2nd NCWG MEETING
Monaco 26-29 April 2016

Paper for Consideration by the Nautical Cartography Working Group (NCWG)

Data Quality Indicators for bathymetric data on ECDIS chart display

Submitted by:	NIPWG
Executive Summary:	Proposed portrayal solution for revised data quality indicators for bathymetric data is provided to NCWG because the responsibility for portrayal of charted features is not a NIPWG responsibility.
Related Documents:	HSSC6_minutes_20150112_final.pdf, DQWG9 minutes Annex A, HSSC6-05.6Arev1
Related Projects:	Action Item 25 from HSSC6

Introduction / Background

The ENCs Bathymetric Data Quality information is currently encoded by M_QUAL/CATZOC. It has been reported that the mariners are not familiar with the meaning of the associated S-52 symbols (triangle field of stars or 'U's) used for the portrayal of the different CATZOC categories. Thus, the HSSC assigned a work item to the DQWG to revise the principles of data quality classification resulting in a less complex and more intuitive solution. The DQWG reported to HSSC6 that this work is planned to be finalised soon. A draft paper has been forwarded to the last TSMAD meeting and the developed data quality classification has been incorporated into the new S-101 Product Specification.

Consequently, the HSSC6 assigned a task to the SNPWG(NIPWG) / CSPCWG(NCWG) to draft a portrayal solution for the proposed new data quality classification of bathymetric data. The findings of the working on this topic and the comments made by the recent NIPWG meeting are provided by this paper.

Meantime, the NIPWG was informed that the recent DQWG meeting discussed the said draft paper on data quality of bathymetric data and the outcome was that the paper requires further revision and may experience further improvements. Thus, the drafted portrayal solution can be seen as a collection of first portrayal ideas on which further developments could be based.

Analysis/Discussion

Status before the recent DQWG meeting:

The DQWG developed a decision tree to determine which bathymetric data quality exists in a certain area. The current S-57 M_QUAL/CATZOC data model was simplified and was downgraded to three different quality levels: Low, Fair and Good. A fourth indicator has been introduced to indicate where the bathymetric data used for charting has not been assessed in respect of its quality. Although this three tier approach is now under further review as a result of DQWG10, the proposed portrayal solutions that follow in this paper are based on the three quality levels anticipated prior to DQWG10.

The proposers are aware of the recommendations made by the DQWG to HSSC6 not to use a red/yellow/green colour wash overlay which should be reserved for Under Keel Clearance display and presents altogether three alternative approaches.

For all three approaches the following basic assumptions have been applied:

- Consideration of the general composition principles of the chart display as standardised by S-52, namely colour tables for different light conditions, contrast between fore- and background colours, symbol size and shape
- No cluttering effects to the chart display by amended symbols or patterns,
- No ambiguities with existing chart symbols,
- Intuitive interpretation of the proposed symbols/colours as indicators for the data quality.
- Practical exercise of the proposed solution with real ECDIS displays.

ECDIS should provide a legend to explain the meaning of the pattern and/or the colour coding of their categories.

The circle patterns could be optionally applied to ECDIS display in the following way:

- During route planning and route monitoring as a corridor along the route's legs
- As part of the "watch dog" area ahead the ships symbol in large display scales

- As a “magnifier glass” bound to the cursor to be scrolled over chart areas

Taking into account that a commercial vessel may navigate with an average speed of 20kn and having calculated that about 10nm need a half hour sailing time and considering further that 30 minutes are a proportionate reaction time for a navigator, the following display rules are proposed:

- The default extension of the data quality indicators should be 10nm on both sides of the course (for better presentations the attached examples show only a 7nm extension).
- The default radius of the circle of the cursor search function should be 10nm (for better presentations the attached examples show only a 7nm radius).
- The extension of the indication area could be user defined.

<u>Approach No 1:</u>

This proposal is based on the known “traffic light” approach. A filler of the various circles is not being used.

Day Bright


Night

The basic symbol is a pattern of circles with the inner diameter of 2mm, the outer diameter of 2.2 mm and a stroke thickness of 0.1 mm (The picture below has been expanded by ten in comparison to the real size). The colour of the circle indicates the class of assessed data quality and is similar for day and night displays. Areas where the data quality of the bathymetric data has been unassessed will be portrayed by white circles.


good

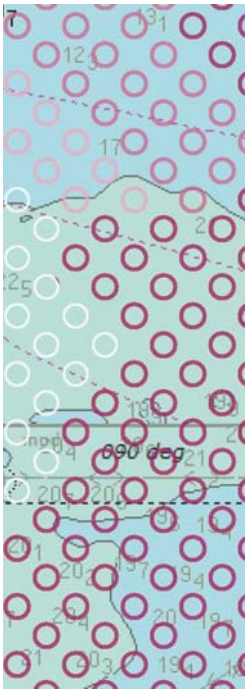
fair


low

The symbols should be disposed horizontally and the outer limits could be open (see also Annex1).

Approach No 2:

Bearing in mind that the “traffic light” solution is reserved for under keel clearance indication purposes, the use of only one colour but with different transparency levels is presented as an alternative approach. The quality of the bathymetric data increases contrarily to the transparency used which means that less transparency indicates a better quality of the bathymetric data. A white circle indicates that the survey data is unassessed.



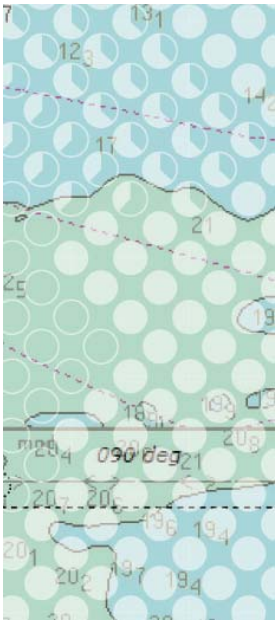
Day Bright


Night

However, it is clear that the differentiation between the different shades of a colour and the mariners’ access to the intended information is possibly not as intuitive as requested.

Approach No 3:

This approach follows “the use of a single colour” principle. The used colour is WHITE with a transparency of 70%. No charted information would be completed hidden by the symbols. Each circle has a 5 mm diameter. The contour of the outer limit is 0.2 mm thick. The anti-clockwise filling of the opacity has a positive indication from a graphic design perspective. More opacity means better quality of the survey. An empty circle indicates that the survey data is unassessed.

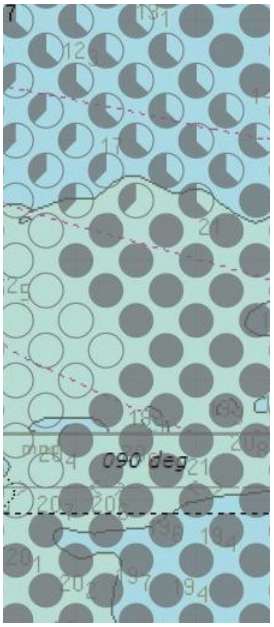


Day Bright


Night

Approach No 4:

This approach replaces the WHITE colour for the Day Bright display by a transparent GREY colour. The advantage of this approach would be that the symbols may also be used for the portrayal of the Source Diagrams on paper charts and the NCWG may benefit from the proposal. As a problem, the overlap of the single depths information has been identified. The portrayal of symbols in Night display mode is the same as for Approach 3.



Day Bright


Night

Feedback by the NIPWG1 meeting

The NIPWG took note of the developments. It was proposed to reverse the dot density; the better the data quality the less will be presented on the chart. The meeting was informed that the University of New Hampshire (UNH) is working on the problem of uncertainty and the depiction of it on an ECDIS. Uncertainty is driven by parameters such as quality. One of the big issues will be screen clutter which is a growing problem.

Conclusions

The proposal presents four different approaches to visualise the revised data quality indicators classification based on the DQWG development prior to the recent DQWG meeting. It also proposes the conditions of the operational use as specific ECDIS functionality during route planning and route monitoring.

Recommendations

The portrayal of charted features is not a NIPWG responsibility. Consequently, it is recommended to forward the development of a portrayal specification of data quality indicators to the NCWG. It is recommended that the NCWG should contact the UHM via Mrs. Briana Sullivan (briana@ccom.unh.edu) to seek academic feedback on the best portrayal solutions for data quality indicators.

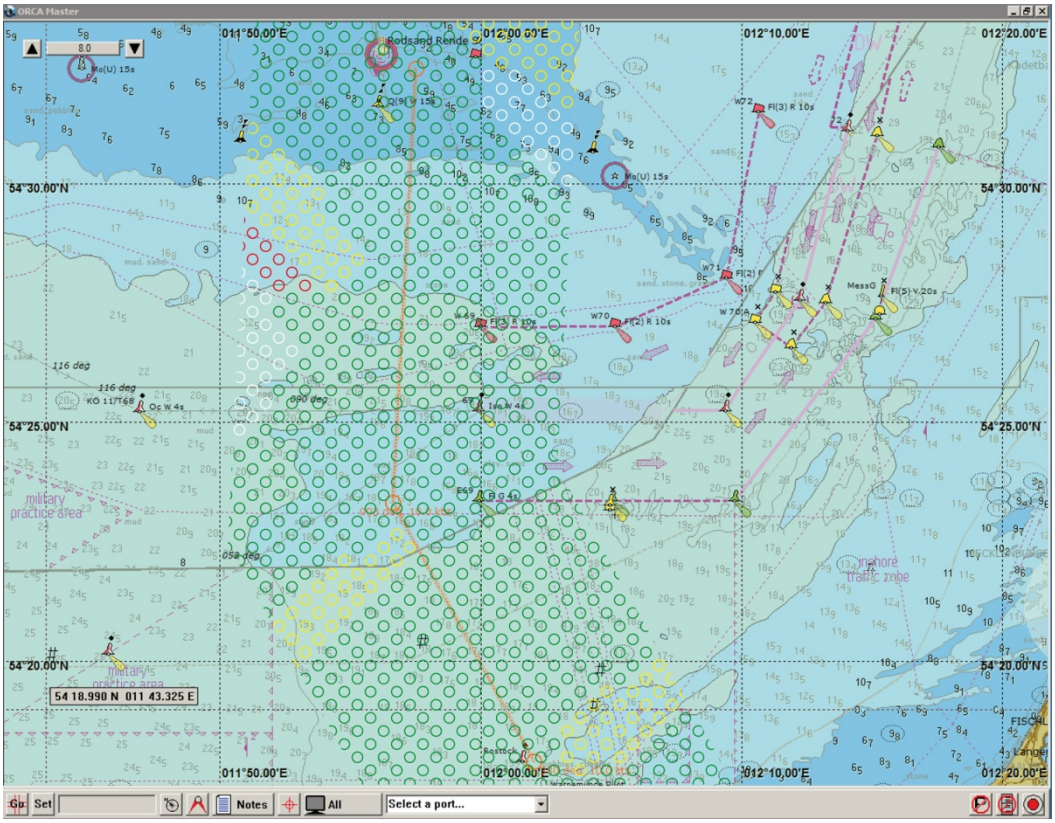
Action Required of NCWG

The NCWG is invited

- to note this paper,
- to discuss the proposal,
- to continue the development of the portrayal of data quality indicators in close liaison with the DQWG.

Annex 1: Example of data quality indicators (Approach 1)

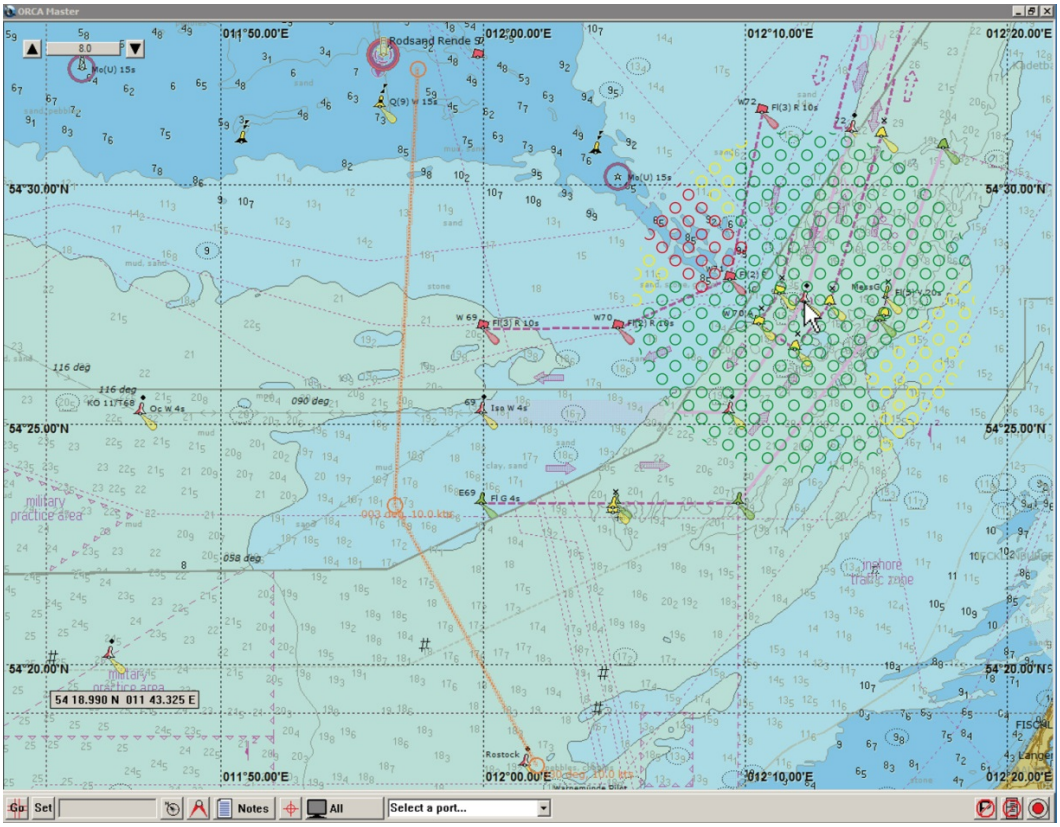
Day bright:



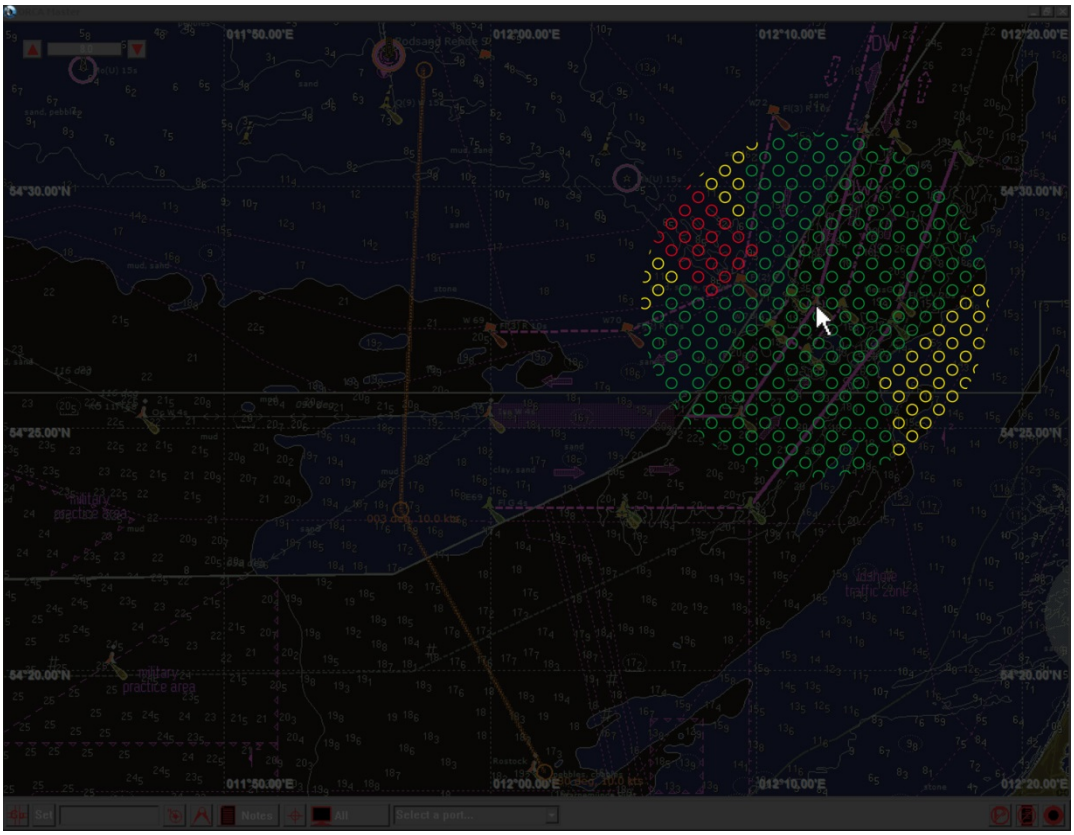
Night:

Annex 2: Cursor search function (Approach 1)

Day Bright:

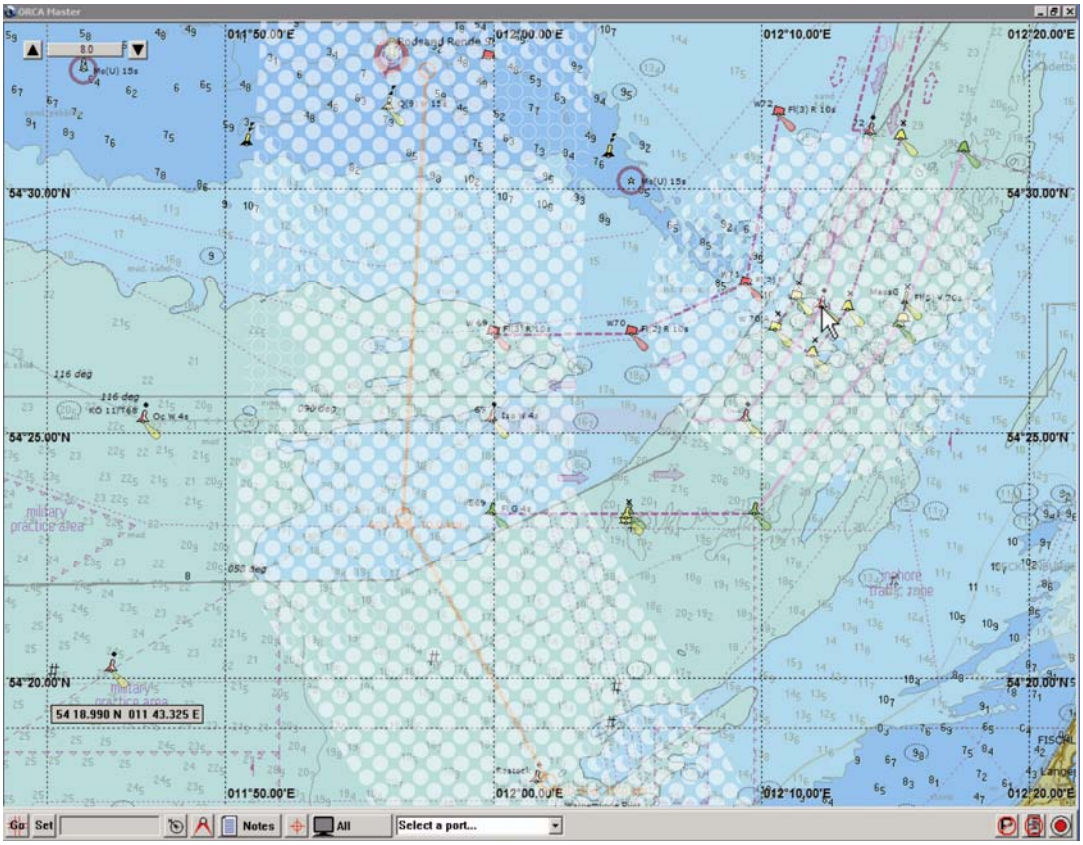


Night:

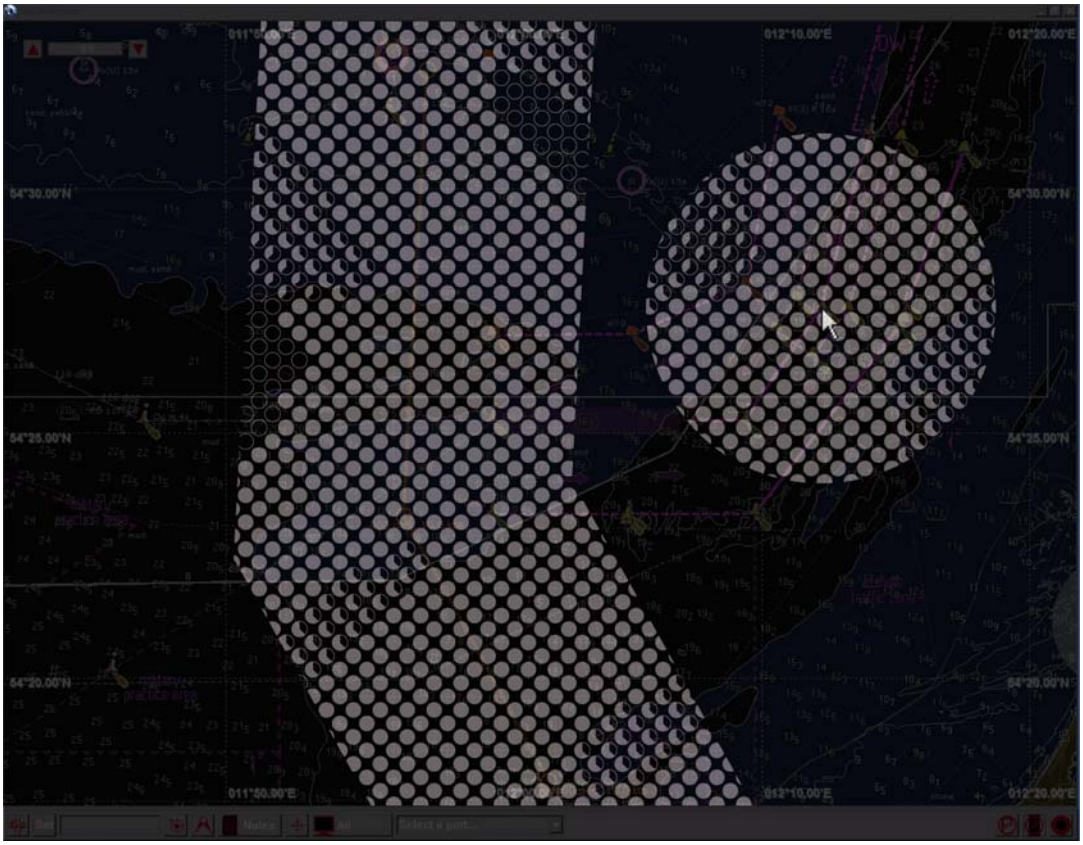


Annex 3: Proposed solution (Approach 3)

Day Bright:



Night:



Annex 4: Alternative for Day Bright Display: (Approach 4)