Conversion of M_QUAL/CATZOC to S-101

Recommendations to HSSC-12

DQWG15-05.7A

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Existing M_QUAL in S-57

Object:	Quality of data
Acronym:	M_QUAL
Code:	308

Geometric primitives: A

Set Attribute_A: ~~CATQUA~~; (!)CATZOC; DRVAL1; DRVAL2; POSACC; SOUACC; SUREND; SURSTA; TECSOU; ~~VERDAT~~;

Set Attribute_B: INFORM; NINFOM; NTXTDS; TXTDSC;

Set Attribute_C: ~~RECDAT~~; ~~RECIND~~; SORDAT; SORIND;

Definition:

An area within which a uniform assessment of the quality of the data exists.

References

INT 1: not specified;

S-4: not specified;

Remarks:

Distinction:

accuracy of data; survey reliability;

Source: S-57.com

Existing CATZOC in S-57

Attribute:	Category of zone of confidence in data
Acronym:	CATZOC
Code:	72

Attribute type: E **Used in: M_QUAL**

Expected input:

ID	Meaning	INT 1	S-4
1	zone of confidence A1		
2	zone of confidence A2		
3	zone of confidence B		
4	zone of confidence C		
5	zone of confidence D		
6	zone of confidence U (data not assessed)		

Source: S-57.com

Zones of Confidence Table in S-57

Definition:

ZOC Table:

1	2	3		4	5
ZOC[1]	Position Accuracy[2]	Depth Accuracy[3]		Seafloor Coverage	Typical Survey Characteristics[5]
A1	± 5 m + 5% depth	= 0.50 + 1%d		Full area search undertaken. Significant seafloor features detected[4] and depths measured.	Controlled, systematic survey[6] high position and depth accuracy achieved using DGPS or a minimum three high quality lines of position (LOP) and a multibeam, channel or mechanical sweep system.
		Depth (m)	Accuracy(m)		
		10	± 0.6		
		30	± 0.8		
		100	± 1.5		
		1000	± 10.5		
A2	± 20 m	= 1.00 + 2%d		Full area search undertaken. Significant seafloor features detected[4] and depths measured.	Controlled, systematic survey[6] achieving position and depth accuracy less than ZOC A1 and using a modern survey echosounder[7] and a sonar or mechanical sweep system.
		Depth (m)	Accuracy(m)		
		10	± 1.2		
		30	± 1.6		
		100	± 3.0		
		1000	± 21.0		
B	± 50 m	= 1.00 + 2%d		Full seafloor coverage not achieved; uncharted features, hazardous to surface navigation are not expected but may exist.	Controlled, systematic survey[6] achieving similar depth but lesser position accuracies than ZOCA2, using a modern survey echosounder[7], but no sonar or mechanical sweep system.
		Depth (m)	Accuracy(m)		
		10	± 1.2		
		30	± 1.6		
		100	± 3.0		
		1000	± 21.0		
C	± 500 m	= 2.00 + 5%d		Full area search not achieved, depth anomalies may be expected.	Low accuracy survey or data collected on an opportunity basis such as soundings on passage.
		Depth (m)	Accuracy(m)		
		10	± 2.5		
		30	± 3.5		
		100	± 7.0		
		1000	± 52.0		
D	worse than ZOC C	worse than ZOC C		Full area search not achieved, large depth anomalies may be expected.	Poor quality data or data that cannot be quality assessed due to lack of information.
U	Unassessed - The quality of the bathymetric data has yet to be assessed				

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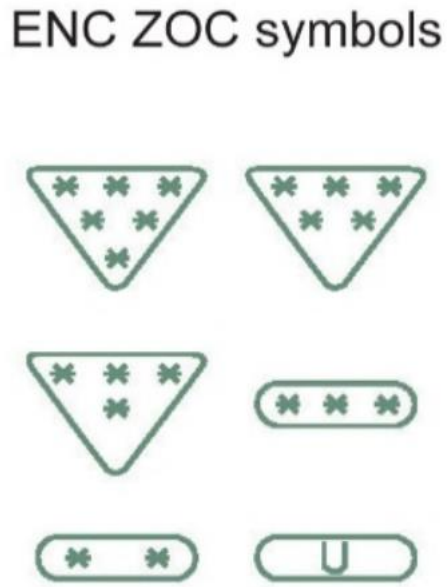
Position accuracy = POSACC

Depth accuracy = SOUACC

Source: S-57.com

Assigning the appropriate CATZOC value in S-57

Seafloor coverage
Depth accuracy
Position accuracy



- Cartographer selects the appropriate CATZOC value.
- This is applied as an overlying quality indicator for the Mariner to be visualized by the CATZOC symbology.

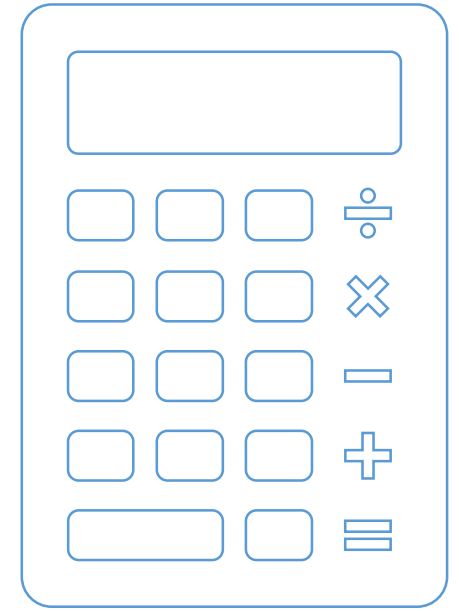
Conversion of the CATZOC value to S-101

- The existing CATZOC value is copied into the S-101 ENC
- The CATZOC value is mandatory
- The “S-101 Database” can still supply the original CATZOC value to produced S-57 ENCs

Populating uncertainty values during conversion to S-101

POSACC/SOUACC populated in S-57 ENC?

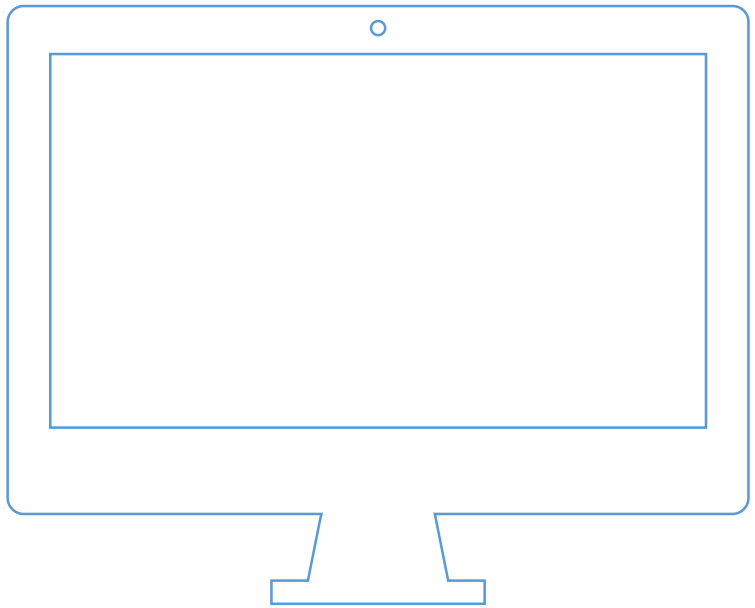
- The Position Uncertainty is calculated using the CATZOC value (A2 = 20m, B = 50 m, C/D = 500 m)
- The Depth Uncertainty is calculated based on the known depth and overlying CATZOC value
- For OBSTRN, UWTROC, WRECKS with unknown depth, the DRVAL2 of the DEPARE where the object is located in will be used, this will produce the safest uncertainty value



Boolean for portrayal of uncertainty values in S-101

- Obstructions
- Soundings
- Under water rocks
- Wrecks

- horizontalPositionUncertainty values
- verticalUncertainty values



Default value to allow Uncertainty Portrayal is automatically set to OFF, to avoid screen clutter

HO's can adjust the Uncertainty values, HO's can decide which OBSTRN, SOUNDG, UWTROC and WRECKS should be allowed to show their Uncertainty values

Advantages

- There is no effort from HO's required during the conversion process, unless they wish to provide better information to the Mariner
- The current display functionality is not affected unless authorized by the HO
- The S-101 ENC can still produce the old CATZOC value
- The S-101 ENC can be activated to facilitate autonomous shipping upon authority of the HO

ENCs in 2030 - Levels of Service

1. UKC shore based service (highest level of confidence)
2. High density, highly informative ENC (with uncertainty values activated)
3. High density ENC (uncertainty values present but not activated)
4. Standard ENC (as produced today in 2020)

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ENC portfolio in 2030

- Not all ENCs within your portfolio have to be at the same service level
- High density, highly informative ENCs to be created where they are needed
- Standard ENCs where they facilitate safe navigation as they do today

Receiving new data by HO

option 1: Cartographer enters the provided values for Horizontal Accuracy, Vertical Accuracy, Bathymetric Coverage, Feature Search and Feature Detection into the system

option 2: Cartographer enters the provided aggregated value of S-44 TABLE 1 (Minimum Bathymetry Standards for Safety of Navigation Hydrographic Surveys), worst case values are automatically populated

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Option 1: Results

1. The system will populate the provided Horizontal Accuracy and Vertical Accuracy values to the appropriate features and objects

2. The system will compute the CATZOC value that is appropriate

3. The original accuracy of the surveys are maintained in the chart product (today they are downgraded with the conversion from S-44 to S-57 - POSACC and SOUACC tend not be populated).

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Option 2: Results

1. The system will use entered value of CATZOC by the Cartographer

2. The system will compute the “worst case” value for the Horizontal Accuracy and Vertical Accuracy that applies within the CATZOC value

3. The system will populate the computed values to the appropriate features and objects

Alerting the Mariner (1)

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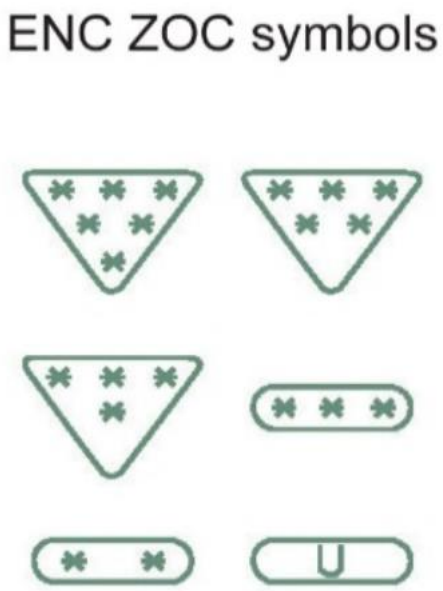

These symbols mean:
stay clear from shoal soundings, obstructions, under water rocks and submerged wrecks.

- 5 stars -> 20 meter
- 4 stars -> 50 meter
- 3 stars -> 500 meter
- 2 stars -> 500 meters or more
- U -> area has not been assessed, act accordingly

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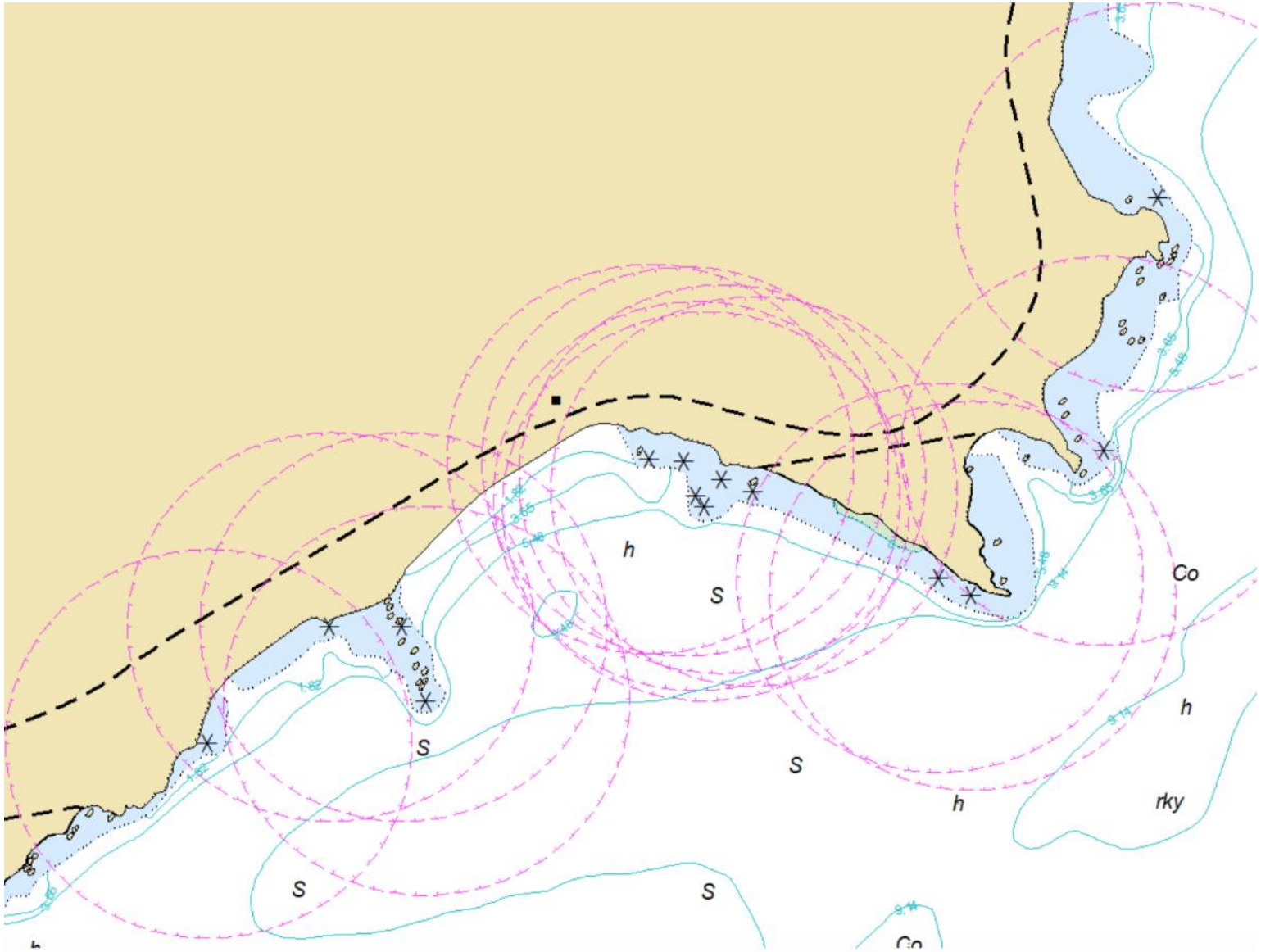
Alerting the Mariner (2)



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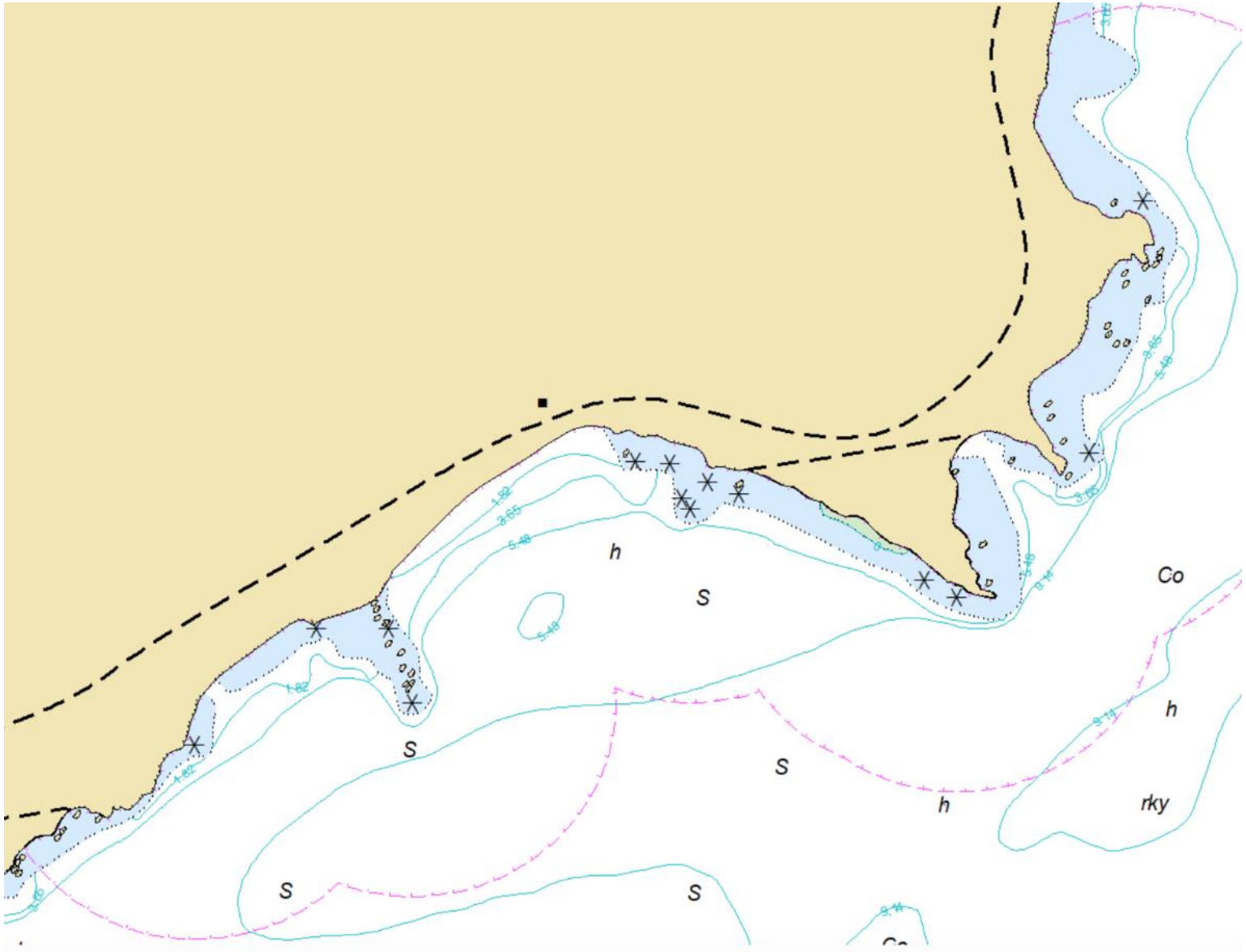
Alerting the Mariner (3)



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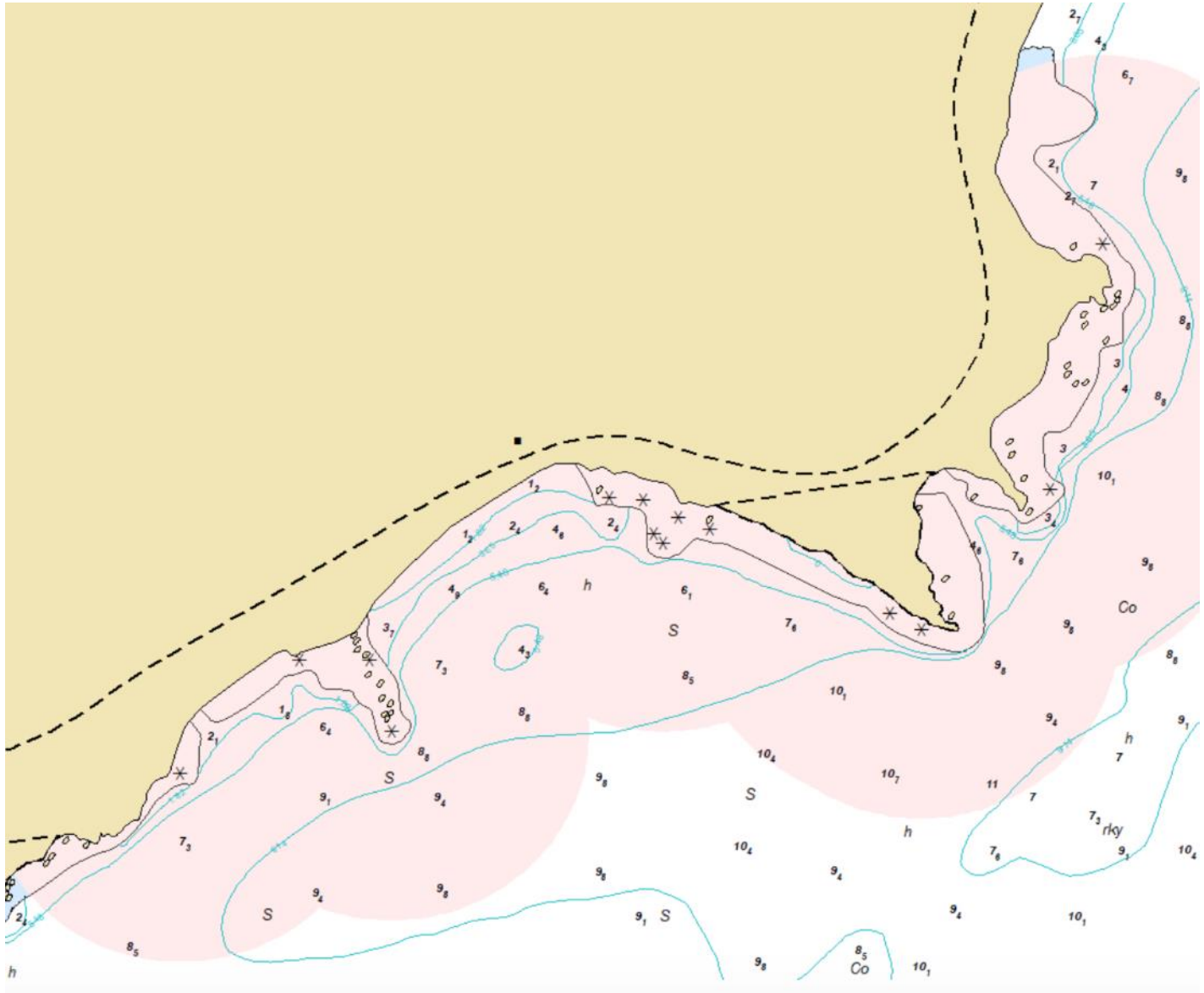
Alerting the Mariner (4)



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