ENCLOSURE 1

Atlantic Coast Port Access Route Study Team Charter

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 Second St. S.W.
Washington, DC 20593-7581
Staff Symbol: CG-5533
Phone: (202) 372-1566
Fax: (202) 372-1991

16650

MAY 04 2011

MEMORANDUM

From: B. M. Salerno, VADM, DCO
R. C. Parker, VADM, LANTAREA

Reply to Attn of: Mr. George Detweiler
(202) 372-1566

To: Distribution

Subj: ATLANTIC COAST PORT ACCESS ROUTE (ACPARS) STUDY TEAM CHARTER

Ref: (a) Ports and Waterways Safety Act (PWSA)(P.L. 95-474, 33 U.S.C. 1223(c))

1. Purpose: To charter the Atlantic Coast Port Access Route Study (ACPARS) team and identify its objectives, membership, and responsibilities.

2. Background: The Bureau of Ocean Energy Management Regulation and Enforcement (BOEMRE) has preliminarily identified numerous locations on the Atlantic continental shelf for potential development of wind energy. These proposed locations have the potential to impact maritime traffic along the entire Atlantic coast. The Deputy Commandant for Operations (DCO) and Commander, Atlantic Area have determined that a Port Access Route Study (PARS) for the entire Atlantic Coast should be performed to examine the impact of the proposals on vessel traffic and help balance the multiple uses of these waters. A study of this magnitude will far exceed the scope of a typical port access route study that focuses on a single port and its associated routes. Commander, Atlantic Area is leading this effort which will be executed by the matrix team described in this charter.

3. Objectives: Using enclosure (1) as a guide, the team will conduct the ACPARS within the limits of available resources to:

a. Determine whether the Coast Guard should initiate actions to modify or create safety fairways, Traffic Separation Schemes or other routing measures;

b. Provide data, tools and/or methodology to assist in future determinations of waterway suitability for proposed projects; and

c. In the near term, develop AIS products and provide other support as necessary to assist Districts with all emerging coastal and offshore energy projects.

4. Membership:

a. LANTAREA (09) - Chair workgroup

b. CG-55 – Co-Chair and Headquarters coordination

c. CG-761- Provide technical assistance and AIS support.

d. D1 (dp)

e. D5 (dp)

f. D7 (dp)

5. Action: The organizational elements identified above shall place a high priority on the ACPARS effort to ensure objectives are met.

6. Meetings: The ACPARS workgroup will meet as scheduled by the workgroup Chair. However, the Chair shall maximize the use of e-mail, online collaboration and teleconferences to achieve the required objectives. The Chair may identify and invite subject matter experts, visiting observers, and advisors to participate in the workgroup.

7. Funding: CG-55 will fund travel and meeting support for the workgroup and articulate additional funding requirements for conducting the study to DCO.

8. Deliverables:

a. Weekly briefings to LANTAREA (09) and CG-55

b. Monthly progress updates to DCO by the last Friday of the month.

c. Publish a Notice of Study by 15 May 2011.

d. Provide AIS products to the Fifth and First Districts for existing Wind Energy Areas by 31 May 2011.

e. Submit final ACPARS report by 01 May 2012.

#

Encl: Atlantic Coast PARS White Paper

Distribution: LANTAREA (00), (09), (P), (3P), CG-5, CG-6, CG-7, CG-094, CGD1, CGD5, CGD7

Enclosure 2

Marine Planning Guidelines

Marine Planning Guidelines -
Recommended Navigational Safe Distances

Purpose: These guidelines are provided to assist offshore developers and marine planners with their evaluation of the navigational impacts of any projects with multiple permanent fixed structures. The coastal areas include multiple users such as commercial shipping, tug and barge operations, commercial and recreational fishing, research vessels, offshore support vessels and aquaculture apparatus. The guidelines consider sea space necessary for ships to maneuver safely, and discuss other factors to be considered when determining appropriate separation distances for the siting of offshore structures near shipping routes and other multiple use areas.

These guidelines are not regulatory. They do not impact the boundaries of any existing leases for site characterization and site assessment activities, but do inform suitability of siting structures within a lease area. These guidelines should be considered during the area identification phase for both unsolicited and solicited development areas and when determining the siting of structures within existing areas. These guidelines also serve as one of the references to inform the Navigation Safety Risk Assessments (NSRA) conducted by developers.

Background: More than 90% of the world's trade is carried by water, making a safe and efficient marine transportation system critical to the Nation's economy. The shipping industry is dynamic as vessel size grows and newer designs meet the ever-changing maritime industry's ambitions. Understanding these changes and the future needs of the maritime transportation system are critical to marine planning efforts. Information such as that identified by a 2012 U. S. Army Corps of Engineers (USACE) study which estimated that the number and size (capacity) of container vessels calling on East Coast ports will double by 2030 is just one example of changing conditions that must be considered.[1] Marine planning has become increasingly important, and more complex with the size and density of vessels increasing and emerging uses of the waterways competing for space.

The United Nations Convention on the Law of the Sea (UNCLOS), Article 60, Paragraph 8 states "Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation." A similar provision is found in U.S. Law – The Outer Continental Shelf Lands Act (OCSLA) as amended by the Energy Policy Act of 2005 (EPAct), provides that the Secretary of the Interior shall ensure that any leases, easements or rights-of-way are carried out in a manner that prevents interference with reasonable uses of the exclusive economic zone, the high seas and the territorial seas; and in consideration of any other use of the sea or seabed, including use for a fishery, sealane, a potential site for a deepwater port, or navigation.[2]

---

[1] U.S. Army Engineer Institute for Water Resources (IWR) report, *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels,* June 20, 2012.
[2] Energy Policy Act, Section 388- Alternative Energy-Related Uses on the Outer Continental Shelf

Both UNCLOS and the International Maritime Organization- General Provisions on Ships' Routeing (GPSR) express intent for the ability of vessels to fully comply at all times with the International Regulations for Preventing Collisions at Sea, 1972, as amended (COLREGS). The GPSR is the IMO standard used when considering vessel maneuvering risk assessment. Impacting the ability of a vessel to fully comply with COLREGS constitutes "interference" in accordance with UNCLOS and the Energy Policy Act of 2005.

The Department of Interior's (DOI) Smart from the Start initiative[3] for promoting large scale, offshore renewable energy development, raised significant concerns from the U.S. and international shipping communities regarding the harmful impacts to navigation posed by large arrays of offshore structures. The Bureau of Ocean Energy Management (BOEM) created Renewable Energy State Task Forces to help BOEM identify priority areas for development, known as Wind Energy Areas or WEAs. While participating in this process, the Coast Guard has been repeatedly asked what the minimum required buffer or separation distance was for wind farms from shipping routes. As a Cooperating Agency, the Coast Guard was also asked to evaluate proposed areas for development.

To accomplish this task, the Coast Guard leveraged the United Kingdom (UK) Maritime Guidance Note MGN-371[4] to develop a RED-YELLOW-GREEN (R-Y-G) methodology to classify lease blocks as an initial recommendation concerning the potential impact to safe navigation, with the understanding that recommendations would be updated as additional information and analyses became available. The R-Y-G methodology assigned Red, Yellow or Green colors to chart aliquots[5] of the proposed WEA by applying risk-distance concepts from MGN 371. However, the methodology did not adopt the UK guideline of 5 NM as the minimum distance to the entry/exit of a traffic separation scheme (TSS), primarily due to the concern that the requirement would have eliminated the majority of proposed wind energy areas already announced as part of the Smart from the Start initiative.

Red aliquots were areas of high conflict and were not recommended to be considered for development. Yellow aliquots were areas that were moderate to high conflict which would require further study and analysis. Green aliquots were areas of lower conflict and considered as likely acceptable for development based on available information. On a case by case basis some areas of high conflict were classified as Yellow in order to allow further study if alternative routing and potential mitigations were being explored. The intent was to leave as much area available for further study and analysis to determine if risk could be lowered to within acceptable levels. Both Yellow and Green areas

[3] http://www.doi.gov/news/pressreleases/upload/02-07-10-wea-fact-sheet.pdf
[4] United Kingdom Maritime and Coastguard Agency (MCA) Marine Guidance Note MGN-371, Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues.
[5] Aliquots are generated from full OCS blocks by sub-dividing each block into 16ths and allow for more detailed boundary delineation in offshore energy leasing. The aliquots use a letter designation in addition to their parent protraction number and OCS block number (ie. NK-1802, 6822F). A full OCS block is 4800 x 4800 meters, while an aliquot measures 1200 x 1200 meters.

remained as part of a WEA in BOEM's notices to developers moving through the leasing process

The R-Y-G methodology resulted in de facto standard distances and left some with the incorrect assumption that the resultant WEAs had addressed all significant conflicts with navigation. However, the majority of blocks were classified as Yellow and conflicts still remained that required analysis to determine if risk could be lowered to within acceptable levels, before being considered suitable for development. Additionally, for certain areas, there was strong resistance to further reduce areas as additional information became available, resulting in areas being leased with significant conflicts remaining.

To address these concerns, more comprehensive guidelines similar to those promulgated by European countries were deemed necessary. The goal of these guidelines is to minimize interference with shipping routes such that the safety of navigation is not compromised, while providing the flexibility to evaluate site specific conditions to maximize area considered for development. In situations where achieving a low risk is not possible, the goal would be to mitigate risk to as *"Low as Reasonably Practicable[6]"*. The remaining level of risk would need to be weighed against other factors by the Lead Permitting Agency to determine whether the project should proceed or not.

Discussion: There is no international standard that specifies minimum distances between shipping routes and fixed structures; however, it is widely accepted internationally that fixed structures in the offshore environment should not interfere with navigation. In developing guidelines for the U.S., criteria established by international shipping organizations and standards published by other nations were considered. Some of these are summarized below.

The Confederation of European Shipmasters' Associations (CESMA) has endorsed a document provided by the Shipping Advisory Board Northsea. The document recommends a minimum distance of 0.3 NM + 6 ship lengths + 500 m to the Starboard side of a route and 6 ship lengths + 500 m to Port. Most self-propelled ships, by propeller design, tend to make tighter turns to port than to starboard. These recommendations are based on the minimum space needed by normal deep sea self-propelled ships to comply with the collision regulations.[7] This would equate to a distance of 1.9 NM to Starboard of a route with 400m vessels.

The World Shipping Council (WSC), which represents over twenty-eight liner shipping companies that carry approximately 90% of U.S. international containerized trade, has recommended a minimum buffer distance of 2 NM. They also recommend the buffers be increased in areas where vessels travel at higher speeds than in port approaches.[8]

---

[6] MGN-371

[7] The distance is based on local conditions and may vary for other locations. Most self-propelled ships, by propeller design, tend to make tighter turns to port than to starboard. http://www.cesma-eu.org/MSP.pdf

[8] World Shipping Council Comments on USCG ACPARS, August 2011. http://www.worldshipping.org/public-statements/regulatory-comments/unitedstates

The WSC also submitted additional information from vessel masters, providing the distances they believe are required for maneuvers that may occur when a vessel encounters an emergency or a collision avoidance maneuver while operating in a maritime traffic route (all values are approximate):

- Crash Stop (backing the vessel from full speed): ~ 1.75 - 2.4 nm
- Complete Stop (letting the vessel stop on its own from full speed): ~3 to 3.5 nm
- Emergency Anchoring: ~1.5 to 1.75 nm
- Width (i.e. tactical diameter) of a 180° turn (starting at full speed): ~0.9 nm

The United Kingdom (UK) combined radar results from the North Hoyle electromagnetic trials with published ship domain theory to determine the inter-relationship of marine wind farms and shipping routes.[9] The template developed was then offered to maritime stakeholders and wind developers for comment. The resulting guidelines are contained in the Maritime Guidance Note MGN-371.

Some of the key distances from the MGN-371 shipping route template include:

- 1NM is the minimum distance to the parallel boundary of a TSS (HIGH/MEDIUM risk).

- 2NM is the distance where COLREGS become less challenging. (MEDIUM risk)

- >2NM risk becomes LOW, except near a TSS where risk would be higher. (MGN-371 does not state a distance where risk becomes LOW near a TSS.)

- 5NM is the minimum distance from the entry/exit of a TSS. (Assumed to be MEDIUM risk)

The German Waterways and Shipping Directorate North West and North guidelines recommend a separation distance of at least 2 NM plus a 500 m safety zone between shipping lanes and wind generators.[10] In actual practice the German Spatial Plans for the North Sea and Baltic Sea have identified priority areas where structures cannot be built and also reservation areas as a supplemental measure in which the needs of shipping are given special consideration. In many cases the priority areas have fully addressed minimum requirements and the reservation areas are additional separation areas far exceeding the minimum requirements. Some reasons listed for the additional separation areas included hazardous cargo transits or heavily trafficked areas.

---

[9] United Kingdom Maritime Guidance Note MGN-371 - Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues, 2008.

[10] Guidelines for the Design, Marking and Operation of Wind Generators in the Area of Responsibility of the Federal Waterways and Shipping Directorates North-West and North to Guarantee the Safety and Efficiency of Vessel Traffic. http://www.wsd-nordwest.de/schifffahrt/Windparks_auf_hoher_See/PDF/Guidelines_for_the_Design,_Marking_and_Operation_of_Wind_Generators_in_the_Area_of_Responsibility_of_the_Waterways.pdf

Planning Guidelines- The enclosure provides the general guidelines for the siting of multiple structures near shipping routes and established ships routing measures. The guidelines would typically result in a medium level of risk as they are based on minimum distances for the largest vessels to maneuver safely. Additional mitigation measures should be considered to achieve a low level of navigational safety risk. As a cooperating agency in the NEPA process, the Coast Guard will request, through the Lead Federal Agency, that the developer complete a Navigation Safety Risk Assessment (NSRA) to evaluate potential impacts to navigational safety.

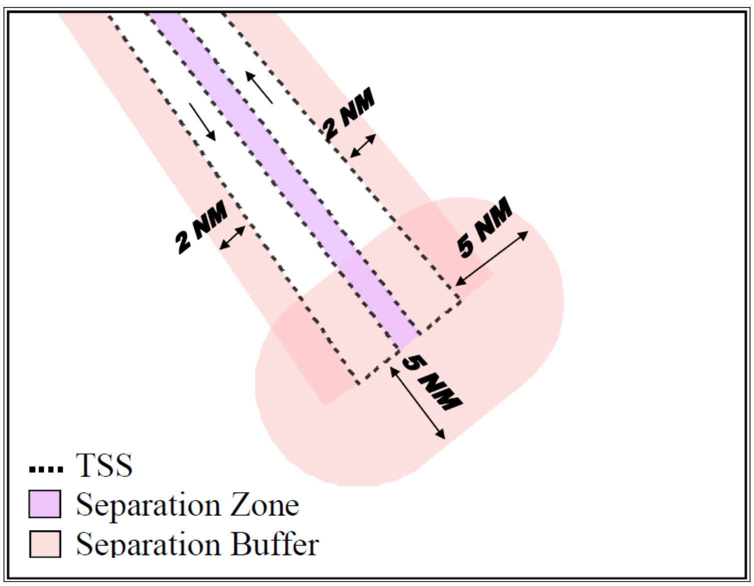
Recommended Guidelines for General Assessment of Areas for Potential Development

1. Port Approaches and Traffic Separation Schemes:

Planning Guidelines

- 2NM from the parallel outer or seaward boundary of a traffic lane. (Assumes 300-400m vessels)
- 5NM from the entry/exit (terminations) of a TSS

These recommendations are based on generic deep draft vessel maneuvering characteristics and are consistent with existing European guidelines. They account for the minimum distances for larger vessels to maneuver in emergency situations.



The 5 NM mile separation from the entry and exit of a TSS is necessary to enable vessels to detect one another visually and by radar in areas where vessels are converging and diverging from and to multiple directions.

2. Coastwise or Coastal Shipping Routes:

Vessels that tend to follow the coastline are typically smaller vessels and vessels that cannot safely transit too far offshore due to sea state limitations. The necessary sea space for vessels to safely maneuver is determined by the size and maneuverability of vessels, and density of vessel traffic. When determining routes near shore the depth of water and location of underwater obstructions must be considered, especially if vessel routes will be displaced by the introduction of fixed structures. Vessels of particular concern are towing vessels towing astern on a wire. In this configuration their footprint is large, maneuvering ability is constrained, and the catenary of the tow wire will dictate significantly larger water depths than the drafts of the tug or barge.

Planning Guidelines-

- Identify a navigation safety corridor to ensure adequate sea area for vessels to transit safely.
- Provide inshore corridors for coastal ships and tug/barge operations.
- Minimize displacement of routes further offshore.
- Avoid displacing vessels where it will result in mixing vessel types.
- Identify and consider cumulative and cascading impacts of multiple offshore renewable energy installations (OREIs), such as wind farms.

3. Offshore Deep Draft Routes:

Offshore deep draft routes can be more flexible in terms of the location of the routes. It is still necessary to have adequate sea area for safe navigation, but less critical to preserve existing routes to achieve safe conditions.

Planning Guidelines-

- Avoid creating an obstruction or hazard on both sides of an existing route.
- If not practicable to avoid structures or hazards on both sides of a route, a navigation safety corridor should be of sufficient size to provide for the safe transit of the largest vessels. Large ocean-going ships often operate a high speeds that effect maneuvering response time. This should be accounted for when making the determination.

4. Navigation safety corridors: Navigation safety corridors identify the amount of area necessary for vessels to safely transit along a route under all situations. These corridors are not considered routing measure by the Coast Guard or the IMO, but are only in this report to delineate areas where no offshore development should be considered. These corridors should not be confused with fairways, two-way routes or Traffic Separation Schemes which are routing measures that identify specific inshore traffic areas. Heat maps (density plots) of Automatic Identification System (AIS) information are useful in determining the location of a route, but are less useful in determining the appropriate size of a route where multiple vessels may be required to pass one another safely. Navigation safety corridors should be given priority consideration over other potential uses of the same water space.

In determining the appropriate size of navigation safety corridors, the following factors must be considered for the largest and least maneuverable vessels expected to use a route.

- Cross Track Error - indicates the difference between the vessel's intended and actual track.
- Closest Point of Approach - the safe distance at which a vessel can pass a fixed or moving hazard accounting for existing conditions.

- Density of vessel traffic - indicates the number of vessels that can be expected to meet, overtake or cross in the same general area.

The factors to be considered are interrelated and should be considered in the context of the maximum most probable weather and sea state conditions. The types of operations requiring the most sea space for maneuvering under normal and emergency situations should be used as the reference point.

Cross Track Error. Cross track error (CTE) is the difference between the intended and actual track. Factors leading to a vessel deviating from intended track include:

- Environmental Forces - include wind, currents and sea state.
  - Wind forces can set a vessel in the downwind direction. The impacts of the wind will vary according to the size and shape of the vessel.
  - Currents, particularly cross currents, can significantly affect the maneuverability of a vessel and space required to navigate safely.
  - Sea state, including size and direction of waves, can cause vessels to pitch, heave and roll. Yawing motions could result in the vessel drifting off course. Following seas can impact the ability of the vessel to steer a steady course.

- Swept Path - (the sum of various factors to determine the total width of the tug and barge path) will depend on the abilities of the vessel operator and the maneuvering characteristics of the vessel and are a secondary cause of cross track error.
  - Vessel Operator Response - consists of the vessel operator's ability to recognize a deviation from an intended track and the time to take corrective action.
  - Vessel's Response - the speed at which the vessel responds to rudder and main engines.

Closest Point of Approach (CPA). In complying with the COLREGS, the Captain of a vessel is required to consider all dangers of navigation and collision and any special circumstances, including limitations of the vessels involved, which may make a departure from the COLREGS necessary to avoid immediate danger.[11] When determining an appropriate CPA, all factors of weather, maneuvering capability, visibility, etc. must be considered, as well as potential emergency situations. Under ideal conditions with low sea states, good visibility and good communications between vessels to arrange a passing agreement, a CPA of ½ to 1 NM may be acceptable. Under less ideal weather and sea conditions and/or higher vessels speeds, a CPA of 2 NM or more may be necessary to ensure safe passage. By increasing the planned CPA, the chance of a collision or allision will be decreased.

[11] COLREGS - International Regulations for Preventing Collisions at Sea - International Regulations for Preventing Collisions at Sea, 1972 - Rule 2 Responsibility.

Density of Traffic. The amount of traffic along a route will dictate the likelihood of vessels sharing sea space in meeting, overtaking or crossing situations. With good communications and early actions, vessels can make arrangements to limit the number of vessels interacting with each other. However, there will be times when multiple vessels converge on the same location, such as in a cluster of OREIs, and additional sea space is necessary to maneuver safely and maintain appropriate CPAs for all vessels. The longer the route is constrained, the more likely multiple vessels will meet along a route. Crossing traffic such as fishing vessels or offshore support vessels transiting to/from offshore installations will further complicate vessel interactions. A navigation safety corridor should be designed to accommodate an appropriate number of vessels passing abeam of one another and other vessel operations in the area. In low density situations such as offshore, a minimum of two vessels may be appropriate. For moderate vessel density situations a minimum of three vessels should be used for planning purposes.

5. Other site specific considerations**:**

Potential contributions to risk

- **High density traffic areas with converging or crossing routes.** Similar to port entrances, areas where vessels are approaching from different directions into a smaller area will produce complex vessel interactions and increase navigational safety risk. This could occur in natural choke points or off shore of a cape, peninsula or other obstruction that vessels must go around.
- **Obstructions/hazards on opposite side of a route.** If hazards or obstructions are present on the opposite side of a route from a development area, the impact will be the constriction of vessel traffic and elimination of collision assessment time and avoiding action of vessels in an emergency situation.
- **Severe weather/sea state conditions.** Predominant severe weather and sea state conditions can impact visibility, maneuverability and navigation, all of which would negatively impact navigational safety.
- **Severe currents.** Severe currents will impact maneuverability of a vessel and ability to maintain intended track, thus negatively impact navigational safety.
- **Mixing of vessel types.** Vessels of differing types will naturally segregate not only due to vessel requirements for a safe transit, such depth of water or sea state limitations, but also to avoid each other for safety reasons. Smaller or slow moving vessels will tend to avoid major shipping lanes containing larger, faster moving vessels. When these vessels are displaced into the routes of other vessel types the number of overtaking situations will increase, thereby increasing risk, particularly if sea space is limited.
- **Complexity of vessel interactions.** In areas where interactions are more complex, impacts due to new obstructions could be amplified. Complexity can be driven by a number of factors, such as those previously discussed above where routes are converging/crossing or mixing of vessel types. Complexity could also be driven by other operations being conducted in the area such as fishing, recreational traffic or pilot boarding areas.

- **Large distances along a route.** The longer the distance of obstructions along a route, the greater the risk. Increased distance equates to increased exposure to the hazard.
- **Undersized routing measures.** If an existing TSS or other routing measure was not designed to accommodate existing or future density and size of vessels, additional separation may be appropriate.

Potential mitigations of risk

- **Mitigating factors such as pilotage areas, vessel traffic services, precautionary areas, areas to be avoided, anchorages, limited access areas, and routing measures.** Mitigating factors can be used to lower risk in many ways, such as increasing predictability of vessel traffic, increasing local knowledge and expertise, increasing situational awareness, or improving navigation. Proper marking and lighting of the structures of a wind farm can be used for navigation purposes improving the ability to fix a vessel's position.
- **Low traffic density.** Low traffic density will decrease vessel interactions and allow for more space for transiting vessels to maneuver.
- **Predominantly smaller vessels.** If only smaller vessels call on a port or if large vessel transits are very infrequent, smaller planning distances may be appropriate; especially if other mitigations are in place for the large vessel transits, such as tug escorts or moving safety zones.
- **Distance from ports, shoals and other obstructions.** If there are large distances to other hazards vessels will be able to adjust their route to ensure safe transits.
- **Aids to Navigation.** Enhanced Aids to Navigation may assist vessels in more accurately determining their position as well as identifying potential hazards.

Other Critical routes- Refers to routes that may not be obvious when looking at regular traffic patterns and may involve specific or unique requirements of particular vessels.

- **Natural Deepwater Approaches.** Natural deep water approaches may not be used by the majority of vessels but may be necessary for some vessels to enter or depart port at present or in the future.
- **Unique Transits.** Other requirements such as sea space, draft, etc. necessary for the safe transit of infrequent, but important vessel transits, such as periodic provisioning of remote communities.

Enclosure 3

U. S. Coast Guard/ American Waterways Operators Quality Action Team Report

U. S. Coast Guard/ American Waterways Operators Quality Action Team Report

Coastwise Towing along the Atlantic Coast

Tug and barge operations are more complex than other commercial vessel operations and require additional considerations when evaluating the spatial requirements necessary for safe navigation. The maneuvering characteristics of towing vessels not only varies significantly from other commercial vessels, but also varies greatly based on the tug and barge involved and the method of towing, such as pushing ahead or towing astern. There are also specially designed tug and barge units where the tug fits into a notch of the barge and is mechanically connected either rigidly in the case of Integrated Tug and Barges (ITB) or with a hinged connection in the case of Articulated Tug and Barge units (ATB). These tug and barge units maneuver more like a single vessel, but typically have lower sea state limitations than a comparable size ship.

For traditional towline tugboats with barges, operating by pushing ahead or towing alongside (towing on the hip) while connected with ropes or wires is generally reserved for inshore operations in more protected waters. When transiting coastwise or in the open ocean, higher sea states typically dictate that the barge is towed astern on a towline. Towing astern adds several additional dimensions to be considered in navigation. Varying sea states and weather conditions will require changes to the towing operation. When winds are from the northwest or west, the tug and barge(s) may operate closer to shore to maximize the protection in the lee of the land. Higher sea states may cause the tug and barge to slow down or lengthen the tow wire, increasing the total footprint of the tugboat and barge. Both of these actions would result in a deeper catenary of the tow wire and may require a transit further from shore to ensure adequate depth to prevent dragging the wire on the ocean floor where it can become snagged on obstructions or break. Slower speeds also amplify the effects of wind and currents. Limiting the maneuvering area available to towing operations will reduce captains' flexibility to vary operations and achieve the safest and most efficient route.

Marine Planning Considerations

In determining the appropriate size and location of alongshore routes to accommodate coastwise towing operations, the following factors must be considered.

- Cross Track Error - indicates the difference between the vessel's intended and actual track.
- Closest Point of Approach - the safe distance at which a vessel can pass a fixed or moving hazard accounting for existing conditions.
- Density of vessel traffic - indicates the number of vessels that can be expected to meet, overtake or cross in the same general area.
- Sea state limitations - will impact the furthest acceptable distance from shore.
- Depth of water - sufficient depth necessary to account for tug and barge draft and the catenary of the towline.

The factors to be considered are interrelated and should be considered in the context of the maximum most probable weather and sea state conditions. The types of operations requiring the most sea space for maneuvering under normal and emergency situations should be used as the reference point.

Cross Track Error

Cross track error (CTE) is the difference between the intended and actual track. Factors leading to a vessel deviating from intended track include:

- Environmental Forces - include wind, currents and sea state, and are the primary cause of cross track error.
    - Wind forces can set the tug and barge in the downwind direction. The impacts of the wind will vary according to the size and shape of the barge being towed and whether it is loaded or empty. An empty barge will ride higher in the water and be more affected by wind.
    - Currents, particularly cross currents, can significantly affect the maneuverability of the vessel and space required to navigate safely.
    - Sea state, including size and direction of waves, can cause vessels to pitch, heave and roll. Yawing motions could result in the vessel drifting off course. Following seas can impact the ability of the vessel to steer a steady course.
    - Tugs towing barges in heavy weather may be unable to make headway. In these cases, tugs may elect to steer into the wind or waves in an effort to hold their current position until conditions improve.

- Swept Path - will depend on the abilities of the vessel operator and the maneuvering characteristics of the vessel and are a secondary cause of cross track error.
    - Vessel Operator Response - consists of the vessel operator's ability to recognize a deviation from an intended track and the time to take corrective action.
    - Vessel's Response - the speed at which the vessel responds to rudder and main engines.

CTE is further complicated when towing astern. The swept path can vary greatly based on the characteristics of the barge and how well it tracks behind the towing vessel. The length of the towline and the environmental forces acting on the barge will impact the degree of sheer experienced by the barge. The actions of the barge will also transfer forces back to the towing vessel through the towline, further impacting the maneuverability of the towing vessel.

Tugboats involved in dredging operations present their own set of challenges. These vessels will regularly have several units towed astern and tows of four or more units occur regularly along the Atlantic Coast. Each trailing unit will have a separate, additional hawser that is approximately 600-900 feet long. Each hopper barge, dump scow, or section of pipeline will have unique handling characteristics due to its load and hull characteristics. These tows will have significantly larger footprints than traditional tugs towing astern due to their long length and unique yaw characteristics.

In general, however, the swept path for towing a large 600-700’ barge astern with 2,000’ wire could easily be up to a ½ NM or more under typical adverse crosswind and crosscurrent conditions. For average tugboat and barge operations, the swept path would range from ¼- ½ NM.

Closest Point of Approach (CPA)

In complying with the COLREGs, the Captain of a vessel is required to consider all dangers of navigation and collision and any special circumstances, including limitations of the vessels involved, which may make a departure from the COLREGS necessary to avoid immediate danger.[1] When determining an appropriate CPA, all factors of weather, maneuvering capability, visibility, etc. must be considered, as well as potential emergency situations such as a Not Under Command situation or loss of tow. Under ideal conditions with low sea states, good visibility and good communications between vessels to arrange a passing agreement, a CPA of ½ to 1 NM may be acceptable. Under less ideal weather and sea conditions, a CPA of 2 NM or more may be necessary to account for prevailing conditions.[2] By increasing the planned CPA, the chance of a collision or allision will be decreased.

Density of Traffic

The amount of traffic along a route will dictate the likelihood of vessels sharing sea space in meeting, overtaking or crossing situations. With good communications and early actions, vessels can make arrangements to limit the number of vessels alongside each other. However, there will be times when multiple vessels converge on the same location and additional sea space is necessary to maneuver safely and maintain appropriate CPAs for all vessels. The longer the route is constrained, the more likely multiple vessels will meet along a route. Crossing traffic such as fishing vessels or service vessels transiting to/from offshore installations will further complicate vessel interactions. At a minimum, a route should be designed to accommodate three vessels passing abreast of each other, a situation which occurs regularly during normal operations. In addition, when towing in the vicinity of faster, deeper draft vessels, tugboats will attempt to stay clear of deep draft vessels by navigating along the edge of an established navigation lane, Traffic Separation Scheme, or other navigation corridor. Therefore, additional sea room may be required at the entrances to harbors, or in other areas traversed by deep draft vessels.

Sea State Limitations and Depth of Water

Most towing operations are restricted to operating within certain sea state limitations. Weather along the intended route will be considered prior to departing port and may dictate when the transit is scheduled. The lee provided by the shore provides some protection from westerly

---

[1] COLREGS - International Regulations for Preventing Collisions at Sea - International Regulations for Preventing Collisions at Sea, 1972 - Rule 2 Responsibility.

[2] A CPA of 2 NM or greater was identified by towing industry captains at a Captains Meeting on February 5, 2015 in Portsmouth, VA, as the distance necessary to minimize the chance of collisions and allisions during adverse weather conditions.

winds by reducing the fetch and therefore sea state. However, if winds are easterly, the only option may be to pay out additional wire or slow the vessel. Both of these actions will increase the catenary and may require additional depth. Ultimately, confined offshore navigation routes that reduce tug captains' discretion in planning a voyage will restrict vessels to departing only during the most ideal circumstances. Canceled and delayed trips will have a significant, negative impact on the flow of interstate commerce. When considering the location and width of a route, these factors need to be considered for the range of towing operations that may occur.

Conclusion

Based on the navigation challenges described above, a coastwise sea lane along the Atlantic Coast would need to accommodate three towing vessels abreast of each other under adverse weather conditions. The below scenario assumes 2 NM as the minimum acceptable CPA under adverse conditions. A ⅓ NM CTE for each tugboat and barge combination was chosen as a reasonable distance based on the range of actual towing vessel operations, knowing that it is unlikely that all three of the tugboat and barge operations would be the maximum size.

Under these assumptions, the resulting navigation route would be 5 NM wide and the total navigation safety corridor width, accounting for separation distances from hazards or obstructions would be 9 NM.[3] In addition to the necessary width, the corridor must also be located an adequate distance from shore so that water depth is appropriate for the range of towing vessel operations expected.

[3] A scenario of two maximum size tugboat and barge operations in a meeting situation, assuming 2.5 NM CPAs and a CTE of 1.0 NM would also result in a total navigation safety corridor width of 9 NM (with a navigation route width of 4 NM).

Atlantic Coast Towing Vessel Safety Corridor