,567	79.2	10.0	3.2	7.6	11.8
Long Island, NY	2,753,913	82.0	8.4	3.5	6.1	10.3
New York, NY	15,569,089	58.0	19.7	8.1	14.2	21.1
Philadelphia, PA	5,687,147	72.6	19.7	3.3	4.5	5.0
Baltimore, MD	2,552,994	67.4	27.2	2.7	2.7	2.0
Hampton Roads, VA	1,576,370	62.4	30.9	2.7	4.0	3.1
Morehead City - Beaufort, NC	104,341	80.7	16.7	0.4	2.3	2.1
Wilmington, NC	274,532	79.5	17.0	0.6	2.8	2.5
Georgetown, SC	55,797	59.6	38.7	0.3	1.4	1.5
Charleston, SC	549,033	65.2	30.5	1.4	2.9	2.4
Savannah, GA	293,000	61.1	34.9	1.6	2.4	2.0
Brunswick, GA	93,044	73.4	23.7	0.7	2.2	2.4
Fernandina, FL	57,663	90.1	7.4	0.7	1.8	1.8
Jacksonville, FL	1,065,087	71.9	22.2	2.3	3.6	3.9
Port Canaveral, FL	476,230	86.7	8.1	1.5	3.7	4.6
Total	39,919,672	69.6	17.0	5.0	8.5	11.5

a/ Includes American Indian and Alaska Native alone, Native Hawaiian and Other Pacific Islander alone, some other race alone and two or more races.

b/ A self-designated classification for people whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Caribbean, or those identifying themselves generally as Spanish, Spanish-American, etc. Origin can be viewed as ancestry, nationality, or country of birth of the person or person's parents or ancestors prior to their arrival in the United States. Spanish/Hispanic/Latino people may be of any race.

Source: US Census Data, Census 2000.

For all of the port areas in 2000, the majority of the population is white with the percentage white only ranging from a high of 97.8 percent in Searsport, ME to a low of 58.0 percent for New York City. Five other port areas where less than 70 percent of the population is white are Georgetown, SC (59.6 percent); Savannah (61.1 percent); Hampton Roads (62.4); Charleston (65.2 percent) and Baltimore (67.4 percent).

In four of the port areas, blacks or African American account for more than 30 percent of the population – Georgetown, SC (38.7 percent); Savannah (34.9 percent); Hampton Roads (30.9 percent) and Charleston (30.5 percent). New York City and Boston are the only port areas where a significant share of the population is Asian with 8.1 percent in New York City and 5. 5 percent in Boston. No other port area has more than 3.5 percent of its population reported as Asian.

In terms of ethnicity structure, New York City has the highest percentage of population that is Hispanic or Latin (21.1 percent) followed by Bridgeport, CT (11.8 percent); Salem, MA (11.0 percent); Long Island (10.3 percent) and Providence (8.6 percent).

The socioeconomic profile for each U.S. East Coast port presented in Appendix D provides additional demographic information such as age distribution of the population, ability to speak English by age group, and educational attainment of population by sex.

Socioeconomic Characteristics

Table 3-3 presents a summary of key socioeconomic characteristics for each of the 26 port areas in 2000 including

- Labor force participation rate
- Unemployment rate
- Median household income
- Per capita income
- Number of people occupied in rail, water and other transportation occupations
- Percentage of families below poverty line

The labor force participation rate represents the percentage of the civilian and military population that is employed or unemployed but looking or work. For 21 of the 26 port areas, the labor force participation rate in 2000 ranged between 60 and 69 percent (Figure 3-2). The port area of Portsmouth, NH with a labor force participation rate of 72.5 percent was the only U.S. East Coast port area where the rate exceeded 69 percent. Four port areas had labor force participation rates below 60 percent in 2000– Eastport, ME (57 percent); Port Canaveral, FL (57.4 percent); Morehead City-Beaufort, NC (58.7 percent) and Cape Cod (58.9 percent).

Table 3-3. U.S. East Coast Ports: Socioeconomic Characteristics, 2000

Port Area	Labor Force Participation Rate a/	Unemployment Rate b/	Median Household Income c/	Per Capita Income d/	Number of People Occupied in Rail, Water and Other Transportation Occupations e/	Percentage of People Below Poverty Line
Eastport, ME	57.0	8.5	25,869	14,119	23	19.0
Searsport, ME	63.9	4.8	35,606	19,189	308	11.3
Portland, ME	68.7	3.5	43,736	22,648	1,031	8.0
Portsmouth, NH	72.5	3.1	54,291	24,877	653	5.8
Boston, MA	67.3	4.2	55,882	28,755	4,289	8.8
Salem, MA	65.5	4.6	51,576	26,358	991	8.9
Cape Cod, MA	58.9	5.1	45,933	25,318	508	6.9
New Bedford, MA	65.8	5.8	43,496	20,978	806	10.0
Providence, RI	64.6	5.6	42,370	21,688	1,346	11.9
New London, CT	67.8	3.9	50,646	24,678	516	6.4
New Haven, CT	65.5	5.9	48,834	24,439	1,015	9.5
Bridgeport, CT	66.0	4.8	65,249	38,350	611	6.9
Long Island, NY	64.3	3.8	68,579	29,278	4,433	5.6
New York, NY	60.8	7.4	48,417	25,693	24,848	15.1
Philadelphia, PA	64.2	6.1	49,077	23,972	7,755	10.8
Baltimore, MD	66.4	4.9	50,572	24,398	3,261	9.8
Hampton Roads, VA	67.9	5.0	43,086	20,313	3,342	10.6
Morehead City - Beaufort, NC	58.7	5.5	35,284	19,305	444	14.5
Wilmington, NC	63.0	5.4	38,438	21,469	546	13.0
Georgetown, SC	58.2	6.2	35,312	19,805	70	17.1
Charleston, SC	64.5	5.3	39,232	19,772	942	14.0
Savannah, GA	63.6	5.4	39,558	20,752	758	14.5
Brunswick, GA	63.0	5.5	36,539	19,581	137	15.6
Fernandina, FL	63.9	4.7	46,022	22,836	75	9.1
Jacksonville, FL	66.8	4.6	42,825	21,567	2,016	10.8
Port Canaveral, FL	57.4	4.9	40,099	21,484	746	9.5

a/ The labor force includes all people classified in the civilian labor force, plus members of the U.S. Armed Forces (people on active duty with the United States Army, Air Force, Navy, Marine Corps, or Coast Guard). The Civilian Labor Force consists of people classified as employed or unemployed.

b/ All civilians 16 years old and over are classified as unemployed if they (1) were neither "at work" nor "with a job but not at work" during the reference week, and (2) were actively looking for work during the last 4 weeks, and (3) were available to accept a job. Also included as unemployed are civilians who did not work at all during the reference week, were waiting to be called back to a job from which they had been laid off, and were available for work except for temporary illness.

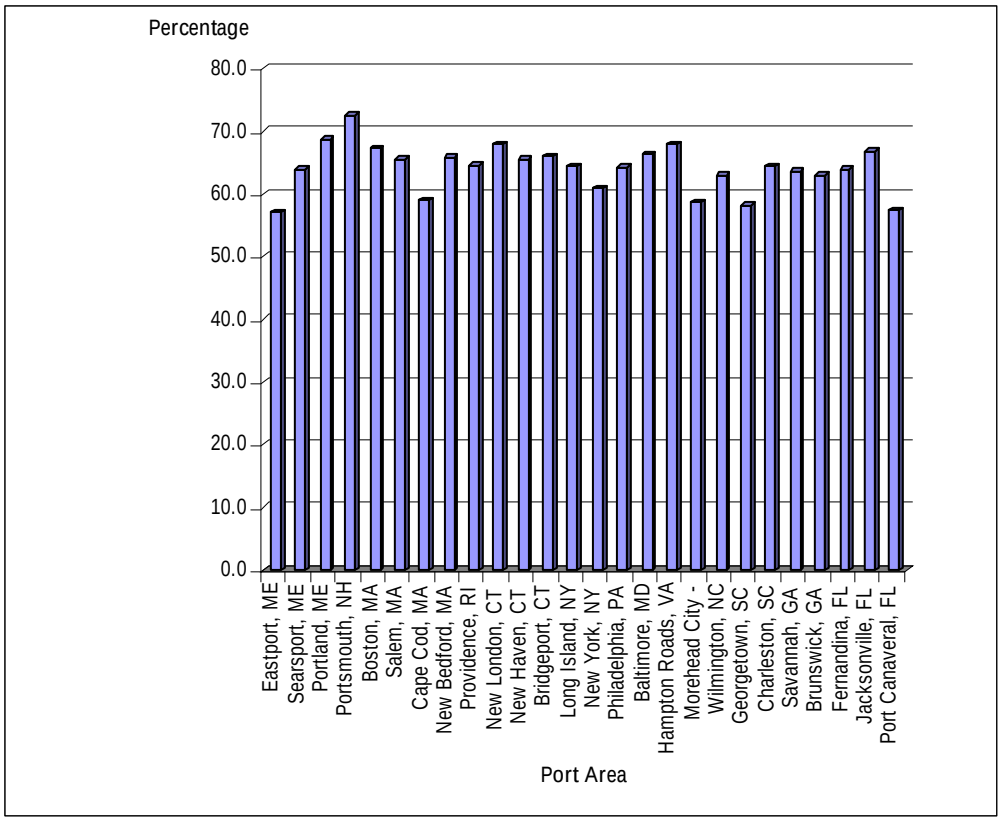
c/ In 1999.

d/ In 1999.

e/ From employed civilian population 16 years and over.

Source: US Census Data, Census 2000.

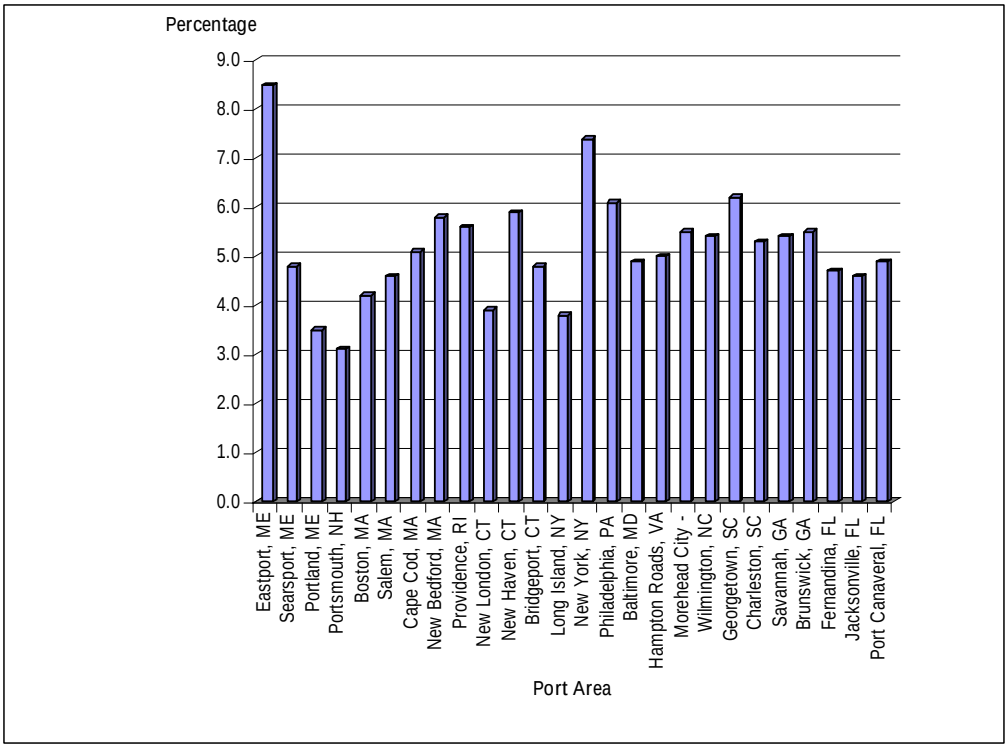
Figure 3-2. U.S. East Coast Port Areas: Labor Force Participation Rate, 2000



Source: Table 3-3.

As can bee seen graphically in Figure 3-3, economic conditions in the port area of Portsmouth, NH resulted in the lowest rate of unemployment in 2000 at 3.1 percent followed by Portland, ME (3.5 percent); Long Island (3.8 percent) and New London, CT (3.9 percent). At the other end of the economic spectrum, Eastport, ME had an unemployment rate of 8.5 percent followed by New York City at 7.4 percent and Georgetown, SC at 6.2 percent and Philadelphia at 6.1 percent. All other U.S. East Coast port areas had unemployment rates ranging from 4.2 percent and 5.9 percent in 2000.

Figure 3-3 U.S. East Coast Port Areas: Unemployment Rate, 2000

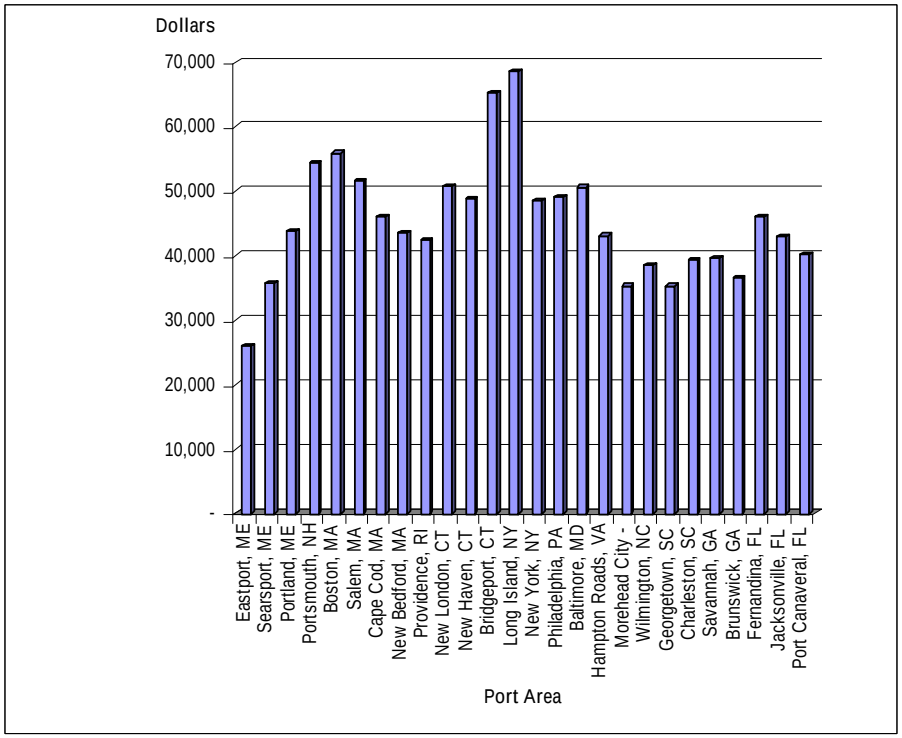


Source: Table 3-3.

The disparity in economic conditions in U.S. East Coast port areas is clearly displayed in Figure 3-4. The median household income in 1999 for the port areas of Long Island ($68,579) and Bridgeport, CT ($65,249) is more than 2.5 times the level of median household income reported for Eastport, ME ($25,869). In general, median household incomes in the northern port areas of the U.S. East Coast are higher than those in the southern port areas. With the exception of Eastport, ME and Searsport, ME the median household income in all port areas from Hampton Roads to the north exceeded $40,000 in 1999. With the exception of Fernandina, FL and Jacksonville, FL all port areas south of Hampton Roads had a median household income under $40,000.

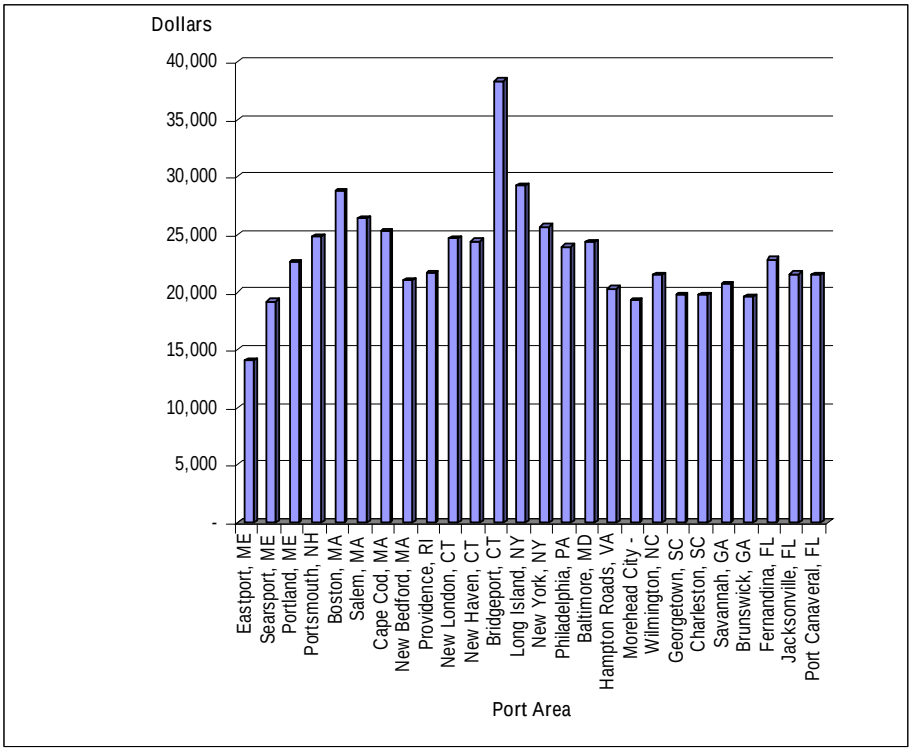
As would be expected, information on per capita income in 1999 by port area shown in Figure 3-5 displays a similar pattern to that of median household income discussed above. In general, the data on per capita income by port area is approximately half that of median household income. The port area of Bridgeport, CT is an exception as its per capita income in 1999 of $38,350 is nearly 59 percent of the median household income of $65,249. For this reason, the per capita income of the port area Bridgeport, CT is more than 30 percent higher than that of the second ranked port area of Long Island.

Figure 3-4. U.S. East Coast Port Areas: Median Household Income, 1999



Source: Table 3-3.

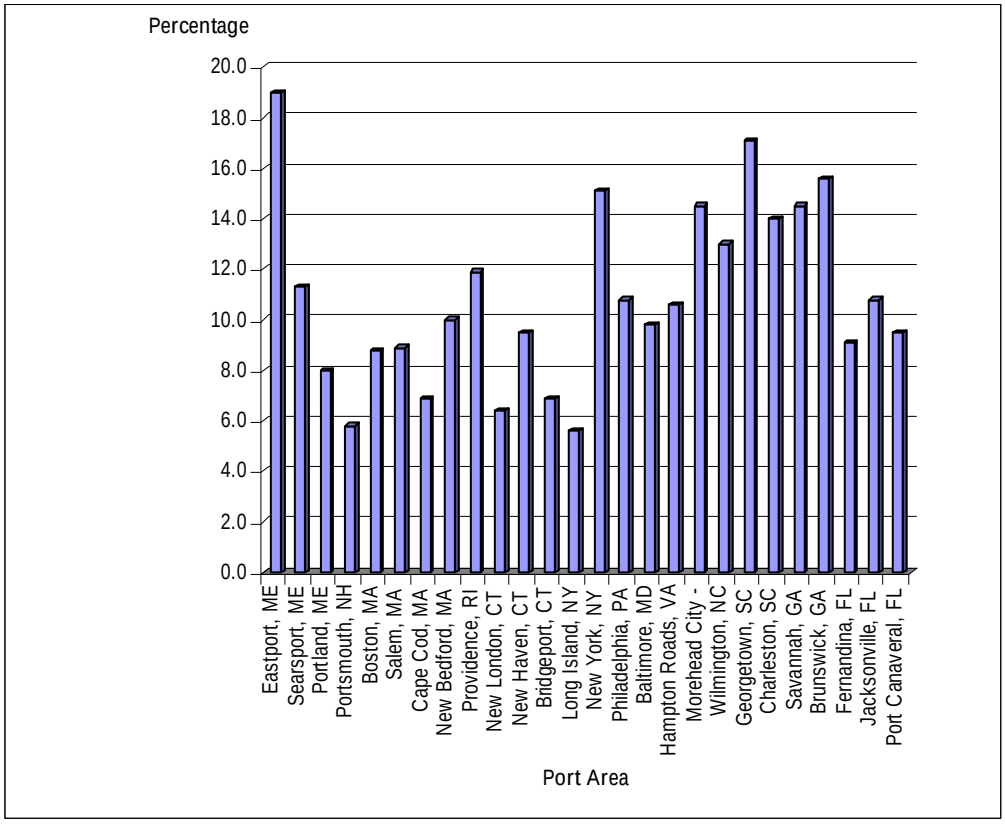
Figure 3-5. U.S. East Coast Port Areas: Per-Capita Income, 1999



Source: Table 3-3.

The percentage of people below the poverty line for each port area in 2000 is presented in Figure 3-6. The highest percentages are observed in the port areas of Eastport, ME (19.0 percent); Georgetown, SC (17.1 percent); Brunswick, GA (15.6 percent) and New York City (15.1 percent). The port areas with the lowest percentage of people below the poverty are Long Island (5.6 percent); Portsmouth, NH (5.8 percent); New London, CT (6.4 percent) and Bridgeport, CT (6.9 percent).

Figure 3-6. U.S. East Coast Port Areas: Percentage of People Below Poverty Line, 2000



Source: Table 3-3.

The socioeconomic profiles for each U.S. East Coast port presented in Appendix D provides additional information such as distribution of household income by household income level, employment by sex and industry, a general description of port facilities and the range of maritime activities conducted.

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4. Potential Economic Impacts

NMFS' preferred operational measures to reduce ship strikes to right whales and the alternative operational measures will directly affect maritime sector activity along the U.S. East Coast.[20] In this chapter we review prior economic studies of the impact of operational measure on the shipping industry, discuss the general approach employed to identify and estimate the potential economic impact, analyze affected vessel traffic, and present key features of our economic impact model. We also report the potential economic impact by alternative and describe the results within the economic context of U.S. East Coast maritime trade and shipping.

Prior Economic Studies

Nathan Associates conducted a review of the following reports have been identified that address the key aspects of economic impact of proposed right whale ship strike protection measures:

- Kite-Powell and Hoagland, Economic Aspects of Right Whale Ship Strike Management Measures, April 2002
- IMO Sub-Committee on Safety of Navigation, Routing of Ships, Ship Reporting and Related Matters, April 2002
- Russell, Knowlton, and Beaudin Ring, Vessel Traffic-Management Scenarios Based on the National Marine Fisheries Service's Strategy to Reduce Ship Strikes of North Atlantic Right Whales, Initially published December 2003, revised May 2005
- Kite-Powell, Economic Implications of Possible Reductions in Boston Port Calls due to Ship Strike Management Measures, Report produced for NOAA National Marine Fisheries and Massport, March 2005

[20] This analysis uses the same definition for U.S. East Coast ports as was presented in Chapter 2; that being from Port Canaveral, FL to the northernmost U.S. jurisdiction in the Gulf of Maine.

In the sections below we discuss the approach and methodology used in each of these reports.

KITE-POWELL AND HOAGLAND, ECONOMIC ASPECTS OF RIGHT WHALE SHIP STRIKE MANAGEMENT MEASURES, APRIL 2002

This study was prepared prior to the development of the proposed rulemaking. It measured order of magnitude of economic effects for shipping of contemplated ship traffic management measures. The primary source of data on vessel traffic was the U.S. Army Corps of Engineers' Waterborne Commerce of the United States for 1999. For some ports (Boston, New York/New Jersey, Charleston and Jacksonville) more specific port call information was obtained from port authorities.

The authors stated approach was to adopt base case assumptions that will tend to overstate actual costs and to present cost estimates for a range of traffic management parameters (maximum speed, geographic extent of restriction, etc.). The report included the ports of Portland ME, Portsmouth NH, Boston MA, Providence RI, New York and New Jersey, Philadelphia PA, Baltimore, MD, Hampton Roads VA, Wilmington NC, Charleston SC, Savannah GA, Fernandina Beach, FL, Jacksonville FL and Cape Canaveral FL. Smaller US East Coast ports were omitted from the study.

According to observations by the authors, the study had the following limitations:

- Assumed larger, more expensive vessels than those actually operating along US East Coast.
- Assumed normal operating speed higher than actual.
- Vessel data was very aggregated by type and size; monthly variation not analyzed.
- Study did not model possible changes in number of port calls per year or the economic effects of such changes.
- Did not include fishing vessels, large recreational vessels or passenger ferries

The use of the US Army Corps of Engineers' as the principal data source also limited the authors' analysis to use 1999 data as there is a several year lag in the public dissemination of the USACE Waterborne Commerce reports.

IMO SUB-COMMITTEE ON SAFETY OF NAVIGATION, ROUTING OF SHIPS, SHIP REPORTING AND RELATED MATTERS, APRIL 2002

This document submitted by Canada to the IMO discussed the impact of proposed amendment of traffic separation scheme (TSS) in the Bay of Fundy. The purpose for amending the TSS is to reduce ship strikes of the highly endangered North Atlantic Right Whale by shifting the traffic lanes of the TSS from an area with the highest density of Right Whales to an area where there is lower density. The TSS was originally adopted by

IMO in 1982 .The TSS is located entirely within Canada's territorial waters and is mandatory for all vessels in accordance with the Collision Regulations.

The proposed amendment would add 5 miles for vessels calling at Saint John (affecting 600 vessels per year) and 11 miles for vessels calling at Bayside and Eastport (affecting 100 vessels per year). The estimated impact on shipping was not quantified but was described as "minimal".

RUSSELL, KNOWLTON, AND BEAUDIN RING, VESSEL TRAFFIC-MANAGEMENT SCENARIOS BASED ON THE NATIONAL MARINE FISHERIES SERVICE'S STRATEGY TO REDUCE SHIP STRIKES OF NORTH ATLANTIC RIGHT WHALES, MAY 2005

This study is an update of a November 2003 report. The study provides a detailed examination of the physical impact (time delays) on vessel operations along the U.S. East Coast of the proposed operational measures contained in the June 1, 2004 Advanced Notice of proposed rulemaking (ANPR). Both speed restrictions and DMAs are addressed. The study does not quantify the delays for vessels into economic impacts.

A detailed analysis is presented of the additional time required for vessels to decelerate from sea speed to the restricted speed as part of the impact of proposed speed restrictions. Some vessels were assumed to take as long as an hour to slow to the restricted speed. Shipping industry representatives claim that this time is an additional impact associated with the proposed speed restrictions. For most port areas we have not incorporated this slowing time in the calculation of delays for designated speed restricted areas. Even without the speed restrictions, most vessels will have to slow down for the pilot to board or as they approach the port. Even though the location at which the vessel commences to slow may be different with the proposed seasonal speed restrictions, there is no additional vessel time involved. [21]

KITE-POWELL, ECONOMIC IMPLICATIONS OF POSSIBLE REDUCTIONS IN BOSTON PORT CALLS DUE TO SHIP STRIKE MANAGEMENT MEASURES, MARCH 2005

This study estimates illustrative direct and indirect economic impacts of the loss of vessel calls in the Port of Boston that may result from costs/delays imposed by right whale ship strike management measures. Estimates were prepared using a customized application of the MARAD Port Economic Impact Model. The model includes direct effects on port operations defined as the expenditures of businesses directly associated with the movement of waterborne cargo and passengers through the terminals; indirect effects of expenditures of the port industries buying goods and services from other industries in the region; and induced effects of spending by employees of the port industries and their suppliers. The results are shown for four scenarios that range from a loss of 27 cruise vessel port calls to a loss of 104 container ship calls. The study's author, however, is

21 The issue of deceleration/ acceleration delay is more relevant for dynamic management areas measures implemented away from the shoreline when vessels could resume speed before approaching the port area.

careful to point out that they have not attempted to quantify the probability of the loss of vessel calls under any of the scenarios.

General Approach

Our approach for the estimation of the potential economic impact of the proposed operational measures of each Alternative has been designed so that results can be identified and analyzed at a summary level or disaggregated by port area, vessel type, vessel size, and vessel flag. An ancillary benefit of this approach is that it also enhances the accuracy and rigor of the analysis. Key factors such as vessel operating speed vary significantly by vessel type and size; vessel operating costs vary by those vessel characteristics as well as flag of registry. For this study, we have used 10 knots as the base case. However in the sensitivity analysis we also identify the direct economic impact on the shipping industry of speed restrictions of 12 and 14 knots.

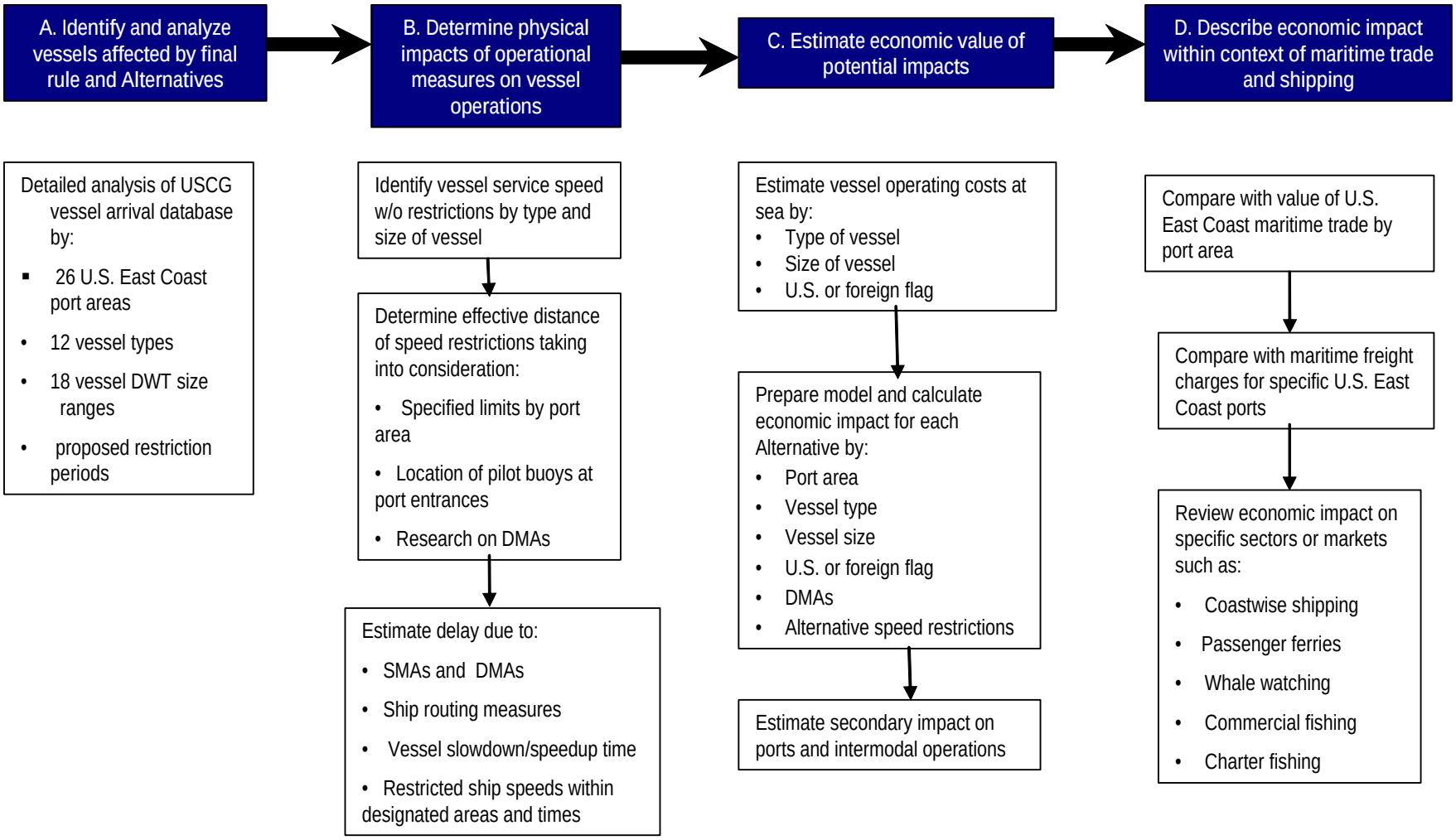
As depicted in Figure 4-1, our general approach is organized into the following four principal tasks:

Task A. Identify and analyze vessels affected by the final rule. Detailed information regarding vessels 150 GRT or higher calling at U.S. East Coast ports during 2003 and 2004 was obtained from the U.S. Coast Guard vessel arrival database.[22] Vessel calls were analyzed for 26 port areas on the U.S. East Coast, 12 vessel types, 18 vessel DWT size ranges and U.S. and foreign flag registration.

Task B. Determine physical impacts of operational measures on vessel operations. Key information include vessel service speed by type and size of vessel and the effective distance of proposed seasonal speed restrictions by port area, including consideration of the location of pilot buoys. Also the effective distance and periods for proposed DMA measures were specified based on available research. Results of this task include estimate of minutes of delay per vessel arrival for seasonal speed restrictions.

[22] A detailed description of the U.S. Coast guard vessel arrival database and the measures undertaken by Nathan Associates to reconcile the data with the port areas was described in Chapter 2, Existing U.S. East Coast Maritime Activity.

Figure 4-1. General Approach



Task C. Estimate economic value of potential impacts. Key data include vessel operating costs at sea by type and size of vessel and whether U.S. or foreign flag registry. Results include detailed estimates of potential economic impact of proposed speed restrictions by port area, vessel type, vessel DWT size range, flag of registration. Analyses of alternative assumptions regarding speed restrictions for speeds of 10, 12 and 14 knots were conducted.[23]

Task D. Describe economic impact within context of U.S. East Coast maritime trade and shipping. For each port area, the estimated potential economic impact is assessed relative to the value of maritime trade and relative to maritime freight charges during proposed seasonal and DMA speed restriction periods. We also conducted separate economic impact analyses for sectors not included in the US Coast Guard database such as whale watching vessels, passenger ferries, commercial fishing and charter fishing.

The analysis is conducted from the perspective of determining the potential economic impact if the proposed operational measures were in place during a recent period when data on maritime sector activity is available, in this case 2003 and 2004. The study however uses estimates of vessel operating costs in 2004 and updated for June 2008 bunker fuel prices to bring this data current.

The final rule calls for the establishment of new operational measures for the shipping industry including consideration of routing and speed restrictions. Operational measures include seasonal speed restrictions for specific U.S. East Coast port areas during particularly sensitive periods when whales are typically present.

NMFS is proposing in the final rule that the speed restrictions would be implemented at 10 knots and would be in effect for a distance generally between 20-30 nautical miles from the shoreline depending on the alternative. During periods outside of the seasonal speed restrictions, all areas along the Atlantic seaboard within the U.S. Exclusive Economic Zone would be subject to dynamic management area (DMA) measures if certain concentrations of right whales were sighted.[24] The final rule also allows for the establishment of recommended routes that provide the greatest possibility of reducing the risk of collisions between vessels and whales. All of the proposed provisions would apply to non-sovereign vessels with a length of 65 feet and above.

Economic Impact Model

We developed an Excel-based spreadsheet model to calculate the potential direct[25] economic impact of the ship strike reduction operational measures. The model uses input worksheets that contain data on

[23] The study uses a speed restriction of 10 knots as the base case.
[24] Possible triggers for implementation of DMA measures are discussed later in this chapter.
[25] The approach and methodology used to calculate in the indirect economic impact is described later in this chapter.

- U.S. East Coast total and restricted period vessel arrivals for 2003 and 2004 by type and size of vessel, port area, and flag of registry
- Vessel service speed by type and size of vessel
- Vessel operating costs at sea by type and size of vessel and flag of registry
- Distance by port area over which proposed seasonal management area speed restrictions would be in effect
- Distance and days per year by port area when proposed dynamic management area speed restrictions would be in effect
- Time for vessels to slow down to restricted speeds and to regain sea speed

A set of calculation worksheets are linked to these input worksheets to calculate the delay in minutes that would be encountered by vessels arriving at U.S. East Coast ports during seasonal speed restriction periods and DMA periods. The economic impact is calculated by multiplying the minutes of delay by vessel operating costs at sea. A set of output worksheets are used to report economic impact by various combinations of the following items:

- Year
- Port area
- Vessel type
- Vessel DWT size range
- U.S. or foreign flag of registry
- Seasonal speed restrictions
- DMA speed restrictions
- Alternative restricted speeds
- Alternative effective distance of speed restrictions by port area

In the sections below, we present the source and values for key input data used in the economic impact model.

OPERATING SPEED

Accurate information on current vessel operating speeds is clearly an important element for the determination of the economic impact of the proposed speed restrictions. We have reviewed information on vessel operating speeds by type and size of vessel from three sources:

- Mandatory Ship Reporting System that provides actual operating speeds reported by ships captains
- U.S. Army Corps of Engineers estimates of vessel service speeds reported in guidance memorandum for use in official planning and economic studies
- Maritime industry comments presented during stakeholder meetings conducted in the fall of 2004.

The Mandatory Ship Reporting System (MSRS) was proposed by the U.S. and approved by the International Maritime Organization (IMO) in 1999. The MSRS requires all commercial ships 300 gross tons or greater to report information regarding entry location and time, route, destination and speed when entering either of two areas surrounding critical right whale habitats. The Northeast System encompasses right whale critical habitats in Cape Cod Bay and the Great South Channel and operates year-round. The Southeast System encompasses right whale critical habitat off the Coastline of Georgia and Florida and is in effect from November 15 to April 15 when right whales aggregate in these waters.

Nathan Associates analyzed the MSRS information reported for 2002, 2003, and 2004. During this 3-year period, there were 8,479 MSRS records reported by 1,557 vessels. Using the reported vessel call sign, vessels in the MSRS database were matched with the U.S. Coast Guard vessel characteristics database to identify type and size of vessel. After making corrections for obvious MSRS data entry errors, we were able to match call signs reported for 1,278 (82 percent) vessels that accounted for 7,779 MSRS records (92 percent). Of these, there were 6,942 MSRS records (89 percent) that contained usable information regarding vessel operating speed.

Table 4-1 presents the MSRS average operating speed by type and size of vessel for 2002 through 2004. The fastest average reported operating speeds were reported for containerships ranging from 14.6 knots for vessels less than 10,000 DWT to 20.4 knots for vessels between 50-70,000 DWT. Average reported operating speeds for bulk carriers range from 11.6 knots for vessels less than 10,000 DWT to 14.1 knots for vessels between 70-100,000 DWT.

Table 4-1. MSRS Average Reported Speed by Vessel Type and DWT Size Range, 2002 -2004 (knots)

	DWT (000s)							
Vessel type	0-10	10-20	20-30	30-40	40-50	50-70	70-100	100+
Bulk Carrier	11.6	12.6	12.7	13.1	13.5	14.2	14.1	-
Combination Carrier	-	-	-	9.3		14.8	13.4	-
Container Ship	14.6	17.8	17.6	18.2	18.5	20.4	-	-
Freight Barge	13.9	-	-	-	-	-	-	-
General Dry Cargo Ship	12.9	16.0	14.6	14.2	15.2	-	-	-
Passenger Ship	15.5	16.6	-	-	-	-	-	-
Refrigerated Cargo Ship	15.7	19.8	-	-	-	22.0	-	-
Ro-Ro Cargo Ship	13.5	16.9	17.6	20.0	17.7	14.3	-	-
Tank Barge	-	-	-	-	14.9	-	-	-
Tank Ship	11.8	13.3	13.0	13.8	13.7	13.9	15.0	15.2
Towing Vessel	10.0	-	-	-	-	-	-	-
Other a/	11.3	-	-	-	-	-	-	-

a/ Includes fishing vessels, industrial vessels, research vessels and school ships.

Source: Prepared by Nathan Associates based on analysis of MSRS data for 2002, 2003, and 2004.

A second source of vessel operating speed by vessel type and size is guidance memorandum published by the U.S. Army Corps of Engineers (USACE) to be used by planners in studies to determine the potential benefits of harbor improvement projects. Vessel service speeds are provided for four vessel types –containerships, general cargo ships, bulk carriers and tankers and for a range of vessel sizes relevant for U.S. maritime commerce.

Table 4-2 presents USACE estimates of vessel service speed for each of the four vessel types. For ease of comparison, we have included vessel DWT size ranges from the USACE similar to those used in the MSRS analysis above. In general, the estimated service speeds correspond closely to those reported in the MSRS. For example, MSRS reports average operating speeds of 14.6 knots and 18.0 knots for the first two DWT size ranges of containerships. The USACE estimates are 14.7 knots and 17.9 knots for these same size containerships. However, starting with containerships of 20,000 DWT and greater, the MSRS reports average operating speeds of 2-3 knots slower than the USACE estimates.

Table 4-2. U.S. Army Corps of Engineers, Estimated Service Speed by Type and Size of Vessel, FY 2005 (knots)

	DWT							
Vessel type	5,000	15,000	25,000	35,000	45,000	60,000	85,000	115,000
Container	14.7	17.9	19.7	20.9	21.9	23.1	-	-
General cargo	13.4	15.8	17.0	17.9	18.6	-	-	-
Bulk carrier	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Tankers	13.5	14.0	14.2	14.3	14.4	14.6	14.7	14.9

Source: U.S. Army Corps of Engineers, FY 2005 Deep Draft Vessel Operating Costs.

A similar pattern is observed for general cargo vessels where the MSRS data and USACE estimates match well for the smaller two DWT size categories, but where the MSRS average reported speeds are 2-3 knots slower than the USACE estimates for the larger vessel DWT size categories.

For bulk carriers, the MSRS reported average operating speed for bulk carriers greater than 50,000 DWT corresponds closely with the USACE estimate. However, the MSRS reported speed for bulk carriers less than 50,000 DWT are approximately 1-2 knots slower than the USACE estimates.

For tankers, the difference between the MSRS reported average speed and the USACE estimated service speed is usually less than 1 knot, except for the smallest tanker DWT size category where the MSRS speed is 1.6 knots below the USACE estimate.

There are several possible explanations for the apparent tendency for the MSRS reported speeds to be below the USACE estimated service speeds. It may be that vessels entering the MSRS reporting may voluntarily slow somewhat from normal operating speeds. Second, there may be a tendency to slightly underreport actual vessel operating speeds in order to appear to be complying. Third, the navigation characteristics of the two MSRS reporting areas may differ from conditions in open seas where vessel operating speeds are higher.

Limited information on vessel operating speeds was also provided by maritime industry comments provided during public stakeholder meetings conducted in the fall of 2004. In general, the anecdotal information was consistent with the general depiction of speeds by vessel type presented above.

Using primarily the USACE data, we have developed estimates of vessel operating speeds for the vessel type and DWT size categories corresponding to those used to report U.S. East Coast vessel arrivals. These estimates of average operating speeds are presented in Table 4-3.

Table 4-3. Average Vessel Operating Speeds by Vessel Type Used in Economic Impact Analysis (knots)

	DWT (000s)																	
Vessel type	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-60	60-70	70-80	80-90	90-100	100-12(	120-15(	150+
Bulk Carriers	11.6	11.6	12.2	12.2	12.5	12.5	13.0	13.0	13.4	13.4	14.0	14.0	14.1	14.1	14.1	14.1	14.1	14.1
Combination Carriers	11.6	11.6	12.2	12.2	12.5	12.5	13.0	13.0	13.4	13.4	14.0	14.0	14.1	14.1	14.1	14.1	-	-
Containerships	13.0	15.8	17.4	18.5	19.3	20.0	20.7	21.2	21.7	22.1	22.7	23.4	24.1	24.6	-	-	-	-
Freight Barges	12.0	14.2	15.3	16.1	16.8	17.3	17.7	18.1	18.4	18.8	19.2	-	-	-	-	-	-	-
General Cargo Vessels	12.0	14.2	15.3	16.1	16.8	17.3	17.7	18.1	18.4	18.8	-	-	-	-	-	-	-	-
Passenger Vessels	16.0	18.0	20.0	22.0	24.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigerated Cargo Vessels	13.0	15.8	17.4	18.5	19.3	20.0	20.7	21.2	21.7	22.1	22.7	-	-	-	-	-	-	-
Ro-Ro Cargo Vessels	13.0	15.8	17.4	18.5	19.3	20.0	20.7	21.2	21.7	22.1	22.7	23.4	24.1	-	-	-	-	-
Tank Barges	13.2	13.7	13.9	14.0	14.2	14.2	14.3	14.4	14.4	14.5	14.5	-	-	-	-	-	-	-
Tankers	13.2	13.7	13.9	14.0	14.2	14.2	14.3	14.4	14.4	14.5	14.5	14.6	14.7	14.7	14.8	14.8	14.9	15.0
Towing Vessels	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other a/	12.0	12.0	12.0	12.0	12.0	12.0	12.0	-	-	-	-	-	-	-	-	-	-	-

a/ Includes fishing vessels, industrial vessels, research vessels, school ships.

Source: Prepared by Nathan Associates Inc. as described in text.

VESSEL OPERATING COSTS AT SEA

The USACE also prepares estimates of vessel operating costs to be used by planners in studies to determine the potential benefits of harbor improvement projects. Vessel operating costs include annual capital costs as determined by the replacement cost of the vessels and application of capital recovery factors; estimates of fixed annual operating costs such as for crew, lubricating materials and stores (supplies), maintenance and repair, insurance and administration; the number of operational days per year; and fuel costs at sea and in port.

The type and DWT size of vessels for which operating costs are reported by the USACE is shown in Table 4-4 below.[26] Vessel operating costs are presented separately for U.S. flag and foreign flag vessels, for five vessel types, and up to 14 vessel DWT sizes within a vessel type.

Table 4-4. Type and Size of Vessels for which USACE Reports Vessel Operating Costs (DWT)

Foreign flag					U.S. flag				
General cargo vessel	Container ship	Bulk carrier	Tanker (double hull)	Tanker (single hull	General cargo vessel	Container ship	Bulk carrier	Tanker (double hull)	Tanker (single hull
11,000	9,000	15,000	20,000	20,000	11,000	9,000	15,000	20,000	20,000
14,000	14,000	25,000	25,000	25,000	14,000	14,000	25,000	25,000	25,000
16,000	17,000	35,000	35,000	35,000	16,000	17,000	35,000	35,000	35,000
20,000	20,000	40,000	50,000	50,000	20,000	20,000	40,000	50,000	50,000
24,000	23,000	50,000	60,000	60,000	24,000	23,000	50,000	60,000	60,000
30,000	28,000	60,000	70,000	70,000	30,000	28,000	60,000	70,000	70,000
	31,000	80,000	80,000	80,000		31,000	80,000	80,000	80,000
	35,000	100,000	90,000	90,000		35,000	100,000	90,000	90,000
	39,000	120,000	120,000	120,000		39,000	120,000	120,000	120,000
	42,000	150,000	150,000	150,000		42,000	130,000	150,000	150,000
	49,000	175,000	175,000	175,000		49,000		175,000	175,000
	55,000	200,000	200,000	200,000		55,000		200,000	200,000
	66,000		265,000	265,000		66,000		265,000	265,000
	82,000		325,000	325,000					

Source: U.S. Army Corps of Engineers, Economic Guidance Memorandum 02-06, Deep Draft Vessel Operating Costs

We applied regression techniques to the USACE vessel operating cost data in order to match exactly with the vessel size categories used in our analysis of U.S. East Coast vessel arrivals. A logarithmic equation was specified relating hourly operating costs at sea with vessel DWT for each of the five vessel type shown in Table 4-4 separately for foreign flag and U.S. flag vessels.

Comments from the shipping industry raised concerns that the USACE vessel operating costs for 2004 understate current conditions, especially due to the increased cost of bunker fuels. The USACE operating cost

[26] Up through 2002, the U.S. Army Corps of Engineers published every several years updated information on vessel operating costs at sea for U.S. and foreign flag vessels. However, starting with the Economic Guidance Memorandum 05-01, deep draft vessel operating costs will not be posted for public access as some or much of the information used to develop the cost estimates is considered proprietary by commercial sources and protected from open or public disclosure under Section 4 of the Federal Freedom of Information Act, as amended. For purposes of this study, we have obtained limited access to the deep draft vessel operating costs for 2004.

estimates provide the assumed fuel consumption per day at sea for the primary propulsion and auxiliary propulsion for each vessel type and DWT size. The primary propulsion is assumed to use heavy viscosity oil while the auxiliary propulsion is assumed to use marine diesel oil. We updated the USACE vessel operating costs to reflect the average bunker fuel prices per ton for New York for June 13, 2008 as reported by Bunkerworld. The price for heavy viscosity oil was $631 per metric ton and marine diesel oil was $1,245 per metric ton. These represent increases of approximately 360 percent over average bunker fuel prices for 2004. While consumption of fuel varies by vessel type and DWT size, the overall increase in vessel operating costs in 2008 due to bunker fuels is about 95-115 percent for foreign flag general cargo vessels and tankers, 130 percent for foreign dry bulk vessels and 150 to 170 percent for foreign containerships. The resulting estimates of vessel operating costs by type and size of vessel for June 2008 are presented in Table 4-5. As the U.S. Coast Guard vessel arrival database did not provide adequate information to distinguish single-hull and double-hull tankers, we used the vessel operating costs for double hull tankers in our analysis.[27]

[27] Generally the additional vessel operating costs per hour for double hull tankers increases from one percent greater for the smaller tankers to seven percent greater for the largest tankers.

Table 4-5. Hourly Vessel Operating Costs at Sea for Foreign Flag and U.S. Flag, Vessel Type and DWT Size Range, June 2008 ($)

	DWT (000s)																	
Vessel type and flag	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-60	60-70	70-80	80-90	90-100	100-120	120-150	150+
Foreign Flag 2008 Hourly Operating Costs at Sea																		
Bulk Carrier	1,153	1,181	1,209	1,239	1,269	1,300	1,332	1,364	1,398	1,432	1,484	1,558	1,635	1,715	1,800	1,935	2,183	2,522
Combination Carrier (e.g. OBO)	1,210	1,240	1,270	1,301	1,333	1,365	1,398	1,433	1,467	1,503	1,559	1,636	1,716	1,801	1,890	2,032	2,292	2,648
Container Ship	1,137	1,291	1,466	1,664	1,890	2,145	2,436	2,766	3,140	3,565	4,313	5,560	7,167	9,239	11,911	17,433	-	-
Freight Barge	697	853	1,044	1,279	1,566	1,917	2,348	2,874	3,520	4,310	-	-	-	-	-	-	-	-
General Dry Cargo Ship	697	853	1,044	1,279	1,566	1,917	2,348	2,874	3,520	4,310	-	-	-	-	-	-	-	-
Passenger Ship a/	5,164	7,558	11,062	17,252	22,240	-	-	-	-	-	-	-	-	-	-		-	-
Refrigerated Cargo Ship	2,558	2,905	3,298	3,744	4,251	4,827	5,481	6,223	7,065	8,021	9,704	-	-	-	-	-	-	-
Ro-Ro Cargo Ship	1,251	1,420	1,612	1,831	2,078	2,360	2,679	3,042	3,454	3,922	4,744	6,116	7,884	-	-	-	-	-
Tank Barge	1,323	1,349	1,375	1,401	1,428	1,456	1,484	1,512	1,541	1,571	1,617	-	-	-	-	-	-	-
Tank Ship	1,323	1,349	1,375	1,401	1,428	1,456	1,484	1,512	1,541	1,571	1,617	1,679	1,745	1,812	1,883	1,994	2,193	2,459
Towing Vessel	1,323	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other b/	697	853	1,044	1,279	1,566	1,917	2,348	-	-	-	-	-	-	-	-		-	-
US Flag 2008 Hourly Operating Costs at Sea																		
Bulk Carrier	1,672	1,720	1,768	1,819	1,870	1,923	1,977	2,033	2,091	2,150	2,242	2,371	2,507	2,651	2,803	3,048	3,504	4,143
Combination Carrier (e.g. OBO)	1,756	1,806	1,857	1,909	1,963	2,019	2,076	2,135	2,195	2,258	2,354	2,489	2,632	2,783	2,943	3,200	3,679	4,350
Container Ship	1,741	1,933	2,147	2,385	2,649	2,942	3,267	3,628	4,030	4,476	5,238	6,461	7,970	9,831	12,126	16,611	-	-
Freight Barge	1,143	1,372	1,647	1,977	2,374	2,850	3,421	4,107	4,931	5,920	7,787	-	-	-	-	-	-	-
General Dry Cargo Ship	1,143	1,372	1,647	1,977	2,374	2,850	3,421	4,107	4,931	5,920	7,787	-	-	-	-	-	-	-
Passenger Ship a/	7,734	10,595	14,514	20,953	25,845	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigerated Cargo Ship	3,917	4,350	4,831	5,366	5,959	6,619	7,351	8,164	9,067	10,070	11,786	-	-	-	-	-	-	-
Ro-Ro Cargo Ship	1,915	2,127	2,362	2,623	2,914	3,236	3,594	3,991	4,433	4,923	5,762	7,107	8,767					
Tank Barge	2,187	2,228	2,270	2,312	2,355	2,400	2,445	2,490	2,537	2,585	2,658	-	-	-	-	-	-	-
Tank Ship	2,187	2,228	2,270	2,312	2,355	2,400	2,445	2,490	2,537	2,585	2,658	2,758	2,862	2,971	3,083	3,260	3,577	3,998
Towing Vessel	2,187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other b/	1,143	1,372	1,647	1,977	2,374	2,850	3,421	4,107	4,931	5,920	7,787	-	-	-	-	-	-	-

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. as decribed in text from data provided in U.S. Army Corps of Engineers, Economic Guidance Memorandum 05-01, Deep Draft Vessel Operating Costs and adjusted for bunker fuel prices reported by Bunkerworld for IFO380 and MDO for New York as of June 13, 2008.

We also used the USACE reported vessel operating costs to develop estimates of vessel operating costs for other vessel types making necessary adjustments for vessel capital cost and operating characteristics and flag of registry. For example, operating costs for U.S. flag ro-ro vessels were related to U.S. flag containerships and foreign flag combination carriers were related to foreign flag bulk carriers

Operating costs for US flag bulk carriers, combination carriers and tankers are generally double those of similar foreign flag vessels. Operating costs for U.S flag containerships, ro-ro vessels and passenger vessels are about 1.5 times higher than comparable foreign flag vessels.

Estimated Direct Economic Impact on Shipping Industry

In this section we estimate the direct economic impact of proposed operational measures of each alternative on the shipping industry by port area and type of vessel. The next section of this report considers other direct economic impacts to shipping such as multiple port calls and increased intermodal costs, and indirect impacts from economic impacts such as diversion of traffic to other port areas and the associated impact on employment and income.

ALTERNATIVE 1 – NO ACTION STATUS QUO

Under this alternative, NMFS would continue to implement existing measures and programs, largely non-regulatory to reduce the likelihood of mortality from ship strikes. Alternative 1 does not include any new operational measures that would affect the shipping industry and hence there is no direct economic impact associated with this alternative.

ALTERNATIVE 2 – USE OF DMAS

The final rule proposes that dynamic management areas would be implemented along the U.S. Exclusive Economic Zone when right whale sightings occur. Triggers for implementing a DMA are based on those specified for the Atlantic Large Whale Take Reduction Plan (ALWTRP) Dynamic Area Management fishing restrictions.[28] A DMA action would be triggered by a single reliable report from a qualified individual[29] of an aggregation of three or more right whales within 75 square nautical miles (nm^2) (257 km^2), such that right whale density is equal to or greater than 0.04 right whales per nm^2 (3.43 km^2), equivalent to four right whales

[28] See the January 9, 2002 Federal Register Proposed Rule (as amended by the October 28, 2002 technical amendment to the final rule) for the definition of Procedures and Criteria to Establish a DAM Zone, Criteria to Determine the Extent of the DAM Zone, and Duration of DAM Zones.

[29] A qualified individual is an individual ascertained by NMFS to be reasonably able, through training or experience, to identify a right whale. Such individuals include, but are not limited to, NMFS staff, USCG and Navy personnel trained in whale identification, scientific research survey personnel, whale watch operators, naturalists, and mariners trained in whale species identification through disentanglement training or some other training program deemed adequate by NMFS. A reliable report is a credible right whale sighting based upon which a DAM zone would be triggered.

per 100 nm² (343 km²). Once a DMA is triggered, NMFS would use the following procedures and criteria to establish a DMA:

- A circle with a radius of at least 2.8 nm (5.2 km) would be drawn around the location of each individual sighting. This radius would be adjusted for the number of observed whales, so as to size the DMA to maintain a density of four right whales per 100 nm² (343 km²). Information on how to calculate the length of the radius can be found in the Proposed Rule to amend the regulations that implement the ALWTRP (67 FR 1133). For a group of three whales the DMA would consist of a core area with a radius of 4.8 nm (8.9 km).

- If any circle or group of contiguous circles includes three or more right whales, this core area and its surrounding waters would be a candidate DMA zone.

Once NMFS identifies a core area containing three or more whales, the agency would expand this initial core area to provide a buffer in which the whales could move and still be protected. NMFS will determine the extent to the DMA zones as follows:

- A large circular zone would be drawn extending 15 nm (27.8 km) from the perimeter of a circle around each core area.

- The DMA would be a polygon drawn outside, but tangential to, the circular buffer zone(s), defined by the latitudinal and longitudinal coordinates of its corners.

Hence each DMA consists of the core area with a radius of 4.8 nm (for a group of three whales) plus the buffer with a radius of 15 nm for a total radius of 19.8 nm. The diameter of the DMA is thus 39.6 nm. The DMA zone would automatically expire after 15 days from the day of the original sighting, unless subsequent surveys within the 15-day period demonstrated (a) whales are present in the zone, or (b) the aggregation had persisted, in which case the period would be extended 15 days from the date of any subsequent sightings in the zone.

Impact on Vessel Operations

For Alternative 2, DMA triggers could be implemented at any time of the year depending on whale sightings. We have reviewed research conducted on the frequency, timing and location of whale sightings to prepare assumptions regarding the expected number of days per year that DMAs would be effective in each port area. A report published by Russell, Knowlton and Beaudin Ring in May 2005 estimated the annual expected duration of DMAs in the Northeast Region and the Block Island Sound portions of the mid-Atlantic Region.[30] However, in calculating the incidence of DMAs, this report assumed that seasonal speed restrictions in designated areas would be in effect.[31] Hence the incidences of DMAs contained in the report are only those

[30] Russell, Knowlton and Beaudin Ring, *Vessel-Traffic-Management Scenarios Based on the National Marine Fisheries Service's Strategy to Reduce Ship Strikes of [North Atlantic] Right Whales*, May 2005.

[31] The report assumed the following seasonal speed restriction periods: Great South Channel east of the shipping lanes leading to Boston, April 1-July 31; Cape Cod Bay critical habitat, January 1-April 30; portion of Boston shipping lanes near Race Point, April

that would occur outside of proposed speed restriction periods. For the southern Gulf of Maine, the report estimated an average of 2.3 DMAs per year. For our analysis we have rounded up to an expected incidence of 3 DMAs per year (45 effective days) outside of the assumed speed restriction periods.[32] We have assumed that DMAs would be implemented for 50 percent of the time that speed restrictions are proposed for the Boston shipping lanes near Race Point (April 1-May 15), or an additional 23 days.

One might assume that DMAs would be effective for 100 percent of the proposed seasonal speed restriction periods; however, the location specific nature of the DMAs means that some DMAs that would have been implemented during seasonal speed restriction periods would not fall within normal shipping lanes. Recent research on right whale sightings from 1978 through 2003 shows that many of the sightings after May appear to be more centrally located within the Great South Channel critical habitat and would be west of normal shipping lanes.[33] Hence as can be seen in Table 4-6, the economic impact analysis assumes 68 effective days per year for DMAs in the Northeast Region (excluding Cape Cod Bay).

Table 4-6. Effective DMA Days by Port Area

Port Area	Effective DMA Days
Northeast U.S.(except Cape Cod Bay)	68
Northeast U.S.- Cape Cod Bay	105
Mid-Atlantic (except Savannah, GA)	15
Southeastern U.S and Savannah GA	75

Source: Nathan Associates as described in text.

For Cape Cod Bay, the Russell Knowlton, Beaudin Ring report shows an average of 0.8 DMAs per year for Cape Cod Bay outside of the seasonal ATBA period of January 1-April 30. We have rounded this up to 1 per year (15 days). Due to the concentration of right whale sightings in the Cape Cod Bay, we have assumed that DMAs would have also been implemented for 75 percent of the seasonal ATBA that would affect shipping lanes, or an additional 90 days of effective DMAs. Hence we assume 105 effective DMA days for Cape Cod Bay.

1-May 15; offshore approaches to Block Island Sound, September-October and February-April; approaches to the ports of NY/NJ, September-October and February-April.

[32] A review of DAM zones implemented under ALWTRP confirms the Russell, Knowlton and Beaudin Ring analysis. This shows that there were no more than 3 DAMs per year implemented outside of proposed speed restriction periods that would affect shipping routes in the Northeast U.S.

[33] A draft paper by Richard Merrick of NOAA Fisheries Service evaluates the spatial and temporal distribution of northern right whales within the Gulf of Maine. The analysis focused on sightings during March-July because this is the time period when whales move out of Cape Cod Bay. The analysis shows concentrations of right whale sightings near shipping lanes during the months of March-May when whales are migrating from Cape Cod Bay to the Great South Channel.

For the mid-Atlantic region, a report by Knowlton, Beaudin Ring and Russell prepared in July 2002 provides information on the spatial and temporal distribution of right whale sightings.[34] Data from 1970 through 2002 were used for this study. With the exception of Savannah, all port areas showed an average of less than one right whale sighting per year.[35] For the economic impact analysis we have assumed one DMA period per year (15 days) for each port in the mid-Atlantic region (except for Savannah). For Savannah we have assumed 75 days per year as specified below in the discussion of the Southeast region.

For the Southeast region, we have used a recent draft report by Lance Garrison to identify the incidence of DMAs in shipping lanes.[36] The report uses data on Right Whale sightings from 1992-2001. The concentration of Right Whale sightings appears consistent with the proposed seasonal speed restriction period of November 15-April 15. As discussed above for the Northeast region, not all DMAs implemented in the region will affect the shipping lanes into Southeast ports. For the Southeast region and Savannah we have assumed that DMAs would be implemented for 50 percent of proposed seasonal speed restriction period or 75 days per year.

Estimated Direct Economic Impact

In all regions, mariners would have the option of either routing around the DMA or proceeding through it at a restricted speed. The direct impact of a DMA on vessel operations is the increased time required to transit through the DMA at the restricted speed. For a vessel normally traveling at an operating speed of 14 knots, it would normally be able to cover the 39.6 nautical miles of a DMA in 170 minutes (Table 4-7). With a speed restriction of 10 knots, covering the distance would take 238 minutes, an increase of 68 minutes. In addition, vessels will need time to slow to the restricted speed prior to entering the DMA and time to speed-up after leaving the DMA.[37] A vessel normally traveling at an average operating speed of 14 knots would take 18 additional minutes to slow down to 10 knots and then speed up again to 14 knots for a total delay of 86 minutes.

For the economic impact analysis we have conservatively assumed that vessels would opt to proceed through a DMA with a speed restriction of 10 knots rather than to route around the DMA. A vessel normally traveling at an average speed of 14 knots would incur a delay of 170 minutes to route the extra 39.6 nautical miles around two sides of the square that circumscribes a DMA,[38] as compared to the 86 minute delay to go through the 39.6 nautical miles of the DMA at the restricted speed.

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[34] Knowlton, Beaudin Ring and Russell, *Right Whale Sightings and Survey Effort in the Mid Atlantic Region: Migratory Corridor, Time Frame and Proximity to Port Entrances,* July 2002.

[35] The report shows that from November through March, right whale sightings at Savannah are three to ten times greater than those of other mid-Atlantic ports.

[36] Garrison, *Applying a spatial model to evaluate the risk of interactions between vessels and Right Whales in the southeast United States critical habitat,* October 14 2005.

[37] An excellent analysis of the time for vessels to slow down to restricted speeds and to speedup to sea speed is presented in the Russell, Knowlton, Beaudin Ring May 2005.

[38] While the two sides of the square that circumscribe a DMA are each 39.6 nautical miles, the extra distance is only equal to one side of 39.6 nautical miles as the vessel would normally have sailed the 39.6 nautical miles through the DMA at regular speed.

Table 4-7. Minutes of Delay of Transiting DMA vs. Routing Around DMA

Average operating speed	Minutes of delay for going through DMA: Normal transit time for 39.6 nm	Transit time with speed restriction	Additional transit time	Slowdown/ speedup time	Total delay	Minutes of delay for routing around DMA
Speed restriction of 10 knots						
12	198.0	237.6	39.6	10	49.6	198.0
14	169.7	237.6	67.9	18	85.9	169.7
16	148.5	237.6	89.1	22	111.1	148.5
18	132.0	237.6	105.6	26	131.6	132.0
20	118.8	237.6	118.8	30	148.8	118.8
22	108.0	237.6	129.6	33	162.6	108.0
24	99.0	237.6	138.6	36	174.6	99.0
Speed restriction of 12 knots						
12	198.0	198.0	-	-	-	198.0
14	169.7	198.0	28.3	8	36.3	169.7
16	148.5	198.0	49.5	16	65.5	148.5
18	132.0	198.0	66.0	20	86.0	132.0
20	118.8	198.0	79.2	24	103.2	118.8
22	108.0	198.0	90.0	27	117.0	108.0
24	99.0	198.0	99.0	30	129.0	99.0
Speed restriction of 14 knots						
12	198.0	169.7	-	-	-	198.0
14	169.7	169.7	-	-	-	169.7
16	148.5	169.7	21.2	8	29.2	148.5
18	132.0	169.7	37.7	13	50.7	132.0
20	118.8	169.7	50.9	18	68.9	118.8
22	108.0	169.7	61.7	21	82.7	108.0
24	99.0	169.7	70.7	24	94.7	99.0

Source: Prepared by Nathan Associates as described in text.

With a speed restriction of 10 knots, vessels with an average operating speed in excess of 18 knots could benefit by routing around the DMA. Routing around the DMA would take an additional 132 minutes (39.6 nm divided by 18 knots). Going through the DMA at 10 knots would take an additional 106 minutes (238 minutes vs. the normal 132 minutes) plus 26 minutes for slowdown and speedup for a total delay of 132 minutes, the same as routing around.

Because NMFS will draw a square around each circular DMA buffer zone (so as to issue coordinates of the corners to mariners), the position of the DMA relative to the vessel routing alters the effective distance of the DMA. For example, a vessel that would route diagonally through the DMA square would have to traverse 56 nautical miles at the restricted speed rather than the 39.6 nautical miles for a vessel crossing the DMA at the mid-points of each side of the square. This phenomenon is perhaps offset by the fact that some vessel's routes will require them to pass only through a portion of a DMA. For the economic analysis, we have assumed that vessels would have to traverse an average of 39.6 nautical miles for each DMA.

Table 4-8 presents the direct economic impact of DMAs implemented under Alternative 2 on the shipping industry in 2003. The total direct economic impact is estimated at $25.0 million with the port area of Savannah having the largest impact of $6.9 million. The port area of Port Canaveral is second at $3.9 million, followed by the port areas of New York/New Jersey and Jacksonville at $2.9 million. The direct economic impact for these four port areas totals $16.5 million or 65.8 percent of the total for this alternative.

In the Northeast region, the port area of Boston has the greatest direct economic impact estimated at $0.8 million in 2003. The port area of Portland has an estimated impact of $0.7 million.

Overall, containerships account for 47.0 percent of the total direct economic impact of Alternative 2 with an estimate of $11.8 million. The vessel type with the next largest economic impact is passenger vessels at $5.1 million followed by ro-ro cargo ships at $2.8 million. Interestingly, the port area of Port Canaveral accounts for $3.5 million or 69.2 percent of the economic impact incurred by passenger vessels.

Table 4-9 presents the direct economic impact of Alternative 2 in 2004. The total economic impact is $27.6 million in 2004, roughly 10 percent higher than 2003. This is due to the overall increase in U.S. East Coast vessel arrivals of 7.3 percent in 2004 and particularly, the 12.3 percent growth in vessel arrivals in the Southeast region that is more affected by DMAs.[39] The rankings by port area and vessel type are the same as described for 2003 above, except that Jacksonville has moved slightly ahead of New York/New Jersey. Figure 4-2 presents graphically the direct economic impact by port area for 2003 and 2004.

Some industry representatives have commented that increased fuel consumption for vessels having to go faster to make up time should be included in the economic analysis. However, the economic analysis conservatively assumes that vessels will not speed up to make up time and hence includes the maximum estimate of delay that would be incurred. If vessels make up for the delay by speeding up then the estimated economic impact would need to be revised to reduce or exclude the cost applied for the time delayed. This assumption applies to all of the alternatives analyzed.

Another comment was that vessels may burn less fuel operating at slower speeds and that these savings may offset some of the cost of delays. However, for economic reasons, vessels operators already operate at close to the vessel's optimal fuel efficiency and any savings in fuel costs are assumed to be minimal.[40]

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[39] Vessel arrivals in 2003 and 2004 by port area are presented in Chapter 2.

[40] Some vessel operators have stated that at a restricted speed of 10 knots they will consume more fuel as their engines were designed for higher operating speeds.

Table 4-8. Alternative 2: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2003 ($000s)

Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	7.7	-	13.4	-	30.4	-	-	-	-	-	-	-	51.6
Searsport, ME	6.0	0.8	-	-	-	371.8	-	0.5	16.0	71.4	0.8	-	467.4
Portland, ME	35.9	15.2	19.3	0.9	39.5	119.5	-	38.2	4.0	400.2	4.5	0.5	677.7
Portsmouth, NH	37.6	2.0	-	-	15.0	3.6	-	-	1.4	97.6	0.4	0.5	158.1
Northeastern US - Off Race Point													
Boston, MA	18.4	0.6	229.5	0.7	6.1	336.4	7.9	22.7	-	178.4	0.4	0.9	802.1
Salem, MA	4.8	-	-	-	-	3.6	-	-	-	1.0	-	-	9.3
Northeastern US - Cape Cod Bay	-	-	-	-	-	11.7	-	-	-	4.0	-	-	15.7
Mid-Atlantic Block Island Sound													
New Bedford, MA	8.7	-	0.1	-	3.1	-	4.8	-	0.5	1.8	-	-	18.9
Providence, RI	9.9	0.3	0.4	-	4.3	43.0	1.9	23.6	0.4	23.0	0.3	0.0	107.2
New London, CT	2.6	-	1.4	-	5.3	25.3	-	-	8.9	1.5	0.1	0.0	45.0
New Haven, CT	6.9	0.4	0.8	0.4	11.1	3.9	-	-	35.8	35.3	1.3	0.1	96.0
Bridgeport, CT	4.8	-	0.0	0.2	0.0	3.2	6.2	-	26.1	7.7	-	-	48.4
Long Island, NY	-	0.4	-	0.1	-	25.3	-	-	77.3	40.6	0.3	0.1	144.1
Mid-Atlantic Ports of New York/New Jersey	48.1	7.8	1,826.0	0.1	15.3	311.9	20.3	314.3	4.0	312.4	1.8	0.4	2,862.5
Mid-Atlantic Delaware Bay	37.4	3.8	200.7	2.8	37.9	29.8	261.1	45.0	1.9	210.3	1.5	0.1	832.3
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	43.9	1.5	235.1	-	59.8	51.3	3.0	274.2	0.9	38.0	1.4	1.7	710.8
Hampton Roads, VA	46.3	6.2	1,340.4	0.1	34.8	38.8	0.6	113.2	0.3	42.4	0.5	0.9	1,624.4
Mid-Atlantic Morehead City and Beaufort, NC	3.5	-	7.1	-	7.8	-	0.7	0.6	-	7.5	-	0.1	27.2
Mid-Atlantic Wilmington, NC	12.2	1.1	64.5	-	44.6	-	0.4	14.7	2.7	46.7	0.1	0.1	187.2
Mid-Atlantic Georgetown, SC	5.1	-	0.4	-	9.9	-	-	-	-	-	-	0.1	15.5
Mid-Atlantic Charleston, SC	20.3	0.3	1,180.9	-	39.8	47.3	3.2	89.6	2.4	41.4	1.3	0.3	1,426.8
Mid-Atlantic Savannah, GA	157.1	10.6	5,482.0	-	359.3	29.5	99.7	398.5	3.0	309.7	2.7	0.7	6,852.9
Southeastern US													
Brunswick, GA	41.2	-	81.8	-	100.9	3.9	37.0	484.5	-	3.8	-	-	753.1
Fernandina, FL	6.2	-	82.6	0.5	115.5	7.9	104.7	6.0	-	1.5	4.5	-	329.4
Jacksonville, FL	113.5	3.0	949.9	159.2	221.6	61.9	30.7	898.9	7.6	290.3	123.2	2.1	2,861.9
Port Canaveral, FL	56.3	1.3	39.0	3.1	89.1	3,529.6	94.0	52.0	2.6	27.2	6.3	0.5	3,901.1
Total	734.4	55.4	11,755.4	168.1	1,251.0	5,059.2	676.2	2,776.7	196.1	2,193.5	151.5	8.9	25,026.5

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-9. Alternative 2: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2004 ($000s)

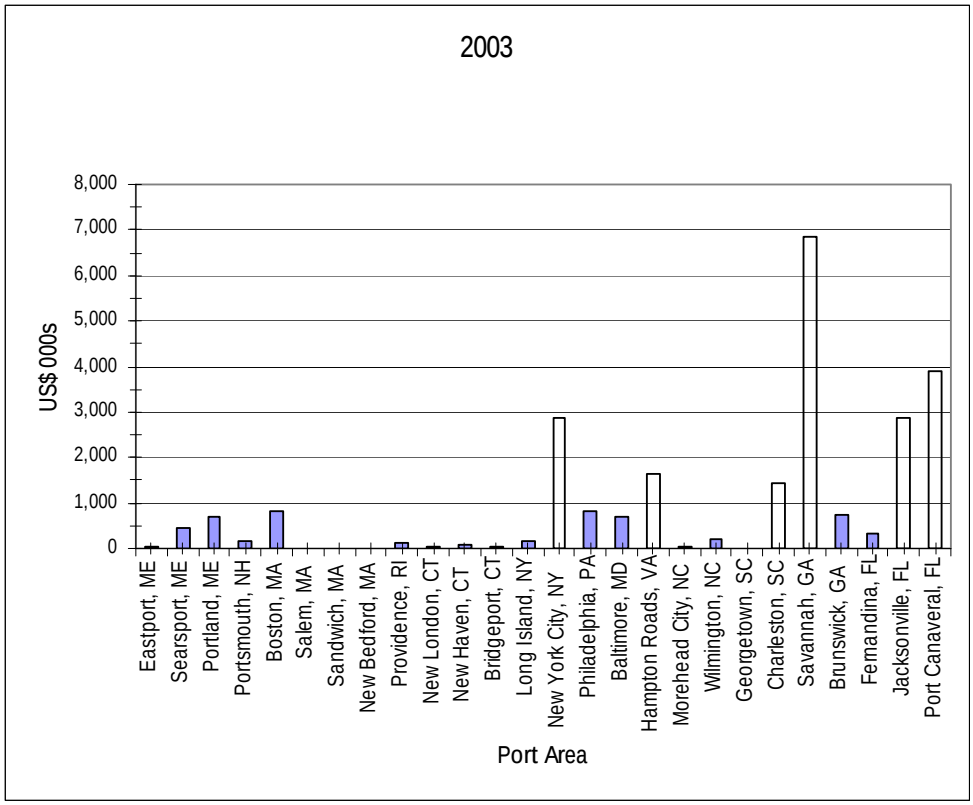
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	10.6	-	13.5	-	63.2	-	-	-	-	-	-	-	87.3
Searsport, ME	4.1	-	10.9	0.9	1.6	424.6	-	1.0	7.8	66.3	3.3	-	520.4
Portland, ME	38.5	4.4	10.7	0.9	40.5	167.6	-	26.2	18.3	417.5	19.2	0.4	744.3
Portsmouth, NH	30.3	1.8	0.5	-	24.0	3.6	-	-	0.7	72.8	3.7	1.1	138.4
Northeastern US - Off Race Point													
Boston, MA	18.4	0.6	229.5	0.7	6.1	336.4	7.9	22.7	-	178.4	0.4	0.9	802.1
Salem, MA	6.0	-	-	-	-	29.4	-	-	-	-	-	-	35.4
Northeastern US - Cape Cod Bay	-	-	-	-	-	22.7	-	-	0.2	6.2	0.1	-	29.3
Mid-Atlantic Block Island Sound													
New Bedford, MA	8.2	-	-	-	2.8	1.6	3.5	0.2	-	1.6	-	-	17.9
Providence, RI	10.2	0.3	-	-	4.5	56.5	-	19.3	0.8	17.7	0.5	0.3	110.0
New London, CT	2.2	-	5.5	-	15.3	46.7	-	-	8.8	2.0	0.3	-	80.9
New Haven, CT	5.4	-	2.4	0.2	10.1	-	-	-	67.2	27.2	2.0	-	114.5
Bridgeport, CT	9.6	-	-	0.0	0.1	3.2	2.5	-	37.7	4.6	-	0.0	57.8
Long Island, NY	-	-	-	0.4	-	30.0	-	-	89.1	41.7	-	0.0	161.3
Mid-Atlantic Ports of New York/New Jersey	46.9	4.8	1,899.1	-	23.5	503.5	21.5	320.4	3.4	301.7	4.2	0.2	3,129.3
Mid-Atlantic Delaware Bay	44.3	1.5	193.2	4.0	56.7	38.8	243.3	45.4	0.5	226.8	4.9	0.2	859.6
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	56.4	1.1	261.7	-	63.1	94.0	5.4	281.0	0.8	58.4	1.2	0.7	823.9
Hampton Roads, VA	63.8	5.0	1,320.6	0.5	39.6	74.4	9.9	104.0	1.2	47.7	2.0	0.9	1,669.4
Mid-Atlantic Morehead City and Beaufort, NC	5.9	0.1	7.8	-	5.2	5.5	-	-	-	10.0	-	0.1	34.7
Mid-Atlantic Wilmington, NC	15.4	0.5	59.5	0.4	48.8	4.7	0.4	17.3	1.4	48.3	0.5	0.4	197.7
Mid-Atlantic Georgetown, SC	4.9	0.3	1.4	-	7.2	0.8	-	-	-	-	-	-	14.7
Mid-Atlantic Charleston, SC	19.5	0.4	1,241.1	0.8	52.1	62.8	3.7	83.8	1.9	40.6	3.5	0.4	1,510.3
Mid-Atlantic Savannah, GA	165.9	8.5	5,581.4	1.0	357.6	196.3	141.3	443.4	2.5	361.5	3.6	0.5	7,263.4
Southeastern US													
Brunswick, GA	45.8	-	29.2	-	109.3	31.6	33.5	481.1	-	0.9	-	0.9	732.1
Fernandina, FL	14.3	-	89.9	1.0	129.7	75.0	45.9	5.4	-	-	10.8	-	372.1
Jacksonville, FL	130.8	5.4	976.6	140.9	248.5	502.1	34.4	931.0	14.7	297.2	165.9	8.8	3,456.3
Port Canaveral, FL	76.3	-	43.9	8.0	122.1	4,125.3	79.1	71.3	12.8	46.4	29.7	0.9	4,615.7
Total	833.8	34.9	11,978.6	159.7	1,431.5	6,837.0	632.3	2,853.4	269.8	2,275.5	255.6	16.6	27,578.8

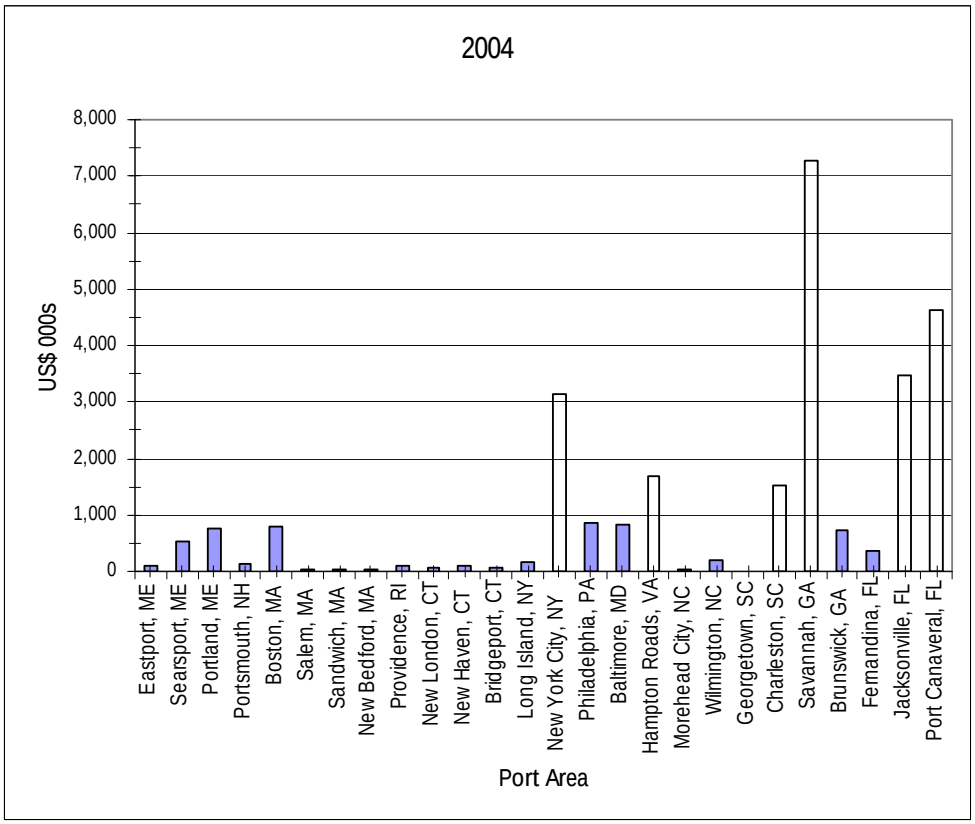
a/ Includes recreational vessels

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Figure 4-2 Alternative 2: Direct Economic Impact on Shipping Industry by Port Area, 2003 and 2004 ($000s)





ALTERNATIVE 3 – SPEED RESTRICTIONS IN DESIGNATED AREAS

Under Alternative 3, speed restrictions would be implemented along the U.S. East Coast during periods when whales are known to be present. The alternative specifies differing spatial scope and timing of the speed restrictions for the Northeast, mid-Atlantic and Southeast regions of the U.S.

In the Northeast region, speed restrictions would be effective year-round and would cover the Cape Cod Bay critical habitat and all waters used by Seasonal Area Management (SAM) zones designated in the Atlantic Large Whale Take Reduction Plan (ALWTRP).[41] The combined area would consist of the Cape Cod Bay critical habitat and cover an extensive continuous polygon extending eastward from Massachusetts Bay (70.5º W) to the Hague Convention Line and southward from 42.5º N to the Cape Cod Bay critical habitat and the southern edge of the Great South Channel critical habitat area.

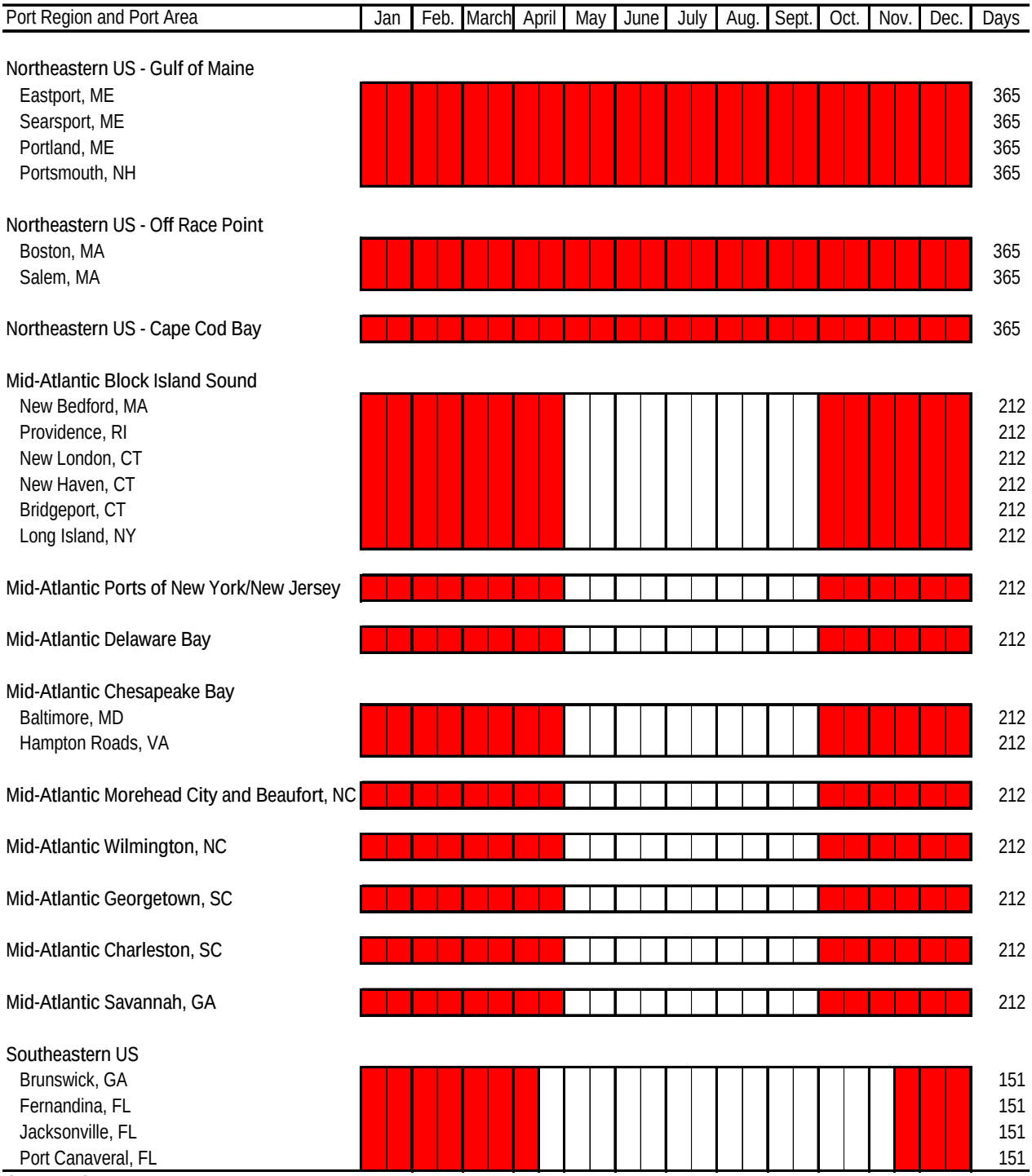
In the mid-Atlantic region, speed restrictions would be implemented from October 1 through April 30 and would extend 25 nautical miles from the U.S. coastline starting from Block Island Sound to Savannah, GA.

In the Southeast region, speed restrictions would be implemented from November 15 through April 15 and would include all waters within the Mandatory Ship Reporting system (MSRS) referred to as MSRS WHALESSOUTH plus the presently designated right whale critical habitat. MSRS WHALESSOUTH is a polygon off the coast of Brunswick, Fernandina and Jacksonville that extends from the shoreline to 80º51.6'W with the southern and northern boundaries at 30º 00'N and 31º 27' N. The northern portion of the right whale critical habitat is encompassed by the MSRS WHALESSOUTH area; however, the southern portion extends 4 to 5 nautical miles from the shoreline from the southern boundary of MSRS WHALESSOUTH past Port Canaveral to 28 º 00'N.

The effective period of proposed speed restriction for each port area is depicted in Figure 4-3. For all port areas in the Northeast region, the restrictions would be effective year-round (365 days). Speed restrictions would be in place for 212 days per year along the mid-Atlantic region and 151 days per year for port areas in the Southeast region.

[41] The definition of the expanded SAM is specified in the ALWTRP Broad-based gear modification final rule (72 FR 57104), October 5, 2007.

Figure 4-3. Alternative 3: Proposed Speed Restrictions by Port Area



Source: NOAA.

Impact on Vessel Operations

As described in Chapter 2, the U.S. Coast Guard Vessel Arrival database and ancillary data sets provide information on all vessel arrivals of 150 GRT or greater at U.S. ports. Information in the database regarding the date of vessel arrival was used to determine the number of vessel arrivals in 2003 and 2004 that would have occurred during the proposed seasonal speed restriction periods for each port area.

Table 4-10 presents U.S. East Coast arrivals of vessels for 2003 during the periods when speed restrictions are proposed for each port area. In 2003 there were 14,935 vessel arrivals during speed restricted periods approximately 58 percent of the total of 25,532 arrivals for 2003 presented in Chapter 2. While there is some seasonality in U.S. East Coast vessel arrivals, the proposed periods of speed restrictions include both peak periods and non-peak periods and hence the percentage of restricted arrivals correspond closely to the percentage of speed restricted days per year.

The port area of New York/New Jersey has the most vessel arrivals during speed restricted periods with 3,103 arrivals in 2003 followed by the port areas of Hampton Roads (1,529 arrivals), Philadelphia (1,521 arrivals), Savannah (1,368 arrivals), Charleston (1,343 arrivals) and Baltimore (1,085 arrivals).[42] These six port areas accounted for 66.6 percent of the total U.S. vessel arrivals during speed restricted periods.

In terms of vessel type, containerships recorded the most vessel arrivals during proposed speed restricted periods with 4,937 arrivals in 2003. Tankers were the next most frequent with 3,483 arrivals followed by ro-ro cargo ships with 1,713 arrivals and bulk carriers with 1,660 arrivals.

In 2004, there were 15,815 vessel arrivals at U.S. East Coast ports during the periods when speed restrictions are proposed for each port area, an increase of 5.9 percent over 2003 (Table 4-11). The increase is lower than the 7.3 percent shown for total U.S. East Coast vessel arrivals in Chapter 2 for several reasons. First, the, Southeast region which recorded an increase of 12.3 percent in total vessel arrivals in 2004 is the region with the fewest speed restricted days. Second, the port area of New York/New Jersey with the largest number of annual vessel arrivals recorded a growth of less than 0.4 percent in vessel arrivals during proposed speed restricted periods.

Detailed statistics on restricted period U.S. and foreign flag vessel arrivals by port area, vessel type, and vessel DWT size category are presented in Appendix E for 2003 and 2004.

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[42] The port areas of Philadelphia, PA and Wilmington, DE are included in the data presented for the port region of mid-Atlantic Delaware Bay in tables in this chapter. A complete definition of port areas included in each port region is presented in Appendix A, Attachment 4.

Table 4-10. Alternative 3: U.S. East Coast Restricted Vessel Arrivals by, Port Area and Vessel Type, 2003

	Vessel Type												
Port Area	Bulk Carrier	Combination Carrier	Container Ship	Freight Barge	General Dry Cargo Ship	Passenger Ship	Refrigerated Cargo Ship	Ro-Ro Cargo Ship	Tank Barge	Tanker	Towing Vessel	Other a/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	16	-	5	-	19	-	-	-	-	-	-	-	40
Searsport, ME	14	1	-	-	-	66	-	1	23	89	2	-	196
Portland, ME	66	14	9	1	38	19	-	58	6	396	11	2	620
Portsmouth, NH	63	3	-	-	10	1	-	-	2	117	1	2	199
Northeastern US - Off Race Point													
Salem, MA	7	-	-	-	-	1	-	-	-	1	-	-	9
Boston, MA	34	1	77	2	8	94	4	33	-	225	1	4	483
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	9	-	-	-	13	-	-	22
Mid-Atlantic Block Island Sound													
New Bedford, MA	36	-	1	-	16	-	5	-	4	7			69
Providence, RI	49	1		-	13	14	3	45	1	74	1	1	202
New London, CT	12	-	2	-	4	20	-	-	47	5	1	-	91
New Haven, CT	38	-	1	1	17	2	-	-	152	110	10	-	331
Bridgeport, CT	17	-	-	2	2	1	32	-	108	30	-	-	192
Long Island, NY	-	1	-	2	-	19	-	-	318	144	2	1	487
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	209	19	1,381	1	31	53	14	405	25	950	11	4	3,103
Mid-Atlantic Delaware Bay													
Philadelphia, PA	206	7	287	6	131	16	266	85	11	493	12	1	1,521
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	188	6	217	-	107	22	3	401	2	122	5	12	1,085
Hampton Roads, VA	193	14	1,006	1	76	14	1	92	1	122	2	7	1,529
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	15	-	9	-	20	-	1	2	-	22	-	2	71
Mid-Atlantic Wilmington, NC													
Wilmington, NC	66	4	54	-	76	-	1	12	13	142	1	-	369
Mid-Atlantic Georgetown, SC													
Georgetown, SC	26	-	1	-	6	-	-	-	-	-	-	1	34
Mid-Atlantic Charleston, SC													
Charleston, SC	100	-	873	-	58	28	3	136	13	118	12	2	1,343
Mid-Atlantic Savannah, GA													
Savannah, GA	166	7	769	-	137	4	5	94	4	177	3	2	1,368
Southeastern US													
Brunswick, GA	33	-	11	-	14	1	5	112	-	2	-	-	178
Fernandina, FL	4	-	43	1	42	1	13	-	-	-	7	-	111
Jacksonville, FL	62	1	185	80	102	8	2	222	7	114	117	5	905
Port Canaveral, FL	40	-	6	8	37	223	26	15	3	10	8	1	377
All Port Regions	1,660	79	4,937	105	964	616	384	1,713	740	3,483	207	47	14,935

a/ Other includes fishing vessels, industrial vessels, research vessels, school ships.

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Table 4-11. Alternative 3: U.S. East Coast Restricted Vessel Arrivals by, Port Area and Vessel Type, 2004

Port Area	Vessel Type												
	Bulk Carrier	Combination Carrier	Container Ship	Freight Barge	Dry Cargo Ship	Passenger Ship	Refrigerated Cargo Ship	Ro-Ro Cargo Ship	Tank Barge	Tanker	Towing Vessel	Other a/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	22	-	4	-	17	-	-	-	-	-	-	-	43
Searsport, ME	10	-	2	2	3	81	-	1	11	78	8	-	196
Portland, ME	71	4	4	1	28	26	-	37	26	395	47	2	641
Portsmouth, NH	51	3	1	-	16	1	-	-	1	87	9	4	173
Northeastern US - Off Race Point													
Salem, MA	9	-	-	-	-	6	-	-	-	-	-	-	15
Boston, MA	34	1	77	2	8	94	4	33	-	225	1	4	483
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	13	-	-	1	21	1	-	36
Mid-Atlantic Block Island Sound													
New Bedford, MA	31	-	-	-	14	-	4	1	-	6	-	-	56
Providence, RI	45	1	-	-	14	25	-	42	1	68	5	2	203
New London, CT	8	-	5	-	14	17	-	-	39	7	1	-	91
New Haven, CT	21	-	3	-	19	-	-	-	286	94	17	-	440
Bridgeport, CT	35	-	-	1	2	-	17	-	178	28	-	1	262
Long Island, NY	-	-	-	5	-	23	-	-	379	157	-	1	565
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	199	14	1,436	-	49	95	16	404	9	868	20	4	3,114
Mid-Atlantic Delaware Bay													
Philadelphia, PA	200	2	261	13	171	12	242	86	3	547	35	2	1,574
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	223	5	229	-	121	38	4	386	2	160	10	7	1,185
Hampton Roads, VA	254	13	986	3	93	37	5	90	1	133	12	11	1,638
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	23	1	9	-	13	4	-	-	-	32	-	1	83
Mid-Atlantic Wilmington, NC													
Wilmington, NC	67	3	48	-	73	4	-	17	9	152	2	2	377
Mid-Atlantic Georgetown, SC													
Georgetown, SC	26	2	2	-	12	1	-	-	-	-	-	-	43
Mid-Atlantic Charleston, SC													
Charleston, SC	84	1	949	2	66	51	3	128	4	117	19	6	1,430
Mid-Atlantic Savannah, GA													
Savannah, GA	174	8	760	-	124	35	10	107	1	206	5	1	1,431
Southeastern US													
Brunswick, GA	33	-	7	-	23	4	5	113	-	-	-	3	188
Fernandina, FL	12	-	30	2	50	6	6	1	-	-	11	-	118
Jacksonville, FL	66	2	204	74	91	43	2	231	9	120	154	14	1,010
Port Canaveral, FL	54		7	10	46	224	17	21	2	14	23	2	420
All Port Regions	1,752	60	5,024	115	1,067	840	335	1,698	962	3,515	380	67	15,815

a/ Other includes fishing vessels, industrial vessels, research vessels, school ships.

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Table 4-12 presents the basis for determining the effective distance that speed restrictions would apply for each port area. We begin with a discussion of the effective distance for port areas in the mid-Atlantic region and then address port areas in the Northeast and Southeast regions.

For port areas in the mid-Atlantic region, Alternative 3 proposes speed restrictions would extend 25 nautical miles from the coastline. However, independent researchers and stakeholders have pointed out that due to vessel operating practices, the effective distance of the proposed seasonal speed restrictions may be less than distances specified. This is because at most port areas, vessels already slow down to 8-10 knots at the pilot buoy for the pilot to board the vessel. In most instances the proximity of the pilot buoys to the shore makes it impractical for the vessel to resume normal operating speed. Thus the effective distance over which the proposed seasonal speed restrictions would apply is lessened by the distance of the pilot buoy from the shore. The location of the pilot buoy relative to the harbor baseline or closing line is shown in Table 4-12. For example, the pilot buoy for the port area of New York/New Jersey is 6.8 nautical miles from the harbor baseline. Thus the distance from the edge of the speed restricted area to the pilot buoy is only 18.2 nautical miles.

It should be noted, however, that for the port area of New York/New Jersey and most other U.S. East Coast port areas, vessels do not approach the port directly perpendicular to the coastline. Rather, mariners approaching from the north or south would approach the port more at on a diagonal routing. For purposes of the economic impact analysis we have assumed that vessels would travel through the speed restricted areas on a 45º routing until they reach the pilot buoy. Thus, for the port area of New York/New Jersey it is assumed that vessel would traverse 25.7 nautical miles through the speed restricted area. This concept was applied to all port areas in the mid-Atlantic region.

Table 4-12 indicates an additional effective distance of 54.9 nautical miles for the port area of New York/New Jersey. This is due to the year-round large speed restricted area established in the Northeast region that some vessels will have to traverse either coming to the port area of New York/New Jersey from the north or departing to the north (Figure 4-4). We have estimated that vessels affected will need to traverse 54.9 nautical miles of speed restricted areas in the Northeast. This factor, though, only affects vessel arrivals into the port area of New York/ New Jersey from the north or departures to north.

Data on the number of vessels arrivals at the port area of New York, New Jersey by direction of approach and departure was not available for this study. However, we have prepared an estimate of the number of arrivals and departures from / to the north based on our general knowledge of shipping patterns in the area and of movements along the US. East Coast. For example, on some liner container trades, the port area of New York/ New Jersey is the end of a northern string for routes that serves the Far East and the US East Coast via the Panama Canal. Once these vessel unload/ load at the port area of New York/ New jersey, they depart to the south for the return trip. On the other hand, most liner vessels that call at the port area of New York/New Jersey from Europe arrive from the north and depart to the south for calls at other US East Cast ports before

heading back. Based on these type of routing considerations, we have assumed that it would affect 30 percent of vessel arrivals in the port area of New York/New Jersey. [43]

Table 4-12. Alternative 3: Effective Distance of Speed Restrictions in Designated Areas

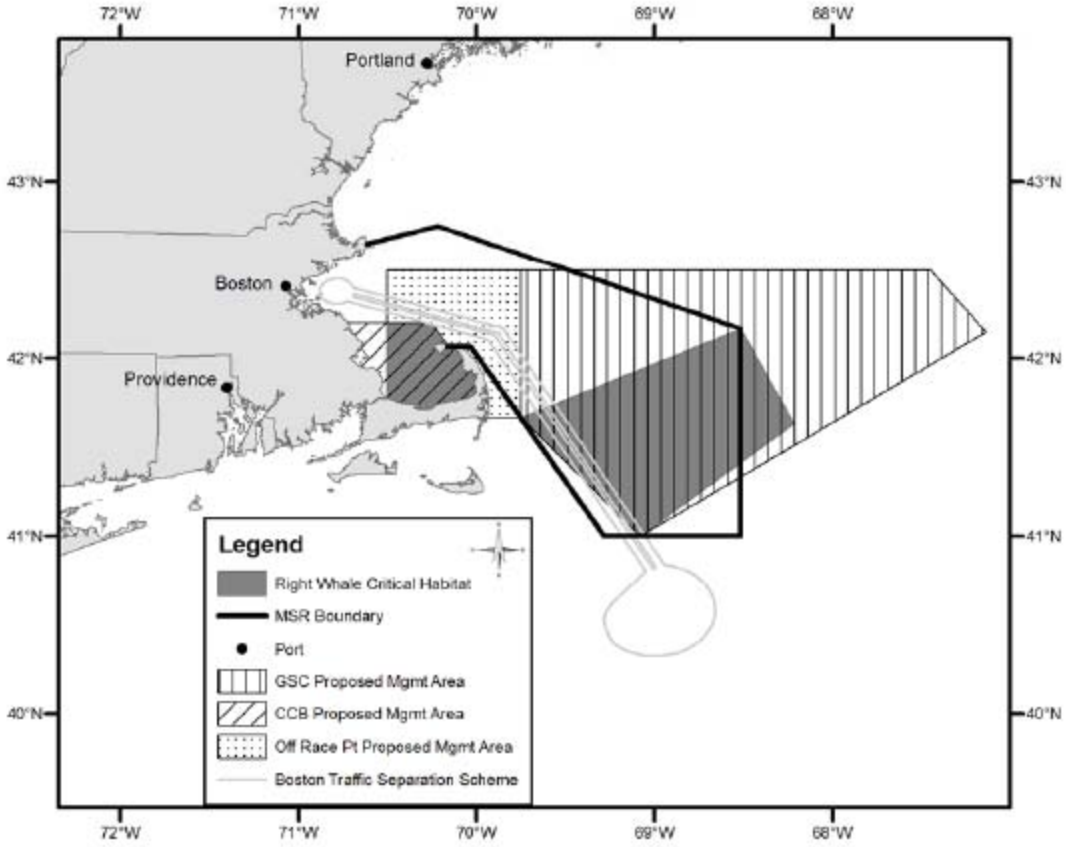
Port Area	Location of pilot buoy relative to harbor baseline or closing line	Distance Stated in NOI	Distance to pilot buoy	Diagonal of distance to pilot buoy	Additional effective distance a/	Slow down/speed up time
Northeastern US - Gulf of Maine						
Eastport, ME	n.a.	n.a.	n.a.	n.a.	54.9	Included
Searsport, ME	n.a.	n.a.	n.a.	n.a.	54.9	Included
Portland, ME	n.a.	n.a.	n.a.	n.a.	54.9	Included
Portsmouth, NH	n.a.	n.a.	n.a.	n.a.	54.9	Included
Northeastern US - Off Race Point						
Boston, MA	n.a.	n.a.	n.a.	n.a.	72.4	n.a.
Salem, MA	n.a.	n.a.	n.a.	n.a.	72.4	n.a.
Northeastern US - Cape Cod Bay	5.0	n.a.	n.a.	n.a.	59.2	n.a.
Mid-Atlantic Block Island Sound						
New Bedford, MA	n.a.	25	25	35.4	54.9	Included
Providence, RI	n.a.	25	25	35.4	54.9	Included
New London, CT	n.a.	25	25	35.4	54.9	Included
New Haven, CT	n.a.	25	25	35.4	54.9	Included
Bridgeport, CT	n.a.	25	25	35.4	54.9	Included
Long Island, NY	n.a.	25	25	35.4	54.9	Included
Mid-Atlantic Ports of New York/New Jersey	6.8	25	18.2	25.7	54.9	Included
Mid-Atlantic Delaware Bay	2.5	25	22.5	31.8	54.9	Included
Mid-Atlantic Chesapeake Bay						
Baltimore, MD	2.8	25	22.2	31.3	54.9	Included
Hampton Roads, VA	2.8	25	22.2	31.3	54.9	Included
Mid-Atlantic Morehead City and Beaufort, NC	6.7	25	18.3	25.9	n.a.	n.a.
Mid-Atlantic Wilmington, NC	4.1	25	20.9	29.6	n.a.	n.a.
Mid-Atlantic Georgetown, SC	5.6	25	19.4	27.4	n.a.	n.a.
Mid-Atlantic Charleston, SC	12.5	25	12.5	17.7	6.3	n.a.
Mid-Atlantic Savannah, GA	9.7	25	15.3	21.6	4.9	n.a.
Southeastern US						
Brunswick, GA	6.7	n.a.	n.a.	26.4	3.4	n.a.
Fernandina, FL	10.9	n.a.	n.a.	32.9	5.5	n.a.
Jacksonville, FL	4.2	n.a.	n.a.	30.9	n.a.	n.a.
Port Canaveral, FL	n.a.	n.a.	n.a.	4.5	n.a.	n.a.

a/ Defined and described in text for each port area.
Source: Nathan Associates as descibed in text.

[43] The determination of 30 percent is based on the following assumptions: 45 percent arrive from the south and depart to the south (0 trips through the northeast speed restricted area); 40 percent arrive from the north and depart to the south (1 trip through the northeast speed restricted area), 10 percent of vessel arrive from the south and depart to the north south (1 trip through the northeast speed restricted area), 5 percent arrive from the north and depart to the north south (2 trips through the northeast speed restricted area). This results in a total factor of 60 percent which is cut in half to apply to vessel arrivals only. Later in the economic impact analysis we double the estimated impact on vessel arrivals to account for the impact on vessel departures.

The mid-Atlantic port areas of Philadelphia, Baltimore and Hampton Roads have been assumed to be equally affected by the year-round large speed restricted area established in the Northeast region. Port areas south of Hampton Roads are assumed not to be affected as vessels normally travel to the east of the Northeast region restricted area.

Figure 4-4 Northeastern U.S. Proposed Regulatory Measures



Source: DEIS, Right Whale Ship Strike Reduction, Figure 1-3.

Port areas in Block Island Sound are assumed to have 40 percent of their vessel arrivals affected by the large speed restricted area in the Northeast region.[44]

As discussed under Alternative 2, another element of the impact on vessel operations is the time for vessels to slow down from sea speed to restricted speed and later to speed back up to sea speed. This will affect vessel

[44] This assumption is premised on consideration of maritime shipping patterns similar to the discussion above for the port area of New York/ New Jersey. The determination of 40 percent is based on the following assumptions: 45 percent arrive from the north and depart to the south (1 trip through the northeast speed restricted area); 30 percent arrive from the south and depart to the south (0 trips through the northeast speed restricted area), 15 percent arrive from the north and depart to the north south (1 trips through the northeast speed restricted area) and 10 percent of vessel arrive from the north and depart to the north (2 trips through the northeast speed restricted area). This results in a total factor of 80 percent which is cut in half to apply to vessel arrivals only

arrivals at the port area of New York/New Jersey mentioned that will traverse the year-round speed restricted areas in the Northeast region. We have included the extra time for these vessels to slow down to restricted speed and to resume sea speed in the economic impact analysis.

The additional distance shown in Table 4-12 for the mid-Atlantic port areas of Charleston and Savannah is calculated as half of the distance of the pilot buoy to the harbor baseline. Pilots at these ports have indicated that without speed restrictions vessel would regain some speed (not sea speed) prior to the entering the harbor baseline. Applying the speed restriction over half of this distance should approximate the extra delay incurred from the pilot buoy to the harbor baseline at these port areas.

For port areas in the Northeast region, Alternative 3 does not specify a specific distance over which speed restrictions would be implemented. Rather, broad geographic areas were delineated as described earlier in this section. With the exception of Cape Cod Bay, vessels arriving in port areas in the Northeast region from the north will not be affected by proposed speed restricted areas. Vessels arriving from the south will be affected primarily by the portion of the restricted area referred to as expanded SAM West. It is assumed that vessels arriving from the south and destined for Northeast port areas will attempt to minimize the impact of the speed restrictions by entering the existing Boston TSS at a point east of the southern tip of Cape Cod. From there vessels will route at restricted speeds through the TSS (65 nautical miles). Vessels destined for Boston may regain some speed (but not sea speed) from the western end of the restricted area to the Boston pilot buoy (15 nautical miles). Similar to the treatment of Charleston and Savannah above we have assumed that applying speed restrictions to half of this distance should approximate the extra delay incurred by the vessel.

Vessels arriving from the south and destined for Gulf of Maine ports will need to route 54.9 nautical miles through the expanded Off Race Point area. These vessels will also be affected by the time to slow down prior to entering and upon leaving the expanded Off Race Point area.

For Alternative 3, the effective distance of speed restrictions for port areas in the Southeast was determined by identifying typical access routes for each port and the distance from the intersection of those routes with the eastern edge of the MSRS WHALESSOUTH area to each port's pilot buoy. For the port area of Brunswick, two routes were considered typical, one to the northeast of 21.8 nautical miles and one to the southeast of 28.4 nautical miles. The southeast route was assumed to account for 70 percent of vessel traffic resulting in a weighted average distance of 26.4 nautical miles. An additional effective distance of 3.4 nautical miles was assumed to account for vessels not being able to regain speed over the 6.7 nautical miles from the pilot buoy to the coastline.

Two typical routes were used for the port area of Fernandina – a northeast route of 39.5 nautical miles and a southeast route of 26.3 nautical miles. Traffic was assumed to be equally divided among the two routes for an average distance of 32.9 nautical miles. An additional effective distance of 5.5 nautical miles was assumed to account for vessels not being able to regain speed over the 10.9 nautical miles from the pilot buoy to the coastline.

Three typical routes were used for the port area of Jacksonville- a northeast route of 39.4 nautical miles (10 percent of vessels), an easterly route of 26.3 nautical miles (30 percent) and a southeast route of 31.7 nautical miles (60 percent). The weighted average distance is 30.9 nautical miles.

For the port area of Port Canaveral, a single route of 4.5 nautical miles was used through the right whale critical habitat area.

Using the economic impact model, we have identified the minutes of delay that will be incurred in each port area, taking into account the distribution of vessel arrivals, normal vessel operating speeds, and the effective distance over which the restriction will apply. Table 4-13 presents the average minutes of delay for a speed restriction of 10 knots per vessel arrival for each affected port area and vessel type in 2003.[45] The overall weighted average delay for all vessels in 2003 is 91 minutes per arrival.[46]

The longest average delay is experienced at the port area of Hampton Roads with an average delay of 132 minutes per arrival. This is due to the predominance of large and fast containerships at the port area coupled with the relatively few arrivals of smaller and slower vessel types. The port areas of Baltimore (116 minutes), Providence (113 minutes), New York/New Jersey (107 minutes), Delaware Bay (103) and New London (103 minutes) are the other port areas with average delays in excess of 100 minutes. The port area of Port Canaveral at 10 minutes has the least average minutes of delay per vessel arrival as the speed restriction is only effective for 4.5 nautical miles from the eastern edge of the right whale critical habitat to the pilot buoy.

Containerships incur the longest average delay with an average of 118 minutes per vessel arrival followed by ro-ro cargo ships (108 minutes), and refrigerated cargo vessels (102 minutes).

[45] The average delay includes slowdown/speedup time for port areas in the Gulf of Maine divided by the number of vessel arrivals by type of vessel for each port area during proposed speed restriction periods. It does not include slow down speedup time for port areas in the mid-Atlantic as those delays would need to be divided annual vessel arrivals at each port.

46 As will be discussed later, vessels are assumed to incur similar delays when leaving each port area.

Table 4-13. Alternative 3: Average Minutes of Delay per Vessel Arrival by Port Area and Type of Vessel, 2003

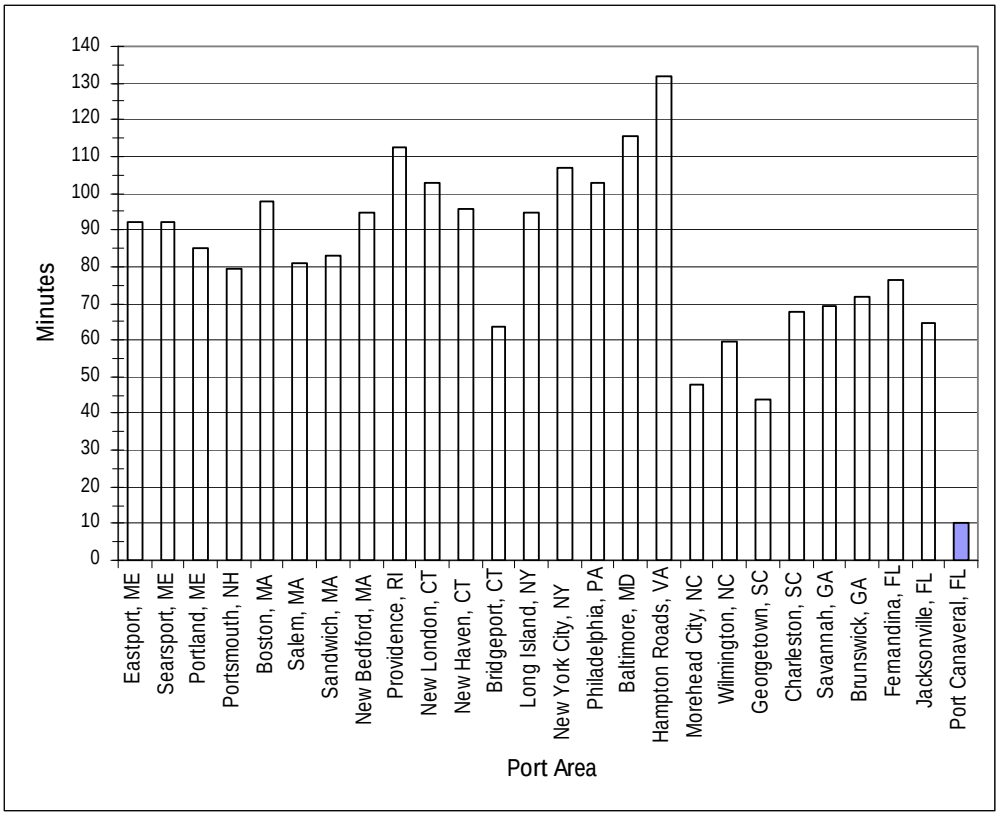
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Weighted Average
Northeastern US - Gulf of Maine													
Eastport, ME	44.9	-	112.0	-	85.2	-	-	-	-	-	-	-	72.4
Searsport, ME	40.3	63.4	-	-	-	94.8	-	50.6	61.1	65.5	37.0	-	72.7
Portland, ME	48.7	64.6	110.2	84.5	78.2	97.4	-	57.3	59.8	68.9	37.0	37.0	66.8
Portsmouth, NH	52.2	55.3	-	-	85.8	83.3	-	-	62.3	66.5	37.0	37.0	62.4
Northeastern US - Off Race Point													
Boston, MA	63.6	67.7	149.0	68.4	85.1	110.0	107.9	78.2	-	85.0	48.9	48.9	97.8
Salem, MA	75.0	-	-	-	-	110.0	-	-	-	92.6	-	-	80.9
Northeastern US - Cape Cod Bay	-	-	-	-	-	93.5	-	-	-	75.4	-	-	82.8
Mid-Atlantic Block Island Sound													
New Bedford, MA	85.4	-	78.4	-	107.9	-	126.6	-	86.4	98.0	-	-	94.8
Providence, RI	79.9	100.1	-	-	122.5	149.2	133.0	150.6	84.3	103.4	57.4	57.4	112.5
New London, CT	79.7	-	185.3	-	146.1	129.0	-	-	91.4	102.2	57.4	-	102.8
New Haven, CT	78.5	-	188.7	58.5	136.3	129.0	-	-	93.8	100.8	57.4	-	95.8
Bridgeport, CT	92.4	-	-	43.1	-	108.7	-	-	75.9	75.4	-	-	63.7
Long Island, NY	-	100.1	-	58.5	-	129.0	-	-	91.7	98.3	57.4	57.4	94.7
Mid-Atlantic Ports of New York/New Jersey	59.1	71.8	134.1	75.1	80.5	111.5	118.0	116.4	66.9	77.1	42.2	42.2	106.9
Mid-Atlantic Delaware Bay	62.8	84.3	129.3	102.2	100.0	120.8	122.2	124.5	79.9	92.1	48.3	48.3	102.7
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	69.0	77.7	149.0	-	107.8	124.8	116.3	132.9	78.9	87.4	47.8	47.8	115.5
Hampton Roads, VA	69.3	83.4	152.1	85.0	103.2	127.5	121.7	144.6	80.5	88.0	47.8	47.8	132.1
Mid-Atlantic Morehead City and Beaufort, NC	32.5	-	73.7	-	49.2	-	35.4	68.5	-	46.5	-	25.9	47.7
Mid-Atlantic Wilmington, NC	37.2	46.6	92.1	-	66.1	-	65.2	90.1	49.9	52.5	29.6	-	59.4
Mid-Atlantic Georgetown, SC	36.1	-	82.5	-	74.8	-	-	-	-	-	-	27.4	44.0
Mid-Atlantic Charleston, SC	32.1	-	77.2	-	58.0	59.4	55.5	66.8	41.9	43.9	23.9	23.9	67.7
Mid-Atlantic Savannah, GA	32.5	39.3	84.6	-	55.6	62.4	89.0	73.8	43.6	47.9	26.5	26.5	69.3
Southeastern US													
Brunswick, GA	33.9	-	94.2	-	67.6	66.9	73.7	81.3	-	53.7	-	-	71.6
Fernandina, FL	62.6	-	84.5	39.1	69.2	86.3	97.6	-	-	-	38.4	-	76.2
Jacksonville, FL	43.9	47.0	82.6	64.6	54.2	74.4	73.4	82.9	54.5	56.5	30.9	30.9	64.6
Port Canaveral, FL	4.8	-	14.3	4.6	9.0	11.8	10.1	10.8	7.9	8.3	4.5	4.5	10.2
Total	55.0	69.6	117.4	61.9	77.3	72.5	101.2	106.2	84.8	76.5	34.1	40.9	91.1

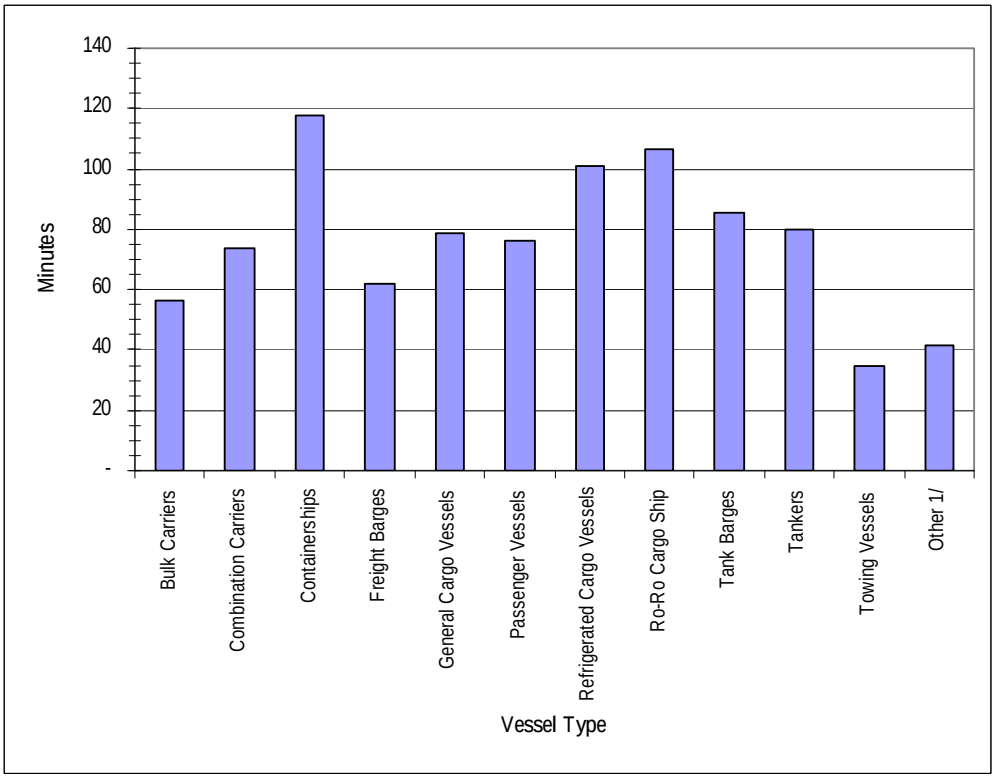
a/ Includes recreational vessels

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Figure 4-5. Alternative 3: Average Minutes of Delay per Vessel Arrival by Port Area and Type of Vessel, 2003





Estimated Direct Economic Impact

Table 4-14 presents the direct economic impact of speed restrictions in designated areas implemented under Alternative 3 on the shipping industry in 2003. The total direct economic impact is estimated at $133.0 million with the port area of New York/New Jersey having the largest impact of $36.6 million. The port area of Hampton Roads is second at $24.5 million, followed by the port areas of Philadelphia at $13.5 million, Baltimore at $11.0 million, Savannah at $10.2 million, Charleston at $9.9 million, Boston at $4.2 million, Jacksonville at $3.6 million and Portland at $3.4 million. The direct economic impact for these nine port areas totals $117.0 million or 87.9 percent of the total for this alternative.

Containerships account for 54.1 percent of the total direct economic impact of Alternative 3 with an estimate of $71.9 million. The vessel type with the next largest economic impact is tankers at $16.4 million followed by ro-ro cargo ships at $14.7 million and passenger vessels at $10.9 million.

Table 4-15 presents the direct economic impact of Alternative 3 in 2004. The total economic impact is $142.5 million in 2004, roughly 7.1 percent higher than 2003 which reflects the overall increase in U.S. East Coast vessel arrivals. The rankings for the major vessel types are similar to 2003.

Figure 4-6 presents graphically the direct economic impact by port area for 2003 and 2004. The rankings for the leading port areas are similar to those described for 2003 above except that Jacksonville has moved ahead of Boston.

Table 4-14. Alternative 3: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2003 ($000s)

Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	39.3	-	68.4	-	154.6	-	-	-	-	-	-	-	262.3
Searsport, ME	30.7	4.2	-	-	-	1,891.2	-	2.7	81.2	363.4	4.1	-	2,377.5
Portland, ME	182.6	77.4	98.3	4.6	201.1	607.7	-	194.5	20.6	2,035.3	22.8	2.4	3,447.2
Portsmouth, NH	191.3	10.4	-	-	76.1	18.2	-	-	7.3	496.3	2.1	2.4	804.1
Northeastern US - Off Race Point													
Boston, MA	97.6	3.2	1,214.7	3.6	32.5	1,780.2	41.8	119.9	-	944.1	2.2	4.5	4,244.4
Salem, MA	25.2	-	-	-	-	18.9	-	-	-	5.2	-	-	49.4
Northeastern US - Cape Cod Bay	-	-	-	-	-	161.8	-	-	-	54.7	-	-	216.5
Mid-Atlantic Block Island Sound													
New Bedford, MA	166.5	-	3.4	-	74.7	-	69.1	-	17.3	36.0	-	-	366.9
Providence, RI	202.2	6.5	-	-	77.5	581.1	45.7	434.0	4.2	439.6	2.9	1.5	1,795.2
New London, CT	49.3	-	44.2	-	60.6	500.9	-	-	218.9	28.8	2.9	-	905.4
New Haven, CT	152.7	-	25.3	1.5	189.2	50.1	-	-	731.3	623.0	28.5	-	1,801.7
Bridgeport, CT	90.2	-	-	2.3	-	20.9	-	-	413.3	120.7	-	-	647.4
Long Island, NY	-	6.5	-	3.1	-	475.8	-	-	1,485.2	872.6	5.7	1.8	2,850.6
Mid-Atlantic Ports of New York/New Jersey	646.2	89.2	24,866.6	2.4	138.4	1,775.4	303.5	4,221.3	85.1	4,441.1	23.2	4.4	36,596.9
Mid-Atlantic Delaware Bay	649.8	41.5	3,257.1	26.4	651.4	503.6	4,450.6	692.5	44.9	3,200.2	28.5	1.3	13,547.8
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	705.8	28.7	3,648.1	-	768.5	743.9	41.3	4,413.0	8.0	641.9	11.8	23.9	11,034.9
Hampton Roads, VA	743.4	77.9	20,353.1	2.7	476.4	557.6	14.9	1,588.6	4.1	662.0	4.7	14.6	24,500.1
Mid-Atlantic Morehead City and Beaufort, NC	21.6	-	57.9	-	51.1	-	3.0	7.9	-	50.5	-	1.2	193.2
Mid-Atlantic Wilmington, NC	109.5	9.7	550.9	-	386.6	-	6.3	111.7	29.9	372.3	1.3	-	1,578.3
Mid-Atlantic Georgetown, SC	42.0	-	5.9	-	49.5	-	-	-	-	-	-	0.8	98.2
Mid-Atlantic Charleston, SC	147.3	-	8,095.7	-	288.0	375.6	16.9	641.2	25.8	268.3	12.7	1.1	9,872.6
Mid-Atlantic Savannah, GA	235.5	13.6	8,190.7	-	513.5	48.6	144.0	564.2	7.9	428.6	3.5	1.2	10,151.3
Southeastern US													
Brunswick, GA	48.6	-	98.3	-	68.1	11.5	39.6	576.8	-	5.3	-	-	848.3
Fernandina, FL	12.2	-	165.5	0.9	186.2	14.9	139.4	-	-	-	11.8	-	530.9
Jacksonville, FL	127.8	2.4	1,141.6	193.1	320.4	122.1	15.2	1,124.4	18.3	332.4	159.5	3.6	3,560.7
Port Canaveral, FL	8.2	-	8.4	0.9	18.5	650.1	25.9	9.0	1.1	4.4	1.6	0.1	728.0
Total	4,725.6	371.0	71,894.0	241.5	4,783.0	10,910.1	5,357.4	14,701.5	3,204.3	16,426.8	329.7	64.9	133,009.9

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-15. Alternative 3: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2004 ($000s)

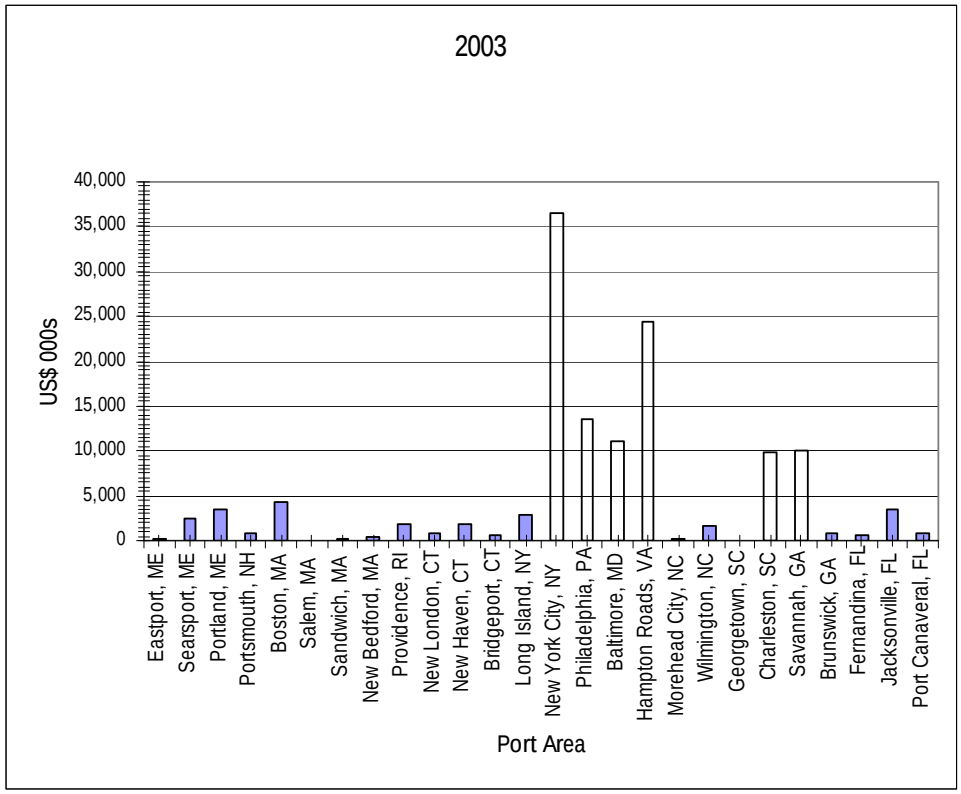
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	54.0	-	68.6	-	321.4	-	-	-	-	-	-	-	444.0
Searsport, ME	20.8	-	55.3	4.5	8.2	2,159.9	-	4.9	39.6	337.3	16.6	-	2,647.1
Portland, ME	196.1	22.2	54.3	4.6	206.1	852.5	-	133.4	93.2	2,123.5	97.4	2.2	3,785.5
Portsmouth, NH	153.9	9.3	2.4	-	122.1	18.2	-	-	3.6	370.1	18.7	5.3	703.7
Northeastern US - Off Race Point													
Boston, MA	97.6	3.2	1,214.7	3.6	32.5	1,780.2	41.8	119.9	-	944.1	2.2	4.5	4,244.4
Salem, MA	31.8	-	-	-	-	155.4	-	-	-	-	-	-	187.2
Northeastern US - Cape Cod Bay	-	-	-	-	-	314.4	-	-	3.1	86.2	1.8	-	405.5
Mid-Atlantic Block Island Sound													
New Bedford, MA	145.1	-	-	-	46.3	-	55.3	6.8	-	31.3	-	-	284.7
Providence, RI	170.7	6.8	-	-	103.3	939.9	-	410.0	5.0	407.3	14.3	5.5	2,062.8
New London, CT	32.2	-	109.8	-	235.0	444.2	-	-	186.4	39.7	2.9	-	1,050.2
New Haven, CT	86.9	-	49.7	-	155.4	-	-	-	1,381.0	537.6	48.5	-	2,259.1
Bridgeport, CT	157.2	-	-	1.1	-	-	-	-	668.4	100.2	-	0.6	927.5
Long Island, NY	-	-	-	7.7	-	576.0	-	-	1,791.1	886.8	-	1.5	3,263.1
Mid-Atlantic Ports of New York/New Jersey	579.5	60.2	25,641.7	-	399.4	3,501.7	301.8	4,439.0	31.2	4,138.4	42.2	4.4	39,139.5
Mid-Atlantic Delaware Bay	642.0	9.9	3,006.5	60.4	940.7	296.6	4,216.7	702.1	13.5	3,495.3	83.2	2.8	13,469.7
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	844.1	24.8	3,883.8	-	974.0	1,196.5	78.0	4,384.6	8.2	893.0	23.6	11.3	12,321.9
Hampton Roads, VA	971.0	64.6	19,812.9	9.3	675.4	1,222.2	129.2	1,591.5	4.1	735.4	28.3	14.8	25,258.7
Mid-Atlantic Morehead City and Beaufort, NC	39.3	1.7	61.8	-	41.5	40.1	-	-	-	72.4	-	0.6	257.4
Mid-Atlantic Wilmington, NC	108.0	5.5	487.1	-	413.3	45.8	-	150.9	20.2	402.8	2.6	3.0	1,639.1
Mid-Atlantic Georgetown, SC	39.1	2.8	5.2	-	75.0	10.6	-	-	-	-	-	-	132.7
Mid-Atlantic Charleston, SC	138.8	0.8	8,469.2	4.7	330.1	554.7	29.8	592.6	8.0	266.6	20.1	3.6	10,418.9
Mid-Atlantic Savannah, GA	248.7	15.1	8,388.1	-	578.0	366.6	216.9	665.5	2.6	516.3	5.8	0.6	11,004.1
Southeastern US													
Brunswick, GA	48.0	-	50.3	-	120.8	46.1	41.5	606.6	-	-	-	2.5	915.9
Fernandina, FL	22.9	-	132.8	3.9	186.0	89.1	59.3	20.4	-	-	18.6	-	533.0
Jacksonville, FL	140.9	4.7	1,197.6	166.2	311.8	708.0	17.3	1,173.3	23.6	354.4	209.9	10.0	4,317.9
Port Canaveral, FL	13.1	-	10.7	1.1	27.5	708.0	16.3	14.5	0.8	6.4	4.6	0.2	803.2
Total	4,981.8	231.6	72,702.5	267.0	6,303.9	16,026.7	5,204.0	15,016.0	4,283.6	16,745.2	641.0	73.6	142,476.8

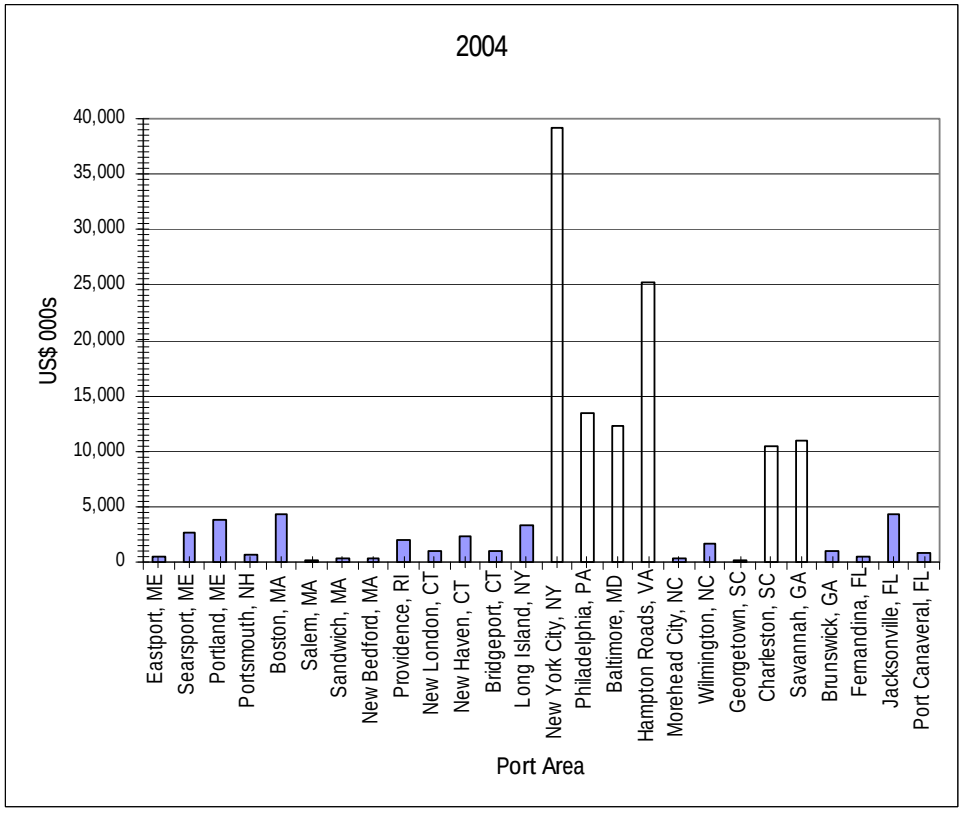
a/ Includes recreational vessels

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Figure 4-6. Alternative 3: Direct Economic Impact on Shipping Industry by Port Area, 2003 and 2004 ($000s)





ALTERNATIVE 4 – USE OF RECOMMENDED ROUTES

Alternative 4 relies on recently altered vessel routing patterns that moved vessels away from areas where whales are known to aggregate in order to reduce the likelihood of mortality due to a ship strike. Vessels 65 ft and greater would be expected to use these routes year round. The following route changes were established in 2006:

- Northeast and southeast port access routes to each of the port areas of Brunswick, Fernandina and Jacksonville. (Figure 4-7).

- Recommended shipping lanes in Cape Cod Bay. (Figure 4-8).

Impact on Vessel Operations

Under Alternative 3, we identified the existing pattern of vessel approaches to each port area. As vessel arriving at these ports generally approach from the south or north, the current pattern of approaches to the pilot buoys are approximately 40-65 degrees and 135-160 degrees from a parallel line to the coastline. Under Alternative 4, the preferred northeast and southeast access routes to each port are flatter. Vessels are assumed to have to route parallel to the eastern boundary of the MSRS WHALESSOUTH until they meet the intersection of the recommended route. The difference in the total distance between current route and the use of the recommended route is then divided by the average operating speed of each type and size of vessel to determine the additional time associated with the use of the recommended route. The economic impact is estimated by multiplying the additional time by the hourly operating cost for each type and size of vessel.

Figure 4-7. Port Access Routes for Brunswick, Fernandina and Jacksonville

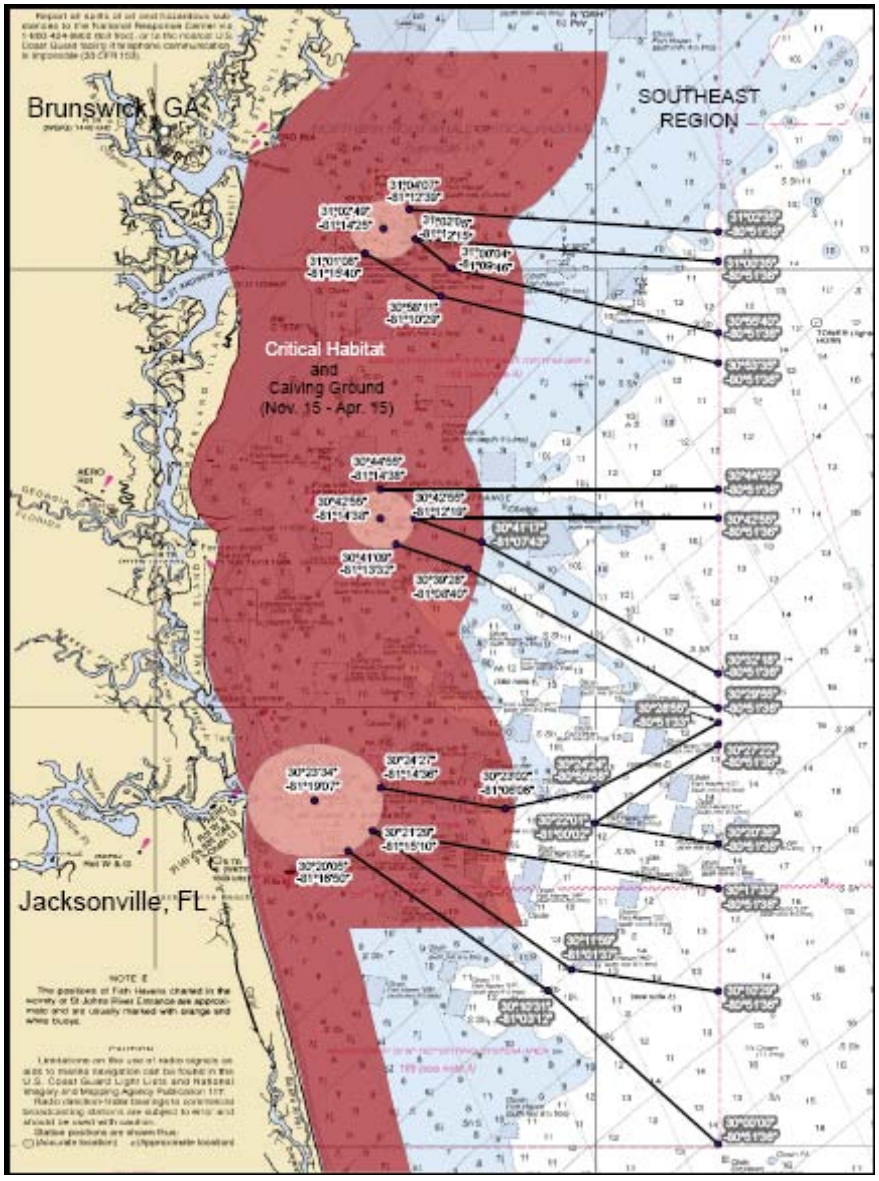
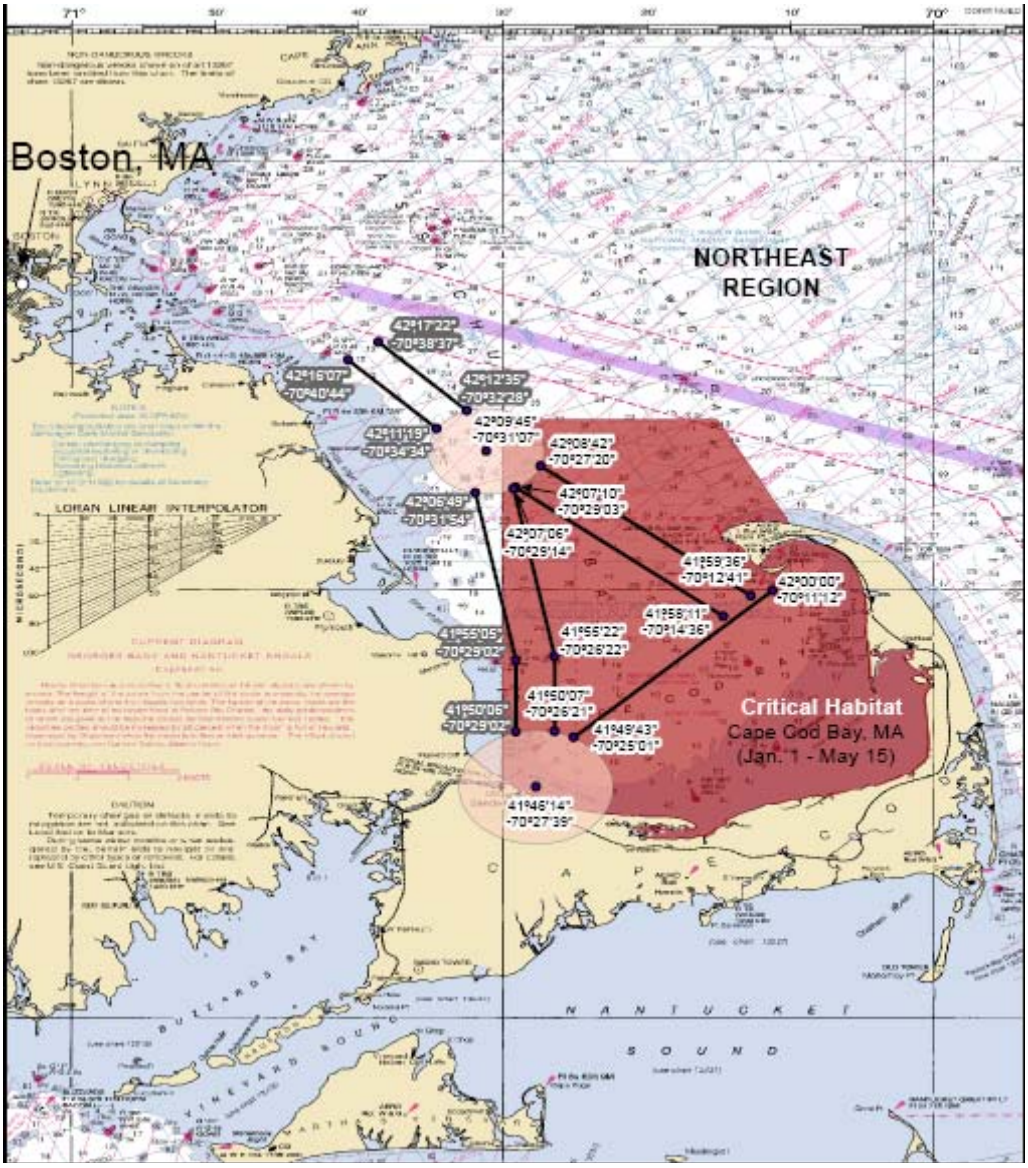


Figure 4-8. Recommended Shipping Lanes for Cape Cod Bay



For the port area of Brunswick, the weighted average incremental distance of using the recommended access route is 6.0 nautical miles, for the port area of Fernandina it is 10.5 nautical miles, and for the port area of Jacksonville it is 10.0 nautical miles.

The recommended shipping lanes for Cape Cod Bay would not measurably impact shipping industry vessel operations as the recommended lanes are not different from existing north-south shipping routes via the Cape Cod Canal to Boston. The economic impact of the recommended shipping lanes for Cape Cod Bay on passenger and other vessels particularly to Provincetown is addressed in a later section of this report.

Estimated Direct Economic Impact

Table 4-16 presents the direct economic impact of use of recommended routes implemented under Alternative 4 on the shipping industry in 2003. For the Southeast port areas of Brunswick, Fernandina and Jacksonville, the economic analysis assumes that all vessels will use the recommended routes during the period of November 15-April 15 when right whales are known to be present. During other periods, the economic analysis assumes that vessel operators will choose to sail via the most direct and economical access route to each port.

The total direct economic impact is estimated at $2.3 million with the port area of Jacksonville having the largest impact of $1.9 million. The other port areas impacted under this alternative-Brunswick and Fernandina each had an economic impact of under $250 thousand.

Ro-ro cargo ships and containerships have the highest direct economic impact at $0.6 million and $0.5 million, respectively, followed by towing vessels, general cargo vessels and tankers at roughly $0.3 million each.

Table 4-17 presents the direct economic impact of Alternative 4 in 2004. The total economic impact is $2.8 million in 2004, representing a 20 percent increase over 2003. This is due to the overall increase in vessel arrivals in the Southeast region and particularly passenger vessels at Jacksonville. The ranking by port area is the same as described for 2003 above. Figure 4-9 presents graphically the direct economic impact by port area for 2003 and 2004.

Table 4-16. Alternative 4: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2003 ($000s)

Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	-	-	-	-	-	-	-	-	-	-	-	-	-
Searsport, ME	-	-	-	-	-	-	-	-	-	-	-	-	-
Portland, ME	-	-	-	-	-	-	-	-	-	-	-	-	-
Portsmouth, NH	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Off Race Point													
Boston, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Salem, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Cape Cod Bay	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Block Island Sound													
New Bedford, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Providence, RI	-	-	-	-	-	-	-	-	-	-	-	-	-
New London, CT	-	-	-	-	-	-	-	-	-	-	-	-	-
New Haven, CT	-	-	-	-	-	-	-	-	-	-	-	-	-
Bridgeport, CT	-	-	-	-	-	-	-	-	-	-	-	-	-
Long Island, NY	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Ports of New York/New Jersey	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Delaware Bay	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	-	-	-	-	-	-	-	-	-	-	-	-	-
Hampton Roads, VA	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Morehead City and Beaufort, NC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Wilmington, NC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Georgetown, SC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Charleston, SC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Savannah, GA	-	-	-	-	-	-	-	-	-	-	-	-	-
Southeastern US													
Brunswick, GA	40.6	-	17.6	-	19.3	3.9	11.3	136.3	-	2.5	-	-	231.4
Fernandina, FL	8.9	-	75.6	1.2	83.6	6.8	51.9	-	-	-	16.2	-	244.2
Jacksonville, FL	130.9	2.2	401.5	114.0	180.0	57.5	7.5	441.5	14.2	244.8	258.0	5.8	1,857.8
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	180.3	2.2	494.7	115.2	282.8	68.1	70.7	577.8	14.2	247.3	274.2	5.8	2,333.4

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-17. Alternative 4: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2004 ($000s)

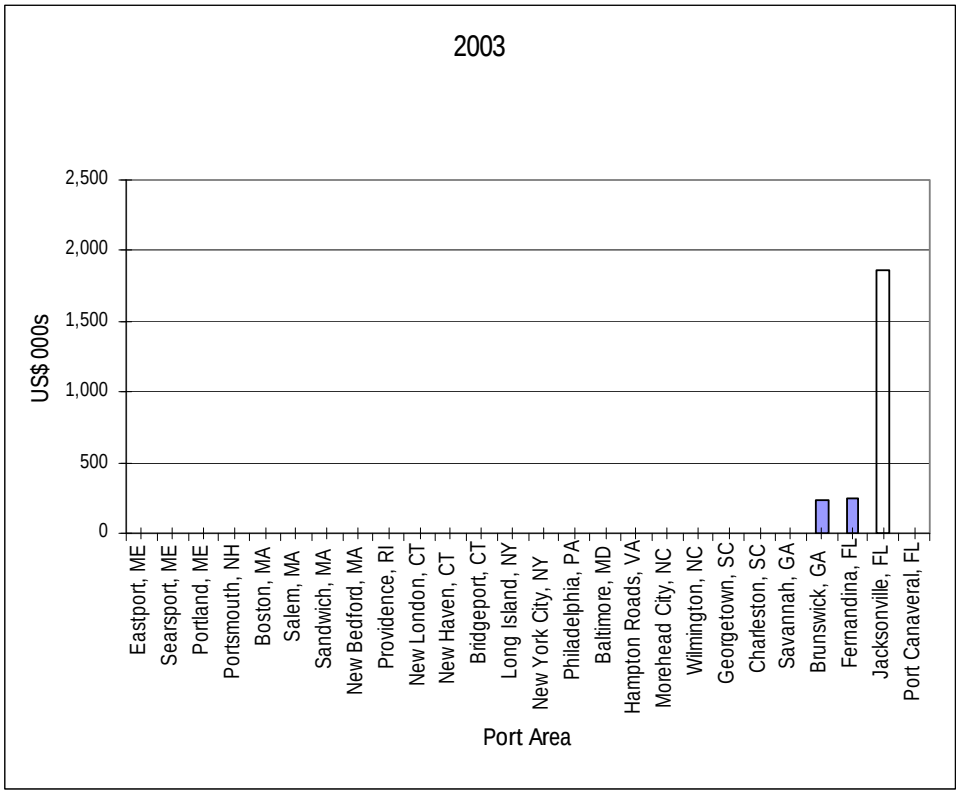
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	-	-	-	-	-	-	-	-	-	-	-	-	-
Searsport, ME	-	-	-	-	-	-	-	-	-	-	-	-	-
Portland, ME	-	-	-	-	-	-	-	-	-	-	-	-	-
Portsmouth, NH	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Off Race Point													
Boston, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Salem, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Cape Cod Bay	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Block Island Sound													
New Bedford, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Providence, RI	-	-	-	-	-	-	-	-	-	-	-	-	-
New London, CT	-	-	-	-	-	-	-	-	-	-	-	-	-
New Haven, CT	-	-	-	-	-	-	-	-	-	-	-	-	-
Bridgeport, CT	-	-	-	-	-	-	-	-	-	-	-	-	-
Long Island, NY	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Ports of New York/New Jersey	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Delaware Bay	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	-	-	-	-	-	-	-	-	-	-	-	-	-
Hampton Roads, VA	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Morehead City and Beaufort, NC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Wilmington, NC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Georgetown, SC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Charleston, SC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Savannah, GA	-	-	-	-	-	-	-	-	-	-	-	-	-
Southeastern US													
Brunswick, GA	40.5	-	9.8	-	33.2	15.5	11.5	139.9	-	-	-	2.6	253.0
Fernandina, FL	25.3	-	54.8	2.5	89.5	40.7	23.7	4.4	-	-	25.5	-	266.3
Jacksonville, FL	139.6	4.5	437.4	102.8	167.4	320.3	7.6	458.7	18.3	258.9	339.6	16.3	2,271.3
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	205.3	4.5	502.0	105.3	290.1	376.5	42.7	603.1	18.3	258.9	365.1	18.8	2,790.6

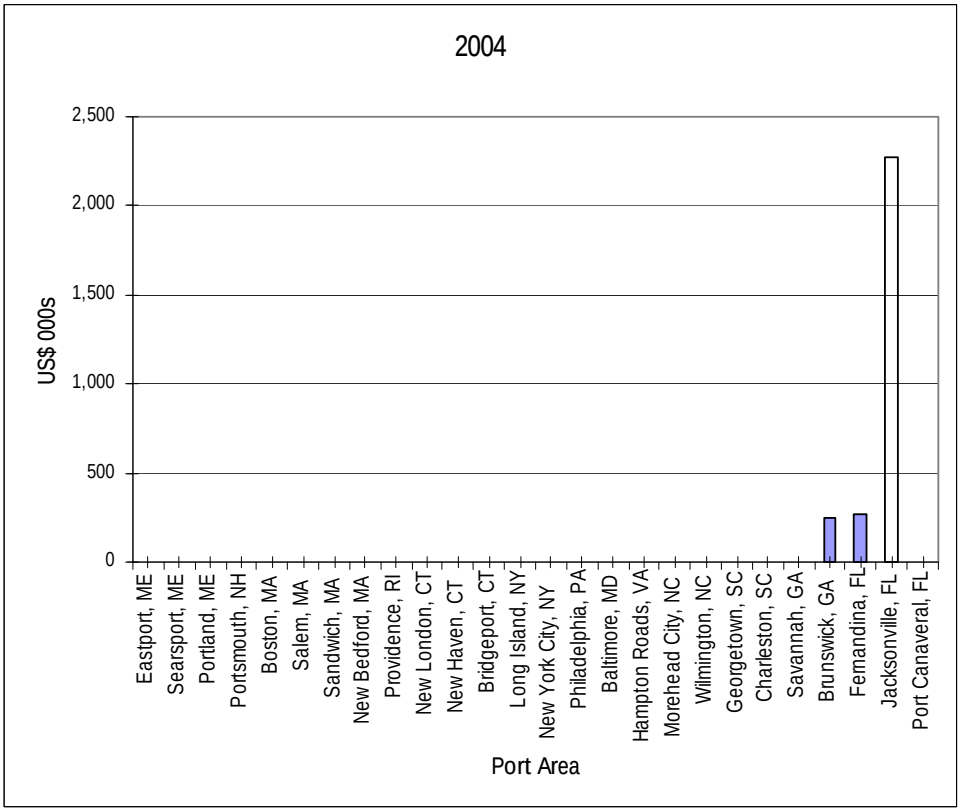
a/ Includes recreational vessels

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Figure 4-9. Alternative 4: Direct Economic Impact on Shipping Industry by Port Area, 2003 and 2004 ($000s)





ALTERNATIVE 5 – COMBINATION OF ALTERNATIVES

Alternative 5 includes all elements of Alternatives 1 though 4. Thus it includes DMAs proposed in Alternative 2, speed restrictions in designated areas from Alternative 3, and use of recommended routes from Alternative 4. In analyzing the economic impact of Alternative 5, we have made efforts to avoid double-counting of economic impacts. For example, we have adjusted the assumed incidence of DMAs from Alternative 2 to include only those DMAs that would fall outside of the periods when speed restrictions for designated areas are implemented.

Impact on Vessel Operations

Table 4-18 presents the key assumptions that are used to analyze the impact of Alternative 5 operational measures on vessel operations. The table presents the basis for determining the effective distance that speed restrictions would apply for each port area similar to that previously shown in Table 4-12 for Alternative 3. Note that the diagonal distances to the buoy for the port areas of Brunswick, Fernandina and Jacksonville differ from those of Alternative 3. This is due to the inclusion from Alternative 4 of the recommended port access routes for these ports that reduces the distance traveled through the speed-restricted MSRS WHALESSOUTH area. For those distances we apply the speed restrictions to determine the additional time incurred by vessels.

The other new element for these three Southeast port areas is the additional distance that is traveled parallel to the eastern boundary of the MSRS WHALESSOUTH until the intersection of the recommended port access route. These distances are shown in Table 4-18 as "extra PARS distance". Speed restrictions do not apply to these distances and the additional time incurred is calculated using the averaging operating speed for each type and size of vessel.

The DMA effective days assumed for each port area under Alternative 5 is presented in the last column of Table 4-18. We have assumed the implementation of one DMA per port area for the Northeast Region taking into consideration the sighting of right whales in the Gulf of Maine outside of the speed restricted Off Race Point area. In the Southeast region, we also assume the implementation of one DMA per port area taking into consideration the sighting of whales outside of the time periods established for speed restricted designated areas. No DMAs for port areas in the mid-Atlantic period have been assumed outside of the periods established for speed restricted designated areas. The slow down speed up time for each port is as specified for Alternative 3. While not shown separately in Table 4-18, each DMA also includes slowdown/speedup time as described in Alternative 2.

Table 4-18. Alternative 5: Effective Distance of Speed Restrictions in Designated Areas, Duration of DMAs and Extra PARS Distances by Port Area

Port Area	Location of pilot buoy relative to harbor baseline or closing line	Distance stated in NOI	Distance to pilot buoy	Diagonal distance to pilot buoy	Additional effective distance a/	Extra PARS	PARS Effective Days b/	Slow down/speed up time	DMA effective days
Northeastern US - Gulf of Maine									
Eastport, ME	n.a.	n.a.	n.a.	n.a.	54.9	0	0	Included	15
Searsport, ME	n.a.	n.a.	n.a.	n.a.	54.9	0	0	Included	15
Portland, ME	n.a.	n.a.	n.a.	n.a.	54.9	0	0	Included	15
Portsmouth, NH	n.a.	n.a.	n.a.	n.a.	54.9	0	0	Included	15
Northeastern US - Off Race Point									
Boston, MA	n.a.	n.a.	n.a.	n.a.	72.4	0	0	n.a.	15
Salem, MA	n.a.	n.a.	n.a.	n.a.	72.4	0	0	n.a.	15
Northeastern US - Cape Cod Bay	5.0	n.a.	n.a.	n.a.	59.2	0	365	n.a.	15
Mid-Atlantic Block Island Sound									
New Bedford, MA	n.a.	25	25	35.4	54.9	0	0	Included	0
Providence, RI	n.a.	25	25	35.4	54.9	0	0	Included	0
New London, CT	n.a.	25	25	35.4	54.9	0	0	Included	0
New Haven, CT	n.a.	25	25	35.4	54.9	0	0	Included	0
Bridgeport, CT	n.a.	25	25	35.4	54.9	0	0	Included	0
Long Island, NY	n.a.	25	25	35.4	54.9	0	0	Included	0
Mid-Atlantic Ports of New York/New Jersey	6.8	25	18.2	25.7	54.9	0	0	Included	0
Mid-Atlantic Delaware Bay	2.5	25	22.5	31.8	54.9	0	0	Included	0
Mid-Atlantic Chesapeake Bay									
Baltimore, MD	2.8	25	22.2	31.3	54.9	0	0	Included	0
Hampton Roads, VA	2.8	25	22.2	31.3	54.9	0	0	Included	0
Mid-Atlantic Morehead City and Beaufort, NC	6.7	25	18.3	25.9	n.a.	0	0	n.a.	0
Mid-Atlantic Wilmington, NC	4.1	25	20.9	29.6	n.a.	0	0	n.a.	0
Mid-Atlantic Georgetown, SC	5.6	25	19.4	27.4	n.a.	0	0	n.a.	0
Mid-Atlantic Charleston, SC	12.5	25	12.5	17.7	6.3	0	0	n.a.	0
Mid-Atlantic Savannah, GA	9.7	25	15.3	21.6	4.9	0	0	n.a.	0
Southeastern US									
Brunswick, GA	6.7	n.a.	n.a.	23.5	3.4	6.0	151	n.a.	15
Fernandina, FL	10.9	n.a.	n.a.	26.0	5.5	10.5	151	n.a.	15
Jacksonville, FL	4.2	n.a.	n.a.	27.0	n.a.	10.0	151	n.a.	15
Port Canaveral, FL	n.a.	n.a.	n.a.	4.5	n.a.	0	0	n.a.	15

a/ Defined and described in text for each port area.

b/ PARS effective days as described in the text for Alternative 4.

Source: Nathan Associates as descibed in text.

Estimated Direct Economic Impact

Table 4-19 presents the direct economic impact of the combination of 10-knot speed restrictions in designated areas, DMAs, and use of recommended routes implemented under Alternative 5 on the shipping industry in 2003. The total direct economic impact is estimated at $137.0 million with the port area of New York/ New Jersey having the largest impact of $36.6 million. The port area of Hampton Roads is second at $24.5 million, followed by the port areas of Philadelphia at $13.5 million, Baltimore at $11.0 million, Savannah at $10.2 million and Charleston at $9.9 million. The direct economic impact for these six port areas totals $105.7 million or 77.2 percent of the total for this alternative.

Containerships account for 53.0 percent of the total direct economic impact of Alternative 5 with an estimate of $72.6 million. The vessel type with the next largest economic impact is tankers at $16.9 million followed by ro-ro cargo ships at $15.5 million and passenger vessels at $11.9 million.

Table 4-20 presents the direct economic impact of Alternative 5 in 2004. The total direct economic impact is $147.2 million in 2004, about 7.4 percent higher than 2003 which reflects the overall increase in U.S. East Coast vessel arrivals. The rankings for the major vessel types are similar to 2003.

Figure 4-10 presents graphically the direct economic impact by port area for 2003 and 2004. The rankings for the leading port areas are the same as described for 2003 above.

Table 4-19. Alternative 5: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2003 ($000s)

Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	41.0	-	71.4	-	161.3	-	-	-	-	-	-	-	273.7
Searsport, ME	32.1	4.4	-	-	-	1,973.2	-	2.8	84.8	379.1	4.3	-	2,480.6
Portland, ME	190.5	80.7	102.6	4.8	209.8	634.1	-	202.9	21.4	2,123.6	23.8	2.5	3,596.7
Portsmouth, NH	199.6	10.9	-	-	79.4	19.0	-	-	7.6	517.8	2.2	2.5	838.9
Northeastern US - Off Race Point													
Boston, MA	101.7	3.4	1,265.3	3.8	33.8	1,854.4	43.5	124.9	-	983.5	2.2	4.7	4,421.4
Salem, MA	26.3	-	-	-	-	19.7	-	-	-	5.4	-	-	51.4
Northeastern US - Cape Cod Bay	-	-	-	-	-	163.5	-	-	-	55.2	-	-	218.7
Mid-Atlantic Block Island Sound													
New Bedford, MA	166.5	-	3.4	-	74.7	-	69.1	-	17.3	36.0	-	-	366.9
Providence, RI	202.2	6.5	-	-	77.5	581.1	45.7	434.0	4.2	439.6	2.9	1.5	1,795.2
New London, CT	49.3	-	44.2	-	60.6	500.9	-	-	218.9	28.8	2.9	-	905.4
New Haven, CT	152.7	-	25.3	1.5	189.2	50.1	-	-	731.3	623.0	28.5	-	1,801.7
Bridgeport, CT	90.2	-	-	2.3	-	20.9	-	-	413.3	120.7	-	-	647.4
Long Island, NY	-	6.5	-	3.1	-	475.8	-	-	1,485.2	872.6	5.7	1.8	2,850.6
Mid-Atlantic Ports of New York/New Jersey	646.2	89.2	24,866.6	2.4	138.4	1,775.4	303.5	4,221.3	85.1	4,441.1	23.2	4.4	36,596.9
Mid-Atlantic Delaware Bay	649.8	41.5	3,257.1	26.4	651.4	503.6	4,450.6	692.5	44.9	3,200.2	28.5	1.3	13,547.8
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	705.8	28.7	3,648.1	-	768.5	743.9	41.3	4,413.0	8.0	641.9	11.8	23.9	11,034.9
Hampton Roads, VA	743.4	77.9	20,353.1	2.7	476.4	557.6	14.9	1,588.6	4.1	662.0	4.7	14.6	24,500.1
Mid-Atlantic Morehead City and Beaufort, NC	21.6	-	57.9	-	51.1	-	3.0	7.9	-	50.5	-	1.2	193.2
Mid-Atlantic Wilmington, NC	109.5	9.7	550.9	-	386.6	-	6.3	111.7	29.9	372.3	1.3	-	1,578.3
Mid-Atlantic Georgetown, SC	42.0	-	5.9	-	49.5	-	-	-	-	-	-	0.8	98.2
Mid-Atlantic Charleston, SC	147.3	-	8,095.7	-	288.0	375.6	16.9	641.2	25.8	268.3	12.7	1.1	9,872.6
Mid-Atlantic Savannah, GA	235.5	13.6	8,190.7	-	513.5	48.6	144.0	564.2	7.9	428.6	3.5	1.2	10,151.3
Southeastern US													
Brunswick, GA	93.7	-	124.6	-	102.3	15.3	55.3	765.4	-	8.2	-	-	1,164.8
Fernandina, FL	20.4	-	231.3	2.1	263.3	20.8	190.0	1.2	-	0.3	27.1	-	756.6
Jacksonville, FL	272.7	5.0	1,655.5	325.8	522.9	183.7	27.8	1,669.2	32.8	612.7	431.3	9.6	5,748.9
Port Canaveral, FL	19.4	0.3	16.2	1.5	36.3	1,356.0	44.7	19.4	1.7	9.8	2.8	0.2	1,508.2
Total	4,959.3	378.1	72,565.7	376.3	5,134.7	11,873.2	5,456.8	15,460.1	3,224.0	16,881.4	619.4	71.4	137,000.4

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-20. Alternative 5: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2004 ($000s)

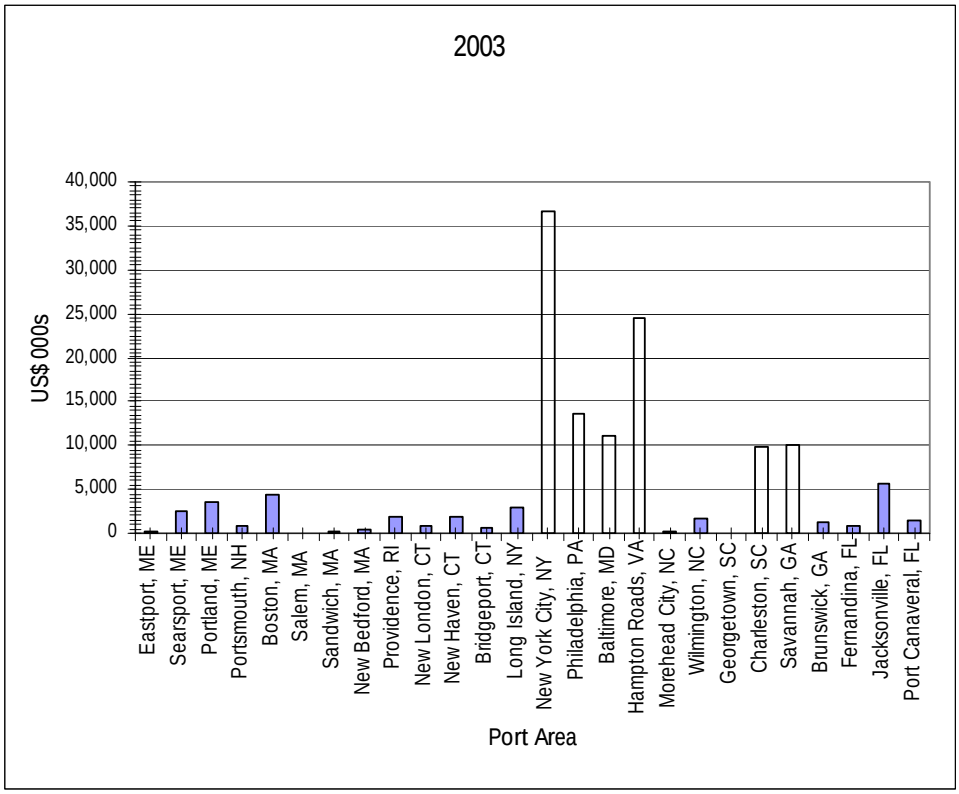
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	56.4	-	71.5	-	335.4	-	-	-	-	-	-	-	463.3
Searsport, ME	21.7	-	57.7	4.7	8.5	2,253.5	-	5.1	41.4	352.0	17.3	-	2,761.9
Portland, ME	204.6	23.2	56.7	4.8	215.1	889.5	-	139.2	97.2	2,215.6	101.7	2.3	3,949.7
Portsmouth, NH	160.6	9.7	2.5	-	127.4	19.0	-	-	3.8	386.1	19.5	5.6	734.2
Northeastern US - Off Race Point													
Boston, MA	101.7	3.4	1,265.3	3.8	33.8	1,854.4	43.5	124.9	-	983.5	2.2	4.7	4,421.4
Salem, MA	33.2	-	-	-	-	161.9	-	-	-	-	-	-	195.0
Northeastern US - Cape Cod Bay	-	-	-	-	-	317.7	-	-	3.1	87.1	1.8	-	409.7
Mid-Atlantic Block Island Sound													
New Bedford, MA	145.1	-	-	-	46.3	-	55.3	6.8	-	31.3	-	-	284.7
Providence, RI	170.7	6.8	-	-	103.3	939.9	-	410.0	5.0	407.3	14.3	5.5	2,062.8
New London, CT	32.2	-	109.8	-	235.0	444.2	-	-	186.4	39.7	2.9	-	1,050.2
New Haven, CT	86.9	-	49.7	-	155.4	-	-	-	1,381.0	537.6	48.5	-	2,259.1
Bridgeport, CT	157.2	-	-	1.1	-	-	-	-	668.4	100.2	-	0.6	927.5
Long Island, NY	-	-	-	7.7	-	576.0	-	-	1,791.1	886.8	-	1.5	3,263.1
Mid-Atlantic Ports of New York/New Jersey	579.5	60.2	25,641.7	-	399.4	3,501.7	301.8	4,439.0	31.2	4,138.4	42.2	4.4	39,139.5
Mid-Atlantic Delaware Bay	642.0	9.9	3,006.5	60.4	940.7	296.6	4,216.7	702.1	13.5	3,495.3	83.2	2.8	13,469.7
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	844.1	24.8	3,883.8	-	974.0	1,196.5	78.0	4,384.6	8.2	893.0	23.6	11.3	12,321.9
Hampton Roads, VA	971.0	64.6	19,812.9	9.3	675.4	1,222.2	129.2	1,591.5	4.1	735.4	28.3	14.8	25,258.7
Mid-Atlantic Morehead City and Beaufort, NC	39.3	1.7	61.8	-	41.5	40.1	-	-	-	72.4	-	0.6	257.4
Mid-Atlantic Wilmington, NC	108.0	5.5	487.1	-	413.3	45.8	-	150.9	20.2	402.8	2.6	3.0	1,639.1
Mid-Atlantic Georgetown, SC	39.1	2.8	5.2	-	75.0	10.6	-	-	-	-	-	-	132.7
Mid-Atlantic Charleston, SC	138.8	0.8	8,469.2	4.7	330.1	554.7	29.8	592.6	8.0	266.6	20.1	3.6	10,418.9
Mid-Atlantic Savannah, GA	248.7	15.1	8,388.1	-	578.0	366.6	216.9	665.5	2.6	516.3	5.8	0.6	11,004.1
Southeastern US													
Brunswick, GA	94.0	-	62.1	-	166.5	64.3	56.5	795.9	-	0.2	-	5.1	1,244.5
Fernandina, FL	47.3	-	184.4	6.0	271.9	130.6	82.7	22.6	-	-	43.3	-	788.9
Jacksonville, FL	297.0	10.0	1,748.9	285.9	507.7	1,080.6	30.6	1,738.5	43.3	648.7	568.5	27.4	6,987.0
Port Canaveral, FL	28.4	-	19.4	2.7	51.9	1,533.1	32.2	28.8	3.4	15.7	10.5	0.4	1,726.3
Total	5,247.5	238.4	73,384.5	390.9	6,685.6	17,499.4	5,273.2	15,797.9	4,311.8	17,211.9	1,036.1	94.1	147,171.3

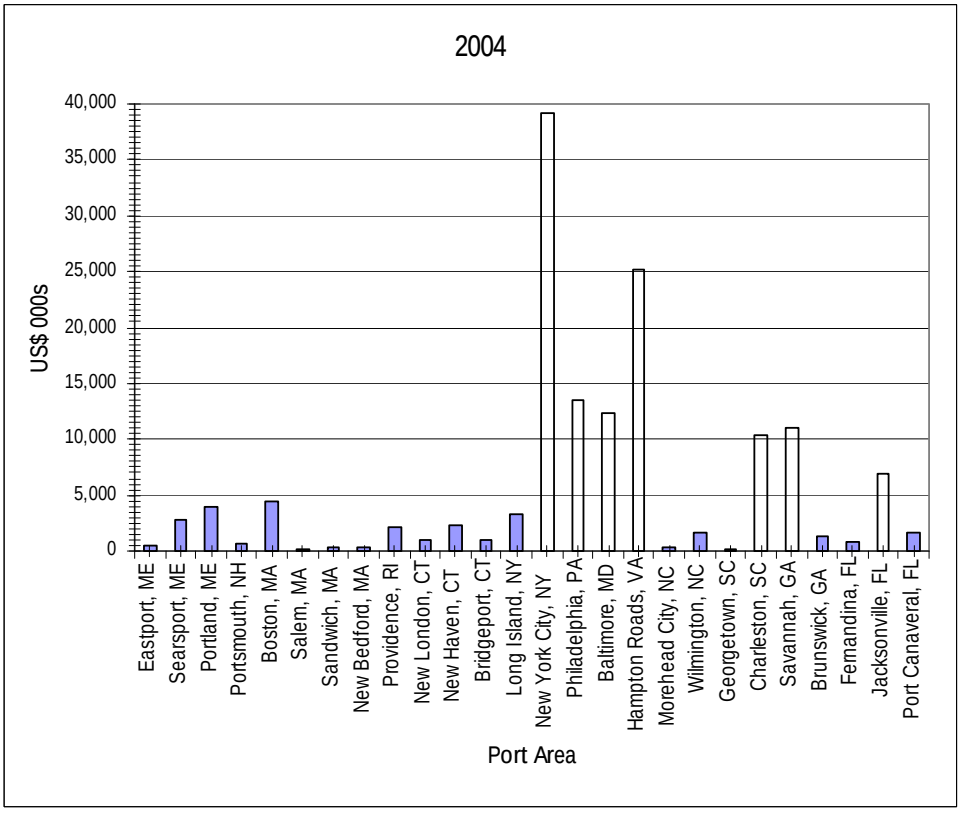
a/ Includes recreational vessels

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Figure 4-10. Alternative 5: Direct Economic Impact on Shipping Industry by Port Area, 2003 and 2004 ($000s)





ALTERNATIVE 6 – PREFERRED ALTERNATIVE

This alternative includes NMFS' preferred operational measures to reduce ship strikes to right whales. This economic impact analysis is based on those operational measures except as modified by the following revisions that are under consideration by NMFS.[47]

- Seasonal speed restriction periods for the Southeast SMA will be implemented from November 15-April 15.
- The shipping lanes into Brunswick, Fernandina, and Jacksonville extend out to longitude 80° 51.6 W (eastern boundary of the MSRS system).
- PARS routings as discussed for Alternative 4 for the port areas of Brunswick, Fernandina, Jacksonville, and Cape Cod Bay.
- SMAs for port areas in the mid-Atlantic US region will be implemented from November 1-April 30 and the port areas north of Wilmington, NC will have a radius of 20 nautical miles.[48] A continuous 20-mile buffer will be implemented from Wilmington, NC through Savannah, GA to the northern boundary of the Southeastern SMA.
- Seasonal speed restrictions for Cape Cod Bay SMA will be implemented from January 1-May 15.
- An expanded Off Race Point Seasonal Management Area as proposed in the ALWTRP will be implemented from March 1-April 30.
- The Great South Channel Seasonal Management Area has also been expanded (west) and will be implemented from April 1-July 31.
- The trigger and duration for DMAs are those described under Alternative 2, except that they are voluntary for Alternative 6.

The operational measures proposed under Alternative 6 will expire five years after their date of effectiveness. In this section we analyze the economic impacts that would likely occur each year that the rule is in effect.

Impact on Vessel Operations

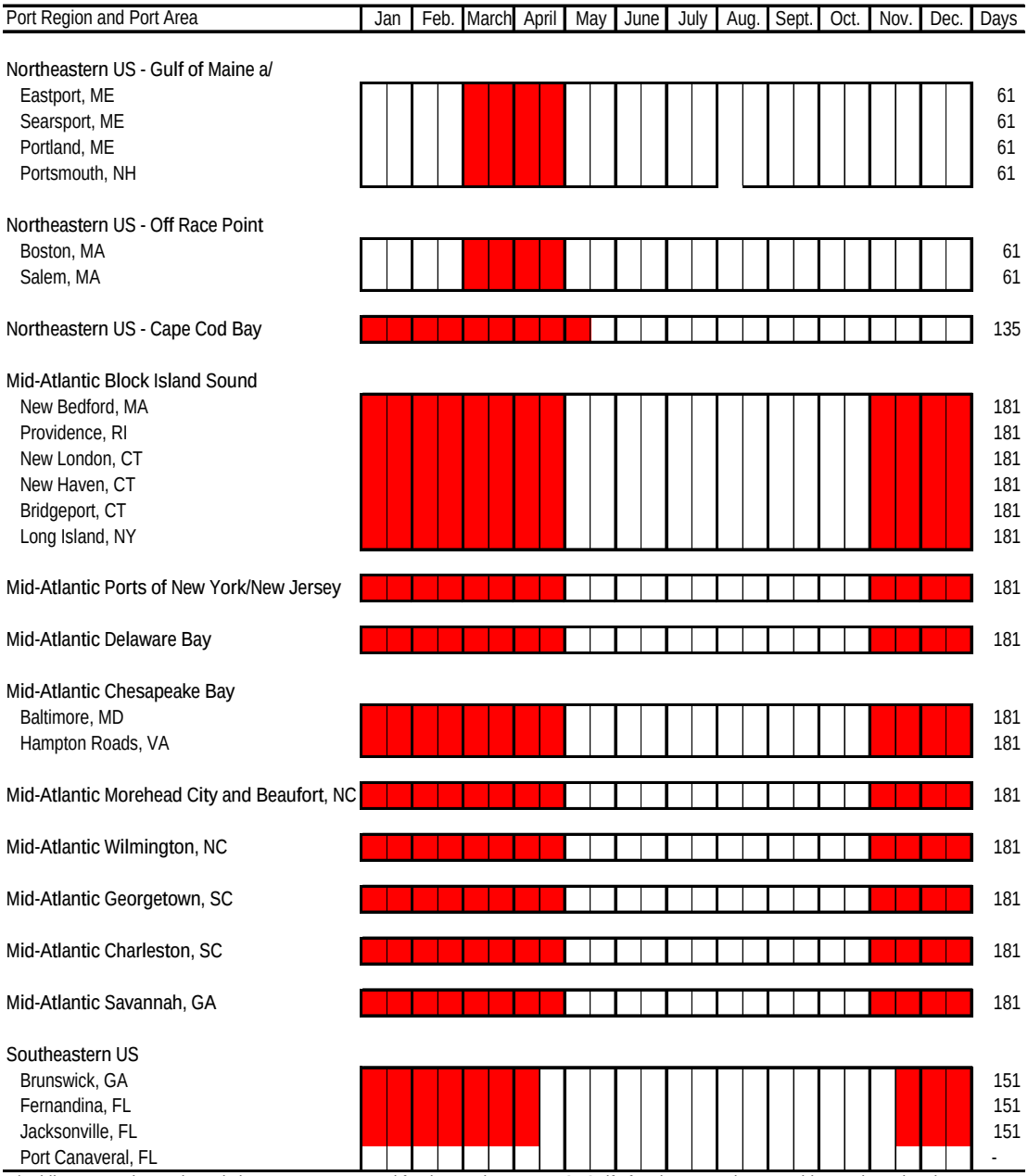
Figure 4-11 presents the periods for proposed seasonal speed restrictions by port area. SMAs have not been proposed for specific port areas in the Northeast region. However, we have assumed that speed restrictions for the expanded Off Race Point Management Area would affect vessel arrivals at the port areas in the Northeast

[47] The ATBA for the Great South Channel and Boston TSS are no longer included in this alternative but are considered in the cumulative impacts section of the EIS. An economic analysis of these measures is presented in Section 4.7.1.3 of the EIS.
[48] Except for Block Island sounds, this is a rectangle with a 30-nm width.

region. Note that this alternative does not include speed restrictions for the port area of Port Canaveral. DMAs will be implemented in all areas outside of the proposed seasonal speed restricted periods.

For all Northeast region port areas (excluding Cape Cod Bay), the seasonal speed restrictions would be effective 61 days per year. For Cape Cod Bay, the seasonal speed restrictions would be effective 135 days. Speed restrictions would be in place for 181 days per year for port areas in the mid-Atlantic region and 151days per year for the three affected port areas in the Southeast region.

Figure 4-11. Alternative 6: Proposed Seasonal Speed Restrictions by Port Area



a/ While seasonal speed restrictions are not proposed for the Northeastern US- Gulf of Maine, vessel approaching or departing these port areas are assumed to be affected by the seasonal speed restrictions proposed for the Northeastern US- Off Race Point.
Source: NOAA.

Table 4-21 presents U.S. East Coast arrivals of vessels for 2003 during the periods when speed restrictions are proposed for Seasonal Management Areas established at each port area. In 2003 there were 11,498 vessel arrivals during speed restricted periods representing approximately 45 percent of the total of 25,532 arrivals for 2003 presented in Chapter 2. While there is some seasonality in U.S. East Coast vessel arrivals, the proposed periods of speed restrictions include both peak periods and non-peak periods and hence the percentage of restricted arrivals correspond closely to the percentage of speed restricted days per year.

The port area of New York/New Jersey has the most vessel arrivals during speed restricted periods with 2, 618 arrivals in 2003 followed by the port areas of Philadelphia (1,315 arrivals), Hampton Roads (1,298 arrivals), Savannah (1,157 arrivals), Charleston (1,140 arrivals), Baltimore (913 arrivals) and Jacksonville (905 arrivals). These seven port areas accounted for 81.3 percent of the total U.S. vessel arrivals during speed restricted periods.

In terms of vessel type, containerships recorded the most vessel arrivals during proposed speed restricted periods with 4,165 arrivals in 2003. Tankers were the next most frequent with 2,473 arrivals followed by ro-ro cargo ships with 1,444 arrivals and bulk carriers with 1,243 arrivals.

In 2004, there were 12,189 vessel arrivals at U.S. East Coast ports during the periods when speed restrictions are proposed for each port area (Table 4-22), an increase of 6.0 percent over 2003. The increase is lower than the 7.3 percent shown for total U.S. East Coast vessel arrivals in Chapter 2 for several reasons. First, the Southeast region which recorded an increase of 12.3 percent in total vessel arrivals in 2004 is the region with the fewest speed restricted days. Second, the port area of New York/New Jersey with the largest number of annual vessel arrivals recorded no increase in vessel arrivals during proposed speed restricted periods.

Table 4-21. Alternative 6: U.S. East Coast Restricted Vessel Arrivals by Port Area and Vessel Type, 2003

	Vessel Type												
Port Area	Bulk Carrier	Combination Carrier	Container Ship	Freight Barge	General Dry Cargo Ship	Passenger Ship	Refrigerated Cargo Ship	Ro-Ro Cargo Ship	Tank Barge	Tanker	Towing Vessel	Other a/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	3	-	1	-	3	-	-	-	-	-	-	-	7
Searsport, ME	2	-	-	-	-	-	-	-	-	18	-	-	20
Portland, ME	14	1	1	-	2	-	-	10	1	78	-	-	107
Portsmouth, NH	9	-	-	-	2	-	-	-	1	25	-	-	37
Northeastern US - Off Race Point													
Salem, MA	3	-	-	-	-	-	-	-	-	-	-	-	3
Boston, MA	7	-	20	-	2	-	-	10	-	72	-	1	112
Subtotal	10	0	20	0	2	0	0	10	0	72	0	1	115
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	3	-	-	-	6	-	-	9
Mid-Atlantic Block Island Sound													
New Bedford, MA	29	-	1	-	14	-	3	-	4	6	-	-	57
Providence, RI	41	1	-	-	11	-	3	38	1	62	1	-	158
New London, CT	9	-	2	-	4	17	-	-	41	4	1	-	78
New Haven, CT	31	-	1	1	14	1	-	-	136	96	8	-	288
Bridgeport, CT	13	-	-	-	1	1	29	-	94	25	-	-	163
Long Island, NY	-	1	-	-	-	15	-	-	281	122	2	1	422
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	172	17	1,172	1	28	14	10	347	25	820	9	3	2,618
Mid-Atlantic Delaware Bay													
Philadelphia, PA	179	7	246	5	116	1	246	72	11	420	12	-	1,315
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	153	4	183	-	95	12	3	347	2	101	4	9	913
Hampton Roads, VA	161	11	857	1	66	4	1	79	1	112	1	4	1,298
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	11	-	7	-	17	-	1	1	-	19	-	2	58
Mid-Atlantic Wilmington, NC													
Wilmington, NC	59	4	44	-	63	-	1	11	11	120	1	-	314
Mid-Atlantic Georgetown, SC													
Georgetown, SC	23	-	1	-	5	-	-	-	-	-	-	1	30
Mid-Atlantic Charleston, SC													
Charleston, SC	85	-	735	-	49	21	3	117	13	103	12	2	1,140
Mid-Atlantic Savannah, GA													
Savannah, GA	140	7	655	-	113	3	5	78	4	148	2	2	1,157
Southeastern US													
Brunswick, GA	33	-	11	-	14	1	5	112	-	2	-	-	178
Fernandina, FL	4	-	43	1	42	1	13	-	-	-	7	-	111
Jacksonville, FL	62	1	185	80	102	8	2	222	7	114	117	5	905
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	0
All Port Regions	1,243	54	4,165	89	763	102	325	1,444	633	2,473	177	30	11,498

a/ Other includes fishing vessels, industrial vessels, research vessels, school ships.

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Table 4-22. Alternative 6: U.S. East Coast Restricted Vessel Arrivals by, Port Area and Vessel Type, 2004

	Vessel Type												
Port Area	Bulk Carrier	Combination Carrier	Container Ship	Freight Barge	General Dry Cargo Ship	Passenger Ship	Refrigerated Cargo Ship	Ro-Ro Cargo Ship	Tank Barge	Tanker	Towing Vessel	Other a/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	5	-	2	-	1	-	-	-	-	-	-	-	8
Searsport, ME	1	-	-	-	-	-	-	-	4	14	-	-	19
Portland, ME	13	-	-	-	2	1	-	11	10	69	5	-	111
Portsmouth, NH	8	1	-	-	3	-	-	-	-	11	1	2	26
Northeastern US - Off Race Point													
Salem, MA	-	-	-	-	-	-	-	-	-	-	-	-	0
Boston, MA	7	-	20	-	2	-	-	10	-	72	-	1	112
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	1	-	-	-	10	-	-	11
Mid-Atlantic Block Island Sound													
New Bedford, MA	26	-	-	-	11	-	4	1	-	5	-	-	47
Providence, RI	33	1	-	-	12	7	-	34	1	57	2	2	149
New London, CT	8	-	4	-	13	10	-	-	36	6	1	-	78
New Haven, CT	14	-	3	-	17	-	-	-	257	83	13	-	387
Bridgeport, CT	34	-	-	1	2	-	13	-	163	21	-	1	235
Long Island, NY	-	-	-	4	-	20	-	-	339	143	-	1	507
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	163	14	1,226	-	43	41	14	345	8	738	20	2	2,614
Mid-Atlantic Delaware Bay													
Philadelphia, PA	163	2	225	13	142	6	223	71	3	470	27	2	1,347
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	190	4	194	-	104	16	3	323	1	140	7	6	988
Hampton Roads, VA	219	13	840	2	81	24	5	76	1	116	11	9	1,397
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	18	1	8	-	13	4	-	-	-	28	-	-	72
Mid-Atlantic Wilmington, NC													
Wilmington, NC	53	3	42	-	66	3	-	14	9	129	1	-	320
Mid-Atlantic Georgetown, SC													
Georgetown, SC	22	1	2	-	11	1	-	-	-	-	-	-	37
Mid-Atlantic Charleston, SC													
Charleston, SC	67	1	798	-	56	42	3	108	4	101	16	5	1,201
Mid-Atlantic Savannah, GA													
Savannah, GA	136	7	648	-	99	33	10	93	1	176	3	1	1,207
Southeastern US													
Brunswick, GA	33	-	7	-	23	4	5	113	-	-	-	3	188
Fernandina, FL	12	-	30	2	50	6	6	1	-	-	11	-	118
Jacksonville, FL	66	2	204	74	91	43	2	231	9	120	154	14	1,010
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	0
All Port Regions	1,291	50	4,253	96	842	262	288	1,431	846	2,509	272	49	12,189

a/ Other includes fishing vessels, industrial vessels, research vessels, school ships.

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Table 4-23 presents the key assumptions that are used to analyze the impact of Alternative 6 operational measures on vessel operations. The table presents the basis for determining the effective distance that speed restrictions would apply for each port area similar to that previously shown in Table 4-18 for Alternative 5. However, for Alternative 6, port area buffers will have a radius of 20 nautical miles (except for Block Island Sound), and except for the Wilmington, NC to Savannah segment will not be parallel to the coastline as in Alternatives 3 and 5. Hence there is no need to determine the diagonal distance of port access route as was calculated for Alternatives 3 and 5.

The effective distance and period of seasonal speed restrictions and the extra PARS distance shown in Table 4-23 for the port areas of Brunswick, Fernandina and Jacksonville are the same as described for Alternative 5.

The additional effective distance shown for port areas in the northeast and for some port areas in the mid-Atlantic is based on the assumption that vessel arrivals at these port areas will have to traverse 54.9 nautical miles through the large speed restricted area of a combined expanded Off Race Point Management Area and the Great South Channel Management Area that will be implemented during the April 1-30. Under Alternatives 3 and 5 this element was effective year-round, whereas under Alternative 6 this element is only effective for 30 days and only applies to vessel arrivals that would need to pass through the area.[49]

For the port areas of Providence and New Bedford we have assumed an additional effective distance of 13.8 nautical miles from the northern boundary of the Block Island speed restriction area to the pilot buoy for Narragansett Bay as vessels would not be able to regain sea speed after passing through the speed restricted area. Combined with the 54.9 nautical miles for the Off Race Point and Great South Channel Management Area, this results in a total additional effective distance of 68.7 nautical miles as shown in Table 4-23.

For the Northeast region, the additional effective distance shown in Table 4-23 is based on an average of the effective distance during March 1-30 (when only the Off Race Point Management Area is implemented) and the effective distance during April 1-30 (when both expanded Off Race Point Management Area and the Great South Channel Management Area are implemented). For the Gulf of Maine port areas, the effective distance during March is estimated at 36.9 nautical miles and for April at 60.5 nautical miles, resulting in the average effective distance of 48.7 nautical miles listed in Table 4-23. For the port areas of Boston and Salem, the effective distance for March is estimated at 52.4 nautical miles and for April at 72.4 nautical miles, which yields the average effective distance of 62.4 nautical miles listed in Table 4-23.

The DMA effective days assumed for each port area under Alternative 6 is presented in the last column of Table 4-23. We have assumed the implementation of three DMAs per port area for the Northeast Region taking into consideration the sighting of right whales in the Gulf of Maine and for time periods outside of those specified for speed restrictions in the Off Race Point Management Area. In the Southeast region, we also assume the implementation of one DMA per port area taking into consideration the sighting of whales outside

[49] See the discussion under Alternative 3 regarding assumptions as to the percentage of vessel arrivals at mid-Atlantic port areas that would be affected.

of the time periods established for speed restricted designated areas. No DMAs for port areas in the mid-Atlantic period have been assumed outside of the periods established for speed restricted designated areas. While not shown separately in Table 4-23, each DMA includes slowdown/speedup time as described in Alternative 2.

Table 4-23. Alternative 6: Effective Distance of Seasonal Speed Restrictions and Duration of DMAs

Port Area	Location of pilot buoy relative to harbor	Distance Stated in Rule	Effective distance to pilot buoy	Diagonal of effective distance	Additional effective distance a/	Extra PARS Distance	PARS Effective Days b/	Slow down/speed up time	DMA effective days
Northeastern US - Gulf of Maine									
Eastport, ME	n.a.	n.a.	n.a.	n.a.	48.7	0	0	Included	45
Searsport, ME	n.a.	n.a.	n.a.	n.a.	48.7	0	0	Included	45
Portland, ME	n.a.	n.a.	n.a.	n.a.	48.7	0	0	Included	45
Portsmouth, NH	n.a.	n.a.	n.a.	n.a.	48.7	0	0	Included	45
Northeastern US - Off Race Point									
Boston, MA	n.a.	n.a.	n.a.	n.a.	62.4	0	0	n.a.	45
Salem, MA	n.a.	n.a.	n.a.	n.a.	62.4	0	0	n.a.	45
Northeastern US - Cape Cod Bay	5.0	n.a.	n.a.	n.a.	39.9	0	0	n.a.	45
Mid-Atlantic Block Island Sound									
New Bedford, MA	n.a.	30	30	n.a.	68.7	0	0	Included	0
Providence, RI	n.a.	30	30	n.a.	68.7	0	0	Included	0
New London, CT	n.a.	30	30	n.a.	54.9	0	0	Included	0
New Haven, CT	n.a.	30	30	n.a.	54.9	0	0	Included	0
Bridgeport, CT	n.a.	30	30	n.a.	54.9	0	0	Included	0
Long Island, NY	n.a.	30	30	n.a.	54.9	0	0	Included	0
Mid-Atlantic Ports of New York/New Jersey	6.8	20	13.2	n.a.	54.9	0	0	Included	0
Mid-Atlantic Delaware Bay	2.5	20	17.5	n.a.	54.9	0	0	Included	0
Mid-Atlantic Chesapeake Bay									
Baltimore, MD	2.8	20	17.15	n.a.	54.9	0	0	Included	0
Hampton Roads, VA	2.8	20	17.15	n.a.	54.9	0	0	Included	0
Mid-Atlantic Morehead City and Beaufort, NC	6.7	20	13.3	n.a.	n.a.	0	0	n.a.	0
Mid-Atlantic Wilmington, NC	4.1	20	15.9	n.a.	n.a.	0	0	n.a.	0
Mid-Atlantic Georgetown, SC	5.6	20	14.4	n.a.	n.a.	0	0	n.a.	0
Mid-Atlantic Charleston, SC	12.5	20	7.5	n.a.	6.3	0	0	n.a.	0
Mid-Atlantic Savannah, GA	9.7	20	10.3	n.a.	4.9	0	0	n.a.	0
Southeastern US									
Brunswick, GA	6.7	n.a.	n.a.	23.5	3.4	6.0	151	n.a.	15
Fernandina, FL	10.9	n.a.	n.a.	26.0	5.5	10.5	151	n.a.	15
Jacksonville, FL	4.2	n.a.	n.a.	27.0	n.a.	10.0	151	n.a.	15
Port Canaveral, FL	n.a.	n.a.	n.a.	n.a.	n.a.	0	0	n.a.	15

a/ Defined and described in text for each port area.

b/ PARS effective days as described in the text for Alternative 4.

Source: Nathan Associates as descibed in text.

Table 4-24 presents the average minutes of delay for speed restrictions of 10 knots per vessel arrival for each affected port area and vessel type in 2003.[50] The overall weighted average delay for all vessels in 2003 is 53 minutes per arrival.

The longest average delay is experienced at the Southeast port areas of Fernandina (105 minutes) Jacksonville (96 minutes) and Brunswick (86 minutes) due to the combination of speed restrictions and the delays caused by the PARS recommended routings. The port areas of Providence (93 minutes) and other port areas in Block Island Sound have above average delays due to the 30-nautical mile rectangular area proposed for that region. Boston (82 minutes) and other port areas in the Northeast also have above average delays due to the longer time period that the additional effective distance is applied (two months in the Northeast as compared to one month for the mid-Atlantic port areas).

Freight barges incur the longest average delay with an average of 91 minutes per vessel arrival (Figure 4-12). This is due the specialized higher-speed freight barge service from Jacksonville to Puerto Rico. Other vessel types with above average delays are ro-ro cargo ships (66 minutes), passenger vessels (62 minutes) towing vessels (61 minutes), containerships (59 minutes) and general cargo ships and refrigerated cargo vessels (each at 54 minutes).

It is important to note that the timing and duration of the proposed seasonal speed restrictions will be well-known and that vessel itineraries for containerships and cruise vessels will be developed taking them into account. For example, shipping lines providing liner service to several U.S. East Coast ports would likely adjust their rotation of port calls and number of vessels deployed on that service to optimize vessel utilization while maintaining a weekly service.

Cruise vessels would also adjust vessel itineraries as necessary to optimize vessel utilization. This could involve reducing the duration of port calls at off-shore destinations or the elimination of an off-shore port of call. For example, a 7-day cruise from Norfolk to Bermuda could easily adjust the scheduled time spent at port of calls in Bermuda such as Hamilton, Saint George or King's Wharf. Similarly, 4-day cruises from Jacksonville to the Bahamas or 5-day cruises to the Western Caribbean could make minor adjustments to the duration of stays at the corresponding port of calls.

[50] The average delay is based on the total minutes of delays for speed restrictions, extra PARS distance and slowdown/speedup time divided by the number of vessel arrivals by type of vessel for each port area during proposed seasonal speed restriction periods. It does not include delays for DMAs as those delays would need to be divided by vessels affected by DMAs.

Table 4-24. Alternative 6: Average Minutes of Delay for Speed Restrictions per Vessel Arrival by Port Area and Type of Vessel, 2003

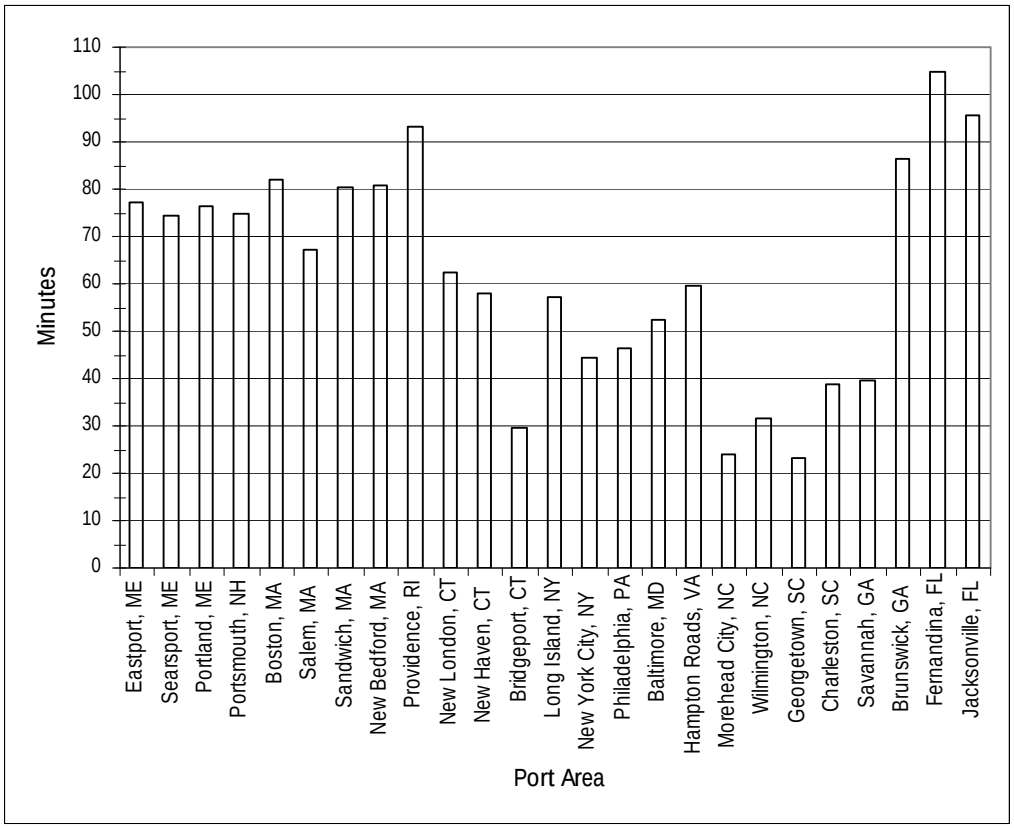
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Weighted Average
Northeastern US - Gulf of Maine													
Eastport, ME	52.7	-	138.7	-	80.7	-	-	-	-	-	-	-	77.0
Searsport, ME	51.5	-	-	-	-	-	-	-	-	77.1	-	-	74.5
Portland, ME	58.2	74.8	94.7	-	95.7	-	-	68.8	69.4	79.8	-	-	76.3
Portsmouth, NH	61.8	-	-	-	106.1	-	-	-	72.3	77.1	-	-	74.8
Northeastern US - Off Race Point													
Boston, MA	52.8	-	129.4	-	65.6	-	-	62.7	-	75.3	-	42.2	81.9
Salem, MA	67.4	-	-	-	-	-	-	-	-	-	-	-	67.4
Northeastern US - Cape Cod Bay	-	-	-	-	-	89.8	-	-	-	75.5	-	-	80.3
Mid-Atlantic Block Island Sound													
New Bedford, MA	73.0	-	66.1	-	94.3	-	106.8	-	72.9	82.8	-	-	80.9
Providence, RI	68.4	84.4	-	-	102.5	-	112.2	127.5	71.1	86.9	48.4	-	93.1
New London, CT	48.2	-	111.6	-	88.0	77.8	-	-	55.0	61.0	34.6	-	62.4
New Haven, CT	47.6	-	113.7	35.3	83.5	77.8	-	-	56.6	60.9	34.6	-	57.9
Bridgeport, CT	55.4	-	-	-	-	49.3	-	-	34.1	33.8	-	-	29.6
Long Island, NY	-	60.3	-	-	-	77.8	-	-	55.2	59.1	34.6	34.6	57.0
Mid-Atlantic Ports of New York/New Jersey	24.5	29.8	55.9	31.3	33.8	47.7	50.1	48.3	27.9	32.1	17.6	17.6	44.5
Mid-Atlantic Delaware Bay	28.6	38.2	58.3	45.6	45.2	58.4	55.2	56.8	36.2	41.7	21.9	-	46.5
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	31.3	33.7	67.3	-	48.3	57.5	52.4	59.8	35.6	39.3	21.6	21.6	52.3
Hampton Roads, VA	31.1	37.6	68.5	38.3	46.5	57.0	54.8	65.2	36.3	39.6	21.6	21.6	59.5
Mid-Atlantic Morehead City and Beaufort, NC	16.3	-	36.4	-	25.0	-	18.2	36.6	-	23.8	-	13.3	24.0
Mid-Atlantic Wilmington, NC	20.2	25.1	49.3	-	35.0	-	35.1	48.2	26.9	28.3	15.9	-	31.7
Mid-Atlantic Georgetown, SC	19.2	-	43.3	-	39.4	-	-	-	-	-	-	14.4	23.2
Mid-Atlantic Charleston, SC	18.4	-	44.4	-	33.1	33.4	31.9	38.4	24.1	25.2	13.8	13.8	38.8
Mid-Atlantic Savannah, GA	18.5	22.5	48.3	-	31.6	34.1	50.9	42.2	24.9	27.4	15.2	15.2	39.6
Southeastern US													
Brunswick, GA	59.8	-	102.0	-	83.4	82.9	87.6	93.0	-	73.7	-	-	86.2
Fernandina, FL	97.2	-	109.2	84.4	100.8	110.1	116.3	-	-	-	84.0	-	104.6
Jacksonville, FL	84.2	85.9	105.4	95.5	89.8	100.9	100.4	105.6	90.0	91.1	77.0	77.0	95.6
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	34.1	34.9	59.1	90.5	54.0	62.1	53.9	65.9	50.1	44.0	60.8	29.8	53.1

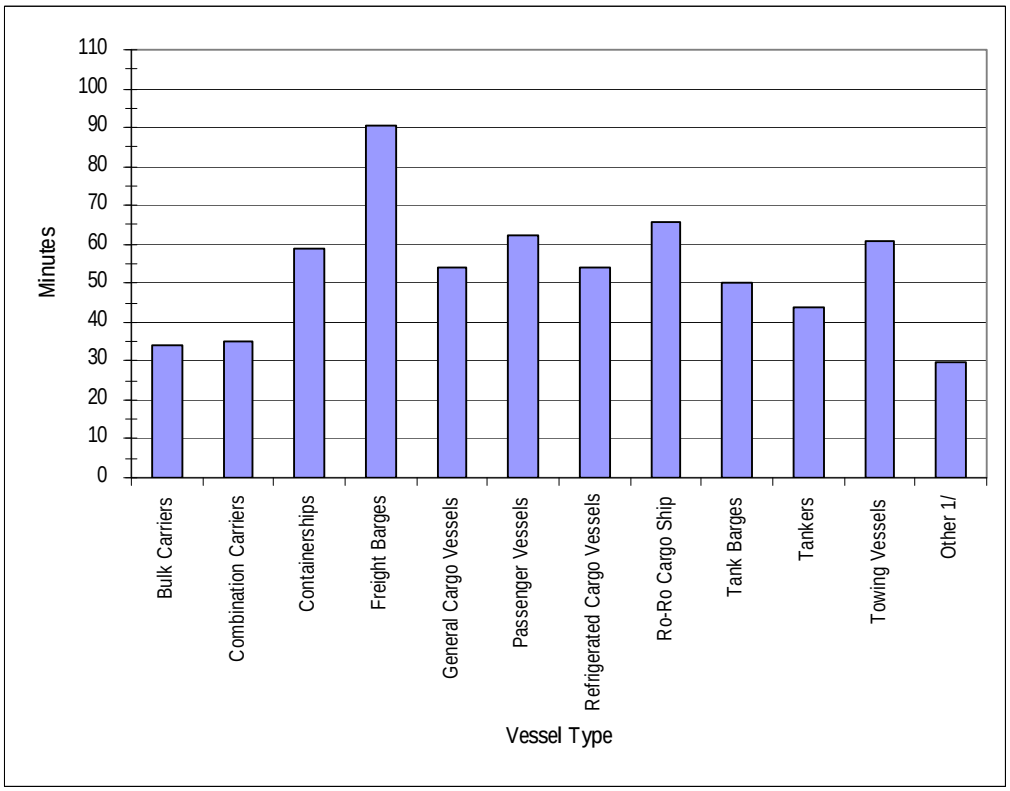
a/ Includes recreational vessels

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Figure 4-12. Alternative 6: Average Minutes of Delay for Speed Restriction per Vessel Arrival by Port Area and Type of Vessel, 2003





Estimated Direct Economic Impact

Table 4-25 presents the direct economic impact of combination of 10-knot speed restrictions and DMAs under Alternative 6 on the shipping industry in 2003. The total direct economic impact is estimated at $53.2 million with the port area of New York/New Jersey having the largest impact of $11.1 million. The port area of Hampton Roads is second at $8.3 million, followed by the port areas of Jacksonville at $5.5 million, Savannah at $4.9 million, Charleston at $4.8 million, Philadelphia at $4.7 million, and Baltimore at $3.7 million. The direct economic impact for these seven port areas totals $43.1 million or 81.0 percent of the total for this alternative. No other port area had a direct economic impact over $1.3 million.

Containerships account for 52.4 percent of the total direct economic impact of Alternative 6 with an estimate of $27.9 million. The vessel type with the next largest economic impact is ro-ro cargo ships at $7.0 million followed by tankers at $6.5 million, passenger vessels at $2.6 million, general cargo vessels at $2.5 million, and refrigerated cargo vessels at $2.2 million.

Table 4-26 presents the direct economic impact of Alternative 6 in 2004. The total direct economic impact is $57.6 million in 2004, roughly 8.3 percent higher than 2003 which reflects the overall increase in U.S. East Coast vessel arrivals. The rankings for the major vessel types are similar to 2003 except for bulk carriers moving ahead of refrigerated cargo vessels.

Figure 4-13 presents graphically the direct economic impact by port area for 2003 and 2004. The rankings for the leading port areas are the same as described for 2003.

Table 4-25. Alternative 6: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2003 ($000s)

Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	11.9	-	23.4	-	27.6	-	-	-	-	-	-	-	62.9
Searsport, ME	8.4	0.5	-	-	-	246.1	-	0.3	10.6	117.1	0.5	-	383.5
Portland, ME	60.7	15.1	16.9	0.6	39.4	79.1	-	56.6	5.8	632.0	3.0	0.3	909.5
Portsmouth, NH	50.8	1.4	-	-	22.2	2.4	-	-	4.3	161.1	0.3	0.3	242.7
Northeastern US - Off Race Point													
Boston, MA	28.4	0.4	431.7	0.5	8.1	222.6	5.2	42.4	-	389.6	0.3	1.5	1,130.8
Salem, MA	13.2	-	-	-	-	2.4	-	-	-	0.6	-	-	16.2
Northeastern US - Cape Cod Bay	-	-	-	-	-	51.4	-	-	-	27.1	-	-	78.4
Mid-Atlantic Block Island Sound													
New Bedford, MA	102.3	-	2.5	-	52.3	-	31.0	-	12.9	23.2	-	-	224.2
Providence, RI	129.0	4.8	-	-	43.1	-	34.2	276.8	3.1	274.5	2.1	-	767.6
New London, CT	19.8	-	23.6	-	32.4	227.6	-	-	101.8	12.0	1.5	-	418.7
New Haven, CT	67.2	-	13.5	0.8	91.7	13.4	-	-	349.8	291.9	12.2	-	840.5
Bridgeport, CT	36.6	-	-	-	-	8.5	-	-	144.6	40.4	-	-	230.2
Long Island, NY	-	3.5	-	-	-	200.8	-	-	701.1	389.9	3.0	1.0	1,299.3
Mid-Atlantic Ports of New York/New Jersey	194.7	29.2	7,780.0	0.9	48.3	183.5	88.4	1,310.0	31.3	1,406.2	7.0	1.2	11,080.7
Mid-Atlantic Delaware Bay	230.9	16.9	1,117.6	8.6	232.0	14.7	1,665.6	239.7	18.2	1,107.9	11.6	-	4,663.8
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	233.8	7.2	1,259.8	-	271.2	173.7	16.7	1,530.8	3.2	212.9	3.8	6.7	3,719.8
Hampton Roads, VA	249.4	24.4	7,015.0	1.1	170.0	61.1	6.0	544.0	1.7	244.3	1.0	3.2	8,321.1
Mid-Atlantic Morehead City and Beaufort, NC	7.9	-	20.7	-	21.7	-	1.6	2.2	-	22.2	-	0.6	76.9
Mid-Atlantic Wilmington, NC	53.4	5.2	241.8	-	166.3	-	3.4	54.2	13.7	169.1	0.7	-	707.7
Mid-Atlantic Georgetown, SC	19.9	-	3.1	-	22.3	-	-	-	-	-	-	0.4	45.7
Mid-Atlantic Charleston, SC	71.5	-	3,963.2	-	132.6	147.0	9.7	316.2	14.8	134.7	7.3	0.6	4,797.6
Mid-Atlantic Savannah, GA	113.0	7.8	3,991.4	-	235.3	17.6	82.4	266.1	4.5	205.4	1.3	0.7	4,925.5
Southeastern US													
Brunswick, GA	92.7	-	122.7	-	100.9	15.1	54.5	753.8	-	8.0	-	-	1,147.7
Fernandina, FL	20.1	-	227.9	2.1	259.4	20.5	187.1	1.2	-	0.3	26.8	-	745.5
Jacksonville, FL	265.2	4.9	1,589.0	314.5	504.3	176.5	26.9	1,603.7	31.7	593.3	422.0	9.4	5,541.5
Port Canaveral, FL	11.3	0.3	7.8	0.6	17.8	705.9	18.8	10.4	0.5	5.4	1.3	0.1	780.2
Total	2,092.2	121.5	27,851.6	329.7	2,498.8	2,569.9	2,231.6	7,008.5	1,453.6	6,469.2	505.7	26.1	53,158.3

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-26. Alternative 6: Direct Economic Impact on Shipping Industry by Port Area and Type of Vessel, 2004 ($000s)

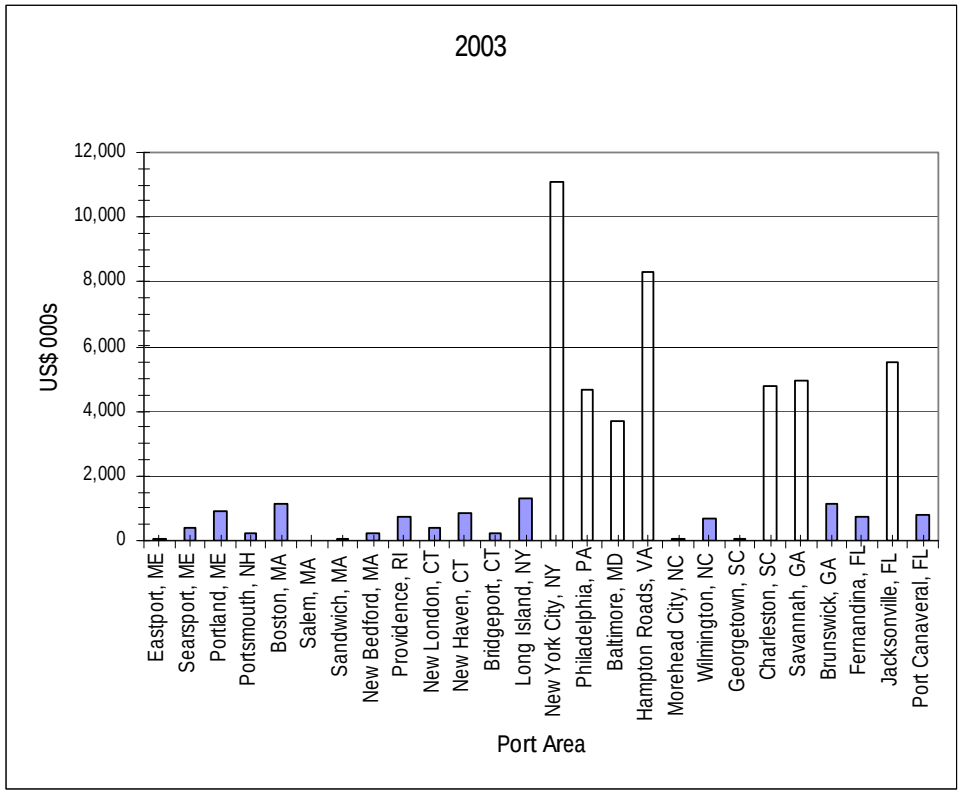
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	19.5	-	40.2	-	59.1	-	-	-	-	-	-	-	118.8
Searsport, ME	5.8	-	7.2	0.6	1.1	281.0	-	0.6	18.2	99.6	2.2	-	416.2
Portland, ME	56.1	2.9	7.1	0.6	33.1	127.5	-	53.8	44.0	608.0	22.1	0.3	955.4
Portsmouth, NH	43.3	4.0	0.3	-	34.9	2.4	-	-	0.5	89.7	4.3	3.1	182.5
Northeastern US - Off Race Point													
Boston, MA	28.4	0.4	431.7	0.5	8.1	222.6	5.2	42.4	-	389.6	0.3	1.5	1,130.8
Salem, MA	4.0	-	-	-	-	19.4	-	-	-	-	-	-	23.4
Northeastern US - Cape Cod Bay	-	-	-	-	-	36.5	-	-	0.1	43.5	0.1	-	80.2
Mid-Atlantic Block Island Sound													
New Bedford, MA	88.8	-	-	-	27.5	-	41.3	5.1	-	19.7	-	-	182.4
Providence, RI	92.1	5.1	-	-	70.2	172.4	-	247.8	3.7	254.6	4.3	4.1	854.3
New London, CT	17.2	-	48.6	-	121.3	133.9	-	-	91.9	18.4	1.5	-	432.9
New Haven, CT	32.3	-	26.6	-	71.9	-	-	-	664.7	252.6	19.8	-	1,067.9
Bridgeport, CT	81.0	-	-	0.4	-	-	-	-	246.1	30.6	-	0.3	358.4
Long Island, NY	-	-	-	3.3	-	267.8	-	-	856.6	432.9	-	0.8	1,561.3
Mid-Atlantic Ports of New York/New Jersey	175.6	22.2	8,051.6	-	127.1	605.5	101.2	1,394.5	9.8	1,296.4	15.5	0.8	11,800.3
Mid-Atlantic Delaware Bay	211.1	4.0	1,051.6	24.5	315.5	69.6	1,573.4	236.5	5.5	1,219.8	26.1	1.1	4,738.8
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	289.1	8.0	1,338.3	-	357.7	213.3	26.9	1,477.6	1.7	315.6	6.7	4.0	4,038.7
Hampton Roads, VA	337.4	26.1	6,835.1	2.2	232.0	316.8	52.1	545.6	1.7	257.2	10.5	4.8	8,621.5
Mid-Atlantic Morehead City and Beaufort, NC	16.3	0.9	27.3	-	21.3	20.6	-	-	-	32.5	-	-	118.8
Mid-Atlantic Wilmington, NC	44.8	3.0	230.1	-	206.5	18.5	-	66.7	10.9	182.9	0.7	-	763.9
Mid-Atlantic Georgetown, SC	17.4	0.5	2.7	-	34.7	5.6	-	-	-	-	-	-	61.0
Mid-Atlantic Charleston, SC	63.3	0.5	4,118.8	-	162.1	247.1	17.1	285.4	4.6	132.4	9.7	1.7	5,042.7
Mid-Atlantic Savannah, GA	110.3	7.6	4,063.3	-	269.0	197.9	124.0	329.8	1.5	250.6	2.0	0.4	5,356.5
Southeastern US													
Brunswick, GA	93.0	-	61.1	-	164.0	63.4	55.7	783.6	-	0.2	-	5.0	1,226.0
Fernandina, FL	46.9	-	181.7	5.9	268.0	128.7	81.5	22.2	-	-	42.9	-	777.8
Jacksonville, FL	288.8	9.7	1,679.2	276.2	489.5	1,039.4	29.6	1,670.2	41.9	628.0	556.2	26.8	6,735.5
Port Canaveral, FL	15.3	-	8.8	1.6	24.4	825.1	15.8	14.3	2.6	9.3	5.9	0.2	923.1
Total	2,177.9	94.8	28,211.2	315.7	3,099.0	5,015.1	2,123.9	7,176.1	2,005.8	6,563.9	730.7	55.0	57,569.2

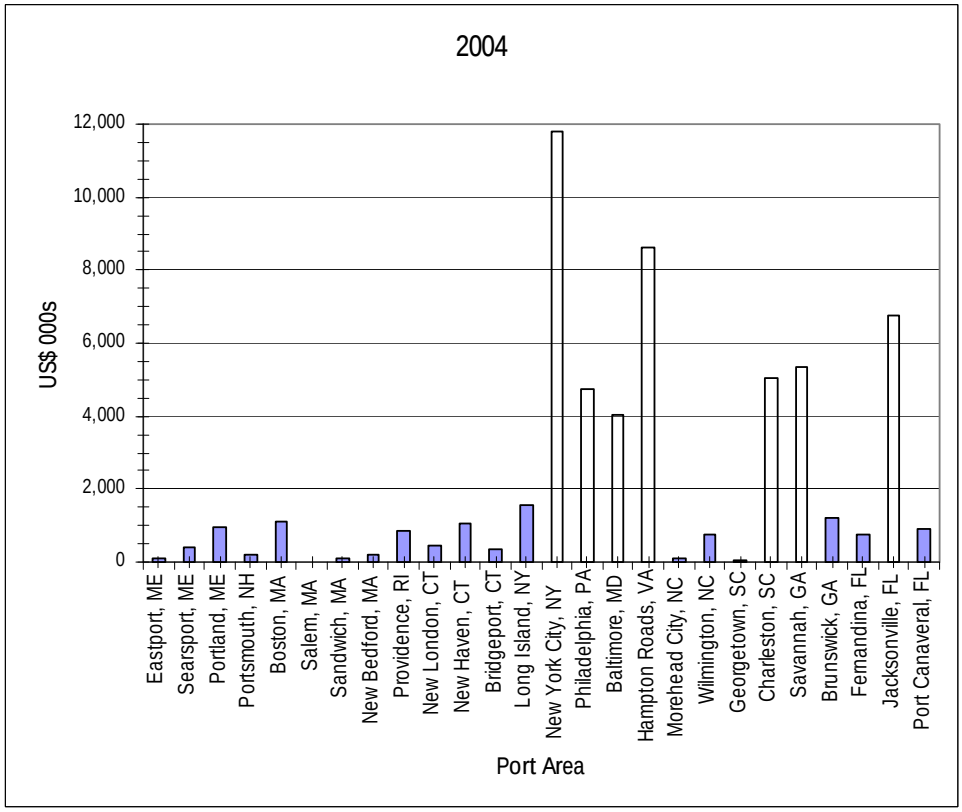
a/ Includes recreational vessels

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Figure 4-13. Alternative 6: Direct Economic Impact on Shipping Industry by Port Area, 2003 and 2004 ($000s)





SUMMARY

In this section we compare the direct economic impact on the shipping industry of operational measures proposed for Alternatives 2 through Alternative 6 by port area for 2003 and 2004. We also present the estimated direct economic impact for U.S.-flag and foreign-flag vessels. The alternatives are discussed in descending order in terms of highest direct economic impact in 2003.

- **Alternative 5 – Combination of Alternatives** has the highest direct economic impact on the shipping industry at $137.0 million in 2003 (Table 4-27). This alternative also has the highest direct economic impact on U.S.-flag vessels at $14.9 million and foreign–flag vessels at $122.1 million in 2003. With the exception of the port area of Port Canaveral,[51] this alternative results in the highest direct economic impact on the shipping industry for each port area.

- **Alternative 3- Speed Restrictions in Designated Areas** has the second highest direct economic impact on the shipping industry at $133.0 million in 2003. This alternative also has the second highest direct economic impact on U.S.-flag vessels at $14.0 million and foreign–flag vessels at $119.0 million in 2003. With the exception of the four port areas of the Southeastern U.S., this alternative results in the second highest direct economic impact on the shipping industry for each port area.

- **Alternative 6- Preferred Alternative** has the third highest direct economic impact on the shipping industry at $53.2 million in 2003. This is 38.9 percent of the direct economic impact estimated for Alternative 5. Alternative 6 also has the third highest direct economic impact on U.S.-flag vessels at $7.2 million and foreign–flag vessels at $46.0 million in 2003. This alternative has the second highest direct economic impact of the alternatives proposed for the Southeast port areas of Brunswick, Fernandina and Jacksonville. For all other port areas, Alternative 6 ranks third in terms of highest direct economic impact.

- **Alternative 2- Use of DMAs** ranks fourth in terms of highest direct economic impact on the shipping industry at $25.0 million in 2003. This alternative also has the fourth highest direct economic impact on U.S.-flag vessels at $2.2 million and foreign–flag vessels at $22.9 million in 2003. For the port area of Port Canaveral, Alternative 2 results in the highest direct economic impact of the alternatives proposed at $3.9 million. For all other port areas it ranks fourth.

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[51] Alternative 2 shows the highest direct economic impact for the port area of Port Canaveral as the effective distance for the DMAs is 39.6 nautical miles for an assumed 75 days per year. Under Alternative 5, the effective distance for the seasonal speed restriction is limited to 4.5 nautical miles through the right whale critical habitat area and the DMAs are assumed to occur for only 15 days per year outside the seasonal speed restriction period.

- **Alternative 4 – Use of Recommended Routes** has the lowest direct economic impact of the proposed alternatives at $2.3 million in 2003. This alternative also has the lowest direct economic impact on U.S.-flag vessels at $0.7 million and foreign–flag vessels at $1.6 million in 2003.

Table 4-28 presents a comparison of the direct economic impact of the operational measures proposed for each alternative for 2004.

Table 4-27. Direct Economic Impact on Shipping Industry for U.S. and Foreign Flag Vessels by Port Area and Alternative, 2003 ($000s)

	Alternative 2			Alternative 3			Alternative 4			Alternative 5			Alternative 6		
Port Area	US	Foreign	Total	US	Foreign	Total	US	Foreign	Total	US	Foreign	Total	US	Foreign	Total
Northeastern US - Gulf of Maine															
Eastport, ME	-	51.6	51.6	-	262.3	262.3	-	-	-	-	273.7	273.7	-	62.9	62.9
Searsport, ME	24.1	443.3	467.4	122.7	2,254.8	2,377.5	-	-	-	128.0	2,352.6	2,480.6	24.1	359.5	383.5
Portland, ME	29.2	648.5	677.7	148.6	3,298.5	3,447.2	-	-	-	155.1	3,441.6	3,596.7	51.0	858.5	909.5
Portsmouth, NH	9.3	148.8	158.1	47.3	756.8	804.1	-	-	-	49.3	789.6	838.9	15.0	227.7	242.7
Northeastern US - Off Race Point															
Boston, MA	6.8	795.3	802.1	35.8	4,208.7	4,244.4	-	-	-	37.3	4,384.1	4,421.4	9.3	1,121.4	1,130.8
Salem, MA	0.6	8.7	9.3	3.1	46.3	49.4	-	-	-	3.2	48.2	51.4	0.4	15.9	16.2
	-	-	-	-	-	-	-	-	-	-	-	-			
Northeastern US - Cape Cod Bay	-	15.7	15.7	-	216.5	216.5	-	-	-	-	218.7	218.7	-	78.4	78.4
Mid-Atlantic Block Island Sound															
New Bedford, MA	2.8	16.1	18.9	72.5	294.3	366.9	-	-	-	72.5	294.3	366.9	48.1	176.1	224.2
Providence, RI	3.3	103.9	107.2	70.9	1,724.3	1,795.2	-	-	-	70.9	1,724.3	1,795.2	47.6	720.0	767.6
New London, CT	34.7	10.3	45.0	727.8	177.5	905.4	-	-	-	727.8	177.5	905.4	333.7	85.0	418.7
New Haven, CT	48.4	47.6	96.0	956.0	845.7	1,801.7	-	-	-	956.0	845.7	1,801.7	444.5	396.0	840.5
Bridgeport, CT	34.2	14.2	48.4	512.6	134.8	647.4	-	-	-	512.6	134.8	647.4	179.6	50.5	230.2
Long Island, NY	118.8	25.4	144.1	2,292.4	558.2	2,850.6	-	-	-	2,292.4	558.2	2,850.6	1,055.0	244.3	1,299.3
Mid-Atlantic Ports of New York/New Jersey	177.4	2,685.1	2,862.5	2,423.2	34,173.7	36,596.9	-	-	-	2,423.2	34,173.7	36,596.9	749.1	10,331.7	11,080.7
Mid-Atlantic Delaware Bay	17.1	815.2	832.3	242.5	13,305.4	13,547.8	-	-	-	242.5	13,305.4	13,547.8	86.3	4,577.5	4,663.8
Mid-Atlantic Chesapeake Bay															
Baltimore, MD	25.8	684.9	710.8	409.4	10,625.5	11,034.9	-	-	-	409.4	10,625.5	11,034.9	138.6	3,581.2	3,719.8
Hampton Roads, VA	159.4	1,465.0	1,624.4	2,412.3	22,087.8	24,500.1	-	-	-	2,412.3	22,087.8	24,500.1	835.3	7,485.8	8,321.1
Mid-Atlantic Morehead City and Beaufort, NC	2.5	24.7	27.2	12.7	180.6	193.2	-	-	-	12.7	180.6	193.2	4.7	72.2	76.9
Mid-Atlantic Wilmington, NC	17.1	170.0	187.2	130.9	1,447.4	1,578.3	-	-	-	130.9	1,447.4	1,578.3	57.4	650.4	707.7
Mid-Atlantic Georgetown, SC	0.1	15.4	15.5	0.8	97.4	98.2	-	-	-	0.8	97.4	98.2	0.4	45.3	45.7
Mid-Atlantic Charleston, SC	276.2	1,150.5	1,426.8	1,943.8	7,928.8	9,872.6	-	-	-	1,943.8	7,928.8	9,872.6	961.5	3,836.1	4,797.6
Mid-Atlantic Savannah, GA	171.3	6,681.6	6,852.9	260.1	9,891.2	10,151.3	-	-	-	260.1	9,891.2	10,151.3	142.6	4,782.9	4,925.5
Southeastern US															
Brunswick, GA	64.1	689.1	753.1	94.4	754.0	848.3	22.6	208.8	231.4	122.5	1,042.3	1,164.8	120.6	1,027.1	1,147.7
Fernandina, FL	9.5	319.9	329.4	27.6	503.3	530.9	24.2	220.0	244.2	49.3	707.3	756.6	48.7	696.8	745.5
Jacksonville, FL	878.3	1,983.5	2,861.9	1,082.9	2,477.9	3,560.7	691.6	1,166.2	1,857.8	1,876.6	3,872.3	5,748.9	1,813.5	3,728.0	5,541.5
Port Canaveral, FL	42.3	3,858.8	3,901.1	11.0	717.0	728.0	-	-	-	19.5	1,488.8	1,508.2	8.5	771.8	780.2
Total	2,153.4	22,873.1	25,026.5	14,041.2	118,968.7	133,009.9	738.4	1,595.0	2,333.4	14,908.6	122,091.8	137,000.4	7,175.4	45,982.9	53,158.3

Source: Nathan Associates Inc.

Table 4-28. Direct Economic Impact on Shipping Industry for U.S. and Foreign Flag Vessels by Port Area and Alternative, 2004 ($000s)

	Alternative 2			Alternative 3			Alternative 4			Alternative 5			Alternative 6		
Port Area	US	Foreign	Total	US	Foreign	Total	US	Foreign	Total	US	Foreign	Total	US	Foreign	Total
Northeastern US - Gulf of Maine															
Eastport, ME	-	87.3	87.3	-	444.0	444.0	-	-	-	-	463.3	463.3	-	118.8	118.8
Searsport, ME	65.4	455.1	520.4	332.5	2,314.6	2,647.1	-	-	-	346.9	2,415.0	2,761.9	53.0	363.2	416.2
Portland, ME	70.0	674.3	744.3	355.9	3,429.6	3,785.5	-	-	-	371.3	3,578.4	3,949.7	93.6	861.8	955.4
Portsmouth, NH	5.8	132.5	138.4	29.6	674.1	703.7	-	-	-	30.9	703.4	734.2	3.8	178.6	182.5
Northeastern US - Off Race Point															
Boston, MA	6.8	795.3	802.1	35.8	4,208.7	4,244.4	-	-	-	37.3	4,384.1	4,421.4	9.3	1,121.4	1,130.8
Salem, MA	7.1	28.3	35.4	37.4	149.8	187.2	-	-	-	39.0	156.0	195.0	4.7	18.7	23.4
	-	-	-	-	-	-	-	-	-	-	-	-			
Northeastern US - Cape Cod Bay	2.2	27.1	29.3	30.9	374.6	405.5	-	-	-	31.2	378.4	409.7	1.0	79.2	80.2
Mid-Atlantic Block Island Sound															
New Bedford, MA	3.4	14.5	17.9	32.6	252.2	284.7	-	-	-	32.6	252.2	284.7	21.3	161.1	182.4
Providence, RI	10.2	99.9	110.0	141.7	1,921.1	2,062.8	-	-	-	141.7	1,921.1	2,062.8	68.7	785.7	854.3
New London, CT	51.6	29.2	80.9	612.4	437.8	1,050.2	-	-	-	612.4	437.8	1,050.2	236.5	196.4	432.9
New Haven, CT	74.6	39.9	114.5	1,538.1	721.0	2,259.1	-	-	-	1,538.1	721.0	2,259.1	737.1	330.8	1,067.9
Bridgeport, CT	45.1	12.6	57.8	765.1	162.4	927.5	-	-	-	765.1	162.4	927.5	275.4	83.1	358.4
Long Island, NY	136.0	25.3	161.3	2,781.7	481.4	3,263.1	-	-	-	2,781.7	481.4	3,263.1	1,328.5	232.8	1,561.3
Mid-Atlantic Ports of New York/New Jersey	179.0	2,950.3	3,129.3	2,414.6	36,724.9	39,139.5	-	-	-	2,414.6	36,724.9	39,139.5	721.9	11,078.4	11,800.3
Mid-Atlantic Delaware Bay	25.9	833.7	859.6	413.8	13,055.8	13,469.7	-	-	-	413.8	13,055.8	13,469.7	133.2	4,605.6	4,738.8
Mid-Atlantic Chesapeake Bay															
Baltimore, MD	35.3	788.6	823.9	493.4	11,828.5	12,321.9	-	-	-	493.4	11,828.5	12,321.9	157.8	3,880.9	4,038.7
Hampton Roads, VA	166.6	1,502.8	1,669.4	2,529.4	22,729.3	25,258.7	-	-	-	2,529.4	22,729.3	25,258.7	880.8	7,740.8	8,621.5
Mid-Atlantic Morehead City and Beaufort, NC	7.1	27.6	34.7	54.0	203.4	257.4	-	-	-	54.0	203.4	257.4	26.5	92.4	118.8
Mid-Atlantic Wilmington, NC	18.1	179.6	197.7	175.2	1,463.9	1,639.1	-	-	-	175.2	1,463.9	1,639.1	83.4	680.5	763.9
Mid-Atlantic Georgetown, SC	0.9	13.8	14.7	10.6	122.1	132.7	-	-	-	10.6	122.1	132.7	5.6	55.4	61.0
Mid-Atlantic Charleston, SC	317.2	1,193.1	1,510.3	2,191.7	8,227.3	10,418.9	-	-	-	2,191.7	8,227.3	10,418.9	1,076.7	3,966.1	5,042.7
Mid-Atlantic Savannah, GA	219.5	7,043.9	7,263.4	369.5	10,634.6	11,004.1	-	-	-	369.5	10,634.6	11,004.1	206.4	5,150.0	5,356.5
Southeastern US															
Brunswick, GA	109.8	622.3	732.1	155.5	760.3	915.9	42.0	211.0	253.0	207.4	1,037.1	1,244.5	204.3	1,021.7	1,226.0
Fernandina, FL	75.0	297.1	372.1	111.6	421.4	533.0	68.7	197.6	266.3	177.5	611.4	788.9	175.2	602.6	777.8
Jacksonville, FL	953.1	2,503.2	3,456.3	1,193.4	3,124.5	4,317.9	793.4	1,477.9	2,271.3	2,096.4	4,890.6	6,987.0	2,026.8	4,708.6	6,735.5
Port Canaveral, FL	92.7	4,523.0	4,615.7	13.1	790.1	803.2	-	-	-	31.6	1,694.7	1,726.3	18.5	904.6	923.1
Total	2,678.4	24,900.4	27,578.8	16,819.3	125,657.5	142,476.8	904.0	1,886.5	2,790.6	17,893.1	129,278.2	147,171.3	8,550.0	49,019.2	57,569.2

Source: Nathan Associates Inc.

SENSITIVITY ANALYSIS

NMFS is proposing in the final rule that speed restrictions will be implemented at 10 knots and in this study, we have used 10 knots as the base case assumption. However in this sensitivity analysis we identify the direct economic impact on the shipping industry of speed restrictions of 12 and 14 knots.

Table 4-29 presents the results of the sensitivity analysis by port area for 2004. The ranking of the alternatives in terms of economic impact does not change with restricted speeds of 12 knots or 14 knots. A change of the speed restriction from 10 knots to 12 knots would generally reduce the direct economic impact of each alternative by 37 percent, whereas a change in the restricted speed to from 10 knots to 14 knots would generally lower the direct economic impact of each alternative by more than 60 percent.[52]

The results of the sensitivity analysis show that alternative restricted speed levels dramatically alter the direct economic impact. For example under Alternative 5, the direct economic impact ranges from $147.2 million with a restricted speed of 10 knots to $55.2 million at 14 knots. For Alternative 6, the range is from $57.6 million to $21.5 million.

At a restricted speed of 12 knots, the direct economic impact on the shipping industry is $92.8million for Alternative 5; $89.2 million for Alternative 3; $36.0 million dollars for Alternative 6; $17.7 million for Alternative 2; and $2.8 million for Alternative 4.

At a restricted speed of 14 knots, the direct economic impact on the shipping industry is $55.2 million for Alternative 5; $52.5 million for Alternative 3; $21.5 million dollars for Alternative 6; $10.8 million dollars for Alternative 2; and $2.8 million for Alternative 4.

Table 4-30 displays the sensitivity analysis results for each alternative using the economic impact of the 10-knot speed restriction as an index. Thus this table shows the percentage of the direct economic impact of a 12-knot speed or 14-knot speed restriction relative to the impact presented for a 10-knot speed restriction. It is evident that changes in economic impacts due to alternative speed restrictions are not uniformly incurred by all port areas. Port areas that are characterized by arrivals of slower vessels show a disproportionate decrease in economic impact when the restricted speed is changed from 10 knots to 12 knots, as fewer vessels are affected at the higher limit. The port areas within Block Island Sound demonstrate this phenomenon. Other port areas such as Charleston and Hampton Roads, whose arrivals consist more of faster vessels, do not show as dramatic a decrease in direct economic impacts at alternative restricted speeds of 12 knots. This is because the economic

[52] The exception is Alternative 4 that does not change with restricted speeds as this alternative uses the time to cover the increased distance of recommended routes at normal vessel operating speed.

impact at 12 knots is not more significant for these port areas than those with arrivals of slower vessels and in relative terms do not have many slower vessels that are only affected at the slower restricted speed.

Table 4-29. Direct Economic Impact on Shipping Industry at Restricted Speeds of 10, 12 and 14 knots, 2004 ($000s)

	Alternative 2			Alternative 3			Alternative 4			Alternative 5			Alternative 6		
	Restriction speed in knots			Restriction speed in knots			Restriction speed in knots			Restriction speed in knots			Restriction speed in knots		
Port Area	10	12	14	10	12	14	10	12	14	10	12	14	10	12	14
Northeastern US - Gulf of Maine															
Eastport, ME	87.3	54.0	33.4	444.0	275.5	170.6	-	-	-	463.3	287.4	178.0	118.8	73.2	45.7
Searsport, ME	520.4	313.2	161.3	2,647.1	1,596.6	823.7	-	-	-	2,761.9	1,665.7	859.3	416.2	240.3	110.5
Portland, ME	744.3	380.4	136.3	3,785.5	1,938.7	696.4	-	-	-	3,949.7	2,022.6	726.4	955.4	464.6	138.0
Portsmouth, NH	138.4	60.9	13.9	703.7	310.5	70.9	-	-	-	734.2	323.9	74.0	182.5	79.6	18.2
Northeastern US - Off Race Point															
Boston, MA	802.1	460.0	217.7	4,244.4	2,339.7	1,065.9	-	-	-	4,421.4	2,441.2	1,113.9	1,130.8	630.8	291.6
Salem, MA	35.4	20.4	10.0	187.2	103.9	48.8	-	-	-	195.0	108.4	51.0	23.4	13.5	6.6
Northeastern US - Cape Cod Bay	29.3	20.4	11.6	405.5	234.9	114.3	-	-	-	409.7	237.8	116.0	80.2	44.5	18.0
Mid-Atlantic Block Island Sound															
New Bedford, MA	17.9	8.0	1.8	284.7	118.8	19.8	-	-	-	284.7	118.8	19.8	182.4	75.1	13.5
Providence, RI	110.0	63.0	31.4	2,062.8	1,144.2	534.5	-	-	-	2,062.8	1,144.2	534.5	854.3	438.8	176.4
New London, CT	80.9	46.5	21.6	1,050.2	585.3	261.6	-	-	-	1,050.2	585.3	261.6	432.9	234.1	101.3
New Haven, CT	114.5	49.2	6.3	2,259.1	944.3	106.2	-	-	-	2,259.1	944.3	106.2	1,067.9	441.4	48.9
Bridgeport, CT	57.8	23.0	2.1	927.5	332.1	3.1	-	-	-	927.5	332.1	3.1	358.4	125.1	1.3
Long Island, NY	161.3	71.0	11.2	3,263.1	1,397.3	208.0	-	-	-	3,263.1	1,397.3	208.0	1,561.3	655.4	94.9
Mid-Atlantic Ports of New York/New Jersey	3,129.3	2,118.0	1,375.0	39,139.5	26,088.1	16,704.8	-	-	-	39,139.5	26,088.1	16,704.8	11,800.3	7,743.8	4,891.4
Mid-Atlantic Delaware Bay	859.6	504.4	253.3	13,469.7	7,766.7	3,842.3	-	-	-	13,469.7	7,766.7	3,842.3	4,738.8	2,700.3	1,322.3
Mid-Atlantic Chesapeake Bay															
Baltimore, MD	823.9	530.3	319.5	12,321.9	7,773.2	4,601.6	-	-	-	12,321.9	7,773.2	4,601.6	4,038.7	2,511.4	1,469.6
Hampton Roads, VA	1,669.4	1,153.5	779.2	25,258.7	17,123.4	11,360.5	-	-	-	25,258.7	17,123.4	11,360.5	8,621.5	5,755.6	3,765.1
Mid-Atlantic Morehead City and Beaufort, NC	34.7	18.1	7.4	257.4	132.2	52.8	-	-	-	257.4	132.2	52.8	118.8	61.8	24.8
Mid-Atlantic Wilmington, NC	197.7	115.7	61.1	1,639.1	926.5	472.1	-	-	-	1,639.1	926.5	472.1	763.9	435.1	223.8
Mid-Atlantic Georgetown, SC	14.7	7.2	3.5	132.7	64.6	30.1	-	-	-	132.7	64.6	30.1	61.0	30.1	14.1
Mid-Atlantic Charleston, SC	1,510.3	1,053.2	717.3	10,418.9	6,979.3	4,566.4	-	-	-	10,418.9	6,979.3	4,566.4	5,042.7	3,379.2	2,212.4
Mid-Atlantic Savannah, GA	7,263.4	5,008.1	3,384.6	11,004.1	7,292.1	4,742.0	-	-	-	11,004.1	7,292.1	4,742.0	5,356.5	3,552.0	2,309.0
Southeastern US															
Brunswick, GA	732.1	459.4	273.7	915.9	556.9	321.2	253.0	253.0	253.0	1,244.5	839.4	560.3	1,226.0	828.2	553.8
Fernandina, FL	372.1	207.6	104.8	533.0	282.0	136.5	266.3	266.3	266.3	788.9	519.5	330.1	777.8	513.6	327.2
Jacksonville, FL	3,456.3	2,011.4	1,106.7	4,317.9	2,429.2	1,294.9	2,271.3	2,271.3	2,271.3	6,987.0	4,575.6	3,094.2	6,735.5	4,434.1	3,018.8
Port Canaveral, FL	4,615.7	2,943.9	1,737.1	803.2	493.5	281.2	-	-	-	1,726.3	1,082.3	628.6	923.1	588.8	347.4
Total	27,578.8	17,700.7	10,781.8	142,476.8	89,229.6	52,530.3	2,790.6	2,790.6	2,790.6	147,171.3	92,772.0	55,237.8	57,569.2	36,050.4	21,544.6

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-30. Direct Economic Impact on Shipping Industry at Restricted Speeds of 10, 12 and 14 knots, 2004 (Indexed 10 knots = 100)

	Alternative 2			Alternative 3			Alternative 4			Alternative 5			Alternative 6		
	Restriction speed in knots			Restriction speed in knots			Restriction speed in knots			Restriction speed in knots			Restriction speed in knots		
Port Area	10	12	14	10	12	14	10	12	14	10	12	14	10	12	14
Northeastern US - Gulf of Maine															
Eastport, ME	100.0	61.9	38.3	100.0	62.0	38.4	-	-	-	100.0	62.0	38.4	100.0	61.7	38.4
Searsport, ME	100.0	60.2	31.0	100.0	60.3	31.1	-	-	-	100.0	60.3	31.1	100.0	57.7	26.6
Portland, ME	100.0	51.1	18.3	100.0	51.2	18.4	-	-	-	100.0	51.2	18.4	100.0	48.6	14.4
Portsmouth, NH	100.0	44.0	10.0	100.0	44.1	10.1	-	-	-	100.0	44.1	10.1	100.0	43.6	10.0
Northeastern US - Off Race Point															
Boston, MA	100.0	57.3	27.1	100.0	55.1	25.1	-	-	-	100.0	55.2	25.2	100.0	55.8	25.8
Salem, MA	100.0	57.7	28.2	100.0	55.5	26.1	-	-	-	100.0	55.6	26.2	100.0	57.7	28.2
Northeastern US - Cape Cod Bay	100.0	69.5	39.4	100.0	57.9	28.2	-	-	-	100.0	58.0	28.3	100.0	55.5	22.5
Mid-Atlantic Block Island Sound															
New Bedford, MA	100.0	44.8	10.0	100.0	41.7	7.0	-	-	-	100.0	41.7	7.0	100.0	41.2	7.4
Providence, RI	100.0	57.3	28.6	100.0	55.5	25.9	-	-	-	100.0	55.5	25.9	100.0	51.4	20.7
New London, CT	100.0	57.5	26.8	100.0	55.7	24.9	-	-	-	100.0	55.7	24.9	100.0	54.1	23.4
New Haven, CT	100.0	42.9	5.5	100.0	41.8	4.7	-	-	-	100.0	41.8	4.7	100.0	41.3	4.6
Bridgeport, CT	100.0	39.8	3.6	100.0	35.8	0.3	-	-	-	100.0	35.8	0.3	100.0	34.9	0.4
Long Island, NY	100.0	44.0	7.0	100.0	42.8	6.4	-	-	-	100.0	42.8	6.4	100.0	42.0	6.1
Mid-Atlantic Ports of New York/New Jersey	100.0	67.7	43.9	100.0	66.7	42.7	-	-	-	100.0	66.7	42.7	100.0	65.6	41.5
Mid-Atlantic Delaware Bay	100.0	58.7	29.5	100.0	57.7	28.5	-	-	-	100.0	57.7	28.5	100.0	57.0	27.9
Mid-Atlantic Chesapeake Bay															
Baltimore, MD	100.0	64.4	38.8	100.0	63.1	37.3	-	-	-	100.0	63.1	37.3	100.0	62.2	36.4
Hampton Roads, VA	100.0	69.1	46.7	100.0	67.8	45.0	-	-	-	100.0	67.8	45.0	100.0	66.8	43.7
Mid-Atlantic Morehead City and Beaufort, NC	100.0	52.0	21.2	100.0	51.4	20.5	-	-	-	100.0	51.4	20.5	100.0	52.0	20.9
Mid-Atlantic Wilmington, NC	100.0	58.5	30.9	100.0	56.5	28.8	-	-	-	100.0	56.5	28.8	100.0	57.0	29.3
Mid-Atlantic Georgetown, SC	100.0	49.0	24.1	100.0	48.7	22.7	-	-	-	100.0	48.7	22.7	100.0	49.4	23.1
Mid-Atlantic Charleston, SC	100.0	69.7	47.5	100.0	67.0	43.8	-	-	-	100.0	67.0	43.8	100.0	67.0	43.9
Mid-Atlantic Savannah, GA	100.0	68.9	46.6	100.0	66.3	43.1	-	-	-	100.0	66.3	43.1	100.0	66.3	43.1
Southeastern US															
Brunswick, GA	100.0	62.7	37.4	100.0	60.8	35.1	100.0	100.0	100.0	100.0	67.4	45.0	100.0	67.5	45.2
Fernandina, FL	100.0	55.8	28.2	100.0	52.9	25.6	100.0	100.0	100.0	100.0	65.9	41.8	100.0	66.0	42.1
Jacksonville, FL	100.0	58.2	32.0	100.0	56.3	30.0	100.0	100.0	100.0	100.0	65.5	44.3	100.0	65.8	44.8
Port Canaveral, FL	100.0	63.8	37.6	100.0	61.4	35.0	-	-	-	100.0	62.7	36.4	100.0	63.8	37.6
Total	100.0	64.2	39.1	100.0	62.6	36.9	100.0	100.0	100.0	100.0	63.0	37.5	100.0	62.6	37.4

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

ADDITIONAL DIRECT ECONOMIC IMPACT ON THE SHIPPING INDUSTRY DUE TO MULTIPLE PORT CALLS DURING RESTRICTED PERIODS

Many of the vessels arrivals at U.S. East Coast ports occur as part of a "string" of port calls by the vessel. For containerships, ro-ro cargo ships and some specialty tankers these multi-port calls constitute a scheduled cargo service offered by the shipping lines. Other types of vessels may have multiple U.S. East Coast port calls as part of a coastwise cabotage service, for delivery of specialty chemicals or other products, or to lighten or top off in order to maximize vessel utilization.

Shipping industry representatives and port officials raised concerns during the stakeholder meetings regarding the cumulative effect of NOAA's preferred operational measures for Right Whale Ship Strike Reduction and alternatives on vessels calling at multiple U.S. East Coast ports during speed-restricted periods. In this section we identify the number of vessel arrivals at each port area that are part of multi-port string during proposed restriction periods and estimate the additional direct economic impact on the shipping industry.

We used U.S. Coast Guard Vessel Arrival Database described in Chapter 2 to determine which vessels made multiple port calls along the U.S. East Coast in 2003 and 2004. For purposes of this analysis, if a vessel arrived at another U.S. East Coast port area within two days after its arrival at the preceding U.S. East Coast port, that arrival was considered to be part of a multi-port string.[53]

Table 4-31 lists sets of multi-port strings that occurred at least 20 times in 2003. Of the total 4,278 occurrences of multi-port strings in 2003, those strings with at least 20 occurrences totaled 2,760 or 65 percent of the total observed. The multi-port string of New York/New Jersey–Hampton Roads–Charleston was the most frequent with 293 occurrences in 2003 followed by the string of New York/New Jersey–Hampton Roads–Savannah with 194 occurrences. The string of New York/New Jersey–Hampton Roads was third with 151 occurrences in 2003.

Table 4-32 presents a similar listing of U.S. East Coast multi-port strings in 2004. Those strings with 20 or more occurrences accounted for 63 percent of the 4,461 total occurrences of multi-port strings that year. While some of the rankings change slightly, it is interesting to note that the port areas of New York/New Jersey or Hampton Roads are part of each of the top ten multi-port strings in 2003 and 2004.

Other port areas with significant participation in multi-port strings each year include Charleston, Savannah, Baltimore, and Philadelphia.

[53] Vessels making multiple port calls within the same port area were not considered as part of a multi-port string as they would not be passing through a speed restricted area for the second port call.

Table 4-31. U.S. East Coast: Most Frequent Multi-Port Strings, 2003

Port Area 1	Port Area 2	Port Area 3	Port Area 4	Occurrences
New York City, NY	Hampton Roads, VA	Charleston, SC		293
New York City, NY	Hampton Roads, VA	Savannah, GA		194
New York City, NY	Hampton Roads, VA			151
Hampton Roads, VA	New York City, NY			143
New York City, NY	Baltimore, MD			139
New York City, NY	Philadelphia, PA			104
Charleston, SC	Hampton Roads, VA	New York City, NY		93
Baltimore, MD	New York City, NY			92
Savannah, GA	Hampton Roads, VA	New York City, NY		84
Savannah, GA	Hampton Roads, VA			76
Charleston, SC	Hampton Roads, VA			69
Charleston, SC	Jacksonville, FL			67
Savannah, GA	New York City, NY			65
Savannah, GA	Charleston, SC			58
Baltimore, MD	Hampton Roads, VA			54
Philadelphia, PA	Hampton Roads, VA			54
Charleston, SC	Wilmington, NC			53
Brunswick, GA	Charleston, SC			46
New York City, NY	Savannah, GA			46
Charleston, SC	New York City, NY			45
New York City, NY	Charleston, SC			43
Charleston, SC	Savannah, GA			41
Philadelphia, PA	New York City, NY			38
Hampton Roads, VA	Savannah, GA			38
Savannah, GA	Charleston, SC	Hampton Roads, VA	New York City, NY	37
Hampton Roads, VA	Charleston, SC			36
Jacksonville, FL	New York City, NY			36
Jacksonville, FL	Charleston, SC			35
Wilmington, NC	Savannah, GA			35
New York City, NY	Hampton Roads, VA	Charleston, SC	New York City, NY	33
Long Island, NY	New York City, NY			33
Philadelphia, PA	Baltimore, MD			28
Savannah, GA	Philadelphia, PA			28
New York City, NY	Baltimore, MD	Hampton Roads, VA		27
Jacksonville, FL	Baltimore, MD	New York City, NY		27
New York City, NY	Baltimore, MD	Savannah, GA		26
Hampton Roads, VA	Philadelphia, PA			26
Jacksonville, FL	Savannah, GA			26
New York City, NY	Baltimore, MD	Hampton Roads, VA	Charleston, SC	25
Hampton Roads, VA	Baltimore, MD			24
Portland, ME	Searsport, ME			24
New York City, NY	Savannah, GA	Hampton Roads, VA	New York City, NY	23
Jacksonville, FL	New York City, NY	Baltimore, MD		22
New York City, NY	Port Canaveral, FL			22
Savannah, GA	Jacksonville, FL			21
New York City, NY	Baltimore, MD	Charleston, SC		20
Hampton Roads, VA	Baltimore, MD	New York City, NY		20
Portland, ME	Boston, MA			20
New Haven, CT	New York City, NY			20
Subtotal				2,760
Other Strings				1,518
Total				4,278

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in the text.

Table 4-32. U.S. East Coast: Most Frequent Multi-Port Strings, 2004

Port Area 1	Port Area 2	Port Area 3	Port Area 4	Occurrences
New York City, NY	Hampton Roads, VA	Charleston, SC		279
New York City, NY	Hampton Roads, VA	Savannah, GA		223
New York City, NY	Hampton Roads, VA			187
Charleston, SC	Hampton Roads, VA	New York City, NY		183
New York City, NY	Baltimore, MD			162
Baltimore, MD	New York City, NY			119
Charleston, SC	Hampton Roads, VA			100
New York City, NY	Philadelphia, PA			99
Hampton Roads, VA	New York City, NY			86
Savannah, GA	New York City, NY			83
Philadelphia, PA	Hampton Roads, VA			69
Savannah, GA	Charleston, SC			65
Charleston, SC	Jacksonville, FL			64
Savannah, GA	Hampton Roads, VA	New York City, NY		58
Jacksonville, FL	New York City, NY			51
Wilmington, NC	Savannah, GA			49
Charleston, SC	Savannah, GA			47
Savannah, GA	Charleston, SC	New York City, NY		45
New York City, NY	Charleston, SC			42
New York City, NY	Hampton Roads, VA	Charleston, SC	New York City, NY	42
New York City, NY	Savannah, GA			40
Hampton Roads, VA	Charleston, SC			39
Charleston, SC	Wilmington, NC			39
New York City, NY	Baltimore, MD	Hampton Roads, VA	Charleston, SC	38
Baltimore, MD	Hampton Roads, VA			38
Philadelphia, PA	New York City, NY			38
New York City, NY	Baltimore, MD	Hampton Roads, VA	New York City, NY	37
Savannah, GA	Philadelphia, PA			37
Hampton Roads, VA	Baltimore, MD			35
Hampton Roads, VA	Savannah, GA			35
Jacksonville, FL	Baltimore, MD	New York City, NY		31
Charleston, SC	Brunswick, GA			31
New York City, NY	Port Canaveral, FL			31
Savannah, GA	Hampton Roads, VA			30
Jacksonville, FL	Savannah, GA			29
New York City, NY	Baltimore, MD	Hampton Roads, VA		28
New York City, NY	Savannah, GA	Hampton Roads, VA	New York City, NY	28
Hampton Roads, VA	Baltimore, MD	New York City, NY		25
Brunswick, GA	Charleston, SC			23
Hampton Roads, VA	Philadelphia, PA			22
Portland, ME	Searsport, ME			22
New York City, NY	Wilmington, NC	Savannah, GA		22
Baltimore, MD	Philadelphia, PA			21
Long Island, NY	New York City, NY			20
Subtotal				2,792
Other Strings				1,669
Total				4,461

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in the text.

The occurrences of multi-port strings presented above were based on total U.S. East Coast vessel movements in 2003 and 2004. In the following sections, we examine the impacts for each alternative.[54]

Alternatives 3 and 5

Seasonal speed restrictions by port area under Alternative 3 were presented earlier in Figure 4-3. They include speed restrictions which are in place year–round in the Northeastern U.S., from October 1 through April 30 for the mid-Atlantic region, and from November 15 through April 15 for the Southeastern U.S. The same seasonal speed restrictions apply for Alternative 5 along with other operational measures.[55]

Table 4-33 presents vessel arrivals in 2003 for port areas that are part of multi-port strings when at least two port areas in the string would contain speed restrictions. In 2003, 6,080 vessel arrivals fell into this category, with the 3,337 containerships arrivals accounting for 55 percent of the total multi-port vessel arrivals during speed restricted periods. Ro-ro cargo ships with 1,052 arrivals (17 percent) and tankers with 921 arrivals (15 percent) were the other vessel types with the most port calls as part of multi-port strings during restricted periods.

The 6,080 multi-port string restricted arrivals in 2003 shown in Table 4-33 represent roughly 41 percent of total U.S. East Coast Alternative 3 restricted vessel arrivals (which were shown in Table 4-10). For containerships, the multi-port string restricted arrivals represents 68 percent of the total containership restricted period arrivals. For ro-ro cargo ships, the multi-port string restricted arrivals represents 61 percent of those vessels total restricted arrivals in 2003.

The port area of New York/New Jersey had the most multi-port string restricted arrivals with 1,489 arrivals in 2003. The port area of Hampton Roads was second with 1,083 arrivals, followed by the port areas of Charleston (737 arrivals), Savannah (631 arrivals), Baltimore (575 arrivals) and Philadelphia (345 arrivals).

Table 4-34 presents similar information for 2004. The total number of multi-port string restricted arrivals increased by 5.5 percent to 6,412 arrivals. The ranking by vessel type remained unchanged from 2003 with the exception of general cargo vessels moving ahead of bulk carriers for fifth place. In terms of vessel arrivals by port area, the rankings for the top eight port areas remained unchanged from 2003.

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[54] Due to their more limited geographic scope at any single point in time, Alternative 2: Use of DMAS and Alternative 4: Use of Recommended Routes would not generate an additional direct economic impact due to the cumulative effect of vessels making multiple U.S. East Coast port calls.

[55] For simplicity, in this section we will refer to Alternative 3; however, the comments apply equally to Alternative 5.

Table 4-33. Alternatives 3 and 5: U.S. East Coast Restricted Vessel Arrivals that are part of Multi-Port String, by Port Area and Vessel Type, 2003

	Vessel Type												
Port Area	Bulk Carriers	Combination Carriers	Container ships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	5	-	-	-	6	-	-	-	-	-	-	-	11
Searsport, ME	-	1	-	-	-	56	-	1	-	32	-	-	90
Portland, ME	6	-	-	-	6	12	-	19	-	65	1	-	109
Portsmouth, NH	2	1	-	-	-	1	-	-	-	35	1	-	40
Northeastern US - Off Race Point													
Boston, MA	1	-	21	-	1	57	-	21	-	50	-	-	151
Salem, MA	1	-	-	-	-	1	-	-	-	1	-	-	3
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	8	-	-	-	5	-	-	13
Mid-Atlantic Block Island Sound													
New Bedford, MA	5	-	-	-	4	-	-	-	-	6	-	-	15
Providence, RI	3	1	-	-	3	14	2	25	-	25	-	-	73
New London, CT	5	-	2	-	2	1	-	-	1	3	-	-	14
New Haven, CT	10	-	1	-	6	-	-	-	11	36	2	-	66
Bridgeport, CT	3	-	-	-	-	-	7	-	9	13	-	-	32
Long Island, NY	-	1	-	-	-	1	-	-	8	51	-	-	61
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	14	5	965	-	5	25	8	263	6	194	4	-	1,489
Mid-Atlantic Delaware Bay													
Philadelphia, PA	32	-	122	1	21	7	7	48	2	99	6	-	345
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	24	-	195	-	14	14	-	271	-	53	2	2	575
Hampton Roads, VA	24	2	898	-	25	8	-	82	-	42	-	2	1,083
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	2	-	5	-	5	-	-	1	-	6	-	1	20
Mid-Atlantic Wilmington, NC													
Wilmington, NC	19	4	41	-	19	-	1	6	6	55	1	-	152
Mid-Atlantic Georgetown, SC													
Georgetown, SC	4	-	1	-	3	-	-	-	-	-	-	-	8
Mid-Atlantic Charleston, SC													
Charleston, SC	12	-	554	-	13	10	-	77	3	66	2	-	737
Mid-Atlantic Savannah, GA													
Savannah, GA	22	5	464	-	37	4	5	45	2	46	-	1	631
Southeastern US													
Brunswick, GA	7	-	6	-	3	1	-	70	-	-	-	-	87
Fernandina, FL	1	-	6	-	10	1	-	-	-	-	-	-	18
Jacksonville, FL	7	-	53	1	6	2	-	115	4	37	3	-	228
Port Canaveral, FL	3	-	3	-	7	5	-	8	1	1	1	-	29
All Port Regions	212	20	3,337	2	196	228	30	1,052	53	921	23	6	6,080

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-34 Alternatives 3 and 5: U.S. East Coast Restricted Vessel Arrivals that are part of Multi-Port String, by Port Area and Vessel Type, 2004

	Vessel Type												
Port Area	Bulk Carriers	Combination Carriers	Container ships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	9	-	-	-	4	-	-	-	-	-	-	-	13
Searsport, ME	-	-	-	-	1	35	-	-	1	41	3	-	81
Portland, ME	13	-	-	-	7	16	-	14	2	59	6	-	117
Portsmouth, NH	4	2	-	-	2	1	-	-	-	24	1	-	34
Northeastern US - Off Race Point													
Boston, MA	1	-	6	-	-	19	-	15	-	29	-	-	70
Salem, MA	6	-	-	-	-	5	-	-	-	-	-	-	11
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	11	-	-	-	5	-	-	16
Mid-Atlantic Block Island Sound													
New Bedford, MA	10	-	-	-	3	-	-	-	-	6	-	-	19
Providence, RI	8	-	-	-	1	22	-	27	-	19	1	-	78
New London, CT	1	-	3	-	3	1	-	-	2	3	-	-	13
New Haven, CT	2	-	3	-	2	-	-	-	45	36	-	-	88
Bridgeport, CT	4	-	-	-	-	-	7	-	43	17	-	-	71
Long Island, NY	-	-	-	-	-	-	-	-	29	52	-	-	81
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	14	5	1,003	-	20	40	8	264	1	189	2	1	1,547
Mid-Atlantic Delaware Bay													
Philadelphia, PA	13	1	113	2	27	10	7	51	-	99	5	-	328
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	15	-	216	-	24	18	2	281	-	60	4	1	621
Hampton Roads, VA	24	3	921	-	33	14	4	82	-	48	2	2	1,133
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	3	1	3	-	3	4	-	-	-	12	-	1	27
Mid-Atlantic Wilmington, NC													
Wilmington, NC	16	2	40	-	31	4	-	12	-	66	1	1	173
Mid-Atlantic Georgetown, SC													
Georgetown, SC	7	-	-	-	2	1	-	-	-	-	-	-	10
Mid-Atlantic Charleston, SC													
Charleston, SC	4	-	616	-	23	23	2	76	-	70	1	1	816
Mid-Atlantic Savannah, GA													
Savannah, GA	11	4	463	-	30	18	8	50	-	58	1	1	644
Southeastern US													
Brunswick, GA	6	-	6	-	11	4	-	80	-	-	-	-	107
Fernandina, FL	1	-	15	-	9	5	1	1	-	-	-	-	32
Jacksonville, FL	5	-	54	2	10	6	-	110	-	56	2	-	245
Port Canaveral, FL	2	-	5	-	7	9	-	9	-	4	1	-	37
All Port Regions	179	18	3,467	4	253	266	39	1,072	123	953	30	8	6,412

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

There are several reasons why the cumulative effect of multiple port calls at restricted ports could impact a vessel more than the sum of the individual direct impacts presented in the prior sections. First, the delays incurred from speed restrictions at one port when combined with speed restrictions at a subsequent port may diminish the ability of the vessel to maintain its schedule and could result in missed tidal windows. Second, even brief delays at arrival at the second port could result in increased costs for scheduled, but unused, port labor. Third, some shipping lines felt that the cumulative impact of three or four port calls at port areas with restrictions could cause them to rework vessel itineraries and could result in dropping of one of the port calls in order to maintain a weekly service without having to add an additional vessel to the service.

However, these cumulative factors will not affect every vessel making multiple port calls at restricted ports. Also the impact may vary from an 8-hour delay due to a missed tidal window to incurring charges for unused labor if a vessel is late arriving at the port.[56] It is realistic to assume that the shipping industry will revise their itineraries to account for the delays imposed by the speed restrictions and that occurrences of missed tidal widows will be rare. We have used an average additional delay of 36 minutes for each vessel arrival that is part of a multi-port string to account for this cumulative impact.[57] The economic value of this additional time has been calculated for each port area based on the June 2008 vessel operating costs by type and size of vessel. The results by port area and type of vessel at a restricted speed of 10 knots are presented in Table 4-35 for 2003 and Table 4-36 for 2004.[58]

The additional direct economic impact of multi-port strings on the shipping industry in 2003 is estimated at $11.3 million. The port area of New York/New Jersey has the largest additional economic impact at $2.9 million followed by Hampton Roads at $2.2 million, Charleston at $1.5 million, Savannah at $1.3 million and Baltimore at $0.9 million. Containerships accounted for 65 percent of the additional economic impact of multi-port strings in 2003.

The additional direct economic impact of multi-port strings in 2004 is estimated at $11.9 million. The ranking of the top six port areas in terms of largest impact remains unchanged from 2003.

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[56] While tides occur on 12-hour cycle, it is assumed that a tidal window is open for 2 hours before and after high tide. This results in an 8-hour waiting period between tidal windows.

[57] Only a small portion of vessel arrivals should be affected by this additional delay. It is assumed that 7.5 percent of vessels could be affected by as much as an additional 8-hour delay due to missing the tidal window. This results in an average additional delay per vessel of 36 minutes.

[58] The estimated impact at alternative restricted speeds of 12 and 14 knots are presented in Table 4-51. The impact at a restricted speed of 12 knots was assumed to be 17 percent lower than the estimate at 10 knots. The impact at a restricted speed of 14 knots was assumed to be 30 percent lower than the estimate at 10 knots. As explained above, it is realistic to assume that the shipping industry will revise their itineraries to account for the (known) delays due to the speed restriction in place. The additional impact for multi-port vessel calls applies more to unknown delays that may occur. At a restriction speed of 12 or 14 knots, the overall known delays are shorter, thereby creating less opportunity for the unknown delays to occur. This factor was judged to be proportionate to the change in the restricted speed.

Table 4-35. Alternatives 3 and 5: Additional Direct Economic Impact of Multi-Port Strings on Shipping Industry by Port Area and Vessel Type, 2003 ($000s)

	Vessel Type												
Port Area	Bulk Carriers	Combination Carriers	Container ships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	3.9	-	-	-	7.0	-	-	-	-	-	-	-	10.9
Searsport, ME	-	0.9	-	-	-	241.7	-	0.8	-	30.7	-	-	274.1
Portland, ME	4.5	-	-	-	4.9	53.0	-	14.3	-	62.0	1.3	-	140.0
Portsmouth, NH	1.5	0.9	-	-	-	4.6	-	-	-	32.8	1.3	-	41.2
Northeastern US - Off Race Point													
Boston, MA	0.8	-	46.5	-	0.6	176.6	-	16.7	-	47.3	-	-	288.5
Salem, MA	1.0	-	-	-	-	3.1	-	-	-	1.0	-	-	5.1
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	26.2	-	-	-	5.0	-	-	31.3
Mid-Atlantic Block Island Sound													
New Bedford, MA	6.1	-	-	-	2.5	-	-	-	-	5.6	-	-	14.2
Providence, RI	2.4	1.0	-	-	1.9	61.3	3.7	26.4	-	25.2	-	-	121.8
New London, CT	4.1	-	3.8	-	3.2	4.6	-	-	1.3	3.3	-	-	20.4
New Haven, CT	8.2	-	2.1	-	9.6	-	-	-	14.8	39.9	2.6	-	77.3
Bridgeport, CT	2.6	-	-	-	-	-	13.9	-	12.1	16.3	-	-	44.8
Long Island, NY	-	1.0	-	-	-	4.6	-	-	10.7	61.0	-	-	77.4
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	11.4	4.9	2,142.3	-	4.1	108.9	23.5	377.8	8.1	207.4	5.2	-	2,893.7
Mid-Atlantic Delaware Bay													
Philadelphia, PA	25.3	-	211.4	1.2	21.0	28.1	32.6	51.2	2.7	103.3	7.9	-	484.6
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	19.3	-	358.4	-	12.8	59.2	-	371.4	-	51.3	2.6	2.8	877.8
Hampton Roads, VA	21.8	2.1	1,956.4	-	23.0	37.6	-	157.4	-	41.5	-	2.8	2,242.6
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	2.1	-	8.8	-	4.5	-	-	1.6	-	6.0	-	0.7	23.7
Mid-Atlantic Wilmington, NC													
Wilmington, NC	15.6	3.7	86.7	-	30.9	-	1.7	12.4	8.3	54.9	1.3	-	215.7
Mid-Atlantic Georgetown, SC													
Georgetown, SC	3.2	-	1.3	-	5.9	-	-	-	-	-	-	-	10.4
Mid-Atlantic Charleston, SC													
Charleston, SC	9.6	-	1,289.7	-	19.9	43.1	-	100.2	4.2	68.7	2.6	-	1,538.0
Mid-Atlantic Savannah, GA													
Savannah, GA	17.6	4.5	1,105.0	-	53.1	15.4	29.1	64.2	2.7	47.8	-	0.7	1,340.1
Southeastern US													
Brunswick, GA	5.5	-	10.9	-	5.2	4.6	-	88.4	-	-	-	-	114.5
Fernandina, FL	0.9	-	5.8	-	16.3	4.6	-	-	-	-	-	-	27.6
Jacksonville, FL	5.4	-	100.1	1.2	9.6	9.3	-	127.2	5.6	36.8	3.9	-	299.0
Port Canaveral, FL	2.3	-	5.7	-	8.4	22.9	-	7.7	1.4	0.9	1.3	-	50.6
All Port Regions	175.0	19.2	7,334.6	2.4	244.3	909.5	104.5	1,417.6	72.0	948.7	30.2	7.0	11,265.1

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-36. Alternatives 3 and 5: Additional Direct Economic Impact of Multi-Port Strings on Shipping Industry by Port Area and Type of Vessel, 2004 ($000s)

	Vessel Type												
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	6.8	-	-	-	10.3	-	-	-	-	-	-	-	17.1
Searsport, ME	-	-	-	-	0.5	143.3	-	-	1.3	39.0	2.9	-	187.1
Portland, ME	10.0	-	-	-	10.9	79.4	-	10.5	2.6	56.5	5.3	-	175.3
Portsmouth, NH	3.3	1.7	-	-	2.8	4.6	-	-	-	21.6	0.8	-	34.8
Northeastern US - Off Race Point													
Boston, MA	0.7	-	13.9	-	-	58.9	-	11.3	-	25.9	-	-	110.7
Salem, MA	6.7	-	-	-	-	19.8	-	-	-	-	-	-	26.6
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	48.4	-	-	-	4.8	-	-	53.3
Mid-Atlantic Block Island Sound													
New Bedford, MA	11.3	-	-	-	1.9	-	-	-	-	5.1	-	-	18.2
Providence, RI	7.3	-	-	-	0.6	94.0	-	29.1	-	17.6	0.8	-	149.6
New London, CT	0.8	-	5.9	-	7.8	4.5	-	-	2.6	3.3	-	-	25.0
New Haven, CT	1.6	-	4.5	-	1.8	-	-	-	60.4	40.0	-	-	108.3
Bridgeport, CT	3.4	-	-	-	-	-	13.6	-	57.3	22.1	-	-	96.4
Long Island, NY	-	-	-	-	-	-	-	-	38.6	63.3	-	-	101.9
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	10.8	4.4	2,191.0	-	24.0	182.0	18.6	408.1	1.3	199.6	2.6	0.7	3,043.1
Mid-Atlantic Delaware Bay													
Philadelphia, PA	10.1	0.9	188.1	2.0	24.1	32.4	36.7	55.8	-	108.2	6.6	-	464.9
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	14.4	-	390.4	-	27.2	71.6	5.8	386.2	-	62.5	4.2	0.5	962.9
Hampton Roads, VA	22.4	2.6	1,985.6	-	33.5	60.7	11.6	163.3	-	46.2	2.6	1.2	2,329.7
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	2.8	0.8	5.7	-	3.9	18.6	-	-	-	10.9	-	0.7	43.4
Mid-Atlantic Wilmington, NC													
Wilmington, NC	13.3	1.8	79.8	-	50.3	17.0	-	23.9	-	66.3	1.3	0.7	254.4
Mid-Atlantic Georgetown, SC													
Georgetown, SC	5.6	-	-	-	2.3	4.6	-	-	-	-	-	-	12.6
Mid-Atlantic Charleston, SC													
Charleston, SC	3.1	-	1,371.1	-	31.7	90.6	5.8	98.5	-	69.8	0.8	0.7	1,672.0
Mid-Atlantic Savannah, GA													
Savannah, GA	8.9	3.6	1,116.0	-	54.5	77.3	40.7	72.4	-	58.1	1.3	0.7	1,433.4
Southeastern US													
Brunswick, GA	4.6	-	9.2	-	19.2	18.6	-	104.0	-	-	-	-	155.5
Fernandina, FL	0.8	-	14.4	-	17.7	23.2	2.0	2.8	-	-	-	-	61.0
Jacksonville, FL	3.9	-	95.0	2.0	10.8	26.3	-	122.8	-	56.0	2.6	-	319.4
Port Canaveral, FL	1.7	-	9.4	-	9.7	39.4	-	11.0	-	3.6	1.3	-	76.1
All Port Regions	154.4	15.8	7,480.1	4.0	345.5	1,115.2	134.8	1,499.8	164.3	980.4	33.1	5.1	11,932.6

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Alternative 6

Seasonal speed restrictions by port area under Alternative 6 were presented earlier in Figure 4-11. They include speed restrictions during March and April for most of the Northeastern U.S., except Cape Cod Bay (January 1 through May 15) and Great South Channel (April 1-July 31), as well as speed restriction from November 1 through April 30 for the mid-Atlantic region, and from November 15 through April 15 for the Southeastern U.S.

Table 4-37 presents vessel arrivals in 2003 for port areas with speed restrictions that are part of multi-port strings when at least two port areas in the string would contain speed restrictions. In 2003, there were 4,829 such total vessel arrivals with the 2,870 containerships arrivals accounting for 59 percent of the total multi-port vessel arrivals during speed restricted periods. Ro-ro cargo ships with 1,075 arrivals (22 percent) and tankers with 722 arrivals (15 percent) were the other vessel types with the most port calls as part of multi-port strings during restricted periods.

The total of 4,829 multi-port string restricted arrivals in 2003 represents roughly 41 percent of total U.S. East Coast Alternative 6 restricted vessel arrivals (see Table 4-21). For containerships, the multi-port string restricted arrivals represents 69 percent of the total containership restricted period arrivals. For ro-ro cargo ships the multi-port string restricted arrivals represents 73 percent of those vessels total restricted arrivals in 2003.

The port area of New York/New Jersey had the most multi-port string restricted arrivals with 1,236 arrivals in 2003. The port area of Hampton Roads was second with 912 arrivals followed by the port areas of Charleston (620 arrivals), Savannah (523 arrivals), Baltimore (481 arrivals) and Philadelphia (289 arrivals).

Table 4-38 presents similar information for 2004. The total number of multi-port string restricted arrivals increased by 6.6 percent to 5,147 arrivals. The ranking by type of vessel remained unchanged from 2003 with the exception of general cargo vessels moving ahead of bulk carriers for fourth place. In terms of vessel arrivals by port area, the rankings for the top 8 port areas remained unchanged from 2003.

The additional direct economic impact of multi-port strings on the shipping industry in 2003 is estimated at $8.7 million (Table 4-39). The port area of New York/New Jersey has the largest additional economic impact at $2.4 million followed by Hampton Roads at $1.9 million, Charleston at $1.3 million, Savannah at $1.1 million and Baltimore at $0.7 million. Containerships accounted for 71 percent of the additional economic impact of multi-port strings in 2003.

The additional direct economic impact of multi-port strings in 2004 is estimated at $9.4 million (Table 4-40). The ranking of the top six port areas in terms of largest impact remains unchanged from 2003.

Table 4-37. Alternative 6: U.S. East Coast Restricted Vessel Arrivals that are part of Multi-Port String, by Port Area and Vessel Type, 2003

	Vessel Type												
Port Area	Bulk Carriers	Combination Carriers	Containerships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	1	-	-	-	-	-	-	-	-	-	-	-	1
Searsport, ME	-	-	-	-	-	-	-	-	-	9	-	-	9
Portland, ME	1	-	-	-	-	-	-	5	-	20	-	-	26
Portsmouth, NH	-	-	-	-	-	-	-	-	-	15	-	-	15
Northeastern US - Off Race Point													
Boston, MA	1	-	9	-	1	-	-	7	-	26	-	-	44
Salem, MA	1	-	-	-	-	-	-	-	-	-	-	-	1
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	-	-	-	-	4	-	-	4
Mid-Atlantic Block Island Sound													
New Bedford, MA	3	-	-	-	4	-	-	-	-	5	-	-	12
Providence, RI	3	1	-	-	3	-	2	20	-	17	-	-	46
New London, CT	3	-	2	-	2	1	-	-	1	2	-	-	11
New Haven, CT	7	-	1	-	5	-	-	-	11	30	1	-	55
Bridgeport, CT	2	-	-	-	-	-	6	-	9	10	-	-	27
Long Island, NY	-	1	-	-	-	1	-	-	8	42	-	-	52
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	11	5	814	-	5	1	7	226	6	159	2	-	1,236
Mid-Atlantic Delaware Bay													
Philadelphia, PA	25	-	103	1	19	1	7	40	2	86	5	-	289
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	17	-	164	-	14	4	-	236	-	44	1	1	481
Hampton Roads, VA	18	2	764	-	22	1	-	69	-	35	-	1	912
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	2	-	3	-	3	-	-	1	-	4	-	1	14
Mid-Atlantic Wilmington, NC													
Wilmington, NC	18	4	33	-	12	-	1	5	6	46	1	-	126
Mid-Atlantic Georgetown, SC													
Georgetown, SC	4	-	1	-	2	-	-	-	-	-	-	-	7
Mid-Atlantic Charleston, SC													
Charleston, SC	10	-	459	-	10	4	-	75	3	57	2	-	620
Mid-Atlantic Savannah, GA													
Savannah, GA	16	5	387	-	29	2	5	37	2	39	-	1	523
Southeastern US													
Brunswick, GA	7	-	6	-	3	1	-	70	-	-	-	-	87
Fernandina, FL	1	-	6	-	10	1	-	-	-	-	-	-	18
Jacksonville, FL	5	-	53	1	6	-	-	107	3	36	2	-	213
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	0
All Port Regions	169	18	2,870	3	169	19	28	1,075	54	722	16	4	4,829

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-38. Alternative 6: U.S. East Coast Restricted Vessel Arrivals that are part of Multi-Port String, by Port Area and Vessel Type, 2004

	Vessel Type												
Port Area	Bulk Carriers	Combination Carriers	Container ships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	3	-	-	-	-	-	-	-	-	-	-	-	3
Searsport, ME	-	-	-	-	-	-	-	-	1	10	-	-	11
Portland, ME	3	-	-	-	1	-	-	5	2	19	-	-	30
Portsmouth, NH	-	1	-	-	-	-	-	-	-	6	-	-	7
Northeastern US - Off Race Point													
Boston, MA	-	-	3	-	-	-	-	5	-	11	-	-	19
Salem, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	1	-	-	-	3	-	-	4
Mid-Atlantic Block Island Sound													
New Bedford, MA	8	-	-	-	2	-	-	-	-	5	-	-	15
Providence, RI	5	-	-	-	-	5	-	22	-	15	-	-	47
New London, CT	1	-	3	-	3	-	-	-	2	3	-	-	12
New Haven, CT	2	-	3	-	2	-	-	-	39	33	-	-	79
Bridgeport, CT	3	-	-	-	-	-	6	-	42	12	-	-	63
Long Island, NY	-	-	-	-	-	-	-	-	24	46	-	-	70
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	9	4	843	-	16	5	7	224	1	151	2	-	1,262
Mid-Atlantic Delaware Bay													
Philadelphia, PA	8	1	100	2	22	4	7	41	-	88	5	-	278
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	10	-	182	-	23	6	2	240	-	49	2	-	514
Hampton Roads, VA	19	3	779	-	28	8	4	69	-	40	2	-	952
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	3	1	3	-	3	4	-	-	-	10	-	-	24
Mid-Atlantic Wilmington, NC													
Wilmington, NC	13	2	33	-	23	3	-	10	-	58	1	-	143
Mid-Atlantic Georgetown, SC													
Georgetown, SC	6	-	-	-	2	1	-	-	-	-	-	-	9
Mid-Atlantic Charleston, SC													
Charleston, SC	4	-	519	-	20	14	2	69	-	60	-	1	689
Mid-Atlantic Savannah, GA													
Savannah, GA	8	4	390	-	23	15	8	42	-	52	1	1	544
Southeastern US													
Brunswick, GA	6	-	6	-	11	4	-	80	-	-	-	-	107
Fernandina, FL	-	-	15	-	9	5	1	1	-	-	-	-	31
Jacksonville, FL	5	-	54	2	10	6	-	103	-	53	1	-	234
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	-
All Port Regions	127	16	3,008	6	228	96	38	1,095	111	777	15	2	5,147

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-39. Alternative 6: Additional Direct Economic Impact on Shipping Industry by Port Area and Vessel Type, 2003 ($000s)

Port Area	Vessel Type												
	Bulk Carriers	Combination Carriers	Container ships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	0.7	-	-	-	-	-	-	-	-	-	-	-	0.7
Searsport, ME	-	-	-	-	-	-	-	-	-	8.9	-	-	8.9
Portland, ME	0.7	-	-	-	-	-	-	3.8	-	19.9	-	-	24.4
Portsmouth, NH	-	-	-	-	-	-	-	-	-	13.8	-	-	13.8
Northeastern US - Off Race Point													
Boston, MA	0.8	-	19.1	-	0.6	-	-	5.5	-	24.2	-	-	50.2
Salem, MA	1.0	-	-	-	-	-	-	-	-	-	-	-	1.0
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	-	-	-	-	4.0	-	-	4.0
Mid-Atlantic Block Island Sound													
New Bedford, MA	3.7	-	-	-	2.5	-	-	-	-	4.7	-	-	10.9
Providence, RI	2.4	1.0	-	-	1.9	-	3.7	21.3	-	17.7	-	-	48.0
New London, CT	2.4	-	3.8	-	3.2	4.6	-	-	1.3	2.3	-	-	17.7
New Haven, CT	5.8	-	2.1	-	7.1	-	-	-	14.8	33.0	1.3	-	64.1
Bridgeport, CT	1.7	-	-	-	-	-	11.9	-	12.1	13.1	-	-	38.8
Long Island, NY	-	1.0	-	-	-	4.6	-	-	10.7	49.7	-	-	66.1
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	8.9	4.9	1,813.1	-	4.1	4.5	21.5	317.1	8.1	168.7	2.6	-	2,353.7
Mid-Atlantic Delaware Bay													
Philadelphia, PA	20.0	-	177.8	1.2	18.6	4.5	32.6	42.5	2.7	87.8	6.6	-	394.4
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	13.7	-	305.4	-	12.8	18.1	-	321.4	-	41.7	1.3	1.4	715.8
Hampton Roads, VA	16.1	2.1	1,667.9	-	20.4	4.5	-	131.9	-	34.2	-	1.4	1,878.5
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	2.1	-	5.1	-	3.6	-	-	1.6	-	4.2	-	0.7	17.2
Mid-Atlantic Wilmington, NC													
Wilmington, NC	14.9	3.7	69.9	-	20.5	-	1.7	10.4	8.3	45.6	1.3	-	176.4
Mid-Atlantic Georgetown, SC													
Georgetown, SC	3.2	-	1.3	-	4.2	-	-	-	-	-	-	-	8.7
Mid-Atlantic Charleston, SC													
Charleston, SC	8.0	-	1,080.0	-	15.0	16.7	-	97.5	4.2	59.2	2.6	-	1,283.2
Mid-Atlantic Savannah, GA													
Savannah, GA	12.8	4.5	930.8	-	41.2	7.7	29.1	52.7	2.7	40.9	-	0.7	1,123.2
Southeastern US													
Brunswick, GA	5.5	-	10.9	-	5.2	4.6	-	88.4	-	-	-	-	114.5
Fernandina, FL	0.9	-	5.8	-	16.3	4.6	-	-	-	-	-	-	27.6
Jacksonville, FL	3.9	-	100.1	1.2	9.6	-	-	119.4	4.2	35.8	2.6	-	276.8
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	-
All Port Regions	129.1	17.4	6,193.0	2.4	186.9	74.7	100.6	1,213.3	69.2	709.5	18.4	4.2	8,718.7

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Table 4-40. Alternative 6: Additional Direct Economic Impact on Shipping Industry by Port Area and Vessel Type, 2004 ($000s)

	Vessel Type												
Port Area	Bulk Carriers	Combination Carriers	Container ships	Freight Barges	General Cargo Vessels	Passenger Vessels a/	Refrigerated Cargo Vessels	Ro-Ro Cargo Ship	Tank Barges	Tankers	Towing Vessels	Other b/	Total
Northeastern US - Gulf of Maine													
Eastport, ME	2.2	-	-	-	-	-	-	-	-	-	-	-	2.2
Searsport, ME	-	-	-	-	-	-	-	-	1.3	9.1	-	-	10.5
Portland, ME	2.2	-	-	-	0.6	-	-	3.8	2.6	19.1	-	-	28.3
Portsmouth, NH	-	0.9	-	-	-	-	-	-	-	5.4	-	-	6.2
Northeastern US - Off Race Point													
Boston, MA	-	-	6.9	-	-	-	-	3.8	-	10.0	-	-	20.6
Salem, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Cape Cod Bay													
Cape Cod, MA	-	-	-	-	-	4.5	-	-	-	2.8	-	-	7.4
Mid-Atlantic Block Island Sound													
New Bedford, MA	9.1	-	-	-	1.3	-	-	-	-	4.2	-	-	14.6
Providence, RI	4.4	-	-	-	-	19.8	-	24.0	-	13.9	-	-	62.2
New London, CT	0.8	-	5.9	-	7.8	-	-	-	2.6	3.3	-	-	20.4
New Haven, CT	1.6	-	4.5	-	1.8	-	-	-	52.5	37.3	-	-	97.7
Bridgeport, CT	2.4	-	-	-	-	-	11.6	-	56.0	15.6	-	-	85.6
Long Island, NY	-	-	-	-	-	-	-	-	32.0	56.5	-	-	88.6
Mid-Atlantic Ports of New York/New Jersey													
New York City, NY	7.0	3.5	1,843.2	-	18.1	19.8	16.6	343.3	1.3	162.1	2.6	-	2,417.5
Mid-Atlantic Delaware Bay													
Philadelphia, PA	6.2	0.9	165.4	2.0	19.3	13.8	36.7	45.4	-	96.7	6.6	-	392.8
Mid-Atlantic Chesapeake Bay													
Baltimore, MD	9.6	-	330.6	-	26.6	25.8	5.8	326.9	-	50.6	2.6	-	778.4
Hampton Roads, VA	18.3	2.6	1,686.8	-	26.7	33.6	11.6	137.6	-	38.2	2.6	-	1,958.1
Mid-Atlantic Morehead City and Beaufort, NC													
Morehead City, NC	2.8	0.8	5.7	-	3.9	18.6	-	-	-	9.1	-	-	40.9
Mid-Atlantic Wilmington, NC													
Wilmington, NC	10.8	1.8	66.3	-	41.0	13.9	-	19.7	-	58.9	1.3	-	213.8
Mid-Atlantic Georgetown, SC													
Georgetown, SC	4.8	-	-	-	2.3	4.6	-	-	-	-	-	-	11.8
Mid-Atlantic Charleston, SC													
Charleston, SC	3.1	-	1,165.4	-	28.7	61.2	5.8	90.4	-	59.8	-	0.7	1,415.0
Mid-Atlantic Savannah, GA													
Savannah, GA	6.4	3.6	936.7	-	43.7	68.0	40.7	61.6	-	51.9	1.3	0.7	1,214.8
Southeastern US													
Brunswick, GA	4.6	-	9.2	-	19.2	18.6	-	104.0	-	-	-	-	155.5
Fernandina, FL	-	-	14.4	-	17.7	23.2	2.0	2.8	-	-	-	-	60.1
Jacksonville, FL	3.9	-	95.0	2.0	10.8	26.3	-	116.0	-	53.2	1.3	-	308.5
Port Canaveral, FL	-	-	-	-	-	-	-	-	-	-	-	-	-
All Port Regions	100.3	14.1	6,335.9	4.0	269.4	351.7	130.8	1,279.3	148.4	757.9	18.4	1.4	9,411.5

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

RE-ROUTING OF SOUTHBOUND COASTWISE SHIPPING

Coastwise shipping or cabotage trade along the U.S. East Coast has always been an important segment of our nation's maritime heritage. In recent years, attention has been focused on the further development of coastwise shipping (also referred to as short-sea shipping) as a means of reducing highway congestion on the Eastern Seaboard. Benefits of coastwise shipping also include lowering transport and environmental costs and reducing our demand for imported fuel. For these reasons, it is important that the speed restrictions not unduly affect the development of increased coastwise shipping.

However, for commercial and navigation purposes, it appears unlikely that the speed restriction would significantly affect coastwise shipping. Northbound vessels prefer to use Gulf Stream further offshore and benefit from the enhanced operating speed and fuel efficiency. Southbound traffic routes closer to the U.S. East Coast; generally within 7-10 nautical miles of the shoreline. However, during the proposed seasonal management periods, masters of southbound vessels would likely route outside of seasonal speed restricted areas incurring an overall increase in distance. This affects southbound vessels between the entrance to the Chesapeake Bay and Port Canaveral.

For Alternative 3 the proposed speed restrictions would be in effect for a distance of 25 nautical miles from the entire mid-Atlantic coastline. Containerships and ro-ro cargo ships are the vessel types that would be most affected by speed restrictions at intermediate seasonal speed restricted areas.[59] In 2003, there were 4,142 restricted period arrivals at U.S east coast port areas from Baltimore through Port Canaveral of containership and ro-ro cargo ships providing coastal liner service in international trade and cabotage routes. Assuming half of these calls were in the southbound direction and that the typical vessel made calls at three U.S. East Coast ports per service, there would be about 690 southbound vessels that would need to route outside of the seasonal speed restricted areas. Based on an increase in routing of 108 nautical miles[60] and an average operating speed of 20 knots, the containership would have increased sailing time of 5.4 hours. Using an approximate average hourly operating cost at sea of $2,000, the estimated economic impact for each southbound vessel would be $10,800. For 2003, the additional economic impact for containerships for coastwise shipping under Alternative 3 is estimated at $7.5 million. In 2004, the same assumptions result in an estimated economic impact of $7.6 million.[61]

For Alternative 6, the proposed speed restrictions in the mid-Atlantic region would be implemented for a radius of 20 nautical mile buffer around each port area for port areas north of Wilmington, NC.[62] A

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[59] Again this analysis pertains equally to Alternative 5.

[60] The vessels are assumed to sail at a distance of 25 nautical miles offshore instead of 8 nautical miles. Based on a diagonal routing to the pilot's buoy, the 25 nautical miles becomes and effective 37 nautical miles. However, the diagonal access for a routing 8 nautical miles off-shore is 10 nautical miles. The difference of 27 nautical miles is thus the additional distance incurred resulting from having to sail further offshore per arrival and departure at the intermediate port calls.

[61] Comments on the DEIS stated that restrictions are proposed during the winter months when speed and schedules are already adversely affected by the weather and hence the economic impact will be greater. To the degree that vessels are operating at slower speeds during the winter months when speed restrictions are proposed, this would result in a lower estimate of economic impact of the proposed speed restriction.

[62] The exception is the Block Island Sound speed restriction area that is configured as a rectangle with a width of 30 nautical miles.

continuous 20-mile buffer will be implemented from Wilmington, NC through Savannah to the northern boundary of the Southeastern SMA. The additional distance incurred by southbound vessels would be 56 nautical miles.[63] In 2003, there were 3,688 containership and ro-ro cargo ship restricted period arrivals at U.S east coast port areas from Baltimore thorough Port Canaveral. Assuming half of these calls were in the southbound direction and that the typical vessel made calls at three U.S. East Coast ports per service, there would be about 615 southbound vessels that would need to route outside of the seasonal speed restricted areas. Based on an increase in routing of 56 nautical miles and an average operating speed of 20 knots, the containership would have increased sailing time of 2.8 hours. Using an average hourly operating cost at sea of $2,000, the estimated economic impact for each southbound vessel would be $5,600. For 2003 and 2004, the additional economic impact for containerships for coastwise shipping under Alternative 6 is estimated at $3.4 million.

DIRECT ECONOMIC IMPACT ON SHIPPING INDUSTRY RELATIVE TO VALUE OF U.S. EAST COAST TRADE AND OCEAN FREIGHT COSTS

In Chapter 2, we presented data collected by the U.S. Census Bureau on volume and value of goods carried by vessels calling at U.S. East Coast ports. We also presented information on vessel import charges that represent the aggregate cost of all freight, insurance and other charges (excluding U.S. import duties) incurred in bringing the merchandise from alongside the carrier at the port of exportation and placing it alongside the carrier at the first port of entry. In this section we will compare the estimates of the direct economic impact on the shipping industry to these indicators of the economic significance of U.S. East Coast maritime activity.

Table 4-41 presents for each port area, the significance of the estimated economic impact of the operational measures relative to the value of U.S. East Coast trade in 2003 and 2004. This comparison is useful to determine whether increased shipping costs associated with the proposed operational measures would significantly affect the price and volume of traded goods via U.S. East Coast ports. The direct economic impact on the shipping industry for each alternative is based on the base case analyses presented in this chapter including a speed restriction of 10 knots. The value of trade merchandise is the same as reported in Chapter 2 for U.S. East Coast imports and exports by Customs District and Port. In 2003, the total annual direct economic impact on the shipping industry is of Alternative 5 is $155.8 million while the value of U.S. East Coast trade is $298.7 billion. Thus the direct economic impact represents five hundredths of one percent of the value of traded merchandise in 2003. For other alternatives the direct economic impact is even smaller. These results indicate that

[63] Vessels calling at port areas with circular buffers will have to travel 20 nautical miles for a diagonal access to the port as compared to a normal distance of 10 nautical miles for the diagonal access. The extra distance of 10 nautical miles applies to each arrival and departure for a total additional distance of 20 nautical miles. Vessels calling at port areas with a continuous buffer from the shoreline are assumed to have an additional distance of 18 nautical miles each way for a total of 36 nautical miles for an arrival and departure as described under Alternative 3. As there are an average of three port calls and hence two intermediate port calls per service, we have assumed one intermediate call per string at a port area with a circular buffer in the northern portion of the MAUS (for example at Hampton Roads) and one intermediate call per string at a southern port area with a continuous buffer (for example at Savannah) for a total additional distance of 56 nautical miles.

implementation of the proposed operational measures will not have any measurable impact on the volume of merchandise traded through U.S. East Coast ports.

To measure the significance of the operational measures on the shipping industry, it is interesting to compare the estimated direct economic impact with ocean freight costs associated with U.S. East Coast trade. Ocean freight costs are considered as a conservative proxy for shipping industry revenues. In Chapter 2 we determined that ocean freight charges averaged 5.3 percent of the value of imports. Given the composition of our trade, it is reasonable to assume that ocean freight charges would represent no less than the same percentage of the value of our exports. Based on these factors, we estimate that the direct economic impact on the shipping industry for Alternative 5 represents less than one percent of the ocean freight costs for U.S. East Coast trade. For other alternatives the relative economic impact is even smaller. For Alternative 6, the direct economic impact represents only four tenths of one percent of the ocean freight costs. These results indicate that the implementation of the proposed operational measures would have a minimal impact on the financial revenues and hence the financial performance of the vessel operators calling at U.S. East Coast ports.

Table 4-41. Economic Impact as a Percent of Value of U.S. East Coast Maritime Trade and Ocean Freight Costs, 2003 and 2004 ($ millions unless otherwise specified)

	Alternative				
Item	2	3	4	5	6
2003					
Direct economic impact	25.0	133.0	2.3	137.0	53.2
Additonal direct economic impact due to cumulative effect of mulit-port strings	-	11.3	-	11.3	8.7
Direct economic impact of re-routing of southbound coastwise shipping	-	7.5	-	7.5	3.4
Total direct economic impact on shipping industry	25.0	151.8	2.3	155.8	65.3
Trade Merchandise Value	298,741	298,741	298,741	298,741	298,741
Total direct economic impact as a percent of trade value (%)	0.008%	0.051%	0.001%	0.052%	0.022%
Ocean Freight Costs	15,833	15,833	15,833	15,833	15,833
Total direct economic impact as a percent of ocean freight cost (%)	0.158%	0.959%	0.015%	0.984%	0.412%
2004					
Direct economic impact	27.6	142.5	2.8	147.2	57.6
Additonal direct economic impact due to cumulative effect of mulit-port strings	-	11.9	-	11.9	9.4
Direct economic impact of re-routing of southbound coastwise shipping	-	7.6	-	7.6	3.4
Total direct economic impact on shipping industry	27.6	162.0	2.8	166.7	70.4
Trade Merchandise Value	325,051	325,051	325,051	325,051	325,051
Total direct economic impact as a percent of trade value (%)	0.008%	0.050%	0.001%	0.051%	0.022%
Ocean Freight Costs	17,228	17,228	17,228	17,228	17,228
Total direct economic impact as a percent of ocean freight cost (%)	0.160%	0.940%	0.016%	0.968%	0.409%

Source: Prepared by Nathan Associates from U.S Census Bureau Foreign Trade Statistics for 2003 and 2004 and analysis of U.S. Coast Guard data on vessel calls at U.S. ports as described in text.

Estimated Indirect Economic Impact

Depending on the nature and significance of the direct economic impact, it is possible that implementation of the proposed operational measures could have indirect economic impacts. Potential indirect economic impacts were raised by port authorities, shipping industry representatives, and community leaders during the public stakeholder meetings. Potential indirect economic impacts include:

- Increased intermodal costs due to missed rail and truck connections
- Diversion of traffic to other ports
- Impact on local economies of decreased income from jobs lost to due traffic diversions

It is important to note that the timing and duration of the proposed seasonal speed restrictions will be well-known and that vessel itineraries will be developed taking them into account. Hence except for DMAs, unexpected disruptions to the manufacturing and transport logistics systems should not occur as a result of the proposed seasonal speed restrictions.

There are many factors that influence a shipping line's decision to call at specific ports. These include the adequacy and suitability of port facilities and equipment, the ability of the terminal operator to quickly turnaround the vessel, overall cargo demand, efficiency of intermodal transportation, port charges, and the port location relative to other ports and cargo markets. At the stakeholders meeting in Boston, there was particular concern raised over the possibility of traffic diverting to other ports such as Halifax.

In the prior sections, we have estimated the cost of the increased vessel time due to delays caused by the operational measures. If cargo is to divert to other ports this would be because the total additional costs associated with those routes are less than the cost of vessel time due to delays at the current port. Hence it would be double-counting to also include any additional overland transport costs to the estimated impact already presented.

As described earlier in this Chapter, under Alternative 3 there would be year-round speed restrictions established for a large area eastward of Massachusetts Bay which would extend through the Great South Channel critical habitat area. This speed restricted area would significantly affect vessel traffic in the Northeast region and port areas from Hampton Roads northward in the mid-Atlantic region. As shown in Table 4-13, the average minutes of delay for a containership in Boston would be 149 minutes per arrival and another 149 minutes per departure. A permanent delay of nearly 5 hours per call year-round would be sufficient for shippers and vessel operators to look at alternative ports such as Halifax that would not be affected by the proposed regulations.

A good portion of a port's traffic is often considered captive to that port. For cargoes that are destined for the port's immediate hinterland, it does not make economic sense to call at a distant port and then to ship back to the port via expensive land transport. However, most ports also accommodate traffic that is not destined for its

immediate hinterland but is through traffic that may have economically attractive routing alternatives. Port areas in the Northeast and northern parts of the mid-Atlantic region serves as gateways to the inland population centers and industrial areas such as western New York, western Pennsylvania, Ohio, Indiana, Illinois and Michigan. These areas may be served via the Canadian ports of Halifax and Montreal without incurring delays caused by the right whale ship strike reduction measures.[64] These Canadian ports currently compete with Northeast U.S. ports for cargo destined for the mid-eastern U.S. and the speed restrictions implemented in the U.S. and not in Canada could shift the current competitive balance to the advantage of Canadian ports.

For Alternative 3, we have assumed that with a speed restriction of 10 knots, 25 percent of the containership and ro-ro cargo ship calls at Northeast ports would divert to Canadian ports.[65] This rate of diversion is considered as a mid-point of a range of possible diversion rates from a high of 35 percent to a low of 15 percent. This relatively high rate of diversion is due to the permanent, year-round speed restrictions that will be in effect under Alternative 3 and considering the portion of cargo at Northeast ports that is destined for inland areas that could realistically be served via Canadian ports.

Port areas in the Block Island are assumed to lose 15 percent of their vessel calls during restricted periods. More of the cargo at these smaller ports is for the local market and they are not considered as gateway ports to further inland areas. The port areas of New York/ New Jersey, Philadelphia, Baltimore and Hampton roads are assumed to lose 3 percent of their containership and ro-ro cargo ship vessel calls during restricted periods. The diversion rate for these port areas is lower for several reasons. First, the speed restrictions will not be in effect year-round in the MAUS; second, due to the size of the local market, most vessels must call at the port area of New York/ New Jersey; and third, due to the distances involved, the Canadian ports are a less viable alternative for most of the cargo handled at MAUS ports.

We have also assumed that a 10-knot speed restriction under Alternative 3 would lead to the diversion of 5 percent of the containership and ro-ro cargo ship calls from the port areas of Savannah during restricted periods. The speed restrictions will be in effect in Savannah for 212 days as compared to 151 days for the nearby Southeastern port areas of Brunswick, Fernandina and Jacksonville. As Jacksonville is by far the largest and more important of these three alternative ports, we have assumed that 50 percent of the diverted Savannah calls would be handled at Jacksonville. Brunswick and Fernandina which are smaller ports but closer to the Savannah hinterland, are assumed to each capture 25 percent of the diverted calls from Savannah.

On the other hand, we have assumed that 15 percent of the restricted period cruise vessel calls at Jacksonville would divert to the nearby port area of Port Canaveral under Alternative 3. The effective distance of speed restriction in Port Canaveral is only 4.5 nautical miles compared to the 30.9 nautical miles at Jacksonville.

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[64] Comments on the DEIS suggested that vessels may divert to other U.S. ports in addition to those diverting to Canada. While this is possible, for the total economic impact analysis only diversions to non-U.S. ports are included. For diversion to ports within the U.S. the negative economic impact for one U.S. port are offset by gains in another U.S. port.

[65] Other types of vessels are less likely to divert as their cargo are more likely to be for the port's immediate hinterland.

Table 4-42 presents the assumed diversion rates for Alternative 3 with restricted speeds of 10, 12 knots and 14 knots.

Table 4-42. Percent of Restricted Period Vessel Calls Assumed to be Diverted by Alternative and Port Area, 2003 and 2004

	Alternative 3			Alternative 4			Alternative 5			Alternative 6		
	Restricted speed in knots			Restricted speed in knots			Restricted speed in knots			Restricted speed in knots		
Port Area	10	12	14	10	12	14	10	12	14	10	12	14
Northeastern US	25.0%	20.0%	15.0%	-	-	-	27.0%	22.0%	17.0%	15.0%	10.0%	7.0%
Mid-Atlantic Block Island Sound	15.0%	10.0%	5.0%	-	-	-	16.0%	11.0%	6.0%	3.0%	2.0%	1.0%
Selected Mid-Atlantic Ports a/	3.0%	1.5%	0.5%	-	-	-	3.5%	1.7%	0.7%	1.5%	0.5%	0.1%
Savannah, GA	5.0%	3.0%	1.0%	-	-	-	-	-	-	-	-	-
Brunswick, GA	-	-	-	5.0%	3.0%	1.5%	-	-	-	3.0%	2.0%	1.0%
Fernandina, FL	-	-	-	5.0%	3.0%	1.5%	-	-	-	3.0%	2.0%	1.0%
Jacksonville, FL	15.0%	10.0%	5.0%	15.0%	10.0%	5.0%	40.0%	30.0%	20.0%	40.0%	30.0%	20.0%

a/ Includes port areas of New York/New Jersey, Philadelphia, Baltimore and Hampton Roads.

Source: Prepared by Nathan Associates as described in text.

Under Alternative 4, the port areas of Brunswick and Fernandina will have modest delays due to the increased distance associated with the use of recommended routes. Because of these delays, it is assumed that 5 percent of the containership and ro-ro cargo ship calls at these two port areas would divert to the port area of Savannah that has no operational measures proposed. The reason for the relatively small rate of diversion are is that much of the cargo handled at these two ports is considered for the local market and not easily diverted to other ports. Under Alternative 4, cruise vessels are assumed to divert again to Port Canaveral where no operational measures have been proposed.

Under Alternative 5, the rates of diversion for the affected port areas in the Northeast and mid-Atlantic regions are similar to Alternative 3, except that the additional impact of DMAs and use of recommended routes are assumed to increase the rate of diversion slightly. The port area of Savannah is assumed not to incur any diversions under Alternative 5 as the delays associated with the increased recommended routes for the Southeast port areas are offset by the longer duration of speed restrictions at Savannah. The port area of Jacksonville is doubly disadvantaged under Alternative 5 relative to Port Canaveral. First, Jacksonville is subject to the increased distance associated with the use of recommended routes, and second the speed restrictions are in effect for 30.9 nautical miles as compared to the 4.5 nautical miles at Port Canaveral. For these reasons we have assumed that as much as 40 percent of the restricted period cruise vessel calls will divert from Jacksonville to Port Canaveral.

Under Alternative 6, the effective speed restrictions for the large area in the Northeast will be implemented during April.[66] Hence, shipping lines will not be as likely to alter their regular service pattern for delays that are only incurred for one month per year. Thus while under Alternative 3 we had assumed a diversion rate of

[66] Speed restrictions will be in effect for other months in the Northeast region but not the large combined area encompassing Massachusetts Bay and the Great South Channel critical habitat area.

25 percent, for Alternative 6 we assume a lower diversion rate of 15 percent for containerships and ro-ro cargo ships during the restricted period.[67] For the port areas in Block Island Sound, we have assumed a diversion rate of only 3 percent for containerships and ro-ro cargo ships due to the limited duration of the large speed restriction area. For the affected mid-Atlantic ports, we have assumed a diversion of 1.5 percent of restricted period containership and ro-ro cargo ship vessel calls.

An additional diversion was assumed to occur under Alternative 6 for the port area of Providence. This port area has speed restrictions in effect for 181 days as compared to 61 days for the port area of Boston. Hence we have assumed that 20 percent of the containership and ro-ro cargo ship restricted period calls at Providence would divert to the nearby port area of Boston.

The Southeastern region ports of Brunswick and Fernandina are assumed to have 3 percent of their restricted period arrivals of containerships and ro-ro cargo ships diverted to Savannah as the effect of the use of recommended routes creates additional delays relative to Savannah. Finally, 40 percent of the restricted period cruise vessel calls at Jacksonville are assumed to divert to Port Canaveral as that port is not affected by speed restrictions or the use of recommended routes.

The Maritime Administration (MARAD), an agency of the U.S. Department of Transportation has developed a Port Economic Impact Kit that allows users to assess the economic impact of port activity on a region's economy. The MARAD Port Economic Impact Kit uses an adaptation of input-output analysis that is a widely established tool for undertaking economic impact assessments. The model calculates the total economic impacts or multiplier effect of deep-draft port industry and includes an indirect effect that reflects expenditures made by the supplying firms to meet the requirements of the deep-draft port industry as well as expenditures by firms stocking the supplying firms.

The model also includes an induced effect that corresponds to the change in consumer spending that is generated by changes in labor income accruing to the workers in the deep-draft port industry as well as employment in the supplying businesses.

The MARAD Port Economic Impact Kit was applied in two recent studies of the economic implications of port calls in Boston.[68] These studies estimate that an average containership port call in Boston results in a positive economic impact for the region of approximately $900 thousand. We have used this estimate for the port area of Boston and other major ports and to estimate the impact of port calls diverted to Canadian ports.[69] For other

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[67] For Alternative 6, speed restrictions are only in place for the months of March and April thus the 15 percent diversion only applies to vessel calls during those months.

[68] Haute Kite-Powell, Economic Implications of Possible Reductions in Boston Port Calls due to Ship Strike Management Measures, a report produced for NOAA National Marines Fisheries and MASSPORT, March 2005.; and Leigh Fisher Associates, Economic Impact Study of Massachusetts Port Authority and Port of Boston facilities, prepared for MASSPORT and the Greater Boston Chamber of Commerce, Draft Technical Report June 30, 2005.Draft

[69] For purposes of this section, other major port areas are New York/New Jersey, Philadelphia, Baltimore, Hampton Roads, Charleston, Savannah, Jacksonville and Port Canaveral.

port areas such as Portland and Providence that would generally have smaller vessels calling at the port, we have used an estimate of $500 thousand of total economic impact per port call.[70]

The indirect economic impact of port diversions in 2003 by alternative, port area and restricted speed is presented in Table 4-43. There are no significant indirect economic impacts associated with the use of DMAs in Alternative 2. For Alternative 3, the net indirect economic impact is estimated at a total of $141.1 million in 2003 at a speed restriction of 10 knots. The port areas of New York/New Jersey ($48.2 million), Savannah ($38.8 million), Boston ($24.8 million) and Hampton Roads ($29.6 million) have the largest indirect economic impacts. Note that the port areas of Jacksonville, Brunswick, Fernandina, and Port Canaveral show a positive net economic impact (in parentheses) as they gain vessel calls diverted from Savannah.

From the perspective of the national economy, there are no net indirect economic impacts under Alternative 4. The diverted vessel calls at the southeastern port areas of Brunswick, Fernandina and Jacksonville are offset by the gains in vessels calling at the port areas of Savannah and Port Canaveral.

For Alternative 5, the net indirect economic impact at a restricted speed of 10 knots is estimated at $162.5 million based on 2003 vessel traffic data. This estimated impact is about 15 percent higher than the estimated impact under Alternative 3. The ranking of results is similar to Alternative 3 with the exception that the port of Savannah is not assumed to have vessel calls diverted to the Southeastern ports as those ports incur delays due to the inclusion of recommended routes in Alternative 5.

For Alternative 6, the net indirect economic impact at a restricted speed of 10 knots is estimated at $49.6 million using the 2003 traffic vessel data (Table 4-43). The largest indirect economic losses are generated in the port areas of New York/New Jersey ($20.5 million), Hampton Roads ($12.6 million), Providence ($4.8 million), Baltimore ($7.2 million), Philadelphia ($4.3 million), Jacksonville ($2.9 million), and Brunswick ($1.8 million). The following port areas experience a net indirect economic impact gain: Port Canaveral ($2.9 million), Savannah ($2.5 million), and Boston ($0.7 million).

Table 4-44 presents the indirect economic impact for 2004. In general, the estimated indirect economic impacts match closely with those described for 2003. The slight decline in impact for 2004 for some port areas reflects the slight decline in containership and ro-ro vessel restricted period arrivals in 2004. It is interesting to note the large increase in indirect economic impact in Jacksonville under Alternative 6 in 2004 as cruise vessel arrivals increased substantially.

[70] The indirect economic impact is relative to the volume of cargo diverted and hence we use the size of containerships and ro-ro vessels calling at the major and other ports as an indicator of the indirect economic impact per vessel.

Table 4-43. Indirect Economic Impact of Port Diversions by Alternative, Restricted Speed and Port Area, 2003 ($000s)

	Alternative 2			Alternative 3			Alternative 4			Alternative 5			Alternative 6		
	Restricted speed in knots			Restricted speed in knots			Restricted speed in knots			Restricted speed in knots			Restricted speed in knots		
Port Area	10	12	14	10	12	14	10	12	14	10	12	14	10	12	14
Northeastern US - Gulf of Maine															
Eastport, ME	-	-	-	625	500	375	-	-	-	675	550	425	75	50	35
Searsport, ME	-	-	-	125	100	75	-	-	-	135	110	85	-	-	-
Portland, ME	-	-	-	8,375	6,700	5,025	-	-	-	9,045	7,370	5,695	825	550	385
Portsmouth, NH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Off Race Point															
Boston, MA	-	-	-	24,750	19,800	14,850	-	-	-	26,730	21,780	16,830	(700)	(150)	(10)
Salem, MA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Cape Cod Bay															
Cape Cod, MA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Block Island Sound															
New Bedford, MA	-	-	-	75	50	25	-	-	-	80	55	30	15	10	5
Providence, RI	-	-	-	3,375	2,250	1,125	-	-	-	3,600	2,475	1,350	4,750	2,850	1,900
New London, CT	-	-	-	150	100	50	-	-	-	160	110	60	30	20	10
New Haven, CT	-	-	-	75	50	25	-	-	-	80	55	30	15	10	5
Bridgeport, CT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Long Island, NY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Ports of New York/New Jersey															
New York City, NY	-	-	-	48,222	24,111	8,037	-	-	-	56,259	27,326	11,252	20,507	6,836	1,367
Mid-Atlantic Delaware Bay															
Philadelphia, PA	-	-	-	10,044	5,022	1,674	-	-	-	11,718	5,692	2,344	4,293	1,431	286
Mid-Atlantic Chesapeake Bay															
Baltimore, MD	-	-	-	16,686	8,343	2,781	-	-	-	19,467	9,455	3,893	7,155	2,385	477
Hampton Roads, VA	-	-	-	29,646	14,823	4,941	-	-	-	34,587	16,799	6,917	12,636	4,212	842
Mid-Atlantic Morehead City and Beaufort, NC															
Morehead City, NC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Wilmington, NC															
Wilmington, NC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Georgetown, SC															
Georgetown, SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Charleston, SC															
Charleston, SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Savannah, GA															
Savannah, GA	-	-	-	38,835	23,301	7,767	(4,150)	(2,490)	(1,245)	-	-	-	(2,490)	(1,660)	(830)
Southeastern US															
Brunswick, GA	-	-	-	(9,709)	(5,825)	(1,942)	3,075	1,845	923	-	-	-	1,845	1,230	615
Fernandina, FL	-	-	-	(9,709)	(5,825)	(1,942)	1,075	645	323	-	-	-	645	430	215
Jacksonville, FL	-	-	-	(19,418)	(11,651)	(3,884)	1,080	720	360	2,880	2,160	1,440	2,880	2,160	1,440
Port Canaveral, FL	-	-	-	(1,080)	(720)	(360)	(1,080)	(720)	(360)	(2,880)	(2,160)	(1,440)	(2,880)	(2,160)	(1,440)
All Port Areas	-	-	-	141,068	81,129	38,623	-	-	-	162,536	91,777	48,911	49,601	18,204	5,303

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004 as described in text.

Table 4-44. Indirect Economic Impact of Port Diversions by Alternative, Restricted Speed and Port Area, 2004 ($000s)

	Alternative 2			Alternative 3			Alternative 4			Alternative 5			Alternative 6		
	Restricted speed in knots			Restricted speed in knots			Restricted speed in knots			Restricted speed in knots			Restricted speed in knots		
Port Area	10	12	14	10	12	14	10	12	14	10	12	14	10	12	14
Northeastern US - Gulf of Maine															
Eastport, ME	-	-	-	500	400	300	-	-	-	540	440	340	150	100	70
Searsport, ME	-	-	-	375	300	225	-	-	-	405	330	255	-	-	-
Portland, ME	-	-	-	5,125	4,100	3,075	-	-	-	5,535	4,510	3,485	825	550	385
Portsmouth, NH	-	-	-	125	100	75	-	-	-	135	110	85	-	-	-
Northeastern US - Off Race Point															
Boston, MA	-	-	-	24,750	19,800	14,850	-	-	-	26,730	21,780	16,830	(200)	150	190
Salem, MA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern US - Cape Cod Bay															
Cape Cod, MA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Block Island Sound															
New Bedford, MA	-	-	-	75	50	25	-	-	-	80	55	30	15	10	5
Providence, RI	-	-	-	3,150	2,100	1,050	-	-	-	3,360	2,310	1,260	4,250	2,550	1,700
New London, CT	-	-	-	375	250	125	-	-	-	400	275	150	60	40	20
New Haven, CT	-	-	-	225	150	75	-	-	-	240	165	90	45	30	15
Bridgeport, CT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Long Island, NY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Ports of New York/New Jersey															
New York City, NY	-	-	-	49,680	24,840	8,280	-	-	-	57,960	28,152	11,592	21,209	7,070	1,414
Mid-Atlantic Delaware Bay															
Philadelphia, PA	-	-	-	9,369	4,685	1,562	-	-	-	10,931	5,309	2,186	3,996	1,332	266
Mid-Atlantic Chesapeake Bay															
Baltimore, MD	-	-	-	16,605	8,303	2,768	-	-	-	19,373	9,410	3,875	6,980	2,327	465
Hampton Roads, VA	-	-	-	29,052	14,526	4,842	-	-	-	33,894	16,463	6,779	12,366	4,122	824
Mid-Atlantic Morehead City and Beaufort, NC															
Morehead City, NC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Wilmington, NC															
Wilmington, NC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Georgetown, SC															
Georgetown, SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Charleston, SC															
Charleston, SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mid-Atlantic Savannah, GA															
Savannah, GA	-	-	-	39,015	23,409	7,803	(3,775)	(2,265)	(1,133)	-	-	-	(2,265)	(1,510)	(755)
Southeastern US															
Brunswick, GA	-	-	-	(9,754)	(5,852)	(1,951)	3,000	1,800	900	-	-	-	1,800	1,200	600
Fernandina, FL	-	-	-	(9,754)	(5,852)	(1,951)	775	465	233	-	-	-	465	310	155
Jacksonville, FL	-	-	-	(13,703)	(7,835)	(1,967)	5,805	3,870	1,935	15,480	11,610	7,740	15,480	11,610	7,740
Port Canaveral, FL	-	-	-	(5,805)	(3,870)	(1,935)	(5,805)	(3,870)	(1,935)	(15,480)	(11,610)	(7,740)	(15,480)	(11,610)	(7,740)
All Port Areas	-	-	-	139,406	79,603	37,251	-	-	-	159,582	89,308	46,956	49,695	18,280	5,355

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004 as described in text.

Estimated Economic Impact on Other Market Segments

As described earlier, the estimates of economic impact by port area and vessel type are based on U.S. Coast Guard data on the arrival of vessel 150 GRT or greater at U.S. East Coast ports. The USCG data captures the vast preponderance of commercial maritime activity that would be subject to the speed restrictions and other operational measures. However, there are some market segments that may be impacted by the speed

restrictions and other operational measures whose maritime activities are not adequately captured in the USCG data. In this section, we identify the most relevant of these market segments and discuss the potential economic impact. Vessel operating costs in this section have been updated to include fuel costs of June 2008.

COMMERCIAL FISHING

Commercial fishing is a multimillion dollar industry along the U.S. East Coast. In 2005, commercial fish landings at U.S. East Coast ports totaled $801 million (Table 2-11). The port of New Bedford, MA is the leading U.S. port in terms of value of commercial fish landings with $282.5 million in 2005.

The right whale ship strike reduction operational measures and alternatives apply to vessels with a length of 65 feet and above. Because the USCG data excludes data on commercial fishing vessels that are less than 150 GRT, we also evaluated data which included fishing vessels which are over 65 feet in length and weigh less than 150 tons, using information provided by NMFS' database of commercial fishing permits. In Chapter 2, we identified that for the Southeast region approximately 84 percent of the fishing vessels over 65 feet weigh less than 150 tons. For the Northeast region, nearly 67 percent of the fishing vessels over 65 feet weigh less than 150 tons.

The estimated economic impact of the operational measures on commercial fishing vessels in 2003 is presented in Table 4-45. The analysis is based on the fishing permits issued in the Northeast and Southeast regions to vessels over 65 feet of LOA and under 150 GRT. The analysis assumes that the commercial fishing vessels are affected for an effective distance of 25 nautical miles under Alternatives 3 and 5 and 20 nautical miles under Alternative 6 each way as they steam to and from fishing areas.[71]

Many commercial fishing vessels steam at 10 knots or below and will not be affected by the operational measures if they were implemented at the 10-knot speed restriction. The typical steaming speed for other commercial fishing vessels is assumed at 12 knots. Based on these assumptions, these commercial fishing vessels will be impacted by the proposed alternative speed restrictions of 10 knots but will not be affected by alternative speed restrictions of 12 knots or higher. Average operating costs per hour of $300 includes fuel costs of June 2008.

[71] The proposed routing measures of Alternative 4 do not affect typical sailing routes of commercial fishing vessels. For DMAs proposed under Alternative 2, it is assumed that similar restrictions on commercial fishing activities would have been triggered by operational measures under the existing ALWTRP and hence no additional impact on commercial fishing due to the Ship Strike operational measures.

Table 4-45. Estimated Economic Impact of Proposed Operational Measures on Commercial Fishing Vessels by Region, 2003

Item	Alternatives 3 and 5		Alternative 6	
	Northeast Region	Southeast Region	Northeast Region	Southeast Region
Commercial fishing permits for vessels over 65 ft LOA and under 150 GRT	572	290	572	290
Percent with steaming speed over 10 knots	40%	40%	40%	40%
Vessels potentially affected by speed restrictions	229	116	229	116
Typical steaming speed of affected vessels (knots)	12	12	12	12
Number of trips per year per vessel	20	20	20	20
Minutes of delay per trip with restricted speed of				
12 knots	-	-	-	-
10 knots	50.0	50.0	38.0	38.0
Operating cost per hour of steaming (dollars)	300	300	300	300
Estimated impact per year with restricted speed (dollars)				
12 knots	-	-	-	-
10 knots	1,144,000	580,000	869,440	440,800

Source: Prepared by Nathan Associates Inc.

With a speed restriction of 10 knots, the estimated impact in 2003 on commercial fishing vessels under Alternatives 3 and 5 is estimated at $1.1 million for the Northeast Region and $0.6 million for the Southeast Region. Under Alternative 6, the estimated impact in 2003 on commercial fishing vessels is estimated at $0.9 million for the Northeast Region and $0.4 million for the Southeast Region. The combined Northeast and Southeast regional economic impact of $1.3 to $1.7 million is less than two-tenth of one percent of the U.S. East Coast commercial fishery landings of $801 million in 2005.

These results indicate that the implementation of the operational measures will not have an undue adverse impact on the commercial fishing industry along the U.S. East Coast.

CHARTER FISHING

During the stakeholder meetings, concerns were raised by representatives of the charter fishing industry regarding the negative effects of the speed restrictions on the industry. In some areas, charter vessels travel up to 50 nautical miles offshore to reach prime fishing areas. At vessel speeds of up to 17 knots they can reach their fishing areas in less than 3 hours. Under Alternative 6, a speed restriction of 10 knots for 20 nautical miles would add about 100 minutes to the roundtrip steaming time, and could severely affect client demand.

The charter fishing industry is active along the U.S. East Coast with concentration in the Carolinas, Virginia, Florida, New Jersey and Massachusetts. The industry consists of half-day charters of about 6 hours that typically go up to 20 nautical miles offshore; full-day charters of 11-12 hours that can go up to 40 nautical miles

offshore; and extended full day charters that can be from 18-24 hours and go up to 50 miles offshore. The vast majority of the charter fishing industry consists of modern and well-equipped fishing boats of less than 65 feet LOA and thus would not be subject to the speed restrictions and other operational measures.

A small segment of the industry referred to as head boats often uses vessels of 80 feet LOA and above that can accommodate 60 to 100 passengers. These vessels go up to 50 miles offshore stop and anchor over wreck and rock formations for fishing species as red snapper, grouper, trigger fish, amberjack. The charter fee for a head boat is typically $50- $80 per person.

As described above an increase of 100 minutes roundtrip steaming time would reduce the competitiveness of the larger head boats (more than 65 foot LOA) particularly for the half-day and full-day charters. It is likely that vessels of less than 65 foot LOA would increase their share of those market segments, partially offsetting the economic impact incurred by the larger head boats. For extended full-day charters, head boats of LOA in excess of 65 feet would incur additional costs associated with the 100 minutes increase in roundtrip steaming time. It is estimated that annual economic impact of a speed restriction of 10 knots for these vessels over 20 nautical miles for Alternative 6 would be approximately $796 thousand.[72] For Alternatives 3 and 5 with a speed restriction over 25 nautical miles, the annual economic impact is estimated at $1.0 million.[73]

PASSENGER FERRIES

As described in Chapter 2, the vast majority of passenger vessels operating along the U.S. East Coast sail within the COLREGS line and as such will not be affected by the preferred operational measures for Right Whale Ship Strike Reduction and alternatives. However, in the southern New England area, there is a well-developed passenger ferry sector that operates beyond the COLREGS line and hence is subject to the proposed operational measures. A list of major southern New England passenger ferry operators, routes served and service characteristics are presented in Table 4-46.

[72] This calculation assumes 40 headboat vessels with 30 roundtrips during the off-season months of November through April and an hourly steaming operating cost of $400. For alternative speed restrictions of 12 and 14 knots, the estimated impact would be $480 thousand and $ 240 thousand, respectively. These calculations do not include any offsetting impact of revenue gains by operators of smaller charter fishing vessels.

[73] The proposed routing measures of Alternative 4 do not affect typical sailing routes of charter fishing vessels. Also due to their flexibility in sailing routes, DMAs proposed under Alternative 2 would not significantly affect charter fishing vessels.

Table 4-46. Southern New England Ferry Operators, 2005

Operator	Route	Vessel Speed (knots)	Distance (nm)	Summer Schedule	Average Adult Fare ($)
Fast Ferries					
Bay State Cruises	Boston-Provincetown	30	50	6 trips daily	32
Boston Harbor Cruises	Boston-Provincetown	39	50	4 trips daily	30
Cross Sound Ferry Service	New London-Block Island	35	30	10 trips daily	15
Cross Sound Ferry Service	New London-Orient Point LI	30	16	12 trips daily	15
Freedom Cruise Line	Harwich-Nantucket	24	30	6 trips daily	26
Hy-Line Cruises	Hyannis- Nantucket	30	27	10 trips daily	31
Hy-Line Cruises	Hyannis-Martha's Vineyard	24	20	8 trips daily	14
Island High Speed Ferry	Point Judith-Block Island	33	11	12 trips daily	15
New England Fast Ferry	New Bedford- Martha's Vineyard	30	30	10 trips daily	25
Steamship Authority	Hyannis- Nantucket	30	27	10 trips daily	28
Vineyard Fast Ferry	Quonset Point-Martha's Vineyard	33	50	4 trips daily	30
Regular Ferries					
Bay State Cruises	Boston-Provincetown	16	50	2 trips Sat and Sun	15
Capt. John Boats	Plymouth-Provincetown	14	25	2 trips daily	18
Cross Sound Ferry Service	New London-Orient Point LI	13	16	30 trips daily	10
Hy-Line Cruises	Hyannis- Nantucket	15	27	6 trips daily	16
Hy-Line Cruises	Hyannis-Martha's Vineyard	12	20	6 trips daily	16
Hy-Line Cruises	Nantucket-Martha's Vineyrd	16	20	6 trips daily	16
Interstate Navigation Company	Point Judith-Block Island	12	11	8 trips daily	10
Interstate Navigation Company	Newport-Block Island	12	22	2 trips daily	12
Patriot Party Boats	Falmouth- Martha's Vineyard	15	5	8 trips daily	7
Pied Piper	Falmouth-Edgartown	12	9	6 trips daily	15
Steamship Authority	Woods Hole-Martha's Vineyard	12	7	32 trips daily	6
Steamship Authority	Hyannis- Nantucket	12	27	12 trips daily	14

Source: Prepared by Nathan Associates from data on operator websites and selected interviews.

Passenger ferry operations in southern New England generally fall into two categories - fast ferry service with vessel speeds ranging from 24-39 knots and regular ferry service with vessel speeds from 12-16 knots. As shown in Table 4-46 there are nine operators providing fast ferry service on eight routes utilizing eleven vessels. Key destinations include Provincetown, Block Island, Nantucket, and Martha's Vineyard, while important origins include Boston, New London, Hyannis, Harwich, Point Judith and Quonset Point.

Regular ferry service is provided by eight operators on eleven routes utilizing 16 vessels. Vessel speeds range from 12-16 knots and serve many of the same origins and destinations as the fast ferry service. Additional origins served by regular ferries include Plymouth, Falmouth and Woods Hole.

Impact on Ferry Operators

Passenger ferry service will be impacted by operational measures proposed under Alternatives 2, 3, 5, and 6 The proposed routing measures of Alternative 4 do not affect typical sailing routes of passenger ferry service vessels. Under Alternative 2, a DMA will be established over a 39.6 nautical mile buffer square based on the trigger conditions described earlier in this chapter. Interviews with passenger ferry operators identified their particular concern of the situation where a DMA were to be implemented during the peak summer season. For

fast ferry operator, a DMA implemented directly along their route would result in the suspension of service for the entire period that the DMA is in effect. There are several reasons for this conclusion. First, the demand for fast ferries that normally operate between 24-39 knots would virtually disappear if the ferries were restricted to a speed of 10 knots. Second, any remaining demand would not be sufficient to cover vessel operating costs, and third, many of the handling and comfort characteristics of fast ferries would suffer at these reduced speeds.

We have estimated the net economic loss of the implementation of a single DMA for these eleven fast ferry operators at $2.2 million (Table 4-47).[74] This analysis assumes 100 percent compliance with the voluntary DMAs. This is based on a daily operating cost of a fast ferry vessel of $13,320 excluding fuel costs. Some operators state that the loss of income and profits from a single 15-day DMA during peak season would cause them to go out of business. However, we assume that many of the fast ferry operators who also operate regular ferries would be able to remain in business as they would generate some incremental profits from passengers that would have otherwise used the fast ferry service.[75]

Table 4-47. Estimated Economic Impact of Proposed Operational Measures on Southern New England Ferry Operators, 2005 ($)

Type of vessel and alternative	Restricted speed in knots		
	10	12	14
Fast Ferries			
Alternative 2	2,178,000	2,178,000	2,178,000
Alternative 3	7,128,000	7,128,000	7,128,000
Alternative 6	2,577,600	2,577,600	2,577,600
Regular Ferries			
Alternative 2	5,900,000	3,933,333	1,966,667
Alternative 3	5,900,000	3,933,333	1,180,000
Alternative 6	6,031,250	3,989,583	1,985,417
Total			
Alternative 2	8,078,000	6,111,333	4,144,667
Alternative 3	13,028,000	11,061,333	8,308,000
Alternative 6	8,608,850	6,567,183	4,563,017

Source: Prepared by Nathan Associates from data on operator websites and selected interviews.

Operators of regular ferry services would also be adversely affected by the DMAs. For these operators it is assumed that a speed restriction of 10 knots would cause an average delay of 30 minutes for each ferry trip.[76]

[74] This same estimate applies to alternative restricted speeds of 10, 12 and 14 knots as it is assumed that the fast ferry service would be temporarily suspended under any of those speeds.

[75] It is very difficult to estimate the portion of passenger demand that would cancel their travel by ferry entirely during a DMA. Relevant factors include the purpose of the trip, the availability of alternative ferry origins that may not be affected by the DMA, availability of other economically viable transport modes and competing entertainment options.

[76] This analysis assumes that, on average, only half of a DMA area would affect the ferry vessel's route, hence the effective distance of the DMA would be approximately 20 nautical miles.

The 118 daily trips of regular ferry services would incur additional costs of $5.9 million for the implementation of a single DMA. With a restricted speed of 12 knots the average delay decreases to 20 minutes and the estimated economic impact to regular-speed ferries is $3.9 million. With a restricted speed of 14 knots, the average delay is 6 minutes and the estimated economic impact is $2.0 million.

Under Alternative 3, speed restrictions would be in place year round in Cape Cod Bay and for the months of October –April for Block Island Sound.[77] The two fast ferry operations from Boston to Provincetown would cease and be replaced by regular ferry service. However, overall ferry demand would diminish as passengers curtail day trips or seek alternative transport modes. It is assumed that the fast ferry operators would either sell their vessels or deploy them in other routes. While a loss for the distressed sale of the vessels may be incurred, this would not represent a recurring annual economic impact and is not included in this assessment.

Fortunately, the proposed speed restrictions for Block Island Sound are outside the peak summer season. Hence, it is assumed that the nine fast ferry operators in this area would lose an average of 30 business days per year[78]. The economic impact of suspending operations for these 30 days for these nine operators is calculated as double the impact of the DMA described above. The resulting estimate is $7.1 million annually.

Regular ferries will incur average delays of approximately 30 minutes per trip with a speed restriction of 10 knots. As the restrictions are during the off-peak season for Block Island Sound, these delays can be absorbed in the more open ferry schedule without losing any round-trip daily service. The estimated incremental cost of the delay is estimated at $5.9 million annually at 10 knots, $3.9 million at 10 knots and $1.2 million at 14 knots.

Under Alternative 6, speed restrictions for Cape Cod Bay are implemented from January 1 through May 15. As such the fast ferry service from Boston to Provincetown would remain in operation. Speed restrictions for Block Island Sound would be from November 1 through April 30. However, the speed restricted area for Block Island Sound under Alternative 6 would not extend to the shoreline and hence would not impact fast ferry operations.[79] DMAs would also be implemented under Alternative 6 and the economic impact of those is estimated to be the same as under Alternative 2 above.[80] The estimated economic impact for fast ferry service under Alternative 6 is thus similar to Alternative 2 with an increment for speed restrictions on the Boston-Provincetown route during January through May 15. The resulting estimated economic impact is $2.6 million annually.

For regular ferries, the economic impact for Alternative 6 is again similar to Alternative 2 with an increment for speed restrictions on the Boston-Provincetown route during January through May 15. The estimated economic impact is $6.0 million at 10 knots, $4.0 million at 12 knots and $2.0 million at 14 knots.

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[77] The analysis in this section for Alternative 3 also applies to Alternative 5.

[78] While regular ferry service is year-round, the high-speed Block Island ferry only operates from mid-April through mid-October. Thus the 30 days of lost business consists of 15 days from October 1- 15 and 15 days from April 16-30.

[79] The rectangular area proposed has its northern limits running approximately in a line from Montauk to the southwestern coast of Block Island.

[80] Even though compliance by ferry operators with the proposed speed restrictions of DMAs under Alternative 6 is voluntary, we have assumed 100 percent compliance for the economic impact analysis. Lesser levels of compliance would result in proportionately lower levels of economic impact.

Impact on Ferry Passengers

The proposed operational measures will have a direct economic impact on ferry passengers whose travel time will be increased due to the speed restrictions. As recognized by the U.S. Department of Transportation, time saved from travel may be devoted to other activities, such as remunerative work or recreation.[81] The USDOT guidelines recommend hourly values of travel-time savings to be used in all economic analysis of transportation regulatory actions. Specific values of travel time are recommended for local travel and intercity travel and whether the travel is for business or personal purposes.

The USDOT guidelines recommend using the median household income (divided by 2000 hours) as the basis for valuation of intercity business travel time, and 70 percent of that value for intercity personal travel time. Hence, based on the 2000 Census data, they recommend hourly values of $21.20 for intercity business travel and $14.80 for intercity personal travel. We have updated the USDOT recommended values using 2005 data for median household income reported by the U.S. Census Bureau.[82] Based on that data, the hourly value of intercity business travel time is $23.16 and intercity personal travel time is $16.21.[83]

The estimated economic impact of proposed operational measures on Southern New England ferry passengers is presented in Table 4-48. The estimates use the same assumptions regarding timing and scope of operational impacts as described in the section above on impacts on ferry operators. However, for the alternatives where we anticipate that fast ferries would cease operations, we assume that fast ferry passengers would divert to regular ferries. In this case, the delay in travel time for former fast ferry passengers consists of two components (1) the extra time due to the slower average speed of regular ferries for the portion of the transit not affected by speed restrictions and (2) the extra time due to the restricted speed over the effective distance of the speed restriction. As an illustration, the average fast ferry trip that previously took 1 hour to transit 30 nm at 30 knots is now estimated to take 2.6 hours. This consists of 2 hours to transit the average effective distance of a DMA of 20 nautical miles at 10 knots plus 0.6 hours to transit the remaining 10 nautical miles at an average speed of 15 knots.

For Alternative 2, the estimated economic impact on fast ferry passengers of a speed restriction at 10 knots is estimated at $3.2 million. This is based on an assumed average of 90 passengers per trip incurring a delay of 1.6 hours for 92 fast ferry trips per day over 15 days and an hourly value of passenger time of $16.21. With a speed restriction of 12 knots, the estimated delay is 1.25 hours and the estimated economic impact decreases to $2.5

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[81] U.S. Department of Transportation, Office of the Secretary of transportation, The Value of Travel Time: Departmental Guidance for Conducting Economic Evaluations, April 9, 1997 http://ostpxweb.dot.gov/policy/Data/VOT97guid.pdf and Revised Departmental Guidance, Valuation of Travel Time in Economic Analysis, February 11, 2003 http://ostpxweb.dot.gov/policy/Data/VOTrevision1_2-11-03.pdf.

[82] U.S. Census Bureau, Income, Poverty and Health Insurance Coverage in the United States: 2005, issued August 2006. http://www.census.gov/prod/2006pubs/p60-231.pdf

[83] In this analysis, we have applied the valuation recommended the USDOT guidelines; however, the use of median household income may overstate the value of time as it does not account for the average number of wage earners per household. The U.S. Census Bureau reports median per capita income in 2005 at $25,036. This would result in a hourly valuation of business time at $12.52 and for personal travel time at $8.76. Use of these values would reduce the estimated impact on ferry passenger time by 46 percent.

million. With a speed restriction of 14 knots, the estimated delay is 1 hour and the estimated economic impact is $2.0 million.

For regular ferries, the estimated economic impact for Alternative 2 at 10 knots is $1.3 million consisting of a delay of 30 minutes for 90 passengers on 118 daily trips over 15 days. At 12 knots the estimated delay is 20 minutes and estimated economic impact is $0.9 million; at 14 knots, the estimated delay is 6 minutes and the estimated economic impact is $0.3 million.

Table 4-48. Estimated Economic Impact of Proposed Operational Measures on Southern New England Ferry Passengers, 2005 ($)

Type of vessel and alternative	Restricted speed in knots		
	10	12	14
Fast Ferries			
Alternative 2	3,221,251	2,516,603	2,013,282
Alternative 3	6,862,666	5,453,368	4,446,727
Alternative 6	3,571,387	2,790,146	2,232,117
Regular Ferries			
Alternative 2	1,291,127	859,890	258,225
Alternative 3	5,164,506	3,439,561	1,032,901
Alternative 6	1,619,379	1,078,506	323,876
Total			
Alternative 2	4,512,378	3,376,493	2,271,507
Alternative 3	12,027,172	8,892,929	5,479,628
Alternative 6	5,190,766	3,868,653	2,555,993

Source: Prepared by Nathan Associates as decribed in text.

For Alternative 3, it is assumed that the nine fast ferry operators in the Block Island Sound area would suspend operations for 30 days per year and their passengers would divert to regular ferries. The two fast ferry operations from Boston to Provincetown would cease and be replaced by regular ferry service. For purposes of calculating the economic impact, we have used 120 days per year of peak operation for the Boston-Provincetown services. The resulting economic impact on fast ferry passengers is estimated at $6.9 million at 10 knots, $5.5 million at 12 knots and $4.4 million at 14 knots.

For regular ferries, the impact is similar to that described for Alternative 2 above, except that regular ferry operations are assumed to be affected for 60 days per year. The resulting economic impact on regular ferry passengers is estimated at $5.2 million at 10 knots, $3.4 million at 12 knots and $1.0 million at 14 knots.

Under Alternative 6, the impact is the same as under Alternative 2 for fast ferry passengers affected by the DMAs. However, there is an additional impact of 15 days during early-May for the two fast ferries operating from Boston to Provincetown that together have 10 trips daily. The estimated economic impact on fast ferry passengers is estimated at $3.6million at 10 knots, $2.8 million at 12 knots and $2.2 million at 14 knots.

For regular ferries, the economic impact for Alternative 6 is again similar to Alternative 2 with an increment for speed restrictions for 30 daily trips on the Boston-Provincetown route over 15 days. The estimated economic impact on regular ferry passengers is $1.6 million at 10 knots, $1.1 million at 12 knots and $0.3 million at 14 knots.

WHALE WATCHING INDUSTRY

The whale watching industry also can be categorized into operations that deploy high-speed vessels with speeds ranging from 25-38 knots; and operations that deploy regular speed vessels with speeds from 16-20 knots. Table 4-49 presents information for the major whale watching operators in Massachusetts Bay. There are four operators of high-speed vessels; two are based in Boston, one in Barnstable and one in Provincetown (2 vessels). There are five operators of regular speed vessels that have operations based in Newburyport, Boston, Gloucester, Plymouth (6 vessels) and Provincetown (4 vessels).

Under Alternative 2, the high-speed vessels are assumed to suspend operations during periods when DMAs are implemented along their route.[84] The estimated economic impact of the suspension of the five high-speed vessels for a single 15-day DMA is $0.4 million.[85] This analysis assumes 100 percent compliance with the voluntary DMAs. The estimated economic impact at 10 knots is $0.9 million for the 13 regular-speed vessels, which incur a 54-minute delay each way for two trips per day. At 12 knots, the estimated economic impact to regular-speed whale watching vessels is $0.5 million and at 14 knots, $0.3 million.

Table 4-49. Massachusetts Bay Whale Watching Operators, 2005

Operator	Location	Vessel Speed	Vessels
High-Speed Vessels			
Boston Harbor Cruises	Boston, MA	37	1
Hyannis Whale Watcher Cruises	Barnstable, MA	38	1
New England Aquarium	Boston, MA	25	1
Portuguese Princess Excursions	Provincetown, MA	25	2
Regular Speed Vessel			
Massachusetts Bay Lines	Boston, MA	18	1
Capt. John Boats	Plymouth, MA	17	6
Newburyport Whale Watch	Newburtyport, MA	20	1
Yankee Whale Watching	Gloucester, MA	20	1
Dolphin Fleet of Provincetown	Provincetown, MA	16	4

Source: Prepared by Nathan Associates from data on operator websites and selected interviews.

Under Alternative 3, the year-round speed restrictions in the Northeast region and Cape Cod Bay would render the high-speed whale watching vessels unprofitable and they would be sold or diverted into other

[84] This analysis assumes that, on average, only half of a DMA area would affect the whale watching vessel's route, hence the effective distance of the DMA would be approximately 20 nautical miles.

[85] Calculated at $13,320 daily operating costs excluding fuel times 15 days for 5 vessels.

service.[86] As this would not be a recurring economic cost, any loss associated with the sale of the vessel is not included in this economic assessment. It is also assumed that regular-speed whale watching vessels would be put into service in their place. However, demand for whale watching from locations such as Boston would diminish as the additional time required to reach whale feeding areas will discourage passengers. It is possible some of this demand would divert to other whale watching operations located closer to the feeding areas.

Regular-speed whale watching vessels would be subject to the year-round speed restrictions extending 25 nautical miles form the Northeast region coastline and in Cape Cod Bay. It is assumed that at 10 knots, the 13 regular-speed vessels would incur a 54-minute delay each way for two round-trips daily during a 90-day summer whale-watching period. The estimated economic impact is $5.6 million for a speed restriction of 10 knots, $3.1 million at 12 knots and $1.9 million at 14 knots (Table 4-50).

Under Alternative 6, speed restrictions for Cape Cod Bay are implemented from January 1 through May 15. Hence, the peak summer whale watching season would not be affected for high-speed or regular speed vessels. Similarly, the proposed speed restrictions for an extended Off Race Point are proposed for March through April would not impact the whale watching season. Accordingly, the economic impact of Alterative 6 is assumed to be the same as Alternative 2 due to the implementation of DMAs.[87]

Table 4-50. Estimated Economic Impact of Proposed Operational Measures on Massachusetts Bay Whale Watching Operators, 2005

Type of vessel and alternative	Restricted speed in knots		
	10	12	14
High-Speed Vessels			
Alternative 2	399,600	399,600	399,600
Alternative 3	-	-	-
Alternative 6	399,600	399,600	399,600
Regular Speed Vessel			
Alternative 2	936,000	520,000	312,000
Alternative 3	5,616,000	3,120,000	1,872,000
Alternative 6	936,000	520,000	312,000
Total			
Alternative 2	1,335,600	919,600	711,600
Alternative 3	5,616,000	3,120,000	1,872,000
Alternative 6	1,335,600	919,600	711,600

Source: Prepared by Nathan Associates from data on operator websites and selected interviews.

[86] This analysis also applies to Alternative 5.

[87] Even though compliance by whale watch operators with the proposed speed restrictions of DMAs under Alternative 6 is voluntary, we have assumed 100 percent compliance for the economic impact analysis. Lesser levels of compliance would result in proportionately lower levels of economic impact.

INDIRECT ECONOMIC IMPACT

Industry representatives and other parties expressed concern that implementation of the proposed operational measures on passenger ferries, whale-watching vessels and charter fishing vessels would also have an indirect economic impact on local communities. For example, operators of fast ferries between Boston and Provincetown stated that suspension of their services due to the implementation of a DMA during peak season would affect tourism-related businesses in Provincetown. However, members of the passenger ferry industry have also expressed concerns about their ability to compete with car travel, suggesting it is likely that in the absence of convenient ferry service, passengers would select a different mode of transportation to travel to Provincetown. If that is the case, any indirect economic impacts on the local economy can be expected to be limited. These indirect impacts may increase slightly if the high price of gas makes car travel less desirable; however, high energy prices would also affect the cost of traveling by ferry.

Similarly, whale watching operators and tourism officials in the Greater Boston area expressed concerns that visitors would cut short their trip or cancel their visit to the region entirely with the implementation of a DMA. However, unlike the passenger ferry operators that have to operate on a fixed route, whale watching operators under most circumstances could alter their route to avoid a DMA implemented offshore. Thus they would select routings to areas outside the DMA where they could observe whale species other than the right whale. Also operators of vessels less than 65 feet in length would likely serve some additional customers desiring to observe right whales within the DMA area, even though the vessels would still be required to comply with the 500 yard approach regulation. In this case, the implementation of a DMA might generate additional business for these whale watching operators. As such, tourists would have sufficient attractive alternatives and would not be expected to cut short or cancel their visit to the region due to the proposed operational measures.

The proposed operational measures for the mid-Atlantic region will be effective from November through April and as such do not fall within the peak months for charter fishing. In addition, it is expected that customers lost to the larger head boats will be served by charter fishing operators with vessels under 65 LOA. For these reasons, the indirect economic impact on the local communities is expected to be minimal.

Summary

In this section we summarize the findings regarding the economic impact of the proposed operational measures for right whale ship strike reduction and alternatives on U.S. East Coast maritime activity.

Table 4-51 presents the direct and indirect economic impacts by alternative and restriction speed for 2003 and 2004. The direct economic impact is shown for each sector or element analyzed.

- Alternative 5 has the largest estimated economic impact in terms of direct economic impact, indirect economic impact and total economic impact. In 2004, the estimated total economic impact of Alternative 5 at a speed restriction of 10 knots is $359.7 million annually. The operational measure of speed restrictions year-round under Alternative 5 (and Alternative 3) will have

substantial repercussions through the Northeast region port areas and the northern mid-Atlantic port areas. The combination of DMA, recommended route designations and speed restrictions also contributes to substantial total economic impact for Alternative 5. The brunt of the direct economic impact is borne by the commercial shipping industry with a combined direct economic impact of $166.7 million. This represents 83 percent of the total direct economic impact for a speed restriction of 10 knots. The total annual economic impact with a speed restriction of 12 knots is estimated at $223.3 million and with a speed restriction of 14 knots at $134.1 million.

- Alternative 3 has the second largest annual economic impact of $334.8million with a speed restriction of 10 knots. The direct economic impact is estimated at $195.4 million while the indirect economic impact is estimated at $139.4 million. The total economic impact at 12 knots is estimated to be $210.0 million, while at 14 knots, it is estimated to be $121.7 million.

- Alternative 6, which is the preferred alternative, has the third largest total economic impact of $137.3 million with a speed restriction of 10 knots. This is comprised of $87.6 million in direct economic impact and $49.7 million in indirect economic impact. The total economic impact with a speed restriction of 12 knots is $77.4 million and with a speed restriction of 14 knots the total economic impact is $45.0 million.

- Alternative 2 ranks fourth in terms of the largest total economic impact with an annual impact of $41.5 million for a speed restriction of 10 knots. This alternative did not have any estimated indirect economic impact as vessel calls were assumed not to be diverted to Canadian ports. The total economic impact at 12 knots is estimated to $28.1 million and at 14 knots, it is estimated to be $17.9 million.

- Alternative 4 has the lowest total economic impact at $2.8 million annually. This alternative consists only of use of recommended routes and port areas that may incur negative indirect economic impacts were offset by port areas with gains. The change in speed restriction is not relevant for this alternative.

Table 4-51. Total Direct and Indirect Economic Impact by Alternative and Restriction Speed, 2003 and 2004 ($000s)

	Alternative 2			Alternative 3			Alternative 4			Alternative 5			Alternative 6		
	Restriction speed in knots			Restriction speed in knots			Restriction speed in knots			Restriction speed in knots			Restriction speed in knots		
Item	10	12	14	10	12	14	10	12	14	10	12	14	10	12	14
2003															
Direct economic impact															
Shipping industry vessels	25,026.5	16,119.0	9,829.8	133,009.9	83,641.1	49,461.4	2,333.4	2,333.4	2,333.4	137,000.4	86,678.1	51,755.2	53,158.3	33,423.8	20,007.9
Cumulative effect of multi-port strings	-	-	-	11,265.1	9,350.0	7,885.6	-	-	-	11,265.1	9,350.0	7,885.6	8,718.7	7,236.5	6,103.1
Re-routing of southbound coastwise shipping	-	-	-	7,500.0	7,500.0	7,500.0	-	-	-	7,500.0	7,500.0	7,500.0	3,400.0	3,400.0	3,400.0
Commercial fishing vessels	-	-	-	1,724.0	-	-	-	-	-	1,724.0	-	-	1,310.2	-	-
Charter fishing vessels	-	-	-	1,000.0	597.6	298.8	-	-	-	1,000.0	597.6	298.8	796.0	480.0	240.0
Passenger ferries	8,078.0	6,111.3	4,144.7	13,028.0	11,061.3	8,308.0	-	-	-	13,028.0	11,061.3	8,308.0	8,608.9	6,567.2	4,563.0
Pasengers' time on passenger ferries	4,512.4	3,376.5	2,271.5	12,027.2	8,892.9	5,479.6				12,027.2	8,892.9	5,479.6	5,190.8	3,868.7	2,556.0
Whale watching vessels	1,335.6	919.6	711.6	5,616.0	3,120.0	1,872.0	-	-	-	5,616.0	3,120.0	1,872.0	1,335.6	919.6	711.6
Subtotal direct economic impact	38,952.5	26,526.4	16,957.6	185,170.2	124,162.9	80,805.4	2,333.4	2,333.4	2,333.4	189,160.7	127,199.9	83,099.1	82,518.5	55,895.8	37,581.6
Indirect economic impact of port diversions	-	-	-	141,608.0	81,489.0	38,803.0	-	-	-	162,536.0	91,777.2	48,911.2	49,600.5	18,203.5	5,302.7
Total economic impact	38,952.5	26,526.4	16,957.6	326,778.2	205,651.9	119,608.4	2,333.4	2,333.4	2,333.4	351,696.7	218,977.1	132,010.3	132,119.0	74,099.3	42,884.3
2004															
Direct economic impact															
Shipping industry vessels	27,578.8	17,700.7	10,781.8	142,476.8	89,229.6	52,530.3	2,790.6	2,790.6	2,790.6	147,171.3	92,772.0	55,237.8	57,569.2	36,050.4	21,544.6
Cumulative effect of multi-port strings	-	-	-	11,932.6	9,904.1	8,352.8	-	-	-	11,932.6	9,904.1	8,352.8	9,411.5	7,811.5	6,588.1
Re-routing of southbound coastwise shipping	-	-	-	7,600.0	7,600.0	7,600.0	-	-	-	7,600.0	7,600.0	7,600.0	3,400.0	3,400.0	3,400.0
Commercial fishing vessels	-	-	-	1,724.0	-	-	-	-	-	1,724.0	-	-	1,310.2	-	-
Charter fishing vessels	-	-	-	1,000.0	597.6	298.8	-	-	-	1,000.0	597.6	298.8	796.0	480.0	240.0
Passenger ferries	8,078.0	6,111.3	4,144.7	13,028.0	11,061.3	8,308.0	-	-	-	13,028.0	11,061.3	8,308.0	8,608.9	6,567.2	4,563.0
Pasengers' time on passenger ferries	4,512.4	3,376.5	2,271.5	12,027.2	8,892.9	5,479.6	-	-	-	12,027.2	8,892.9	5,479.6	5,190.8	3,868.7	2,556.0
Whale watching vessels	1,335.6	919.6	711.6	5,616.0	3,120.0	1,872.0	-	-	-	5,616.0	3,120.0	1,872.0	1,335.6	919.6	711.6
Subtotal direct economic impact	41,504.8	28,108.1	17,909.6	195,404.6	130,405.4	84,441.6	2,790.6	2,790.6	2,790.6	200,099.1	133,947.9	87,149.0	87,622.2	59,097.4	39,603.2
Indirect economic impact of port diversions	-	-	-	139,406.0	79,603.0	37,251.0	-	-	-	159,582.0	89,308.4	46,956.4	49,695.0	18,280.0	5,355.0
Total economic impact	41,504.8	28,108.1	17,909.6	334,810.6	210,008.4	121,692.6	2,790.6	2,790.6	2,790.6	359,681.1	223,256.3	134,105.4	137,317.2	77,377.4	44,958.2

Source: Prepared by Nathan Associates as described in text.

5. Economic Analysis for a Regulatory Flexibility Act Determination

This section presents the economic analysis for a Regulatory Flexibility Act (RFA) threshold assessment of whether the operational measures of the final rule will have a significant economic impact on a substantial number of small entities. The analysis includes an identification of the number of small entities affected using size standards issued by the U.S. Small Business Administration, Office of Advocacy; an estimate of the economic impact on small entities based on the approach and methodology presented in Section 4; and an assessment of the significance of the economic impact within the context of the RFA standards.

Size Standards for Small Entities

According to the U.S. Small Business Administration[88], a small business is a concern that is organized for profit, with a place of business in the United States, and which operates primarily within the United States or makes a significant contribution to the U.S. economy through payment of taxes or use of American products, materials or labor. Further, the concern cannot be dominant in its field, on a national basis. Finally, the concern must meet the numerical small business size standard for its industry. SBA has established a size standard for most industries in the U.S. economy.

Size standards for the industries potentially affected by the final rule are presented in Table 5-1. For international and domestic commercial shipping operators, the SBA size standard for a small business is 500 employees or less. The same threshold applies for international cruise operators and domestic ferry service operators. For whale watching operators and charter fishing operators the SBA threshold is $6.5 million of average annual receipts. For commercial fishing operators, the SBA threshold is $4.0 million of average annual receipts.

[88] United States Small Business Administration, Frequently Asked Questions About Small Business Size Standards, www.sba.gov/size/indexfaqs.html

Table 5-1. Small Business Size Standards and Firms by Employment Size and NAICS Code, 2002

Type of entity	NAICS Code	NAICS U.S. Industry Title	Size Standard ($ millions)	Size Standard Employees	Firms Employment size Total	< 20	< 500	500+
International commercial shipping operator	483111	Deep Sea Freight Transportation	n.a.	500	229	156	206	23
International cruise operator	483112	Deep Sea Passenger Transportation	n.a.	500	94	71	85	9
Domestic commercial shipping operator	483113	Coastal and Great Lakes Freight Transportation	n.a.	500	377	242	349	28
Domestic ferry service operator	483114	Coastal and Great Lakes Passenger Transportation	n.a.	500	124	97	123	1
Whale watching operators	487210	Scenic & sightseeing transportation, water	6.5	n.a.	1,756	1,632	1,748	8
Charter fishing operators	487210	Scenic & sightseeing transportation, water	6.5	n.a.	1,756	1,632	1,748	8
Commerical fishing	114111	Finfish Fishing	4	n.a.	1,100	1,058	1,093	7
	114112	Shellfish Fishing	4	n.a.	791	774	791	-
	114119	Other Marine Fishing	4	n.a.	10	9	10	-

Source: U.S. Small Business Administration,Table of Small Business Size Standards matched to North American Industry Classification System Codes, July 31, 2006 and SBA Office of Advocacy, Firm Size Data provided by U.S. Census Bureau on Employer Firms and Employment by Employment Size of Firm by NAICS Codes, 2002.

Table 5-1 also presents information on the total number of firms in the U.S. in 2002 by employment size ranges for these industries. The preponderance of firms involved in these industries is considered as small entities by the SBA size standards. In 2002, there were 229 firms involved in deep sea freight transportation industry of which 206 firms had 500 employees or less. In the deep sea passenger transport industry, 85 firms of the total 94 firms had 500 or fewer employees. In the Coastal and Great Lakes freight transportation industry, 349 firms of the total 377 firms had 500 or fewer employees. In the Coastal and Great Lakes passenger transportation industry, all but one firm of the 124 total firms had 500 or fewer employees.

There were 1,756 firms providing scenic and sightseeing water transportation in 2002 of which 1,748 firms had 500 or fewer employees. For the finfish fishing industry 1,093 firms of the total 1,100 firms had 500 or fewer employees; while all 791 firms involved in shellfish fishing had 500 or fewer employees.

Number of Small Entities Potentially Affected

We first present estimates for the number of small entities involved in commercial shipping along the U.S. East Coast that are potentially affected by the operational measures of the final rule followed by estimates for other maritime industries.

COMMERCIAL SHIPPING

Many of the firms operating within the international commercial shipping industry and international cruise industry have foreign ownership and have their primary place of business outside the U.S. and hence would not qualify as a U.S. small entity.

To identify vessel owned by U.S. entities, we analyzed information provided by the U.S. Coast Guard regarding parties owning vessels that had arrivals at the U.S. East Coast in 2004. We were able to identify the vessel owner and/or managing owner for 99.6 percent of the vessels that had U.S. East Coast vessel arrivals in 2004.[89] The USCG data provides information on the address of the vessel owner and/or managing owner in terms of zip code, state and country. Using that information we identified vessels with U.S. East Coast arrivals in 2004 that were owned by U.S. entities or foreign entities.

Of the 27,385 U.S. East Coast vessel arrivals in 2004, 6,540 arrivals or 23.9 percent were recorded by vessels owned by parties with U.S. address (Table 5-2). The U.S. East Coast arrivals were made by 4,114 vessels of which 620 or 15.1 percent were by vessels owned by parties with a U.S. address. In terms of number of parties, the 2004 vessel arrivals were made by 3,505 parties of which 432 or 12.3 percent had a U.S. address.

Table 5-2. U.S. East Coast Vessel Arrivals by Vessels with U.S. or Foreign Parties, 2004

	Party address		
Item	U.S	Foreign	Total
Number of vessel arrivals	6,540	20,845	27,385
Percent	23.9%	76.1%	100.0%
Number of vessels	620	3,494	4,114
Percent	15.1%	84.9%	100.0%
Number of parties	432	3,073	3,505
Percent	12.3%	87.7%	100.0%

Source: Prepared by Nathan Associates Inc. from analysis of U.S. Coast Guard as described in text.

We then conducted an analysis of the entire U.S. Coast Guard vessel characteristics database to identify the number and type of vessels owned by the U.S. parties with U.S. East Coast arrivals in 2004.[90] Approximately 71 percent of the U.S.-based parties owned only one vessel and 90.7 percent owned 4 or less vessels (Table 5-3).

[89] We were not able to match party information for 198 vessels of the 4,114 vessels that had U.S. East Coast arrivals in 2004. These vessels accounted for 3.8 percent of 2004 U.S. East Coast arrivals (1,004 of the 27,385 arrivals). However using information on U.S. or foreign flag of registry, we assigned these vessels by country of ownership.

[90] For this analysis, we included all vessels owned by the party, not just those with vessel arrivals at U.S. East Coast ports in 2004.

Table 5-3. U.S-Based Parties with U.S. East Coast Arrivals by Number of Vessels Owned, 2004

Number of Vessels Owned	Number of Parties	Percentage of Parties	Number of Vessels	Percentage of Vessels
1	306	70.8	306	30.6
2	49	11.3	98	9.8
3	24	5.6	72	7.2
4	13	3.0	52	5.2
5	6	1.4	30	3.0
6	7	1.6	42	4.2
7	6	1.4	42	4.2
8	3	0.7	24	2.4
9	4	0.9	36	3.6
10	1	0.2	10	1.0
11	3	0.7	33	3.3
12	1	0.2	12	1.2
15	1	0.2	15	1.5
16	1	0.2	16	1.6
17	2	0.5	34	3.4
20	1	0.2	20	2.0
24	1	0.2	24	2.4
35	1	0.2	35	3.5
38	1	0.2	38	3.8
61	1	0.2	61	6.1
Total:	432	100	1,000	100

Source: Prepared by Nathan Associates inc. from U.S. Coast Guard data as described in text.

The next step was to determine which of these U.S. based parties should be considered a small-business for the RFA analysis. Information on the number of employees is not readily available for U.S.-based parties that own vessels with arrivals at the U.S. East Coast. However, we reviewed the list of U.S-based parties and removed the 53 parties that obviously do not qualify as a small business such as Carnival Cruise Lines, Chevron, Maersk, Holland America Line, BP Oil Shipping, etc. A further classification was made to exclude an additional 17 parties that own 5 or more vessels from the set of small businesses on the assumption that a business with 5 or more capital intensive commercial cargo vessels would employ at least 500 employees throughout its organization. We assume that the remaining set of 362 US-based parties that own vessels that had U.S. East Coast arrivals in 2004 be assumed to be small businesses for the purposes of the RFA analysis. Table 5-4 presents information on vessels and vessel arrivals for this set of vessels assumed to be operated by U.S.-based small entities.

Table 5-4. U.S. East Coast Vessel Arrivals by U.S.-Based Small Entities, 2004

Vessel Type	Number of 2004 Vessel Arrivals	Number of vessels	Number of parties
Bulk Carrier	142	25	24
Container Ship	502	30	28
Freight Barge	77	13	12
General Dry Cargo Ship	99	24	22
Multiple	435	49	31
Passenger Ship	463	33	31
Refrigerated Cargo Ship	51	6	6
Ro-Ro Cargo Ship	433	25	22
Tank Barge	702	61	51
Tank Ship	784	83	79
Towing Vessel	209	44	43
Other a/	65	14	13
Total:	3,962	407	362

a/ Other includes fishing vessels, industrial vessels, and research vessels.
Source: Prepared by Nathan Associates Inc. from U.S. Coast Guard data as described in text.

The 362 parties assumed to be small businesses operated 407 vessels that had 3,962 vessel arrivals at U.S. East Coast ports in 2004. Tank ships and tank barges are the vessel types with the most parties, vessels and vessel arrivals for the set of vessels assumed to be owned by U.S. based small businesses.

OTHER INDUSTRIES

In Section 4, we presented information on entities involved in other maritime industries that would potentially be affected by the operational measures of the final rule. For purposes of this RFA analysis we have assumed that all U.S. East Coast entities involved in commercial fishing industry, domestic ferry service industry, and charting fishing industry are considered as small entities. In the whale watching industry all entities (except the New England Aquarium) are considered as small entities.

Thus as shown in Table 5-5, we estimate that there are 406 small entities potentially affected by the final rule. Of these, 229 entities are involved in commercial fishing in the Northeast Region and 116 entities in the Southeast region. There are 13 entities identified involved in Southern New England passenger ferry service[91], 8 entities providing whale watching services in Massachusetts Bay and 40 entities providing charter fishing service along the U.S. East Coast. Note that only the subset of charter fishing entities operating larger head boats that accommodate 60 to 100 passengers is included in this analysis. The majority of charter fishing

[91] In Table 4-46, nine entities are listed as operating fast ferries in Southern New England and eight entities that operate regular ferries. However, four of the entities operate both fast ferries and regular ferries and hence, there are only 13 entities involved in Southern New England passenger ferry service.

entities operates fishing boats of less than 65 LOA and thus would not be subject to the operational measures of the final rule.

Table 5-5. Number of Small Entities in Other Industries Potentially Affected by Proposed Rule, 2005

Industry	Number of Small Entities Potentially Affected
Commercial Fishing	
Northeast Region	229
Southeast Region	116
Southern New England Passenger Ferries	13
Massachusetts Bay Whale Watching	8
Charter Fishing	40
Total	406

Source: Prepared by Nathan Associates Inc. as described in Section 4, and presented inTable 4-45, Table 4-46 and Table 4-49.

Economic Impact on Small Entities

The economic impact of the operational measures of the final rule on small entities was estimated using the same approach and methodology for all entities described in Section 4. Below, we first present the economic impact on the small entities involved in the commercial shipping industry[92] followed the estimated impact on small entities in other maritime industries. Vessel operating costs in this section have been updated to include fuel costs of June 2008.

COMMERCIAL SHIPPING

All of the operational measures of the final rule described in Section 4 for Alternative 6 are assumed to apply to commercial shipping vessel operated by small entities. Table 5-6 presents the number of vessel arrivals by type of vessel and flag of registry that occurred in 2004 during proposed seasonal speed restriction periods. In total there were 1,745 such vessel arrivals consisting of 1,369 arrivals by U.S.-flagged vessels and 376 arrivals by foreign-flagged vessels. Tank barges and tankers each had 433 vessel arrivals during proposed seasonal speed restriction periods. Containerships were next with 260 vessel arrivals followed by ro-ro cargo ships with 244 vessel arrivals.

[92] Passenger cruise vessels are included in this section as the data sources, approach and methodology applied for this market segment is same as those of the commercial shipping industry.

Table 5-6. U.S. East Coast Restricted Period Vessel Arrivals Operated by Small Entities and Economic Impact of Final Rule by Vessel Type, 2004

Vessel type	2004 Restricted Period Vessel Arrivals			Economic Impact ($000s)	Economic Impact as a % of Annual Revenues
	U.S.Flag	Foreign	Total		
Bulk Carrier	47	25	72	107.3	0.05%
Combination Carrier (e.g. OBO)	-	-	-	-	-
Container Ship	225	35	260	1,760.2	0.24%
Freight Barge	16	-	16	19.6	0.06%
General Dry Cargo Ship	8	42	50	107.2	0.06%
Passenger Ship	89	9	98	1,346.9	0.19%
Refrigerated Cargo Ship	-	27	27	130.7	0.13%
Ro-Ro Cargo Ship	129	115	244	1,707.6	0.29%
Tank Barge	433	-	433	1,072.9	0.11%
Tanker	325	108	433	1,048.5	0.11%
Towing Vessel	86	-	86	116.6	0.02%
Other a/	11	15	26	19.6	0.03%
Total	1,369	376	1,745	7,437.1	0.15%

a/ Other includes fishing vessels, industrial vessels, research vessels, school ships.
Note: Annual revenue estimated as average of daily operating cost at sea and daily operating cost in port by vesel type and size presented in Section 4 for 365 days for vessels accounting for 2004 restricted period arrivals. Daily operating cost in port was assumed at 60 percent of daily operating cost at sea. Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

With a speed restriction of 10 knots proposed by NMFS in the final rule, the economic impact of the operational measures on small entities in the commercial shipping industry is estimated at $7.4 million in 2004. This estimate includes the direct economic impact of speed restrictions during seasonal management periods and dynamic management periods plus the cumulative effect of multi-port strings and the re-routing of southbound coastwise shipping. Containerships ($1.8 million) ro-ro cargo ships ($1.7 million) and passenger ships ($1.3 million) together account for 65 percent of the economic impact on small entities in the commercial shipping industry.

Table 5-6 also presents the economic impact on small entities as a percent of annual revenues for alternative speed restrictions by vessel type. Annual revenues for U.S.-flag and foreign-flag vessels were estimated from the 2008 vessel operating costs presented in Section 4, Table 4-5 by size and type of vessel. For vessels operated by small entities it was assumed that they spend equal amounts of days at sea and in port.

Overall, the economic impact of a speed restriction of 10 knots represents less than two-tenths of one percent of the annual revenues of vessels operated on the U.S. East Coast by small entities. For small entities operating ro-ro cargo ships and containerships, the economic impact increases to up to three-tenths of one percent.

Based on these findings, we conclude that the operational measures of the final rule would not have a significant economic impact on a substantial number of small entities involved in commercial shipping along the U.S. East Coast.

OTHER INDUSTRIES

The estimated economic impact of the final rule on small entities in other maritime industries is presented in Table 5-7. The economic impact is the same as presented in Section 4 for these industries with the exception of the high-speed vessel segment of the whale watching industry that excludes the economic impact associated with the New England Aquarium operations that is not considered a small entity[93]. For purposes of the RFA determination we have segmented the passenger ferry and whale watching industries by high-speed vessel operators and regular-speed vessel operators.

With a speed restriction of 10 knots proposed by NMFS in the final rule, the economic impact on small entities operating high-speed passenger ferries is estimated at $2.6 million in 2004. For small entities operating regular speed passenger ferries, the annual estimated impact is $6.0 million. In the whale watching industry, the estimated impact on operators of high-speed vessels and regular vessels is approximately $1.3 million. The impact on small entities in the charter fishing industry is estimated at $0.8 million. The estimated economic impact on small entities in the commercial fishing industry is $1.3 million.

Table 5-7. Estimated Economic Impact of Final Rule on Small Entities in Other Industries 2004 ($000s unless otherwise specified)

Industry	Estimated Economic Impact ($000s)	No. of Small Entities	Average Economic Impact per Small Entity ($000s)	Economic Impact as a % of Annual Revenues
Passenger ferries				
High-speed vessels	2,577.6	9	286.4	4.9%
Regular-speed vessels	6,031.3	8	753.9	7.9%
Whale watching				
High-speed vessels	319.7	3	106.6	4.2%
Regular-speed vessels	936.0	5	187.2	3.8%
Commercial fishing	1,310.2	345	3.8	0.5%
Charter fishing	796.0	40	19.9	3.9%

Source: Prepared by Nathan Associates Inc. as described in text.

Based on information provided by industry members, annual revenues for passenger ferries have been estimated using an average of $40,000 per vessel per day during a peak season of 120 days. For whale watching vessels, an average of $16,000 per vessel per day was assumed for a peak season of 120 days. Average annual revenue per small entity also takes into account the average number of vessels operated by small entities in each industry segment. The average economic impact per small entity is calculated by dividing the estimated economic impact by the number of small entities[94].

For small entities operating high-speed passenger ferries, the economic impact of the operational measures of the final rule will represent nearly 5 percent of their annual revenue. This is primarily due to the effects of a 15-

[93] See Table 4-45 for estimation of economic impact on commercial fishing; Table 4-47, for ferry operators; Table 4-50, for whale watching operators; and the discussion on pp. 145-146 for the economic impact estimation for charter fishing operators.

[94] As mentioned earlier, the economic impact on high-speed ferries and regular ferries was calculated separately; however, as shown in Table 4-46, four entities operate both high-speed and regular ferries.

day DMA assumed to be implemented on their routes during the peak season. Note that 100 percent compliance with the voluntary DMA is assumed. For regular-speed ferries, a speed restriction of 10 knots would result in an economic impact of 7.9 percent of annual revenues of the small entities affected. These economic impacts on small entities operating high-speed ferries and regular-speed are considered significant and if the costs were not passed on to passengers would substantially affect the profitability and viability of these small entities. Even if the increased costs could be transferred to passengers, overall demand could be affected as the ferry industry competes with other transportation modes.

The estimated direct economic impacts presented in Table 5-7 assume 100 percent compliance with the voluntary speed restrictions proposed for DMAs. If ferry operators choose not to comply with the speed restrictions during DMA periods, then the estimated economic impact on high-speed ferries would be $400,000 per year or about $45,000 per entity. This corresponds to less than one percent of estimated annual revenues. For regular speed ferries, the economic impact excluding voluntary DMA speed restrictions would be only $132 thousand per year, and would represent about two-tenths of one percent of annual revenues.

Small entities operating high-speed whale watching vessels would also be affected significantly by DMAs during their peak season with the estimated economic impact representing 4.2 percent of their annual revenues, again assuming 100 percent compliance with voluntary DMAs. The economic impacts on small entities operating high-speed whale watching vessels are considered significant and if the costs were not passed on to passengers would substantially affect the profitability and viability of these small entities. The impact on operators of regular-speed whale watching vessel is somewhat less at 3.8 percent of annual revenues. Even if the increased costs could be transferred to passengers, overall demand could be affected as the whale-watching industry competes with other entertainment options. If whale watching vessel operators choose not to comply with the voluntary DMA speed restrictions, there would not be any economic impact on the whale watching industry.

The economic impact on commercial fishing vessels is estimated at $3,800 per vessel per year and constitutes about one-half of one percent of their annual revenues. This is not considered to be a significant economic impact.

The annual revenue of a small entity operating a charter fishing headboat is estimated at $504 thousand based on an average of 80 passenger paying $70 for 90 charters. The estimated economic impact of the final rule at is 3.9 percent of their estimated annual revenue and for purposes of the FRFA determination is not considered to be a significant economic impact.

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