13 April 2021

Chesapeake Bay Entrance Two Way Route Proposal

Introduction/Summary

This report is an addition to the *Chesapeake Bay Entrance Vessel Incident Report*, Jan 28 2021, and attempts to assess the impact of establishing two-way routes in the fairways proposed in the Chesapeake Bay Port Access Route Study. While the model shows a slight advantage to establishing two-way routes, due to limitations in the modeling software, no clear conclusions can be drawn from the results. The model shows that establishing two-way routes may decrease the probability of allisions and groundings, but may also increase probability of collisions. However, the only substantial change is the decrease in allisions, which registers as a full order of magnitude difference. Because this modeling exercise stretched the analytical limits of the IWRAP tool, less faith should be placed in the cases where small changes in probability are indicated. The model was also not able to estimate the difference from establishing each individual two-way route.

Model Development - Delta

In addition to the three models discussed in the previous report, model Delta (Figure 1) incorporates two-way routes in all proposed fairways approaching the Chesapeake Bay Entrance Traffic Separation Scheme. Routes were modeled by creating an additional lane and copying all inbound traffic to one lane and outbound traffic to the other, simulating the traffic separation that takes place in two-way routes. In Figure 1 the red arrows denote the direction where there is no traffic, therefore on the inbound lanes arrows point outbound and vice versa for outbound lanes.

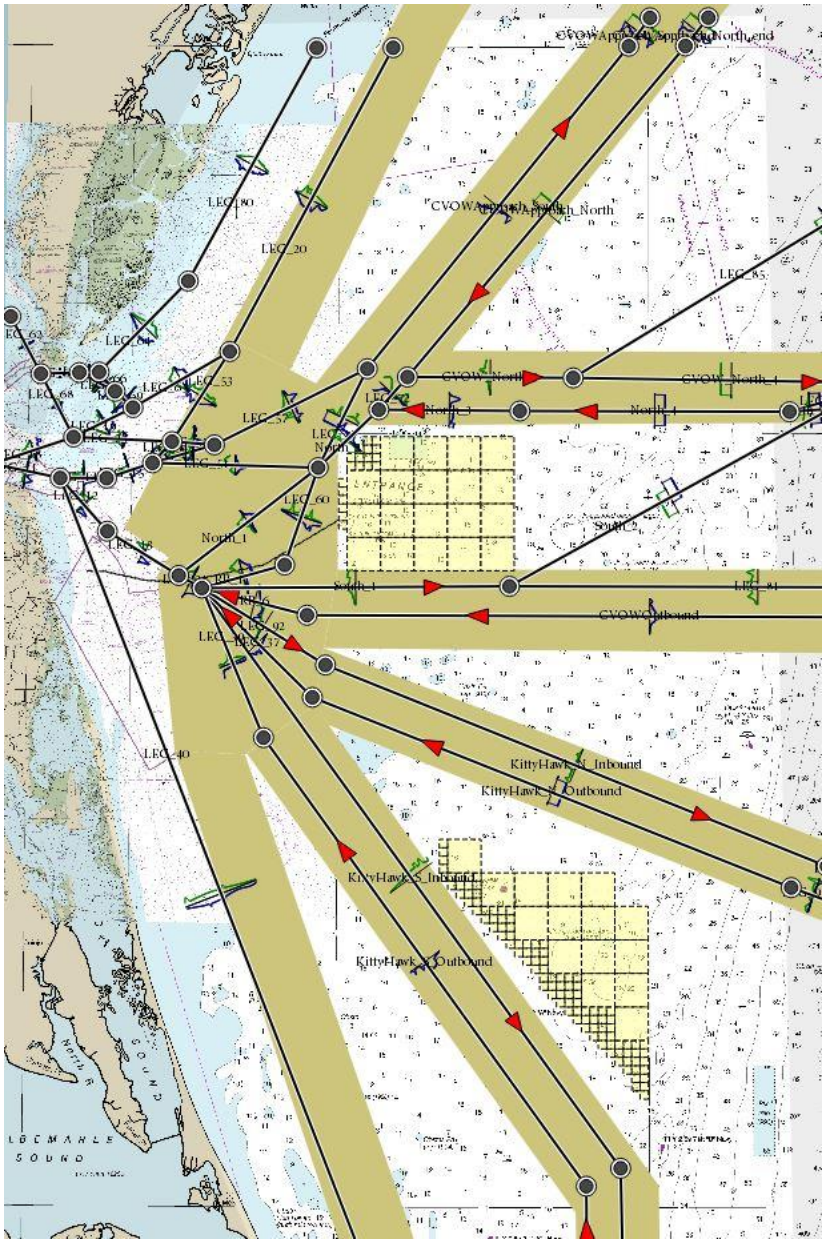

Figure 1: Delta Model

Delta Results

Results of the delta model are shown in Table 1 as incident probabilities and Table 2 as years between incidents. Overall, there was an improvement to both groundings and allisions and a slight increase in probability of collisions. Except for allisions, which registered as a change greater than an order of magnitude, the other differences should be considered negligible owing to the uncertainty caused by the limitations this modelling effort posed for IWRAP. Accordingly, the only substantial change is in the decrease in probability of allisions, which occurs because half of the traffic on the legs closest to the wind energy areas was moved further away to their respective one-way legs.

The probability of groundings slightly decreased but, again, these changes were likely within the bounds of the model's uncertainty. The probability of merging and crossing incidents increases but NAVCEN has low confidence in the validity of these estimates due to the model's treatment of waypoints. Additionally, many of these waypoints are in a large precautionary area which will mitigate the crossing and merging probabilities. Limitations in the modeling software do not allow an estimation of precautionary area impact.

	Charlie		Delta
Powered Groundings	0.18937000	-12.26%	0.16616000
Drifting Groundings	0.04524900	0.35%	0.04540900
Total Groundings	0.23462000	-9.82%	0.21157000
Powered Allisions	0.01048500	-70.06%	0.00313900
Drifting Allisions	0.00039457	-7.60%	0.00036457
Total Allisions	0.01088000	-67.80%	0.00350350
Overtaking	0.00204190	5.16%	0.00214720
Head On	0.00174920	-13.75%	0.00150870
Crossing	0.00034182	10.66%	0.00037827
Merging	0.00053398	69.11%	0.00090299
Bend	0.00956680	1.04%	0.00966620
Total Collisions	0.01423400	2.59%	0.01460300

Table 1: Incident Frequencies in Incidents/year

An attempt was made to isolate routing proposals by only calculating the legs and waypoints that were involved in creating each two-way route. However, the values for both the Charlie and Delta versions of these sections were too low (approximately $.1E^{-6}$) to gain any insight. This model is unable to quantify the impact of each individual two-way route.

	Charlie	Delta	
Powered Groundings	5.280667	13.97%	6.0182956
Drifting Groundings	22.099936	-0.35%	22.022066
Total Groundings	4.262211	10.89%	4.726568
Powered Allisions	95.374344	234.02%	318.57279
Drifting Allisions	2534.404542	8.23%	2742.9575
Total Allisions	91.911765	210.55%	285.42886
Overtaking	489.739948	-4.90%	465.7228
HeadOn	571.689915	15.94%	662.8223
Crossing	2925.516354	-9.64%	2643.6143
Merging	1872.729316	-40.87%	1107.432
Bend	104.528160	-1.03%	103.45327
Total Collisions	70.254321	-2.53%	68.47908

Table 2: Incident Frequencies in Years between incidents

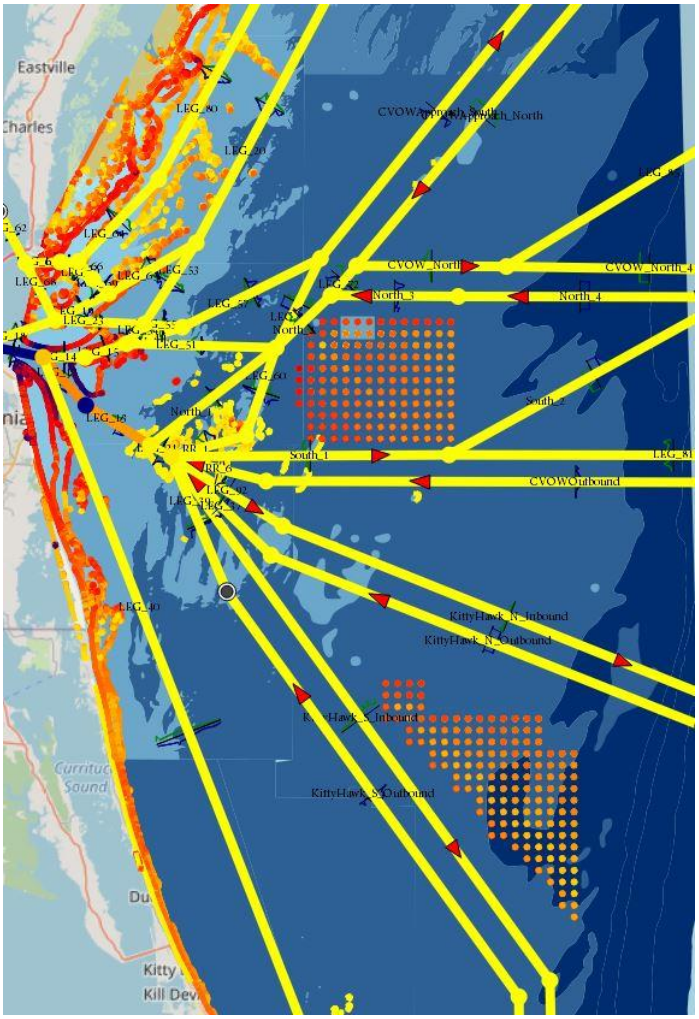

Figure 2: Delta Model Results