

**Anchorage Technical Discussion  
July 14<sup>th</sup>, 2021**

**Ecology Staff:**

Brian Kirk, *Prevention Section Manager*  
Jase Brooks, *Legislative Policy Analyst and Tribal Liaison*  
Adam Byrd, *Research and Information Technology Unit Supervisor*  
Alex Suchar, *Expert Model and Analysis Scientist*  
James Murphy, *Model and Analysis Scientist*  
Alex Hess, *Maritime Risk Lead*  
JD Ross Leahy, *Maritime Risk Modeling Specialist*

**Attendees:**

Blair Bouma, *Puget Sound Pilots*  
Christopher Burns, *Jamestown S'Klallam Tribe*  
David Bain, *Orca Conservancy*  
Eleanor Kirtley, *Green Marine*  
Fred Felleman, *WAVE Consulting*  
Green Marta, *San Juan County*  
Joseph Williams, *Swinomish Indian Tribal Community*  
Joycelyn Blue, *Snohomish County Surface Water Management*  
Liz Wainwright, *Maritime Fire and Safety Association*  
Lovel Pratt, *Friends of the San Juans*  
Mark Curtis, *Crowley Marine*  
Paul McCollum, *Port Gamble S'Klallam Tribe*  
Paula Doucette, *Transport Canada*  
Robert Poole, *Western States Petroleum Association*  
Ross McDonald, *Sause Bros.*  
Tessa Coulthard, *Clear Seas Centre for Responsible Marine Shipping*  
Tom Ehrlichman, *Swinomish Indian Tribal Community*

**The following summary notes are not intended to be a transcript but rather a review of the discussion session. Participant questions and comments are shown in bold text followed by Ecology responses.**

**Ecology responses that have been added after the conclusion of the event are preceded by the text "Supplementary answer."**

**The Swinomish Tribe would like to see a credible study done on the hazards associated with anchorages. It may be the case that you are planning to take incidents into account mathematically, but for the Swinomish it is important to remember that what is at risk, is the potential for losing a way of life. (Joe Williams)**

**Not all anchorages are suitable for all types or sizes of ships, for instance, around Vendovi some are dedicated to ATBs. In terms of matching the vessel to the anchorage, there are additional considerations. How will this be addressed? (Fred Felleman)**

JD Leahy: The model will be able to appropriately represent anchorages that are used by specific vessel types, since it relies on historical data. With regard to the suitability of each anchorage based on the size of the ship, that is not so easily represented. This is partly due to the lack of clear stipulations as to how big is too big. When thinking about potential model outputs, we see vessel type as the most important factor for determining anchorage location, with the specific length of the vessel being less important.

**When evaluating AIS data for historical anchorage use, if the AIS signal is outside the standard anchorage area, could the model miss it? (Lovel Pratt)**

Adam Byrd: We have a method in place to assure that vessels anchoring just outside an anchorage area are still counted as anchoring. We use a 500 meter buffer zone around the defined anchorage area. If the vessel stops within that buffer zone, it is counted as anchoring. Our goal is to capture all of the vessels that have anchoring behavior, regardless of how cleanly they happen in defined anchorage areas. The buffer is limited to 500 meters because if we extend the buffer too far, it starts interfering with the ability of the model to capture usage of berths or other anchorages.

**How are vessel swings that cross the anchorage border addressed? (Lovel Pratt)**

JD Leahy: If a vessel swing crosses the boundary of the anchorage, or remains on the outside of the defined boundary, it is not treated any differently by the model than if it had stayed inside the boundary.

**We suggest that any stopped vessel be treated as anchored because vessels can actually anchor anywhere. (Tom Ehrlichman)**

Supplementary answer: Treating all stopped vessels as anchored would produce a large number of inaccurate anchored vessels in areas where vessels don't habitually anchor. The model produced by that methodology would not be reasonably representative of waterway usage.

However, if anyone is aware of areas that see occasional or habitual anchorage use by covered vessels, not included in our list ([link](#)), please let us know. We can also look further into the data for examples of vessels anchoring in uncommon or otherwise undesignated areas.

**Using the anchorage maximum capacity numbers from the Harbor Safety Committee is not appropriate. Vessels sometimes anchor in numbers that exceed those maximum capacities. (Tom Ehrlichman)**

JD Leahy: We can look into vessels anchoring beyond the maximum capacity listed in the Harbor Safety Plan, and at what frequency.

**You should be basing the model on historical AIS data from 2020 and 2021. To do otherwise would skew it to the pre Covid era. The predictor of the future is what's happening now. Nobody is anticipating a return to some previous state. (Tom Ehrlichman)**

JD Leahy: We are using AIS from 2015-2019 as a training set. The algorithms that we build using the training data can then be used with any selected time period. That means the modeled vessel behavior underway or at anchor will not be tied to the 2015-2019 time period. We will select the base case time period when we move to the analysis phase.

**Rather than assign historical swing arbitrarily, we urge you to define certain anchorage area as areas of special importance. Heaviest use areas with low vacancy rates should be treated as fixed obstacles. It is paramount to err on the side of caution rather than to err on the low end of risk because of the critical nature of this area and the large volume of oil on the water. (Tom Ehrlichman)**

Supplementary answer: Representing some anchorage areas as fixed hazards that have an area larger than an individual vessel would skew the outputs of the model. Our model represents each ship on a minute by minute basis. Each ship is modeled as being at a single location at a single time, whether underway or at anchor.

Our approach allows us to see the different effects of higher or lower utilization rates of traffic lanes, and of anchorages. Alternatively, using a fixed hazard that is larger than a single ship for just a subset of model locations, has the effect of creating a different evaluation criteria for specific areas of the model. Using different evaluation criteria for different areas of the model puts us at risk of telling the model which areas are more dangerous, and then asking the model to reflect that belief back to us.

**We request that you use the circles in the Marico report and that these be considered as high hazard areas. AIS tracking data will show underway vessels going in and out of the anchorage area. How will that proximity to circle of anchor swing be addressed? Will the entire circle be treated as the encounter? (Tom Ehrlichman)**

Brian Kirk: The Marico study Tom refers to has a figure that showed a year's worth of AIS data for anchorage locations. The heat-map approach shows circles which represent the areas that ships swing due to tide and current and wind; similar to a long exposure photograph. From our perspective, one difference is the factor of timescale. The Marico report represents an entire year of data. The model we're developing uses a 1-minute time step so our modeled vessels move at a 1-minute interval. Mixing those two methods of representing vessels would create issues.

As we evaluate the choices that are made in model development, one of our guiding principles is that we are doing this as accurately as possible and in a way that is internally consistent throughout the model. We want the model to produce valid results so we want to be cautious about making choices that could skew the results one way or another. That's the lens the development team uses.

Adam Byrd: The approach you suggest is valid, but it doesn't mesh with how we are approaching other hazards within the model. We need a consistent approach.

**My follow up question on the technical explanation, I understand the rationale for using historical data to show swing as long as it is quality controlled and accurate. How does the model portray the entering vessel and its interaction with vessels at anchor? (Tom Ehrlichman)**

Alex Suchar: At each minute, the model checks if any vessels is close to another, using the ship domain. This is regardless of whether they are underway or at anchor. If there is overlap between domains an encounter is recorded.

We are unable to know what is behind a vessel's individual decision making, so instead of modeling something we can't know, we use the concept of blind navigation. The vessel does not make active decisions based on the presence or absence of other vessels. The ship's track, which is pulled from a list of historical tracks, might go right over another vessel while overtaking, for instance. This means that, in

the model, there is no difference between an encounter between two ships that were very close to one another, and an encounter between two ships that barely got close enough to count.

An underway vessel will not make different navigational decisions based on the presence of a vessel at anchor. If the ship domains overlap, this will be measured as an encounter. Vessels that are transiting near an anchorage won't make a decision to go around in order to avoid an anchored vessel. They still go through, regardless of the presence of an anchored vessel, because that's how historical vessels behaved.

**We urge the Vendovi area, including Anacortes, to be modeled as a special case study because this area has such high rates of oil on the water and it is right in the middle of the Swinomish homeland. We understand that the legislature has directed certain research questions but this is the most critical component to us. It is important that anchorages be treated realistically, especially because the model must be able to address other policy questions down the road. (Tom Ehrlichman)**

**Will crew boats and service tugs be modelled transiting anchorage areas? (Tom Ehrlichman)**

JD Leahy: Yes, these will be modeled as underway vessels. Dependent vessels like escort tugs and crew boats will run out specifically to meet anchored vessels.

**Does this ship domain for vessels at anchor include the natural swing of the vessel around the anchor? (Lovel Pratt)**

JD Leahy: The ship domain surrounds the ship, so as the ship moves, so does the ship domain. On a time step by time step basis, the domain moves with the swinging vessel.

**Relying on historic anchorage behavior to model ships brings up the question of whether the model would be run based on certain weather conditions and if that would have impacts on vessel's behavior while at anchor? (Lovel Pratt)**

JD Leahy: With our proposed approach, we can't account for the specific effect of a simulated weather pattern on the anchored ship. Instead our approach relies on the concept of past behavior at anchor being representative of what may happen in the future.