APPENDIX IV

Transits in the Atlantic Coast Wind Energy Areas and Lease Areas

Appendix IV

A. Introduction

The purpose of this analysis is to quantify the number of vessels and transits in each of the Bureau of Ocean Energy Management (BOEM) Wind Energy Areas (WEAs) and Wind Planning Areas along the Atlantic Coast and to visualize conflicts using a series of heat maps by vessel type.

B. Methods

1. Quantify Unique Vessels and Unique Transits:

For this analysis, the 2009 Automatic Identification System (AIS) data was obtained from the Marine Cadastre website (http://marinecadastre.gov/AIS/default.aspx). This data represents one-minute samples of AIS messages. This dataset does not include data from June 5, 2009 through June 30, 2009. The AIS data obtained from the Marine Cadastre is organized in separate files by month and Universal Transverse Mercator (UTM) zone. A master Atlantic Coast dataset was created by merging the data from all twelve months in 2009 in UTM zones 17, 18, and 19.

Fourteen areas along the Atlantic coast were analyzed. The location of each is shown in Figure 1.

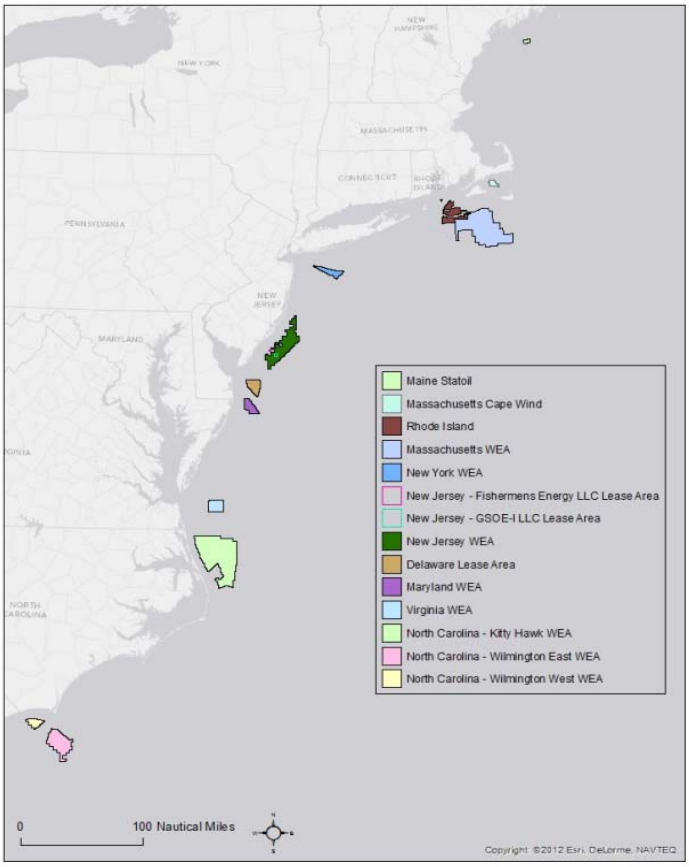

Figure 1: WEAs and Wind Planning Areas

The number of unique vessels transiting an area was determined by creating track lines from the AIS messages in the area surrounding the area of interest. See Appendix 1 for an example Python script used in for this analysis. First, a 50 nautical mile (nm) buffer was calculated around the area of interest. An analysis dataset was created by selecting the AIS message points that were within this buffer. Track lines were created by connecting the AIS message points in the analysis dataset by Maritime Mobile Service Identity (MMSI) in date and time order (Figure 2). The MMSI is a unique vessel identifier. However, there are instances of MMSI misuse and multiple vessels could have broadcasted the same MMSI. This AIS dataset has been processed in such a way that each MMSI correlates with one vessel. Because of the processing, it is impossible to determine how many vessels are using the same MMSI. With this dataset, MMSI is the best proxy for unique vessels. However, it is possible that some of the track lines generated do not represent true historical vessel movement and could be the movement of multiple vessels.

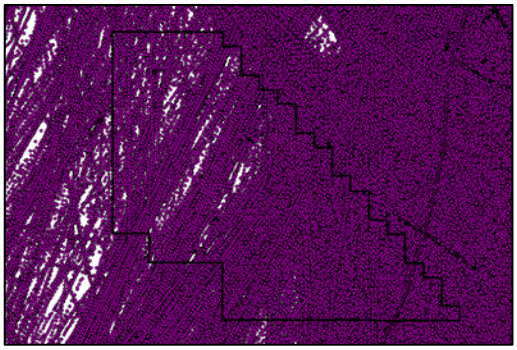

Figure 2 - 2009 AIS Broadcast Messages

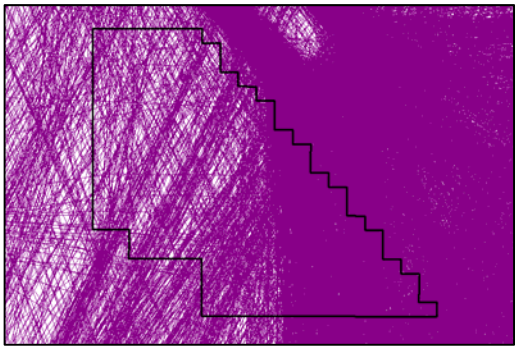

Figure 1 - Connecting the AIS Messages in the Vicinity of the Maryland WEA

Next, the track lines were clipped to the area of interest, as shown in Figure 3, below.

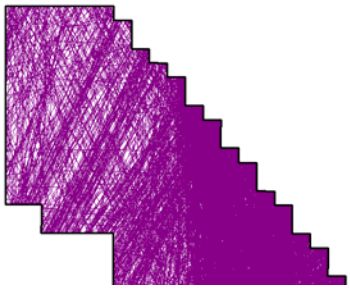

Figure 3 - 2009 Track Lines Clipped to the Maryland WEA

Each track line represents the movement of each MMSI over the entire year. The track lines are multipart features, meaning that multiple transits through the area of interest are drawn as one line feature. The track line was converted to single part features to determine the total number of transits in 2009 in the area of interest.

An example showing the multipart line feature from one vessel and the corresponding unique transits is shown in Figure 4 below.

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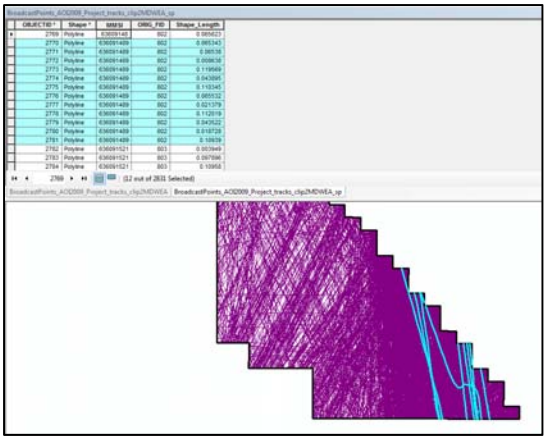

Figure 4 - Example of a Track Line From a Single MMSI and the Twelve Corresponding Transits

For this analysis, a transit is defined as any time a line enters and exits the area of interest. By counting this way, a vessel that is transiting near the edge of the area of interest may enter and exit the area several times, each time being counted separately. Figure 5 shows an example of an MMSI that had ten transits through the WEA in 2009.

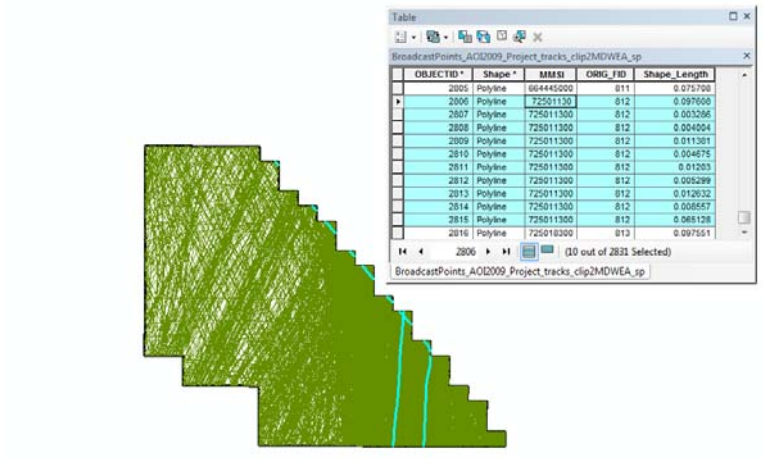

Figure 5 - Example of a Transit Near the Edge of the Maryland WEA

The number of features in the multipart line feature class was recorded as the number of unique vessels for the area being investigated. The number of features in the single part line feature class was recorded as the number of unique transits for the area being investigated. The area, in square meters and square nm, was calculated for each of the WEAs and lease areas. The number of unique vessels per square nm and the number of transits per square nm were calculated. This normalizes the number of vessels and transits by unit area and allows for a comparison between different WEAs and lease areas. Maps showing the track lines in the vicinity of the area of interest were created to show the distribution of vessel traffic in the area.

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Summary of Transits Through Wind Energy Areas and Wind Lease Areas
by Summary Vessel type

C. Results of Quantifying Transits through Wind Energy Areas and Wind Lease Areas

The number of unique MMSIs and unique transits for 2009 for all vessel types are summarized below in Table 1 for Wind Energy and lease areas (as of May 2013).

Wind Energy and Wind Lease Areas	Unique MMSI	Unique Transits
Maine Statoil	44	133
Massachusetts WEA	373	1206
Massachusetts Cape Wind	170	1087
Rhode Island/ Massachusetts Are of Mutual Interest	347	2609
New York	220	677
New Jersey	1257	10774
New Jersey - Fishermens Energy LLC	119	533
New Jersey - GSOE-I LLC	160	360
Delaware WEA	459	1508
Maryland WEA	823	2841
Virginia	892	2263
North Carolina - Kitty Hawk WEA	1553	7180
North Carolina - Wilmington East WEA	1008	4119
North Carolina - Wilmington West WEA	87	218

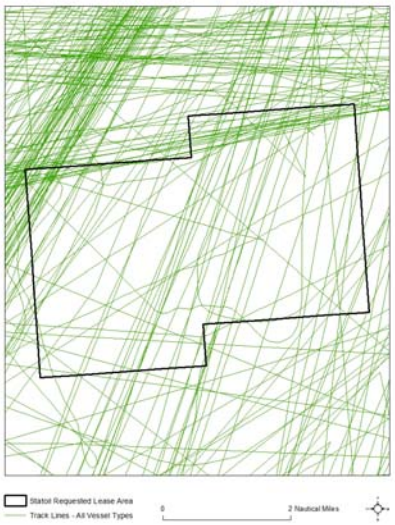

Figure 7 - Tracklines for Statoil

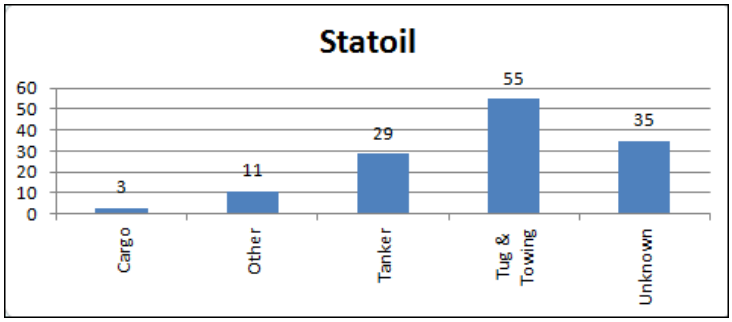

Figure 6 - Number of Transits by Summary Vessel Type

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Summary of Transits Through Wind Energy Areas and Wind Lease Areas
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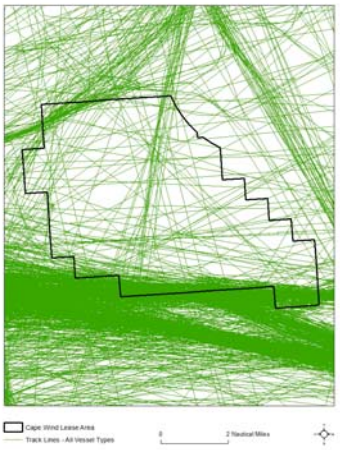

Figure 11 - Tracklines for Cape Wind

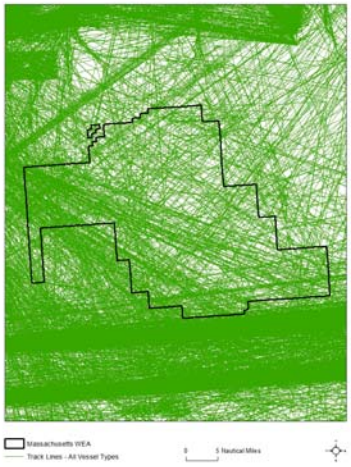

Figure 10 - Tracklines for Massachusetts

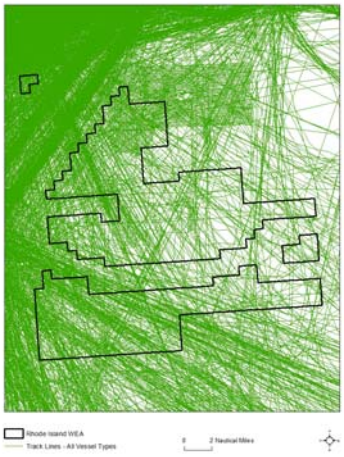

Figure 8 - Tracklines for Rhode Island

Table 1: Summary of Unique Vessels and Unique Transits

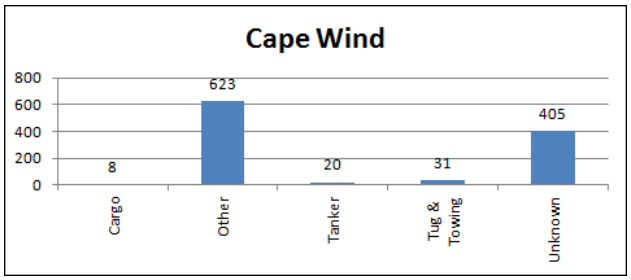

Figure 12 - Number of Transits by Summary Vessel Type

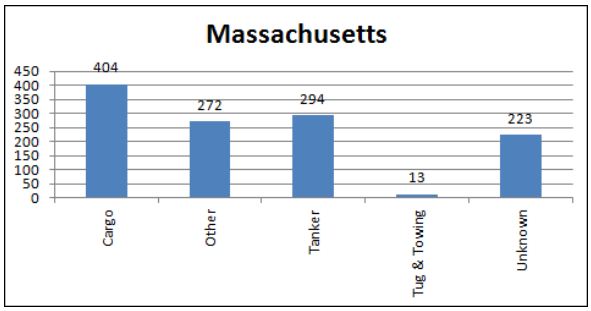

Figure 13 - Number of Transits by Summary Vessel type

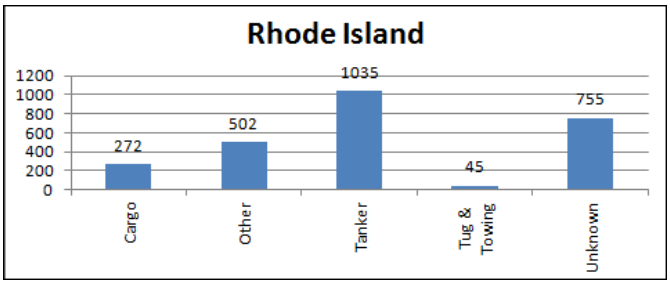

Figure 9 - Number of Transits by Summary Vessel type

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Summary of Transits Through Wind Energy Areas and Wind Lease Areas
by Summary Vessel type

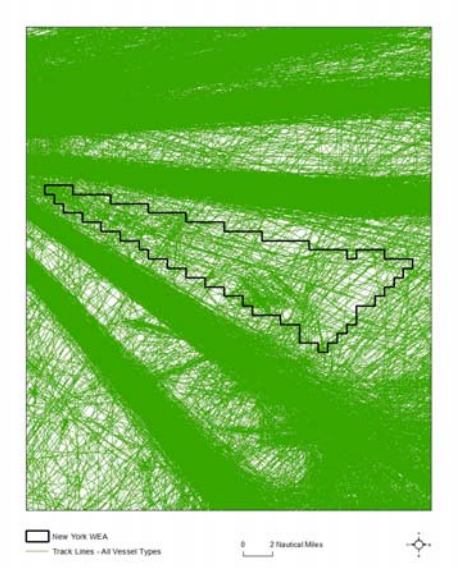


Figure 17 – Tracklines for New York

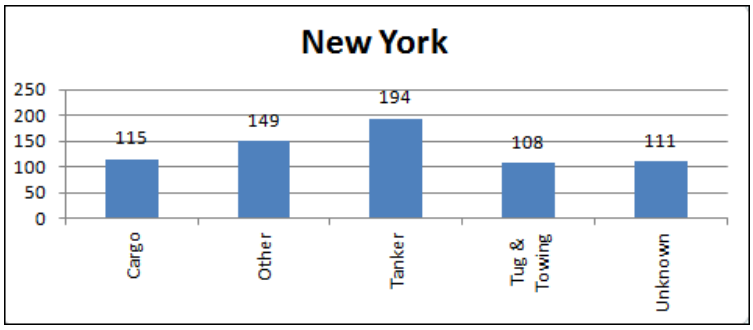


Figure 16 - Number of Transits by Summary Vessel type

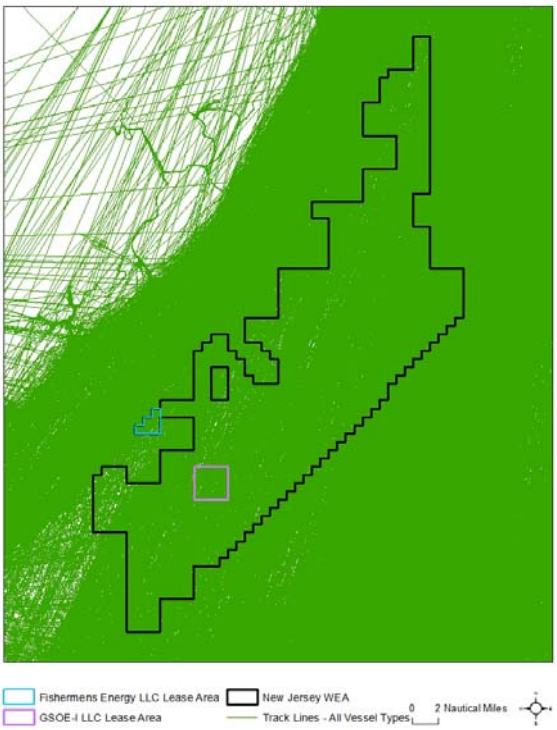
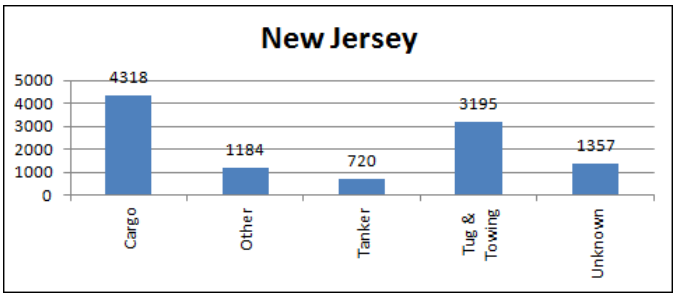
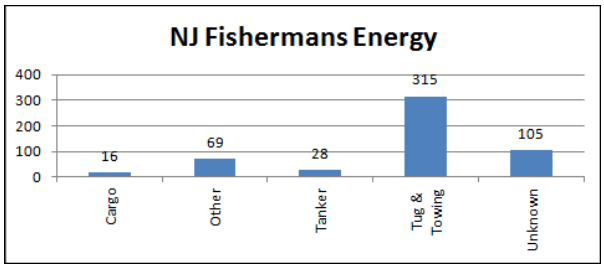


Figure 15 – Tracklines for New Jersey





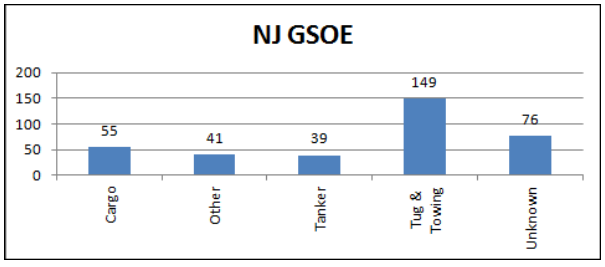


Figure 14 - Number of Transits by Summary Vessel type

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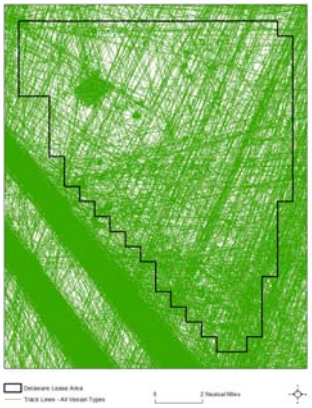

Figure 23 – Tracklines for Delaware

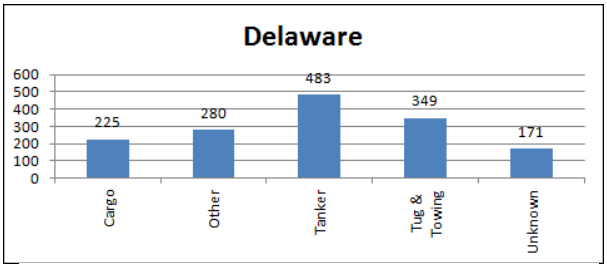

Figure 22 - Number of Transits by Summary Vessel type

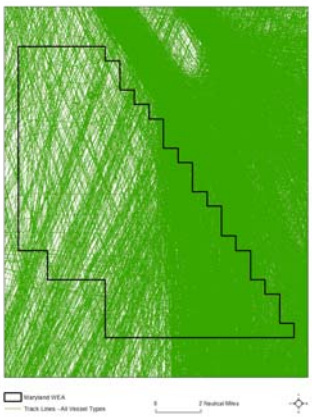

Figure 21 – Tracklines for Maryland

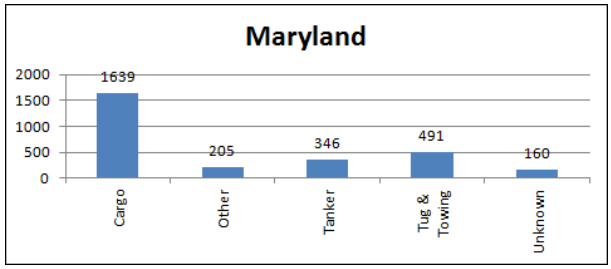

Figure 20 - Number of Transits by Summary Vessel type

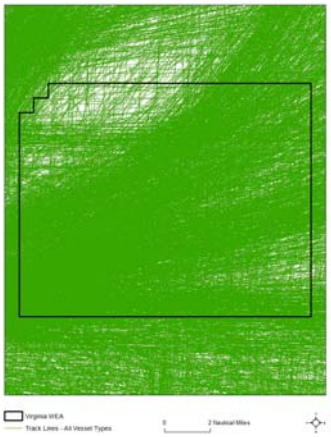

Figure 19 – Tracklines for Virginia

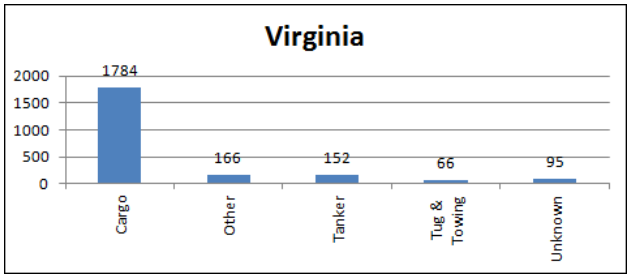

Figure 18 - Number of Transits by Summary Vessel type

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Summary of Transits Through Wind Energy Areas and Wind Lease Areas
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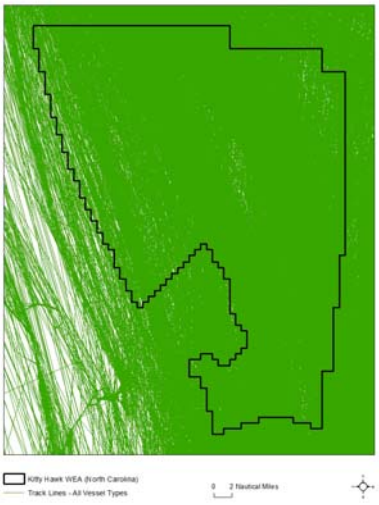


Figure 27 – Tracklines for Kitty Hawk

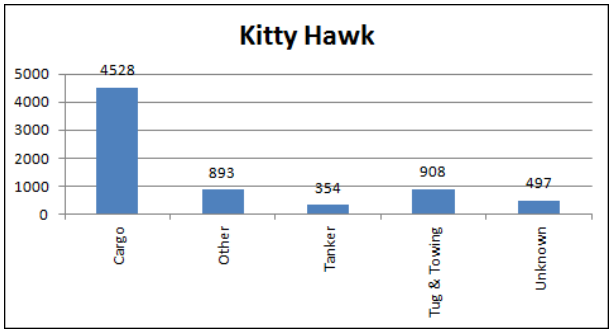


Figure 26 - Number of Transits by Summary Vessel type

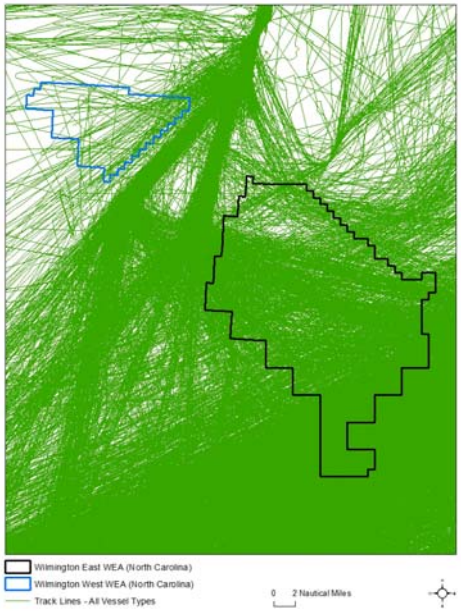
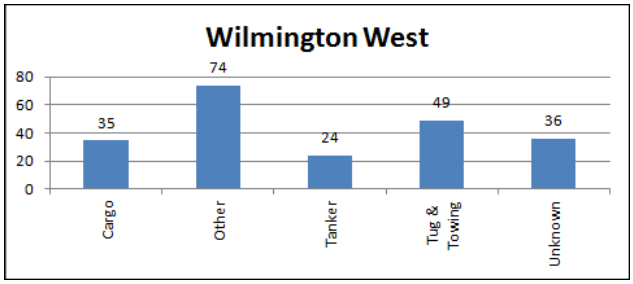


Figure 24 - Tracklines for Wilmington West and Wilmington East



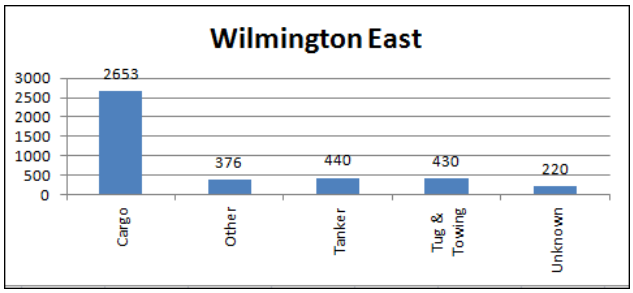


Figure 25 – Number of Transits by Summary Vessel type