S-101PT6-14

Paper for Consideration by the S-101PT

***"quality of horizontal measurement"* in S-101 ENCs**

Submitted by:	S-100WG (S-101PT)
Executive Summary:	S-101 and Quality of horizontal measurement
Related Documents:	a) 100WG1/S-101PT/S-101PT01-03.2A_S-101_DCEG_Proposals_Australia.pdf b) DQWG12-04.7A S-101PT4_2019_05.4_EN_Quaily of Horizontal Measurement_v1.pdf c) DQWG12-04.7A
Related Projects:	S-101 DCEG, S-32, IHO registry

Introduction / Background

1. At S-100WG1 (2016, Tokyo) Australia proposed (see related document a.), to replace in the S-101 Data Classification and Encoding Guide (DCEG) the use of *quality of horizontal measurement = 4 (approximate)* by value *5 (inadequately surveyed)* on "approximate contours".
2. The output of the discussions was Action S-101PT1 3.2A to prepare a paper to "clarify the use of attribute *quality of horizontal measurement* on DEPCNT at the next DQWG meeting.
3. A paper (see see related document b.) was submitted by France at DQWG12, pointing out the inconsistency of the current values allowable for this attribute, and suggesting that the DQWG would undertake a review of S-101 *quality of horizontal measurement* attribute values.
4. In the absence of decision from the DQWG, this paper suggests changes in the S-101 Feature Catalogue and DCEG.

Analysis/Discussion

5. S- 4 (clause B-411.2) states that "Where it is necessary to draw the navigator's attention to inadequacy in survey data, depth contours should be indicated as approximate …). Indeed, "approximate" is a well-known term for nautical chart users, as it is frequently used in INT1.
6. According to S-57 UOC (clause 5.2), spatial attribute QUAPOS is normally used with value *4* (approximate) on the geometry (edges) of depth contours in areas where bathymetric data do not allow to draw them precisely. The "approximate" characteristic of the depth contour is the consequence of the inadequacy of the surveys in the area (one could consider that all depth contours on nautical charts are "approximate" as they are generalized and do not reflect the real world).
7. QUAPOS (generally with values 4 and 5) is also used in S-57 on other individual objects (ex: WRECKS, SOUNDG) to indicate that the position of the object is not precisely known).
8. It is proposed to focus the encoding of *quality of horizontal measurement* on:
   - what is needed/useful to the mariner and
   - what is implemented by the ECDIS.
9. **What is needed/useful to the mariner?**. In the current S-101 Feature Catalogue, Enumerated attribute *quality of horizontal measurement* has 9 permitted values (S-57 values *7* (*reported_not surveyed*) and *8* (*reported_not confirmed*) have been moved to the attribute *quality of vertical measurement* in S-101):
   1: surveyed
   2: unsurveyed
   3: inadequately surveyed
   4: approximate
   5: position doubtful
   6: unreliable
   9: estimated
   10: precisely known

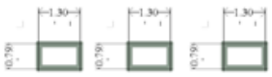
11: calculated

- Values *1*, *2* and *3* do not relate to the quality of the measurement but to the global quality of bathymetry in the area. Noting that "inadequately surveyed" is also value 10 of attribute *survey type*, it is proposed to remove values *1*, *2* and *3*.
- Values *4* and *5* are commonly used on nautical charts and documented in S-4 and INT1. Although the usefulness to distinguish between these two values is questionable (it is not sure these values trigger different behaviors in terms of navigation), it is proposed to keep values 4 and 5 (and as they are useful in driving "PA"/"PD" abbreviations from S-57 source data on the paper chart product.
- Value *6* has about the same meaning than 4 and 5. It is proposed to remove value *6*.
- Values *9*, *10* and *11* bring no useful information or/and are subjective. It is proposed to remove values *9*, *10* and *11*.

The allowable values for *quality of horizontal measurement* would thus be restricted to;

4: approximate
5: position doubtful

10. **What is implemented by the ECDIS?** *quality of horizontal measurement* provides a qualitative information on the position/geometry of an object. On current ECDIS, when QUAPOS is encoded with values different then 1, 10 and 11, symbology LOWACCXX is displayed (question mark for point or area objects; dashed line for line objects) or SOUNDSC2/SOUNDGC2 for soundings:

		
SOUNDSC2/SOUNDGC2	LOWACCnn	LOWACC01

11. In the S-101 world, DF (and post DF) ECDIS will probably have functionalities that allows generating horizontal safety margins. These margins will be calculated based on the value of attribute *horizontal position uncertainty*, which gives quantitative information on the position. The population of this attribute will have to be privileged by HOs rather than *quality of horizontal measurement.* Thus, the use of *quality of horizontal measurement* by the ECDIS will be limited.

12. A more radical alternative to the proposal would be to create a boolean attribute "*unreliable*" in place of *quality of horizontal measurement*, having a default value 0 (false), and which would be populated with 1 (true) when attention of the mariner must be drawn on the lack of precision of the object. This solution would change the data model and would have impacts on other S-10X products and probably needs further investigation before being proposed.

Recommendations

13. It is proposed to:

- Reduce the allowable values for *quality of horizontal measurement* to:
  4: approximate
  5: position doubtful

  This implies changes to the S-101 Feature Catalogue, DCEG, and S-101 Portrayal Catalogue.
- Consider, after a testing period (between S-101 edition 1.0.1 and 1.1.0), whether all other S-1XX products could share this data model, in which case, the IHO registry could be aligned to reflect these changes (it may be worth waiting for testing before suggesting changes in the Registry).
- Prepare additional guidance in S-4 to draw the attention of HOs on the importance of populating quantitative rather than qualitative attributes in their data bases, and on the implications in terms of ECDIS functionalities.
- Consider a proposal to the NCWG to merge the notions of *approximate* and *position doubtful*, as the difference is questionable in terms of navigation, for nowhere is it written that one would be "less precise" than the other.
- Consider the possibility of a Boolean attribute "unreliable" that would replace *quality of horizontal measurement.*

Action Required of S-101PT

1. The S-101PT is invited to:
    a. Note this paper.
    b. Discuss on the recommendations.
    c. Take any necessary actions according to the decisions made.