

## Paper for Consideration by NIPWG Status report on the development of S-126

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| <b>Submitted by:</b>      | UNH   |
| <b>Executive Summary:</b> | A study of the definition of S-126 and focus on interoperation with surface currents. |
| <b>Related Documents:</b> | NIPWG4-WP3-1, NIPWG5-21.2, NIPWG5-21.3  |
| <b>Related Projects:</b>  | S-101, S-111, S-104, S-124  |

### Introduction / Background

On the NIPWG wiki site the S-126 is defined as *the physical environment: describing marine and terrestrial topography, prevailing, seasonal, and hazardous currents, tides, weather, and other environmental conditions*. In [NIPWG5-21.3](#) it was stated that the S-126 contain “short- or long-term predictions of ocean data such as current velocity and use them to forecast marine physical phenomena and load warnings according to the level of risk”. KHOA also mentioned in an emailed storyboard that the S-126 would be the “standard for expressing the symbols and colors for the physical environment”. This brought up a discussion on the need to clearly define what exactly the S-126 will contain and how it will interoperate with other similar data from the [TWCWG](#) (Tides Water-levels and Currents Working Group; S-111, S-104) and the [WMO](#) (World Meteorological Organization; S-412). As a reminder from the paper [NIPWG5-21.2](#) the question was posed: “What publications are the NIPWGs main focus?”

Since the TWCWG group has released the first product from the S-111 standard it was decided to focus only on surface currents (choosing to work with one item, instead of eliminating items from a very long list) following up from the tasks generated by [NIPWG4-WP3-1](#). The rest of this paper conveys insights on usefulness, interoperability, data-structuring details and a prototype to illustrate the findings.

### Analysis/Discussion

#### The Prototype

In the background of Figure 1 on top of the nautical chart is the UNH portrayal of streamlines for the S-111 surface current data model.

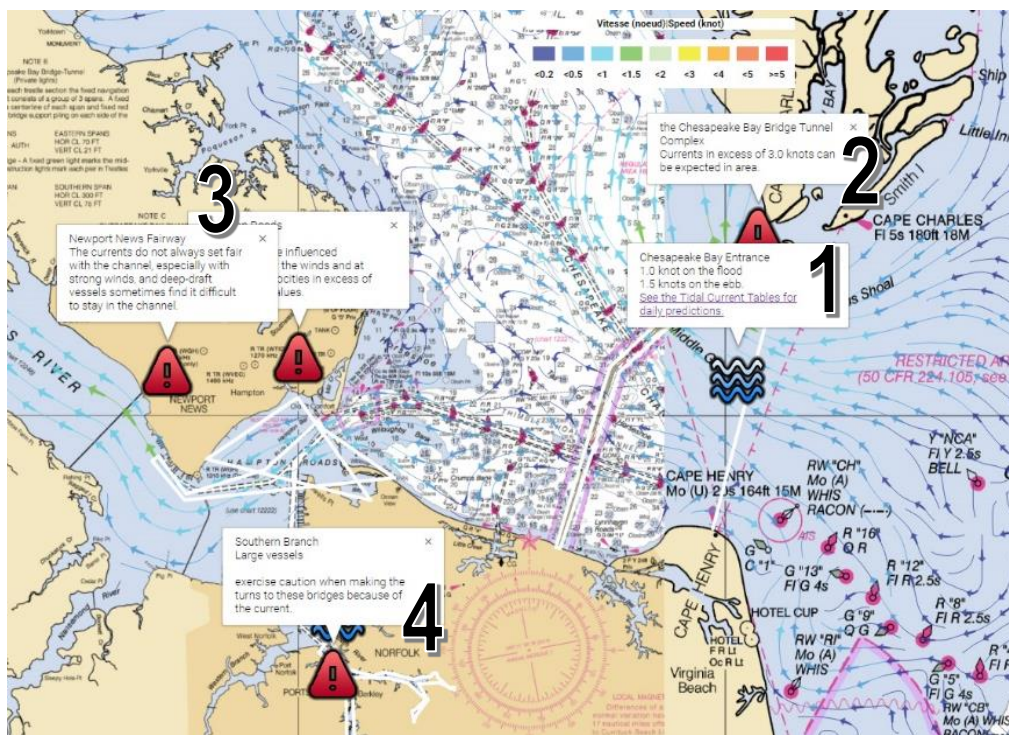


Figure 1. UNH prototype to visualize S-111 data with Coast Pilot textual data.

Note: FOR REASONS OF ECONOMY, DELEGATES ARE KINDLY REQUESTED TO BRING THEIR OWN COPIES OF THE DOCUMENTS TO THE MEETING

Overlaid on a separate layer are feature object outlines (in white) and icons associated with those objects (most of which are ENC objects). There are two markers types used as an example of a possible portrayal method to indicate warnings (the red triangle) and general conditions (the blue waves). The number 1 in the figure shows a line for a feature *not* in the S-101 catalogue...an *entrance*. (There are many textual descriptions related to the entrance of a body of water or waterway.) The 1 also indicates the general trend for the current velocity at that location, which tells of both the typical ebb and flow at a glance, vs. just one time-step in a possible series of data. 2 indicates a warning for a max current that could exceed predicted models (note: in this time-step the max speed at that location is about 1.5 knots). Warnings in both 3 and 4 have vessel size associated with them indicating these parts of the message could be filtered by vessel dimensions.

From this simple example some observations were noted:

- The textual data indicates specific areas of concern where the data model can't.
  - The textual data is already a refinement by years of experience of all possible data a mariner could receive...less is more sometimes.
- The textual data gives values where there isn't a data model available.
- The textual data can give more information at a glance for specific locations than the flow model can (as a flow model gives more information over a larger area to visualize general patterns)
- There are only two different types of data being represented in the text from this example: Warnings and General Trends.
  - Are warnings for currents repeated in S-124?
  - Are there categories in S-124 to also show surface current related warnings on this layer?
  - Is it adding value to have the general trend information for planning purposes? (especially where there might not be prediction models)
- The textual data can be mapped to existing S-101 features
- The textual data could be filtered depending on vessel type or location (i.e. if a track-line was created)
- An Entrance feature is not yet represented in the S-101 catalogue.

### Surface Current Data Models

Looking to the S-101 features for surface currents and tides there are four options:

1. Current – non-gravitational
2. Tidal Stream – flood/ebb
3. Tidal Stream Panel data
4. Water turbulence

These contain well defined data models that the ENC uses to replicate the data displayed on the RNC, just as the S-57 did. The question came up as to whether the S-126 would use this data model to feed the S-101 objects, or if ultimately these would be taken out of S-101 and used by NIPWG within the S-126. Either way, it seems a good idea to incorporate this data model into NIPWG work while building the S-126 to prepare.

The basic data model for Currents and Tidal Stream is shown on the left and right sides of Figure 2.

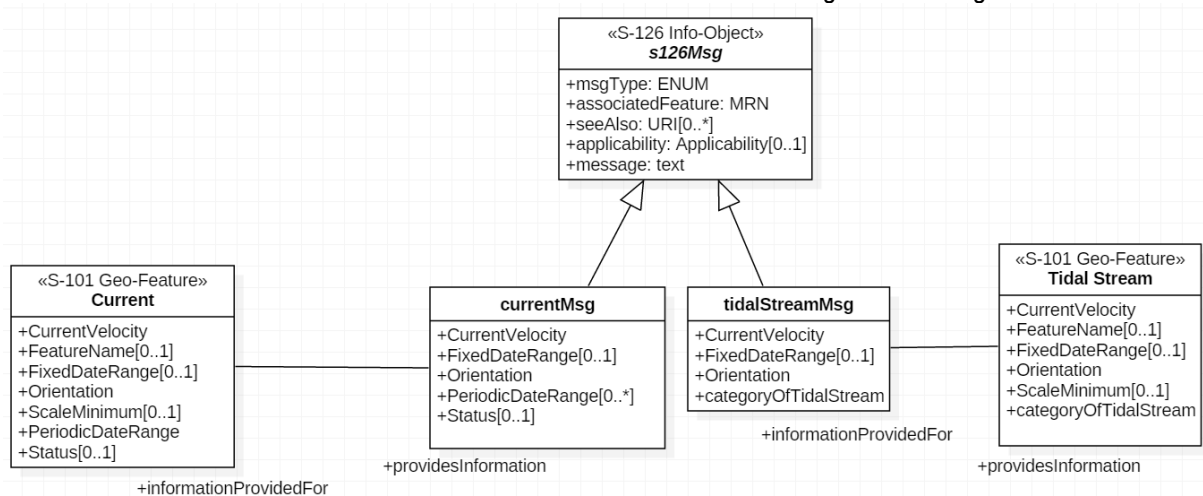


Figure 2. Possible S-126 schema for tides/current information

## Conclusions

Comparing the data model in the S-101 to the desires from the sample Coast Pilot text yielded some observations depicted in Figure 2.

Figure 2 also includes a proposed schema for a few items that are missing in the S-101 data model that would be needed for a more robust system as demonstrated in Figure 1:

1. An additional field indicating the type of data; a warning/caution or general trends (and perhaps others)
2. The ability to associate specific cultural and natural features to the current and tidal information
3. A URL reference for related tables or external data sources
4. The applicability of the message relating to vessel type/size
5. The message to convey, if it is more than just a speed and direction.

In mapping out the data from the prototype to the S-101 features it was clear there were cases for the textual information that didn't contain speed/direction (or orientation) values or contained average values and not the maximum or minimum as is defined by the CurrentVelocity attribute.

## Recommendations

A repeated recommendation from [NIPWG5-21.2](#) as well as from a member of the S-412 working group: *"a very clear definition of the intended scope (including temporal scope) of S-126 is needed."* Including answering the question regarding what publications / data are the NIPWGs main focus and responsibility?

Another recommendation from this research is to start slowly adopting and building the S-126 data model related to supporting data currently in production from other groups. Namely, starting with surface currents, tides and also weather. With this in mind, it is necessary to keep open and clear communication with the TWCWG group, the S-101 group and the S-412 group as to the progress of this portion of the S-126.

It is recommended to have a detailed discussion on the data model and conclusions outlined in this paper and come to a consensus on their merits as well as the direction moving forward; what are the next steps if it is to be rejected or approved? A last recommendation is to invite input from the HO's on their needs for representing this data and ability to implement this small portion of a possible data model.

## Justification and Impacts

Defining the S-126 standard will enable a better focus on the work to be done within the group to make sure it is well within the NIPWG bailiwick.

Working in conjunction with the other IHO working groups will enable for a better understanding of the roles of each group in relation to each other, thereby instilling interoperability at the ground level of this new product specification.

If the surface current and tide related data and data model could be agreed upon by the next meeting, it could be something implementable alongside with the recent release of the S-111 very soon.

There could be some impact to the S-101 or NIPWG depending on who decides is the owner of the tides and currents information,

## Action Required of NIPWG

The NIPWG is invited to:

- a. Note the paper and the recommendations outlined.
- b. Take time to CLEARLY and meticulously define what is the expected data contained within the S-126 as well as the expected sources of said data.
- c. Set up regular communication with the S-101, TWCWG and S-412 working groups regarding the development of coinciding areas of work; establishing a main point of contact in each group who will be responsible for liaisons.
- d. Agree upon a plan of action moving forward relating to the recommendations given in this paper.