**Paper for Consideration by ENCWG3**

# Improvement of ENCs display on ECDIS

| | |
|---|---|
| ***Submitted by:*** | ENC Display Sub Working Group (lead: France) |
| ***Executive Summary:*** | This paper lists the possible improvements so far identified by the ENC Display SubWG. |
| ***Related Documents:*** | S-100WG2-11.7_ENC_Display_Issues.pdf<br>S-57 UOC<br>S-52 |
| ***Related Projects:*** | |

**Introduction / Background**

1. As a consequence of some feedbacks from its Navy, France presented a paper at S-100WG2 and ENCWG2 (Genoa, Apr. 2017) and NCWGWG3 (Redlands, May 2017), which aimed at drawing the attention to the current shortcomings of the display of ENCs on the ECDIS.
The paper and its accompanying presentations were welcomed and France's recommendation to set up a Sub Working Group that would concentrate on the Improvement of ENC Display on the ECDIS was supported by these three IHO Working Groups.
HSSC9 (Ottawa, Nov. 2017) also welcomed the establishment of this SubWG and placed it under the ENCWG (Decision – HSSC9/14).
The ENC Display SubWG is led by France (Christian Mouden).

2. Following S-100WG2 and ENCWG2, an IHO basecamp was created (April 2017) to share the discussions and files among the participants. 43 individual participants are currently registered on the basecamp, representing 22 organizations:

- 13 Hydrographic Offices (Australia, Brazil, Canada, France, Denmark, Estonia, Finland, Italy, Japan, Korea, Norway, UK, USA);
- IHO Secretariat;
- 2 RENCs: IC-ENC, PRIMAR;
- 3 OEMs: Furuno, Sevenc's, Transas;
- 3 Expert Contributors: IALA, IIC Technologies, Geomod.

10 organizations have contributed to the discussions.

ECDIS screenshots, based on S-52 Presentation Library edition 4.0.2 were collected and commented until January 2018.
Comments were then gathered in a single XLS file and enriched until 9 March.

**Analysis/Discussion**

3. First, all the participants in this SubWG must be thanked for their fruitful contributions. Most of the issues identified were probably known, but not explicitly described. This is now done. The work accomplished so far is good, but there are surely still other aspects of the display to improve.

4. This paper gives details of the issues identified by the SubWG and the suggested solutions. The ENCWG being in charge of the standards in force, issues for which the only solution was identified as lying in S-101 (7 over 29) have been excluded from this paper (S-101 is not in the attributions of the ENCWG). This does not mean they must be forgotten. These issues will be passed on to the S-101 Project Team (S-101PT) which has a meeting planned in June 2018. In this perspective, and from the various comments received, the ENC Display SubWG leader's opinion is that the transfer of S-52 to S-101 portrayal is the perfect opportunity to undergo a global systematic review of the portrayal. S-52 portrayal is often seen as "old-fashion". It was elaborated in the late 1980's with technology of that time (including screen resolution). Most of the members of the S-101PT being also members of the ENCWG, a quick discussion on the possible global review of S-101 portrayal could be organized during ENCWG3.

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

5. The ENCWG must also decide (or ask HSSC) whether its work and proposals are limited to "Improving S-57 encoding for a better ENC display" or if it is admitted to change S-52 (or the Presentation Library only). There is a major obstacle to changing S-52 which is the huge energy and very long time-line (about three years) needed to see a new edition of S-52 officially implemented on the ECDIS. Changing the Presentation Library only is more simple, but to which extent (amendments, edition?). On the other hand, the ENCWG must have in mind that "S-52 ECDIS" will still be present on the market for a long time (10-15 years?) before being totally replaced by S-100 based ECDIS. Is it the correct approach to ask the mariner to wait for S-101ENCs to have a better portrayal?

6. Apart from considering individual issues based on screenshots, important general comments were also made as regards to the way ENCs are currently elaborated. These comments hereafter could be either the base for a guide line (complement to the UOC) document to the attention of the HOs, either directly introduced in a next edition of the UOC, or a new set of recommendations (S-65/Encoding Bulletins) regarding encoding practices.

7. Issue 1 (general): ENC content

It is globally recognised that ENCs and paper charts, although they have the same purpose (ensure safety of navigation), are definitely two different products. It is also identified that the ENC on screen is often "overcrowded", creating a very poor clarity. ENCs are used on the ECDIS which triggers indications and alarms. This should be taken into account in the way HOs encode dangerous areas in the ENC and the issue is probably more critical at larger scales.

- To avoid screen clutter, the density of information in the ENC should be reduced as compared to what is on the paper chart. The former should not be a strict copy of the latter. But this as a possible strong impact on the production process (common S-57 database for both products).
- Another option (or additional measure) is probably to adopt a larger scale for the CSCL (Compilation scale = ENC optimum display scale. This is subject to the quality/accuracy of the source data.
- Australia suggests to adopt an "ENC first" scenario rather than the "paper chart first" current approach. This is to be taken with Norway's experience: although having the same content, based on the ENC, the paper chart portrayal is often better than the ENC, even when the paper chart is at a smaller scale.
- On the "Production side", there is a need to have an ECDIS view (with display priorities and masking) within the production tools. This would help the cartographer identify cluttered areas.

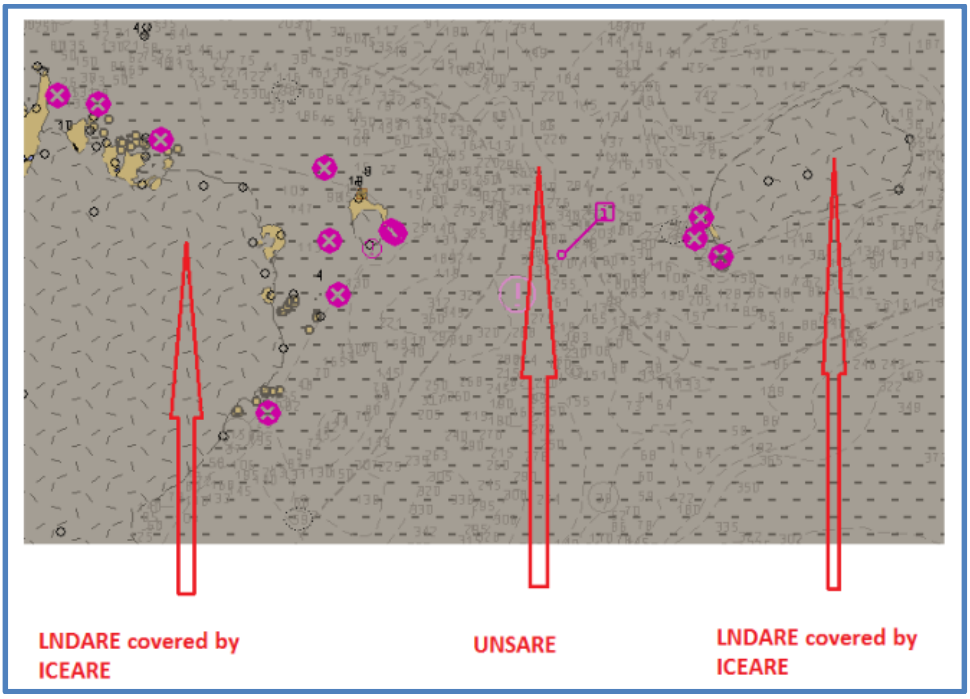
8. Issue 2 (general): SCAMIN

When applied, the SCAMIN table in the UOC considerably improve the display of an ENC when zooming-out from CSCL. Yet, there remain several issues:

- Not all HOs (sometimes for regional considerations) apply the table recommended in the UOC;
- This table is sometimes insufficient to get a clear display. A case-by-case approach with a manual population of SCAMIN is recommended by some HOs, but this has an impact on the time needed to compile the ENC;
- The steps in the SCAMIN table are may be too large and away from the actual portfolio (INTU and CSCL) of the ENCs available.
- The UOC SCAMIN table could still be improved, especially to "clear" isolated dangers in obstruction areas.

9. Issue 3: ICEARE_ON_LNDARE_VS_UNSARE

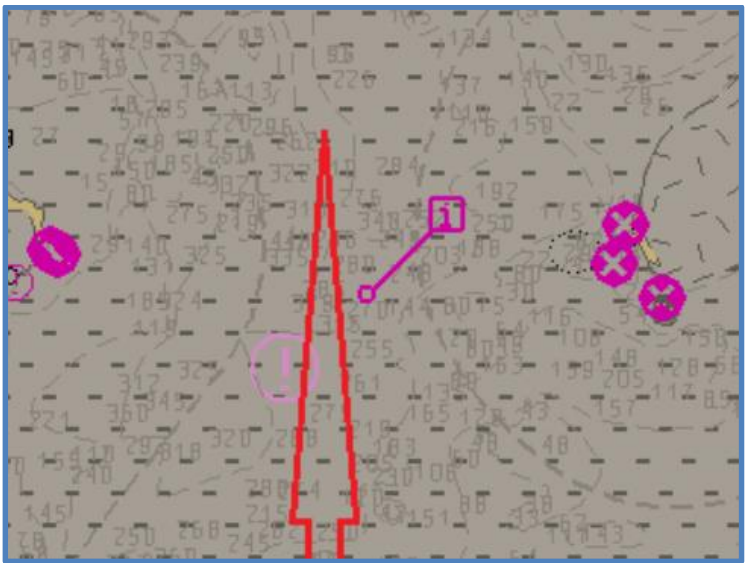
The portrayal of an ICEARE encoded on LNDARE is very similar to UNSARE. It is then very difficult to distinguish between ICEARE and UNSARE.




Possible solution: where possible, use DEPAREs instead of UNSARE.

10. Issue 4: DEPCNT AND SOUNDG ON UNSARE

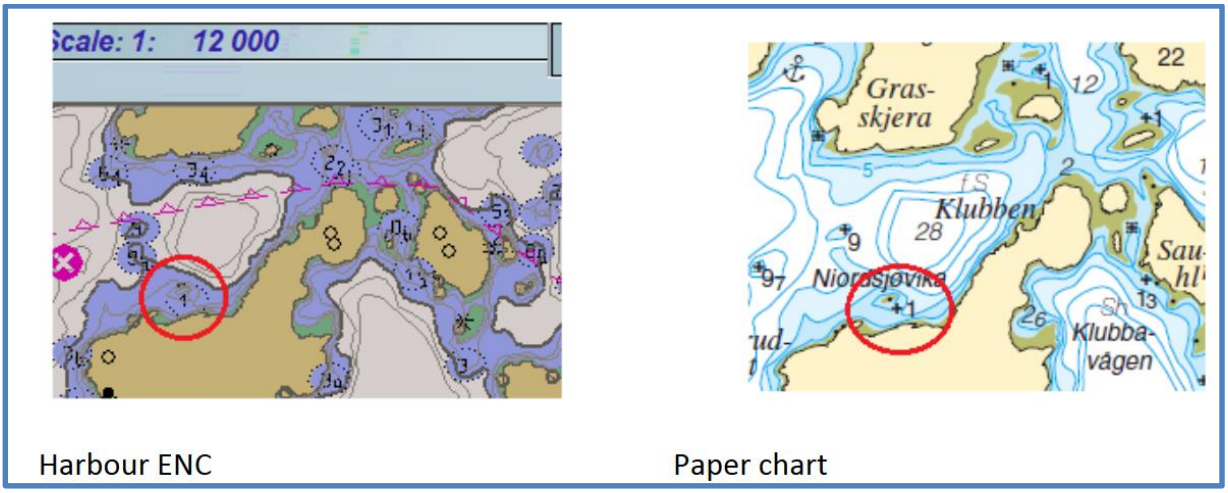
DEPCNT and SOUNDG are hardly visible within UNSARE



Possible solution: As suggested in UOC (§5.8.2) DEPARE objects can be encoded with a CTNARE and appropriate value of QUAPOS on bathymetric objects.

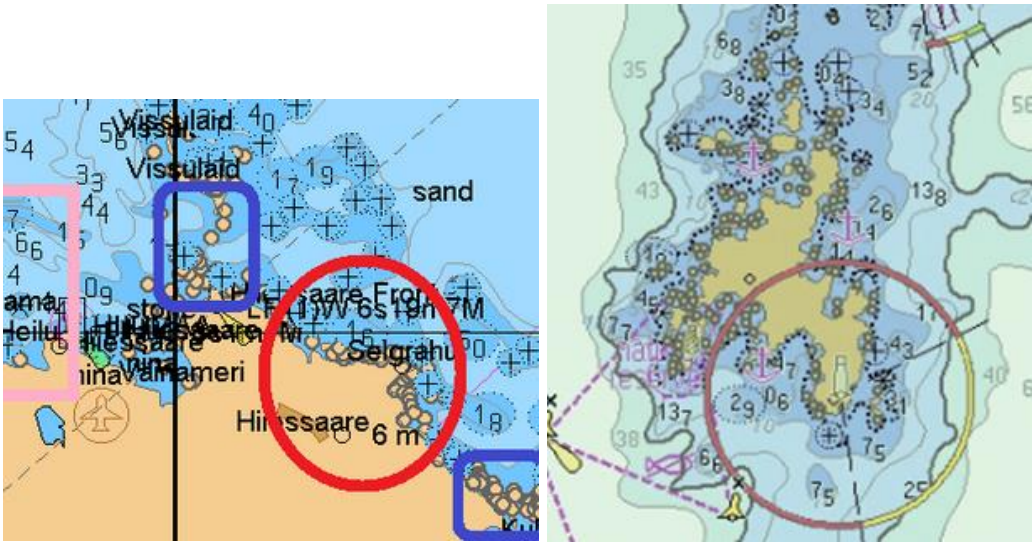
11. Issue 5: UWTROC COVERS LNDARE

UWTROC symbol covers (hides) point LNDARE (which is a more dangerous feature).




Possible solution: The general opinion of the SubWG is that this is not an encoding issue, but a portrayal one. This is a problem of Display Priority: a feature should never mask a more dangerous one. Although this could only be solved in S-101, the issue is presented here as the display is potentially dangerous for safe navigation. There may be compilation issues. Can't we consider that the UWTROC is "protected" by the LNDARE? Such issues could be passed to the NCWG for advice.

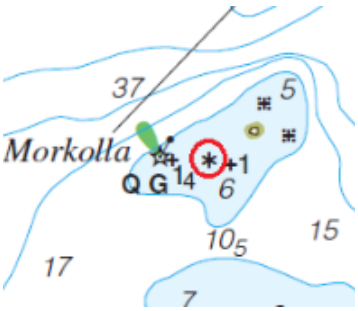
12. Issue 6: LNDAREs OVERLAP

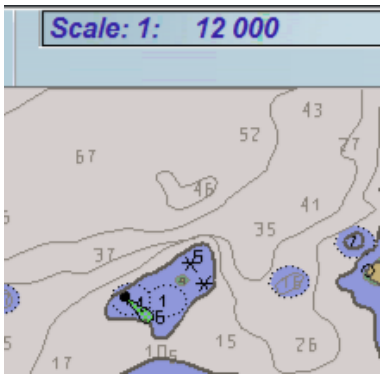


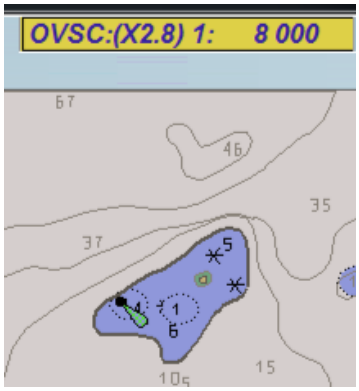

Possible solution: Apart from the size of the point LNDARE symbol (S-101), this is seen as a compilation (generalization) issue. Is there a need to encode so many objects?

13. Issue 7: UWTROCs OVERLAP

UWTROC 1m covers UWTROC - 0.1m (EXPSOU: shoaler than)



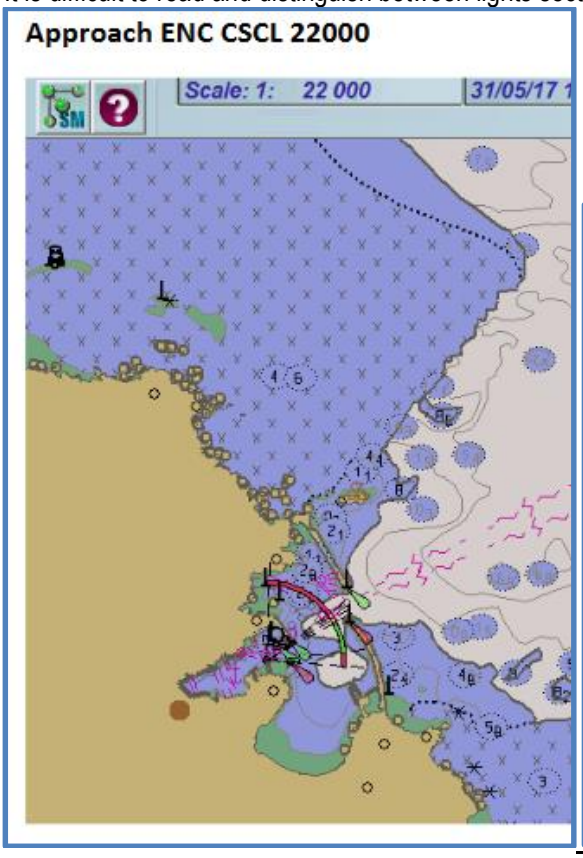



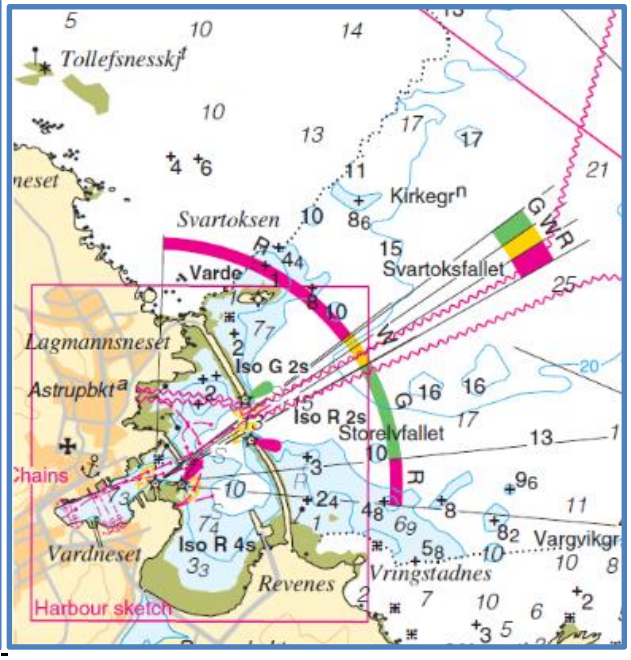




Possible solution: It is suggested to encode an area OBSTRN (CATOBS=Foul area, NATSUR=Rock) to replace two or more UWTROC.

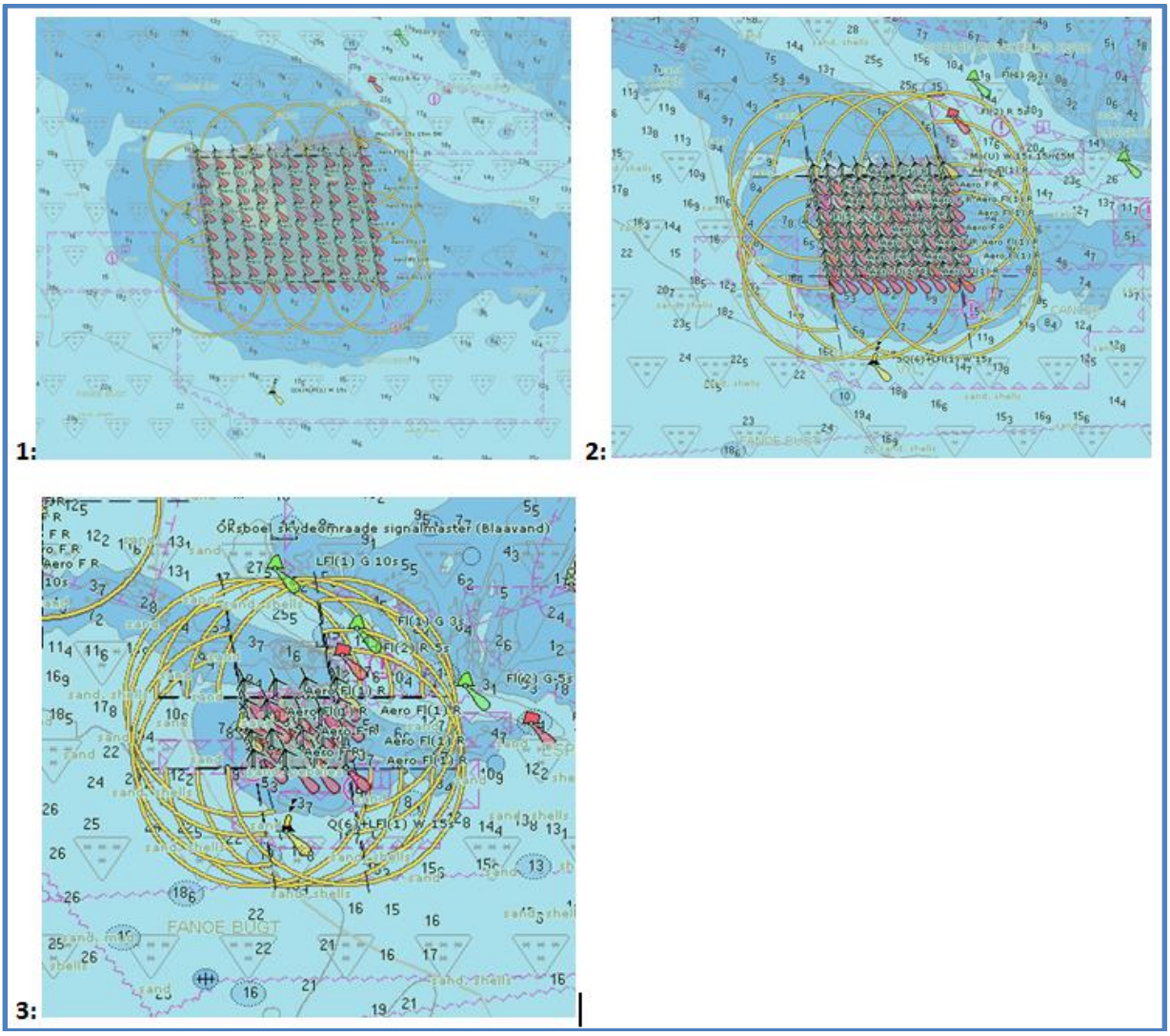
14. Issue 8: LIGHTS_CLUTTER

It is difficult to read and distinguish between lights sectors.



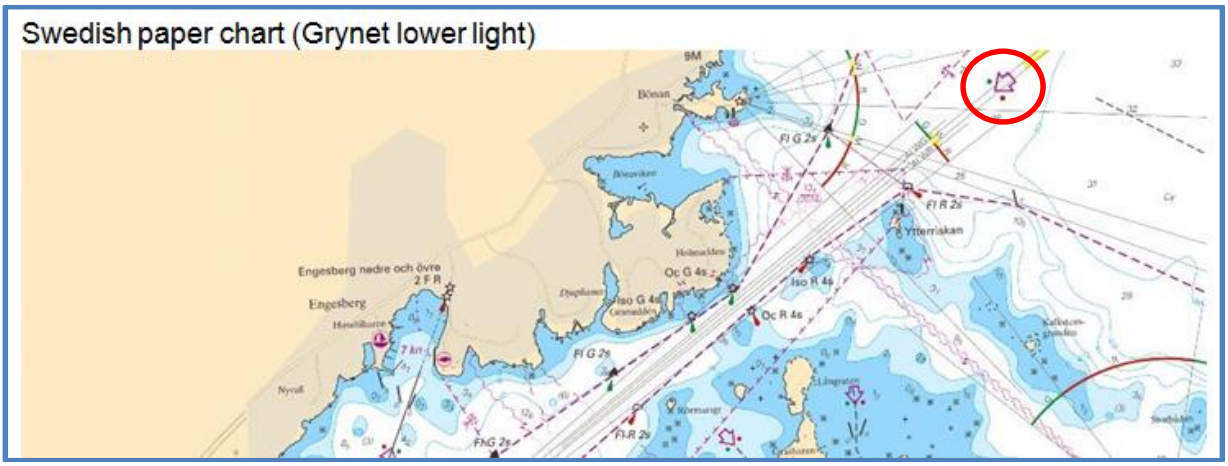

Note: FOR REASONS OF ECONOMY, DELEGATES ARE KINDLY REQUESTED TO BRING THEIR OWN COPIES OF THE DOCUMENTS TO THE MEETING

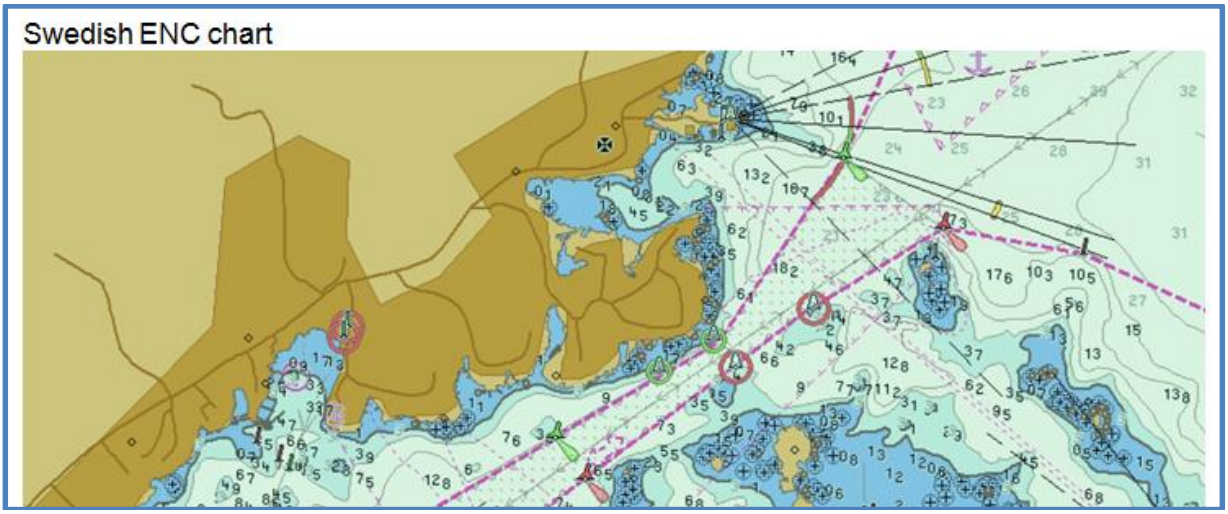



Possible solution: It is suggested to make a better (i.e. manual) use of SCAMIN.

15. Issue 9: BUOYAGE_DIRECTION_SYMBOL

ENC charts are missing the directional buoyage symbol.

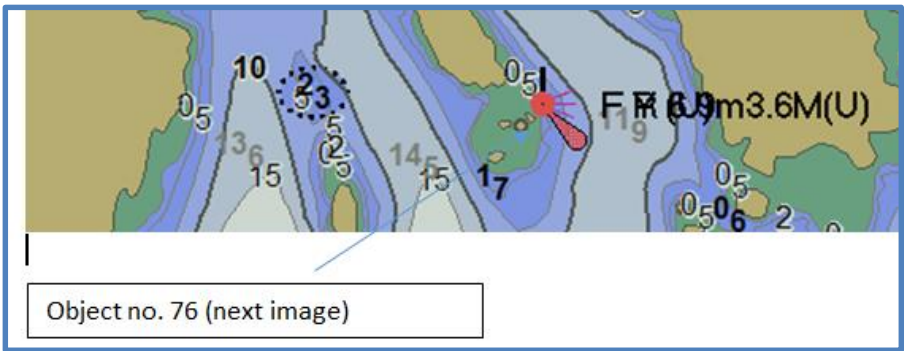





Possible solution: Use M_NSYS area object with ORIENT encoded (and mask the limits?).

16. Issue 10: BUOYAGE_NUMBER

Le number of the Aid to Navigation is missing on the ENC





Possible solution: Encode the number as OBJNAM on the structure (BCNxxx).

17. Issue 11: SOUNDG_vs_SLCONS

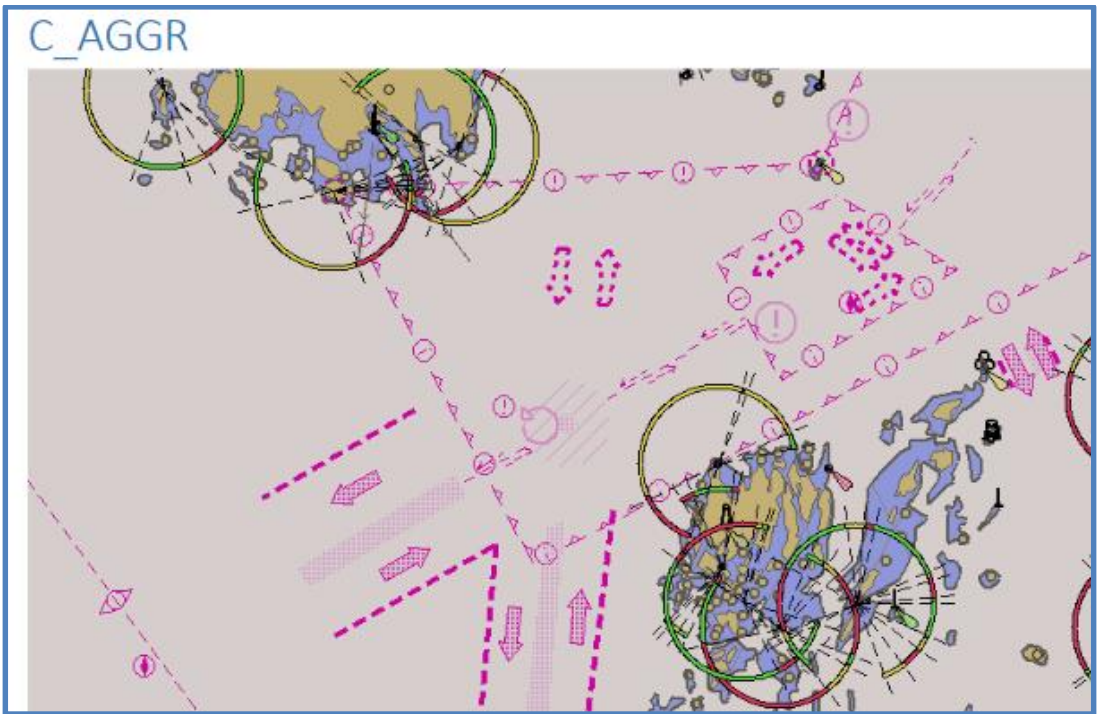
A zoom far beyond overscale is necessary to read the soundings alongside the quay.


Possible solution:

- Encode additional DEPCNT (IC-ENC);
- Use the "Safety depth tool" of the ECDIS to highlight the dangerous soundings in black (Italy);
- Use SCAMIN (IC-ENC);
- Produce berthing ENCs (IC-ENC + PRIMAR);
- Use DRGARE (USA).

18. Issue 12: C_AGGR

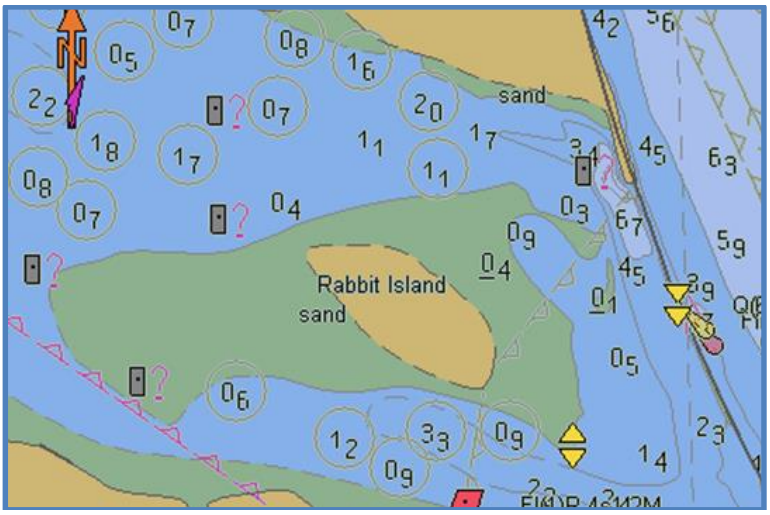
The ECDIS does not highlight objects connected in the C_AGGR, or show which objects are aggregated. Due to this lack (not a failure as regards to the standards), some HOs do not encode C-AGGR.



Possible solution: Suggest that the ENCWG considers the display of a pick report for C_AGGR and C_ASSO as part of any future changes to the S-52 Preslib.

19. Issue 13: SOUNDING_APPROXIMATE

The use of a circle around approximate sounding increases clutter and can be confused with a depth contour.




Possible solution: the portrayal should be improved (S-52 PresLib ?)

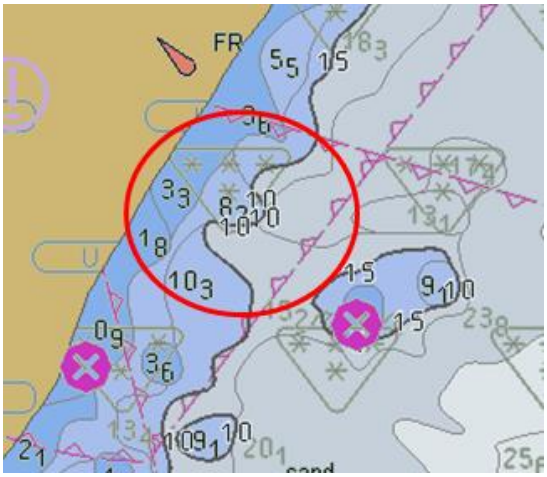
20. Issue 14: DANGER_SYMBOL

Symbol ISODGR_01 is too big.


Possible solution: the size of the symbol needs to be reconsidered.

21. Issue 15: DEPCNT_CONTOUR_VALUES

There are too many values on the ECDIS. They seem to be added on each edge rather than on each object with QUAPOS=4.
The value sometimes masks a sounding.




Possible solution: this seems to be an ECDIS issue. What can be done to improve?

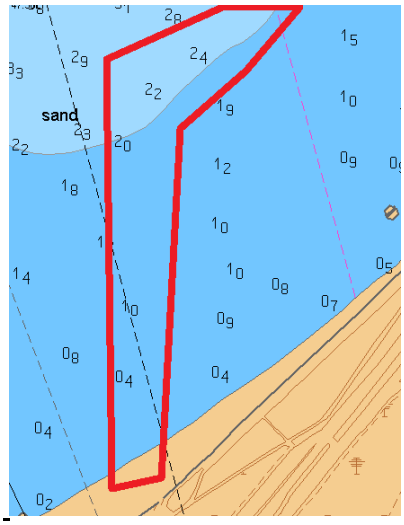
22. Issue 16: NO_DISPLAY

This issue gathers a certain amount of encoding that do not have a specific display symbol (ex: SMCFAC, VAGATN). Two different views have been expressed:

- Any object should have its proper symbol, at least like INT1 (France)
- Is it realistic to have a separate symbol for each and every attributes instead of enquiring the pick report for the details (Norway)?

23. Issue 17: M_CSCL_NO_DISPLAY

M_CSCL does not display on ECDIS.

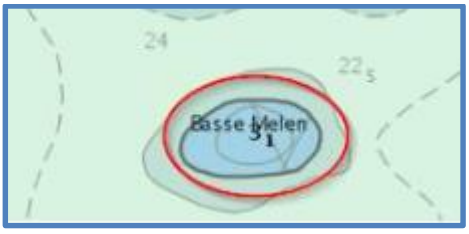



Possible solution:

- There should be more guidance in the UOC on how to use M_CSCL objects. This needs discussion among the ENCWG.
- Why not adding a CTNARE when CSCALE of the M_CSCL is smaller than CSCL of the ENC?

24. Issue 18: OBJNAM_SMALL_AREA

OBJNAM encoded on small areas sometimes hides important information (the shoaler sounding in the example below).

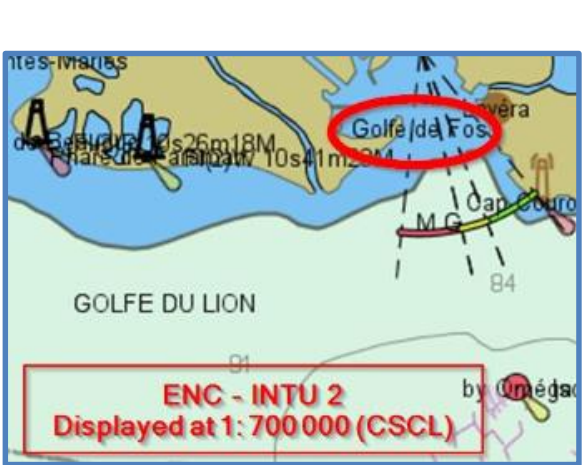


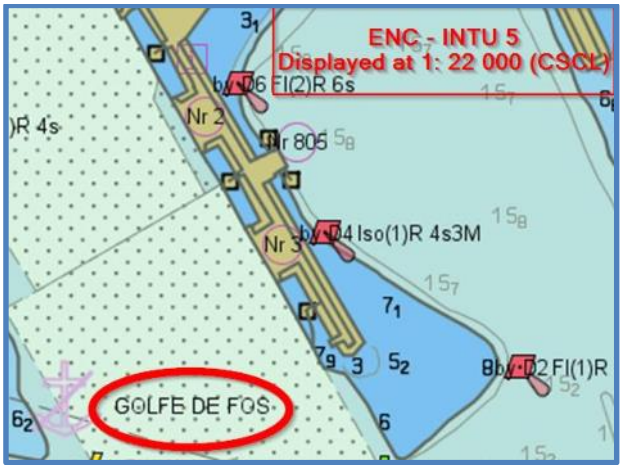

Possible solution:

- Encode the object (here) SEAARE as a point, at a position so that the text does not hide an important feature. The major inconvenient in using this work around is the loss of information as regard to the real world.
- Need for "ECDIS intelligence".

25. Issue 19: OBJNAM_LARGE_AREAS

On large areas, texts are often displayed when no longer needed (whether on a single ENC or on various ENCs of the same or different INTU).




Possible solution:

- Encode as point object rather than area;
- Do not encode if not necessary at this INTU (but production issue with paper chart).

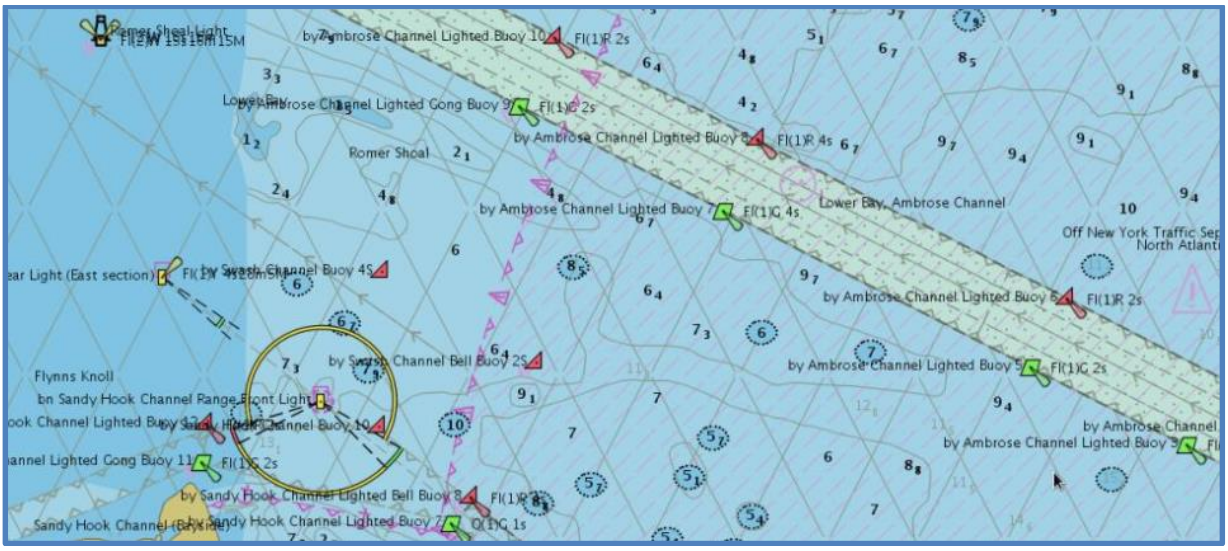
26. Issue 20: OBJNAM_OVERLAP

When SEAARE objects overlap and cover the entire screen, the texts overlap and become unreadable.


Possible solution: Need for "ECDIS intelligence".

27. Issue 21: LONG_OBJNAM

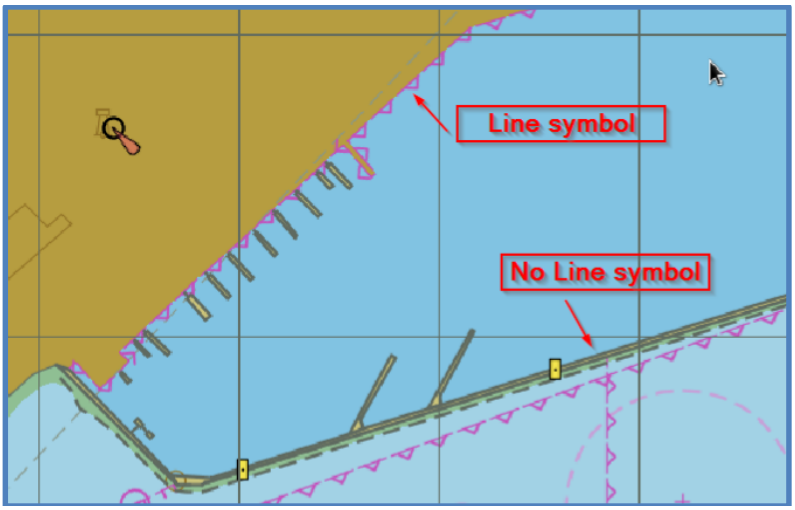
Sometimes long important texts (OBJNAM) are encoded in busy areas and create clutter.




Possible solution: Long OBJNAM should be avoided in S-57 ENCs.

28. Issue 22: RESARE_ON_DOCARE

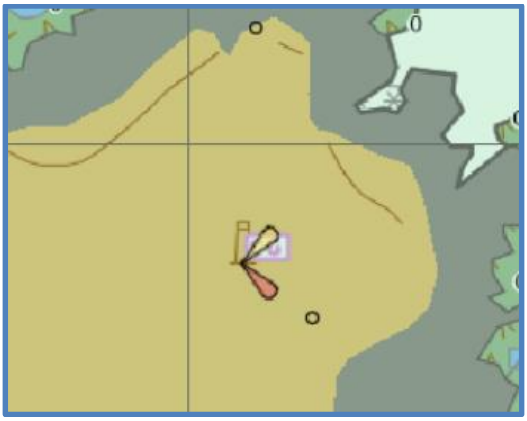
In a DOCARE, there is no need to encode a COALNE object. The consequence (because of the display priority) is that an unnecessary line symbol on the coastline.




Possible solution: Display priorities should be reviewed (S-52 PresLib?).

29. Issue 23: CGUSTA_VARIOUS_LIGHTS

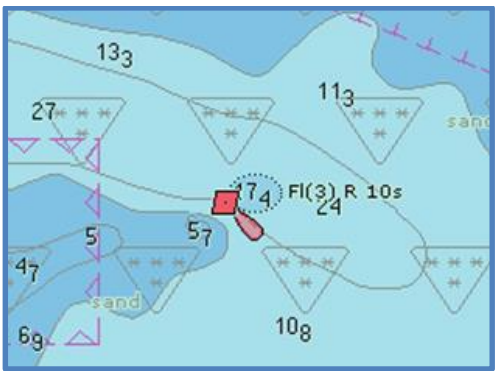
Where a structure carries a coastguard station and 2 lights, one of the light hides the CGUSTA symbol (other similar situations probably exist).



Possible solution: Need for "ECDIS intelligence".

30. Issue 24: UWTROC_WRECK_HIDDEN

A critical feature can be hidden by another feature object (here the buoy hides the sounding value of the wreck).




Possible solution: Need for "ECDIS intelligence".

**Conclusions**

31. The examples above do not constitute an exhaustive list of the display issues. Many other aspects can be improved which should be solved by S-101 portrayal. S-100 ECDIS will also have to be more "intelligent" as everything cannot be solved by the single portrayal (typically texts overlap).

**Recommendations**

It is recommended that the ENCWG:

- Decide (or refer to HSSC) the scope of the changes to be considered by the ENC Display SubWG;
- Discuss in detail the issues above;
- Decide if the current standards (S-57 UOC, S-52 Presentation Library) need to be changed and how.
- Ask the ENC Display SubWG to draft (work by correspondence) the changes needed.
- Consider the relations between the ENC Display SubWG and the S-101PT.

**Justification and Impacts**

The first quality of a chart, whether digital or under paper form, is to be easily readable. The improvement of the display of the ENC on the ECDIS is one of the key factors for the benefit of mariners and safe navigation.
It is felt that the work of the ENC Display SubWG should be continued and probably extended to consider the shift from S-52 to S-101 portrayal.

**Action Required of ENCWG**

The ENCWG is invited to:

a. note this paper;
b. discuss the recommendations;
c. take any necessary action.

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