

Paper for Consideration by NCWG

Non-Portrayal of Information Encoded in S-101 ENC in ECDIS

<b>Submitted by:</b>	IHO Secretariat (S-101 DCEG Sub-Group Lead)
<b>Executive Summary:</b>	This Paper raises the issue of ENC encoding combinations currently included in S-101 ENCs that do not portray or provide any other indication in ECDIS; and the possible inconsistencies between this issue and the guidance included in S-4/INT1.
<b>Related Documents:</b>	CSMWG17-03.7A (Jun 2007) – <i>List of S-57 Objects Not Symbolized According to Pres Lib Look-Up Tables (Edition 3.3)</i> ; TSMAD15-06.1 (Jan 2008) – <i>S-57 Object Classes Not Symbolized on ECDIS</i> CSMWG18-05.3A (May 2008) – <i>No-Symbol Objects</i> ; and summary of resultant discussion and decisions/actions included in the <i>Minutes of Meeting</i> ; ENC Encoding Bulletin #29 (Revised May 2010); <a href="#">S-101 Portrayal GitHub Issue #35</a> ; <a href="#">S-101 Documentation and FC Issue #22</a> ; S-4; S-101 draft Edition 1.1.0
<b>Related Projects:</b>	S-101 Portrayal; S-57; S-52

Introduction/Background

1. For a number of years there have been discussions that have taken place in various IHO Working Groups regarding identified ENC encoding combinations that provide no corresponding S-52 portrayal or indication in ECDIS. This means that, where a Producing Authority considers it important enough to include this information in an ENC, there is no resultant indication to the mariner that this information exists in the ENC data. While guidance has been included in the S-57 ENC Use of the Object Catalogue (S-57 Appendix B-1, Annex A) as to how this information may be included in the ENC such that it will portray in ECDIS as a “work-around”, this issue is now being more fully investigated by the S-101 Project Team (S-101PT) for S-101 ENC data model and portrayal development. During discussions within the S-101PT, it has been suggested that investigation should also be carried out within S-4 to identify any possible inconsistency between the general charting guidance included in S-4 and corresponding ENC/ECDIS encoding/portrayal.

Analysis/Discussion

2. Investigations conducted some years ago indicated that the following allowable geometric primitive/encoding combinations for S-57 ENC would not result in any portrayal or indication of the existence of this encoding in the ECDIS:

	GEO Object classes	Meta Objects classes
Points – “No symbol” (empty “symbolization instruction” in look-up table)	CURRENT (No ORIENT); DAMCON; GRIDRN; PIPSOL; RAPIDS; ROADWY; RUNWAY; TUNNEL; VEGATN; WATFAL	

<b>Lines – “No symbol”</b> (empty "symbolization instruction" in look-up table)		M_SREL
<b>Areas – “No symbol”</b> (empty "symbolization instruction" in look-up table)	SLOGRD (CATSLO<>6); VEGATN	M_ACCY; M_HOPA; M_NPUB; M_SDAT; M_SREL; M_VDAT

NOTE: Encoding combinations for which the encoding guidance requires the additional encoding of a “physical” object that results in some portrayal in ECDIS at the location (for example CHKPNT of type point) have not been included in this table.

3. Discussion within the relevant IHO Working Groups resulted in the publication of an ENC Encoding Bulletin (ENC EB #29 – see Annex A) advising Producing Authorities of these “non-portrayal” encoding combinations and advising alternate encoding if it is considered that it is important that this information is displayed. The guidance included in this Encoding Bulletin was subsequently incorporated in the Edition 3.0.0 (2011) of S-57 Appendix B.1, Annex A – *Use of the Object Catalogue for ENC* at Clauses 2.5; 4.6.6.6; 4.7.4; 4.7.7.1; 4.7.7.2; 4.7.11; 4.8.3; 4.8.5; 4.8.8; 4.8.10; 4.8.12; 4.8.13 and 11.6.1.

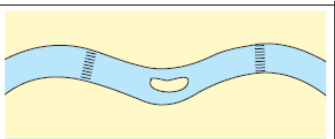
4. In the process of developing the S-101 ENC Product Specification, discussion has taken place in regard to addressing many of these “non-portrayal” combinations in the encoding; in some cases this has resulted in the removing of allowable geometric primitive/encoding combinations as follows:

- a. S-101 feature **Dam** (S-57 Object Class DAMCON) – point primitive prohibited;
- b. S-101 feature **Gridiron** (S-57 Object Class GRIDRN) – point primitive prohibited;
- c. S-101 feature **Pipeline Submarine/On Land** (S-57 Object Class PIPSOL) – point primitive prohibited (NOTE: INT1 includes a single reference to a vertical pipe (point feature) at L23 (above-water wellhead); in S-57/S-101 this would be encoded as an OBSTRN/**Obstruction** feature of type point);
- d. S-101 feature **Road** (S-57 Object Class ROADWY) – point primitive prohibited;
- e. S-101 feature **Tunnel** (S-57 Object Class TUNNEL) – point primitive prohibited;
- f. S-101 feature **Vegetation** (S-57 Object Class VEGATN) – S-57 attribute CATVEG values 1, 10 and 12 not allowable values in S-101.

5. The allowable remaining encoding combinations for which no portrayal currently exists in S-101 is as follows:

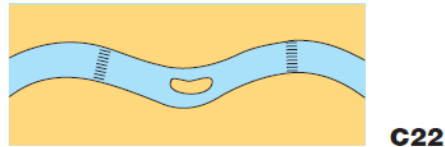
- a. S-101 feature **Rapids** (S-57 Object Class RAPIDS) – point primitive (DCEG clause 5.8);
- b. S-101 feature **Runway** (S-57 Object Class RUNWAY) – point primitive (DCEG clause 6.4);
- c. S-101 feature **Vegetation** (S-57 Object Class VEGATN) – attribute **category of vegetation** value 11 (reed) (DCEG clause 5.12);
- d. S-101 feature **Waterfall** (S-57 Object Class WATFAL) – point primitive (DCEG clause 5.9);
- e. S-101 feature **Sloping Ground** (S-57 Object Class SLOGRD) – area primitive, attribute **category of slope** ≠ 6 (cliff) and not radar conspicuous (DCEG clause 5.14);
- f. Meta features – considered to be out of scope in regard to this Paper.

6. Rapids: Current S-4/INT1 symbols (C22):

22		Rapids, Waterfalls	353.5
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This suggests that the feature should possibly exist as only a curve (line) or surface (area) primitive and is relevant for the largest scale charts where the waterway is considered to be navigable, which appears to be supported by the current guidance in S-4:

**B-353.5** Rapids and waterfalls in otherwise navigable rivers must be represented, where scale permits, by a block of dashes drawn parallel to the stream:



Based on current INT1 symbology and the guidance in S-4, it may be implied that the point primitive should not be allowable for the S-101 feature **Rapids**. Alternately, consideration may be given to indicating rapids using a point symbol, for example, to indicate rapids as a visual aid to navigation when visible from seaward.

7. Runway: Current S-4/INT1 symbols (D17,18):

17		Airport, Airfield	366.1 366.2
18		Heliport, Helipad	366.3

In the above image from INT1, the left symbol for D17 would be encoded in S-101 as a **Runway** feature of type surface (area); all other symbols in D17 would be encoded using the feature **Airport/Airfield**. The symbol at D18 could be encoded as an **Airport/Airfield** feature of type point (attribute **category of airport/airfield** = 3 (military heliport) or 4 (civil heliport)); or as a **Runway** feature of type point (attribute **category of runway** = 2 (helicopter landing pad)). Therefore, based on the current INT1 symbology the only requirement to encode a **Runway** feature of type point would be to encode a helicopter landing pad (helipad). Guidance included at S-4 – B-366.3 includes the following:

Helipads may be charted, if required, using the same symbol as a heliport.

The implication of this statement and the corresponding symbol at INT1 – D18 is that, in terms of navigation, there is no significance to the mariner as to whether the symbol is an indication of a helipad or a heliport. For ENC therefore, the same symbol should be used for both but be distinct from a point representation of an airport/airfield. Currently in ENC portrayal the same symbol (S-52 symbol AIRARE02) is used to represent both a point airport/airfield and a heliport, which appears to be in conflict with the clear distinction as specified in S-4 and INT1.

8. Vegetation (reed): Current S-4/INT1 symbols (C2):

33		Marsh, Swamp, Salt marsh, Reed beds	312.2

This suggests that the reeds should possibly exist as only a surface (area) primitive and is relevant for the largest scale charts only, which appears to be supported by the current guidance in S-4:

A **marshy shore** (sometimes called saltings) must be represented, if useful on large-scale charts, either by marsh symbols or, exceptionally, by a legend. They may be shown either side of the coastline:



Where the seaward edge of the marshes represents the only visible indication of the low water line, it must be shown by a fine dashed line (as used for delimiting intertidal areas of different characteristics, see B-426.1) in addition to the actual coastline (HW line). Land tint should not extend beyond the HW line.

Where it is not possible to determine the HW line, an approximate coastline should be charted at the outer limits of vegetation emerging at high water (that is: the apparent coastline).


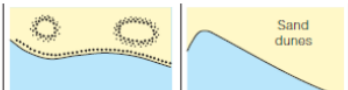


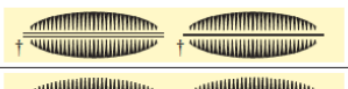
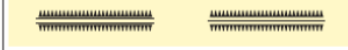

**Reed beds** may be charted using the same symbol as marsh; however, reed beds may extend beyond the low water line.

Noting the last paragraph of the above S-4 guidance it is considered that, in terms of navigation, there is no significance to the mariner as to whether the symbol is an indication of marshes or reeds. For ENC therefore, the same symbol should be used for both. Currently in ENC portrayal the S-52 area fill pattern MARSHE1 is used to represent marsh and swamp, and based on the current INT1 symbology and the guidance in S-4 the same area fill pattern should be used to indicate reed beds.

9. Waterfall: Current S-4/INT1 symbols (C22):

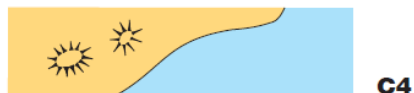
Refer to paragraph 6 above. The same considerations should be given to waterfalls as for rapids, with the possible exception that waterfalls may be more prominent/conspicuous in regard to being utilized as a possible visual aid to navigation.

10. Sloping ground: Current S-4/INT1 symbols (C4,8; D14,15):

4		Hillocks		312.1
8		Sandhills, Dunes		312.3
14		Cutting		363.2
15		Embankment		364.1

The non-symbolization of sloping ground is seen as the greatest area of concern for Data Producers, particularly for hillocks and sand dunes. Corresponding S-4 guidance for these features is as follows:

**Prominent small hills** adjacent to the coast may be portrayed by simple hachures if the contour interval is too large to show the outline.



Prominent sandhills or dunes adjacent to the coast should be portrayed:



A cutting, if required to be charted, must be represented:



Cuttings should be charted only if likely to be visible from seaward, for example when visible against the skyline.

Embankments inland should be charted only if likely to be visible from seaward. Short lengths of embankment may be shown by hachures with road or rail symbols along the crest as appropriate.



It must be noted that, while the portrayal rules for S-52/S-101 currently symbolise dunes, hills, cuttings and embankments of type surface (area) only if they are encoded as radar conspicuous, there is no guidance in S-4 to this effect; indeed in all cases the guidance states that they should (only) be encoded if visible (and/or prominent) from seaward. There is therefore an inconsistency between the specifications in S-4 and the conditions for portrayal of these features in ECDIS. Additionally, Data Producers have reported that in most cases the characteristic of a feature as being radar conspicuous is not known/encoded as the information is generally not easily obtained.

[ADDITIONAL NOTE: For the remaining allowable values for the attribute **category of slope** in S-101 (pingo, scree), there is no INT1 entry or S-4 guidance in regard to their inclusion on charts.]

11. Unfortunately the original reason why it was decided that certain allowable ENC encoding combinations would not display in ECDIS has been lost, however it is assumed that there was concern over potential ECDIS screen clutter. With Data Producers now having had over 20 years of experience in ENC production and feedback from ECDIS end-users, particularly in the application of ENC specific portrayal filtering capability such as population of the attribute **scale minimum** (SCAMIN), it may be considered that ECDIS screen clutter is no longer an issue, or can be mitigated in other ways. Regardless, the inconsistencies identified above between the charting specifications in S-4 and corresponding ECDIS portrayal need to be addressed, either through modification of the ECDIS portrayal rules or by amendments to S-4. [NOTE: The intention of this Paper is only to address the gaps between S-4 guidance and non-portrayal of encoded ENC information in ECDIS. There are likely many other inconsistencies between S-4 and corresponding ECDIS portrayal/performance that should be addressed in the future.]

## Recommendations

12. In general, the following recommendations support changes to be made from the perspective of ECDIS portrayal rather than amendments to S-4; however the NCWG is invited to discuss the merits of ensuring consistency from either perspective.

- A. It is recommended that the NCWG confirm that there is no requirement to show rapids on charts as a point feature; and instruct the S-101PT to remove point as an allowable geometric primitive for the S-101 feature **Rapids**.
- B. It is recommended that the NCWG confirm that a clear distinction must be made on charts between an aeroplane airfield represented as a point feature and a heliport as specified in S-4 and INT1, and instruct the S-101PT to therefore develop an appropriate ECDIS symbol for a heliport. It is further recommended

that the NCWG confirm that there is no requirement to indicate any distinction between a heliport and a helipad on charts, thus allowing the S-101PT to use this symbol for the representation of a helipad in S-100 ECDIS.

- C. It is recommended that the NCWG confirm that there is no requirement on charts to indicate any distinction between a marsh and a reed bed, thus allowing the S-101PT to use the area pattern fill MARSHE1 for the representation of reed beds of type surface (area) in S-100 ECDIS. It is further recommended that the NCWG agree that there is no requirement to chart reed beds using a point feature and instruct the S-101PT to include such guidance in the S-101 DCEG.
- D. It is recommended that the NCWG discuss the possible merits of including guidance for the charting of waterfalls as a visual aid to navigation and, if so, provide appropriate guidance in S-4. If not, confirm that there is no requirement to show waterfalls on charts as a point feature; and instruct the S-101PT to remove point as an allowable geometric primitive for the S-101 feature **Waterfall**.
- E. It is recommended that the NCWG confirm the current S-4 guidance for the inclusion of dunes, hills, cutting and embankments based on their relevance to mariners as a visual aid to navigation; and instruct the S-101PT that as a result the caveat the such features have to be encoded as radar conspicuous in order to be portrayed in ECDIS should be removed. The features pingo and scree should also be taken into consideration by the S-101PT in regard to symbolization of **Sloping Ground** features in S-100 ECDIS. NCWG should also discuss any requirement to include guidance in S-4/INT1 as to any requirement to show pingo's or scree on charts.
- F. It is recommended that the NCWG discuss the merit of expanding the identification and resolution of inconsistencies between the charting specifications included in S-4 and the corresponding S-101 encoding and portrayal specifications as a lower priority activity. This task should include input from the S-101PT.

### **Justification and Impacts**

- 13. Resolving the issues identified in this paper will assist in resolving inconsistencies between allowable encoding for S-101 ENCs and the inability for this information to be displayed in ECDIS; and will additionally begin to address inconsistencies between the specifications for chart content included in S-4 and the corresponding S-101 encoding/portrayal specifications.

### **Action Required of NCWG**

- i. NCWG is invited to **discuss** the remaining incidences in S-101 where allowable encoding combinations result in no resultant ECDIS portrayal as described in paragraphs 2-11.
- ii. NCWG is invited to **agree** on a way forward in resolving these inconsistencies based on the recommendations in paragraph 12.
- iii. NCWG is invited to **determine**, based on the decisions taken on the recommendations in this paper, any subsequent changes required to S-4.
- iv. NCWG is invited to **discuss** the possibility of continuing this process so as to resolve any remaining inconsistencies between the charting specifications included in S-4 and the corresponding S-101 encoding and portrayal specifications as a lower priority activity; possibly in consultation with the S-101PT.

## ENC Encoding Bulletin #29 (Revised may 2010)

**29. ENC PS Clause 3.3 Objects permitted for use in ENC and their geometric primitives**

Clause 3.3, Table 3.1 of Edition 2.0 (November 2000) of the ENC Product Specification (S-57 Appendix B.1) lists those object classes allowed in an ENC and the geometric primitives allowed for each of them.

Edition 3.4 (January 2008) of the IHO Presentation Library (S-52 Appendix 2, Edition 4.3 – IHO Colour and Symbol Specifications for ECDIS, Annex A) contains Look-Up Tables that map S-57 object classes and associated geometric primitives to S-52 symbols for display in ECDIS.

It has been identified that there are some ENC feature object classes and associated geometric primitives that do not have entries in the S-52 Look-Up Tables, and therefore will not display on an ECDIS. At the joint IHO Transfer Standards Maintenance and Applications Development (TSMAD) Working Group and Colours and Symbols Maintenance Working Group (CSMWG) meeting in 2008, those object classes that do not display in ECDIS were discussed and it was agreed that there was no requirement to symbolise some of these due to there being no relevance to safety of navigation in an ECDIS, and/or encoding of these objects using the particular geometric primitive is illogical for ENC.

**Encoders are advised that the following ENC object classes and associated geometric primitives will not display in ECDIS:**

<b>DAMCON</b>	<b>(of type Point);</b>
<b>GRIDRN</b>	<b>(of type Point);</b>
<b>PIPSOL</b>	<b>(of type Point);</b>
<b>RAPIDS</b>	<b>(of type Point);</b>
<b>ROADWY</b>	<b>(of type Point);</b>
<b>RUNWAY</b>	<b>(of type Point);</b>
<b>TUNNEL</b>	<b>(of type Point);</b>
<b>VEGATN</b>	<b>(of type Point) – Attribute CATVEG = 1, 10, 11, 12;</b>
<b>WATFAL</b>	<b>(of type Point);</b>
<b>SLOGRD</b>	<b>(of type Area) – Attributes CATSLO = 1, 2, 3, 4, 5, 7; CONRAD ≠ 1; and</b>
<b>VEGATN</b>	<b>(of type Area) – Attribute CATVEG = 1, 10, 11, 12.</b>

**Encoders wishing to display these objects in ECDIS must consider alternative encoding options (e.g. using LNDMRK, OBSTRN, SLCONS).**