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Prioritizing Ports and Waterways Safety Assessments (PAWSAs)

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Prioritizing Ports and Waterways Safety Assessments (PAWSAs)

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Prioritizing Ports and Waterways Safety Assessments (PAWSAs) – Spring 2023

16 Baseline Risk Factors

Vessels	Traffic	Navigation	Waterway
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Dimensions
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Currents/Tides	Obstructions
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Visibility Impediments
Recreational Vessel Quality	Congestion	Bottom Type	Configuration

A PAWSA is a USCG NAVCEN-facilitated discussion among port stakeholders who provide feedback on the above 16 baseline risk factors that contribute to risk mitigation strategies.

Ports of Interest

Ideally, NAVCEN would conduct PAWSAs in every port and waterway, but due to man-hour constraints this is not feasible. This capstone project investigated how the above seven ports could be prioritized for PAWSA workshops based on vessel traffic and characteristics of the waterways. The goal was to construct a framework to compare waterways and determine which is most in need of a PAWSA workshop.

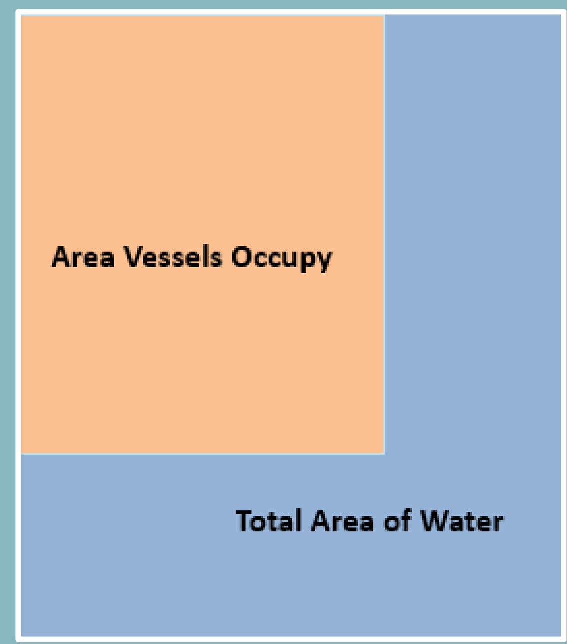
In this project, not all 16 of the baseline risk factors were addressed. Instead, three factors, one each related to vessel traffic, navigation, and waterway characteristics, were considered and used to make the final recommendation. Following the framework and procedure established by this project, additional baseline risk factors can be incorporated in the future.

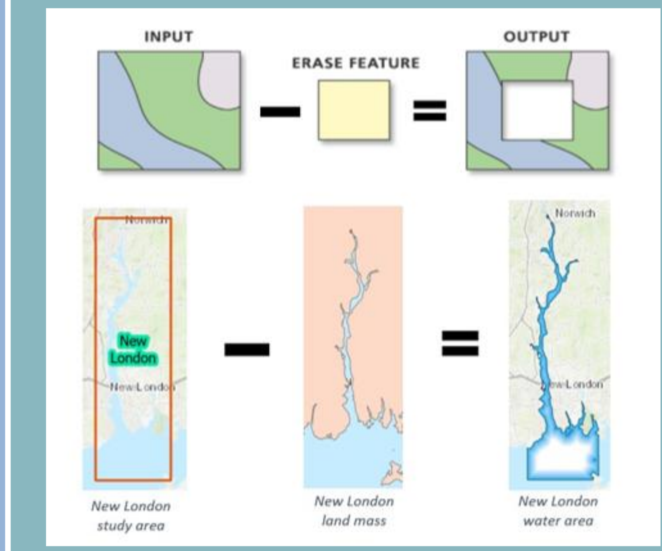
Methodology

Rank the ports along each of the following three factors, then combine each port's disparate rankings by multiplying the user's weighting of each factor's relative importance (1,2, or 3) by the port's ranking (1 to *n*; *n* = number of ports being compared) for that factor to obtain a port's overall rank. The final rank sum determines which port is in most need of a PAWSA.

Factor 1: Relative Vessel Congestion

The approximate surface area vessels in a port occupy compared to the area of water in that port, found by using AIS data and the erase feature in *ArcGIS Pro*.





Port/Waterway	Average Relative Congestion	Rank
Seattle/Tacoma	3.445%	7
New London	1.701%	6
Brownsville	1.047%	5
LA/LB	0.772%	4
New Orleans	0.440%	3
Boston	0.225%	2
Cape Canaveral	0.121%	1

Factor 2: Bottom Type

Using the *Coast Pilot* and nautical charts, ports were ranked from most to least dangerous bottom type.

Port/Waterway	Bottom Type	Rank
Boston	Rock	7
LA/LB	Rock	6
New Orleans	Mud, Clay, Shell	5
Brownsville	Mud	4
New London	Mud	3
Seattle/Tacoma	Mud	2
Cape Canaveral	Sand	1

Factor 3: ATON Availability Rate

Using the Availability Rate formula, the ports were ranked from least to largest percentage of time their aids were on station.

$$Availability\ Rate = 1 - \frac{Cumulative\ Hours\ of\ Nonfunctional\ Aids}{Cumulative\ Total\ Hours\ of\ All\ Aids}$$

Port/Waterway	Size (mi^2)	Number of Aids	Availability Rate	Rank
New Orleans	14390	955	92.52%	7
Brownsville	1840	198	94.45%	6
Cape Canaveral	2690	310	94.33%	5
Seattle/Tacoma	1000	75	98.00%	4
Boston	952	417	98.69%	3
LA/LB	4531	134	99.02%	2
New London	98	95	99.76%	1

Calculations

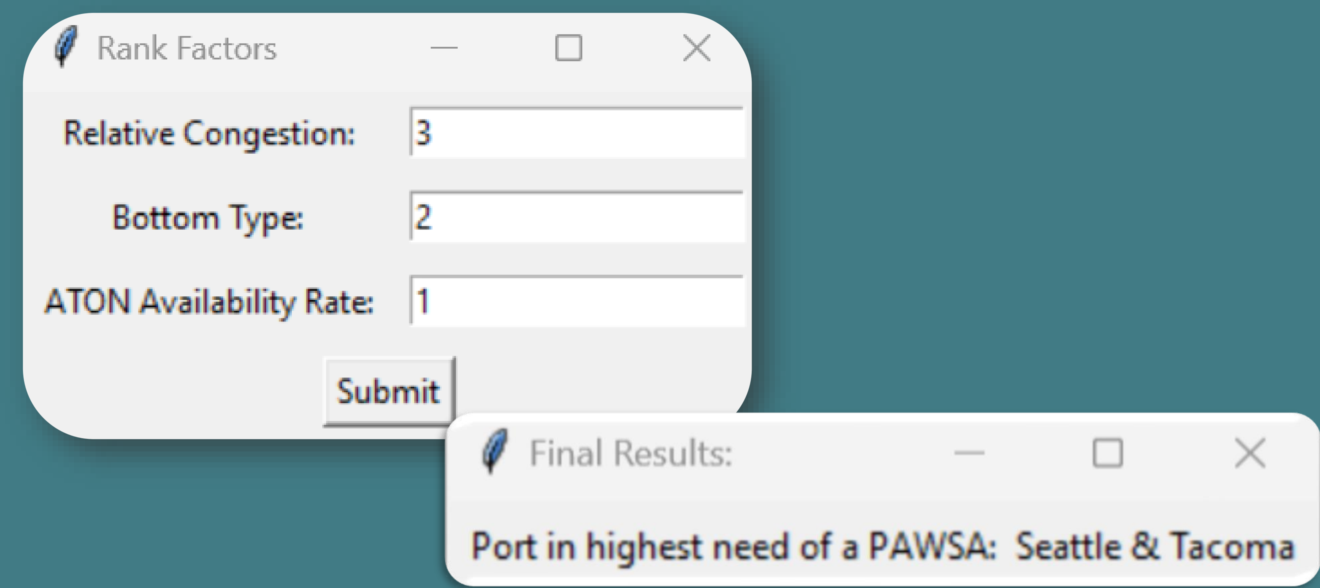
	Weight = 3	Weight = 2	Weight = 1	
Port/Waterway	Relative Congestion	Bottom Type	ATON Availability	Row Sum
New London	Rank = 6 6 x 3 = 18	Rank = 3 3 x 2 = 6	Rank = 1 1 x 1 = 1	18 + 6 + 1 = 25

Final Rankings

Port/Waterway	Relative Congestion	Bottom Type	ATON Availability	Row Sum	Final Rank
Seattle/Tacoma	**21**	**4**	**4**	**29**	**7**
Brownsville	15	8	6	29	6
LA/LB	12	12	2	26	5
New Orleans	9	10	7	26	4
New London	18	6	1	25	3
Boston	6	14	3	23	2
Cape Canaveral	3	2	5	10	1

Increasing need for PAWSA

Based on the example weights used for each factor above, we would recommend a PAWSA be conducted at Seattle/Tacoma first.



A GUI was created in *Python* to enable decision makers at NAVCEN to prioritize PAWSAs based on their own weighting of the level of importance of the three factors.

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