



A Preliminary Analysis of Ship Domain Violations and Vessel Bank Interactions in the Houston Ship Channel

ERDC Dredging Operations Technical Support Program (DOTS)

U.S. ARMY CORPS OF ENGINEERS

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Response Summary:

USACE Galveston District requested a preliminary analysis of vessel-vessel and vessel-bank interactions in the Lower Houston Ship Channel (LSHC), between Barbours Cut and the Gulf of Mexico (Figure 1). Between Bolivar Roads Channel is just 530 feet wide. A large number of interactions among cargo vessels and tankers are reported in this area. Because the channel is so narrow, a collision or grounding event could close the channel to navigation traffic. An objective method of quantifying these risks is needed to support decisions about channel improvements. The ERDC implemented a method of analyzing vessel-vessel interactions and vessel bank interactions that was previously developed under ERDC's Navigation Systems Research Program and has been applied in other navigation projects.

ERDC used 23-days of automatic identification system (AIS) data from the spring of 2018 to enumerate ship domain violations (SDVs) among cargo vessels and tankers and identify vessel-bank interactions involving cargo vessels and tankers. A ship domain is the area around a vessel that should remain clear of other vessels. A modified Fuji domain was used in this study. The domain was an ellipse centered on the vessel and aligned with the course of the vessel. Its major axis was four times the length of the vessel and its beam was three times the swept path of the vessel.

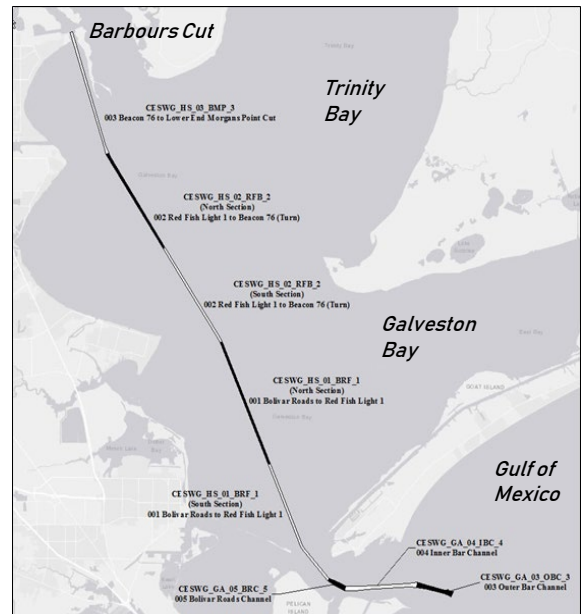


Figure 1: LSHC Study Domain

SDVs occur when one vessel encroaches on the domain of another vessel. ERDC identified and mapped instances of SDVs during the period of record and used these results to calculate two metrics of collision risk. The first metric was the probability that a cargo vessel or tanker operating in a navigation reach will be involved in an SDV with another cargo vessel or tanker. This metric can be used to quantify collision risks attributable to the design or condition of navigation channels and compare them with those in other channels because it controls for differences in the amount of traffic, reach size, and vessel dwell time and speed. The second collision metric was the annual frequency of SDVs in the LSHC. ERDC also identified and mapped vessel bank interactions to show where vessels were operating within five percent of their beam from the channel boundary.

Period of Performance:

October 15, 2018 – November, 15, 2018.

Benefits of the Response to the USACE Dredging/Navigation Program:

Results of the study enabled the navigation program to quantify collision and grounding risks and make objective comparisons of those risks with risks in other navigation projects.

Deliverable:

The results of this study were summarized in a white paper to USACE Galveston District.



Providing environmental and engineering technical support to the U.S. Army Corps of Engineers Operations and Maintenance navigation and dredging missions

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