DGWG7-04.6A

7th Meeting of the Data Quality Working Group (DQWG)
University of New Brunswick, Fredericton, NB, Canada, 16-18 July 2013

Paper for Consideration by the Data Quality Working Group (DQWG)

Comments for review from the S101 Data Classification and Encoding Guide baseline draft.

Submitted by:	DCEG
Executive Summary:	During the meeting of the Data Capture and Encoding Guide sub working to TSMAD many comments on the data quality where referred to the DQWG for resolution.
Related Documents:	S101 Data Classification and Encoding Guide Working SubWG
Related Projects:	S-100 Register and S-101 Feature Catalogue

Introduction / Background

During the sub working group meeting of TSMAD on the S101 Data Capture and Encoding Guide baseline document there were many comments to document that where related to data quality or the Meta data objects. Most of these comments were referred to the DQWG for resolution and clarity.

Analysis/Discussion

Comments from DCEG 2013

Initials	Section	Proposed Change	Justification	DCEG Review	JW Comments
TR	3.1	Consider definition based on the Positional Accuracy concept in ISO 19157.	To conform to ISO 19100 standard for consistency across GI data. By providing quantifiable quality measures for ENC we are able to work towards minimum quality standards.	Defer to DQWG: Action Sean L to report to DQWG	Will need to see the Positional Accuracy concept definition before we can discuss further.
TR	3.1	Clarify in simple terms that non bathymetric means land consider new def to reflect..	To be clear.	Defer to DQWG: Action Sean L to report to DQWG	Will need a fully worked change proposal to consider.
TR	3.1	Propose remove SCAMIN if no display.	SCAMIN not logical for features with no display.	Defer to DQWG: Action Sean L to report to DQWG	Agree. Do not know why it has been included here as it is not a valid attribute for M_ACCY in S-57.
TR	3.1.1	Qualitative and Quantitative examples/clarify	Expand to be clear especially ESL.	Defer to DQWG: Action Sean L to report	This whole clause 3.1.1 will need to be reviewed once DQWG have submitted their

				to DQWG	recommendations and the Sub-WG (and full TSMAD) has had a chance to evaluate these recommendations.
TR	3.5	Subject to DQWG work 3.5 and 3.7 not reviewed.	Work to be completed by DQWG.	DQWG to review	Agree.
TR	3.5	Category of temporal variation amend to mult 0,1	Suggest omit rather than populate a large number with unassessed.	DQWG to review	Wait to see what DQWG come back with, but at this stage would disagree.
TR	3.5	Amend Features detected mult to 0,1	Surely features detected may be not known?	Defer to DQWG: Action Sean L to report to DQWG	Will need to refer to S-44, but think that this is a requirement, or can be interpreted by the validating officer (as it is now for CATZOC).
NO AA	3.5	Add the complex attribute Full seafloor coverage or remove section in Remarks	Paragraph one of the remarks section talks about the complex attribute full seafloor coverage but the attribute in the table is not complex.	Defer to DQWG: Action Sean L to report to DQWG	Should be "features detected", not "full seafloor coverage". Have amended for consistency for now but need to see what DQWG comes back with and discuss further.
2J	3.5	Change multiplicity of survey date range to 0,1	Complex attribute shouldn't be mandatory unless one of its single attributes is also mandatory.	Defer to DQWG: Action Sean L to report to DQWG	I think this was in the original DQWG proposal this way. Agree that this is incorrect and the correct multiplicity is to make the complex non-mandatory but both of its sub-attributes mandatory. Have done this but again will need to wait on DQWG.
TR	3.7	Propose add TECSOU.	To allow for all situations and cater for existing data.	Defer to DQWG: Action Sean L to report to DQWG	Disagree. Refer to 2nd Remarks bullet at clause 3.7.1. Also, TECSOU is not a valid attribute for M_SREL so do not understand the "cater for existing data" remark.
TR	11	Tecsou additional Xx values suggets review entire list as it mixes concepts. Use	Items need review.	Refer to DQWG	Agree that TECSOU needs a full review. Need to take into account the needs (and enumerate numbers already used - hence

		of found by seems inconsistent.			"xx") of IENCWG.
GU	11.7.5	Areas of continual change : Add a statement to explain the use of the attribute value Category of temporal variation = 3 (likely to change) on the feature Quality of Bathymetric Data.		Hold for DQWG - but if we change to Quality of Bathymetric Data for this scenario we would expect an alarm to sound - so portrayal would need to be involved.	Agree that this will need to be done, but pending the results of DQWG study and TSMAD conclusions.
TR	11.9	Propose inadequately surveyed area as separate feature.	To reflect current mix of approaches using UNSARE with or withoput DEPAREs etc	DQWG	This should be a function of the quality indicator (for us ZOC C- is inadequately surveyed). Need to await DQWG conclusions.
GU	11.9	Amend must for may. The area must may also be covered by Quality of Bathymetric Data features (see clause X.X), with suitably defined attribute category of zone of confidence in data value, usually value 5 (zone of confidence D).	see 3.5.1 : "Therefore, the use of Quality of Bathymetric Data is mandatory for areas containing depth data or bathymetry…" This means that this feature is optional on unsurveyed areas with no bathymetric data.	DQWG	Disagree, although this is another argument for having only LNDARE under rivers, lakes etc.

Recommendations

TSMAD feels that DQWG is best qualified to clarify the questions from the TSMAD DCEG review regarding items of data quality. TSMAD requests that DQWG review the comments from TSMAD and make changes to the S101 DCEG baseline document and report back to the Vice-Chair of TSMAD by the END of July 2013 so they can be included in the S-101 DCEG baseline.

Action Required of DQWG

DQWG is invited to:

a. Accept comments and send changes to the S101 DCEG baseline document to the Vice-Chair of TSMAD.

b. Reject comments and send rejected items to the Vice-Chair of TSMAD.

Annexe A Draft Sections of the S101_Data Classification and Encoding Guide_Working_SubWG

3.1 Quality of non-bathymetric data

IHO Definition: **QUALITY OF NON-BATHYMETRIC DATA**. An area within which the best estimate of the overall accuracy of the data is uniform. The overall accuracy takes into account for example the source accuracy, chart scale, digitising accuracy etc. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.208, November 2000).		
S-101 Geo Feature: Quality of non-bathymetric data (M_ACCY)		
Primitives: Surface		
Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
~~Category of temporal variation~~		~~1 : unassessed~~ ~~2 : event~~ ~~3 : likely to change~~ ~~4 : unlikely to change~~	~~EN~~	~~0,1~~
Horizontal distance uncertainty	(HORACC)		RE	0,1
Orientation uncertainty			RE	0,1
Positional uncertainty	(POSACC)		RE	1,1
Survey date range			C	0,1
Date end	(SUREND)	ISO 8601:1988	(S) DA	0,1
Date start	(SURSTA)	ISO 8601:1988	(S) DA	0,1
Vertical uncertainty	(VERACC)		(S) RE	0,1
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	(INFORM)		(S) TE	1,1
~~Scale minimum~~	~~(SCAMIN)~~	~~See clause X.X~~	~~IN~~	~~0,1~~
Textual description			C	0,*
File reference	(TXTDSC)		(S) TE	1,1
Language		ISO 639-3	(S) TE	0,1
~~Recording date~~	~~(RECDAT)~~	~~ISO 8601:1988~~	~~DA~~	~~0,1~~
~~Recording indication~~	~~(RECIND)~~		~~TE~~	~~0,1~~
~~Source indication~~			~~C~~	~~0,*~~
~~Authority~~			~~(S) TE~~	~~1,1~~

~~— Nationality~~			~~(S) TE~~	~~1,1~~
~~— ID code~~			~~(S) TE~~	~~0,1~~
~~— Source~~			~~(S) TE~~	~~0,1~~
~~— Source date~~	~~(SORDAT)~~	~~ISO 8601:1988~~	~~(S) DA~~	~~1,1~~

INT 1 Reference:

3.1.1 Quality of positions

The meta feature **Quality of Non-bathymetric Data** may be used to provide an overall accuracy of position for all non-bathymetric features. It must not be used to provide the accuracy of bathymetric information.

The attributes **quality of position** and **positional uncertainty** may be applied to any spatial type, in order to qualify the location of a feature.

Horizontal distance uncertainty, quality of position and **positional uncertainty** must not be applied to the spatial type of any geo feature if they are identical to the **horizontal distance uncertainty, quality of position** and **positional uncertainty** values of the underlying meta feature.

quality of position gives qualitative information, whereas **positional uncertainty** gives quantitative information.

Positional uncertainty on the **Quality of Non-bathymetric Data** applies to non-bathymetric data situated within the area, while **quality of position** or **positional uncertainty** on the associated spatial types qualifies the location of the **Quality of Non-bathymetric Data** feature itself.

Meta features **Quality of Non-bathymetric Data** and **Quality of Bathymetric Data** should not overlap.

Remarks:
- No remarks.

3.1.2 Horizontal accuracy

If it is required to encode the accuracy of a horizontal clearance (complex attributes **horizontal clearance fixed** and **horizontal clearance open**), it must be done using the sub-attribute **horizontal distance uncertainty**.

horizontal distance uncertainty applies only to **horizontal clearance fixed** and **horizontal clearance open**. There is no attribute to express the accuracy of the attributes **horizontal length** and **horizontal width**.

Remarks:
- No remarks.

3.1.3 Vertical accuracy

If it is required to encode the accuracy of a vertical clearance (complex attributes **vertical clearance fixed**, **vertical clearance open**, **vertical clearance closed** and **vertical clearance safe**), it must be done using the sub-attribute **vertical uncertainty**.

If several vertical clearances are given for one feature, the accuracy given must be that of the least accurate.

Remarks:
- No remarks.

~~**3.1.4 — Source of non-bathymetric data**~~

~~The source of non-bathymetric information should be encoded using both the attributes **source indication** and **source date** on the individual features, but only if this information is considered to be useful to the mariner.~~

~~Remarks:~~
- ~~No remarks.~~

Distinction: Quality of bathymetric data; quality of survey.

3.5 Quality of bathymetric data

IHO Definition: **QUALITY OF BATHYMETRIC DATA**. An area within which a uniform assessment of the quality of the bathymetric data exists. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.216, November 2000).				
S-101 Geo Feature: Quality of Bathymetric Data (M_QUAL)				
Primitives: Surface				
Real World	*Paper Chart Symbol*	*ECDIS Symbol*		
S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
~~Category of zone of confidence in data~~	~~(CATZOC)~~	~~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)~~	~~EN~~	~~1,1~~
Category of temporal variation		1 : unassessed 2 : event 3 : likely to change 4 : unlikely to change	EN	1,1
Depth range maximum value	(DRVAL2)		RE	0,1
Depth range minimum value	(DRVAL1)		RE	0,1
Features detected			C	1,1
Least depth of detected features measured			(S) BO	0,1
Significant features detected			(S) BO	1,1
Size of features detected			(S) RE	0,1
Positional uncertainty	(POSACC)		RE	0,1
Full seafloor coverage			BO	1,1
Sounding uncertainty	(SOUACC)		RE	0,1
Survey date range			C	0,1
Date end	(SUREND)	ISO 8601:1988	(S) DA	1,1
Date start	(SURSTA)	ISO 8601:1988	(S) DA	1,1
Technique of sounding measurement	(TECSOU)	1 : found by echo-sounder 2 : found by side scan sonar 3 : found by multi-beam	EN	0,*

		4 : found by diver 5 : found be lead-line 6 : swept by wire-drag 7 : found by laser 8 : swept by vertical acoustic system 9 : found by electromagnetic sensor 10 : photogrammetry 11 : satellite imagery 12 : found by levelling 13 : swept by side-scan sonar 14 : computer generated		
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	(INFORM)		(S) TE	1,1
Textual description			C	0,*
File reference	(TXTDSC)		(S) TE	1,1
Language		ISO 639-3	(S) TE	0,1
~~Recording date~~	~~(RECDAT)~~	~~ISO 8601:1988~~	~~DA~~	~~0,1~~
~~Recording indication~~	~~(RECIND)~~		~~TE~~	~~0,1~~
~~Source indication~~			~~C~~	~~0,*~~
~~Authority~~			~~(S) TE~~	~~1,1~~
~~Nationality~~			~~(S) TE~~	~~1,1~~
~~ID code~~			~~(S) TE~~	~~0,1~~
~~Source~~			~~(S) TE~~	~~0,1~~
~~Source date~~	~~(SORDAT)~~	~~ISO 8601:1988~~	~~(S) DA~~	~~1,1~~

INT 1 Reference:

3.5.1 Quality, reliability and accuracy of bathymetric data (see S-4 – B-297)

Information about quality, reliability and accuracy of bathymetric data is given using:

- the meta feature **Quality of Bathymetric Data** for an assessment of the quality of bathymetric data;
- the meta feature **Quality of Survey** for additional information about individual surveys (see clause X.X);
- the attributes **quality of sounding measurement**, **sounding uncertainty** and **technique of sounding measurement** on groups of soundings or individual features;
- the attributes **positional uncertainty** and **quality of position** on the spatial types (see clause X.X).

For the mariner, **Quality of Bathymetric Data** provides the most useful information. Therefore, the use of **Quality of Bathymetric Data** is mandatory for areas containing depth data or bathymetry on ENC datasets at maximum display scale 1:700000 and larger.

More detailed information about a survey may be given using **Quality of Survey** (see clause X.X). For example, in incompletely surveyed areas, lines of passage soundings may be indicated as such using a curve **Quality of Survey** feature. This information is more difficult for the mariner to interpret. Therefore, the use of **Quality of Survey** is optional.

For individual features (wrecks, obstructions etc), or small groups of soundings, **quality of sounding measurement**, **sounding uncertainty** and **technique of sounding measurement** may be used to provide additional information about quality and accuracy.

The meta feature **Quality of Bathymetric Data** defines areas within which uniform assessment exists for the quality of bathymetric data, and must be used to provide an assessment of the overall quality of bathymetric data to the mariner. Areas of a dataset containing depth data or bathymetry must be covered by one or more **Quality of Bathymetric Data**, which must not overlap.

Remarks:

- To express completeness of bathymetric data, the complex attribute **features detected** must be encoded. **Features detected** indicates that a systematic method of exploring the sea floor was undertaken to detect significant features. The sub-attributes **size of features detected** and **least depth of detected features measured** must not be encoded unless the sub-attribute **significant features detected** is set to *True*.
- Wherever possible, meaningful and useful values for the attributes **category of temporal variation**, **full seafloor coverage**, and the complex attribute **features detected** must be used for areas of bathymetry. For areas of unstable seafloors, the complex attribute **survey date range** (**date end**) must be used to indicate the date of the survey of the underlying bathymetric data.
- **Depth range minimum value** must only be used on a **Quality of Bathymetric Data** feature where a swept area occupies the entire **Quality of Bathymetric Data** surface.
- **Depth range maximum value** must only be used on a **Quality of Bathymetric Data** feature to specify the maximum depth to which all other attributes for the **Quality of Bathymetric Data** feature applies. When **depth range maximum value** is specified, values populated for all other attributes apply only to depths equal to or shoaler than **depth range maximum value**. No quality information is provided for depths deeper than **depth range maximum value**.
- **Positional uncertainty** is used on a **Quality of Bathymetric Data** feature to specify the positional accuracy of the depths covered by the surface. When **depth range minimum value** is specified, **positional uncertainty** must not be used - there is no positional accuracy information provided for any underlying depths in this circumstance.
- **Sounding uncertainty** is used on a **Quality of Bathymetric Data** feature to specify the vertical accuracy of the depths covered by the surface. When **depth range minimum value** is specified, **sounding uncertainty** refers only to the accuracy of the swept depth defined by **depth range minimum value** - there is no depth accuracy information provided for any underlying depths in this circumstance.
- ~~When the **Quality of Bathymetric Data** surface contains soundings of two or more different techniques, the attribute **technique of sounding measurement** must not be used.~~
- When the **Quality of Bathymetric Data** surface contains data from only one survey, the date of survey, if required, must be specified using the complex attribute **survey date range**, sub-attribute **date end**. When the **Quality of Bathymetric Data** surface contains data from two or more surveys, the date of the most recent and the oldest survey, if required, must be specified using the complex attribute **survey date range**.
- Additional quality information may be given using the meta feature **Quality of Survey**.
- Where **Quality of Bathymetric Data** areas are encoded over land, all mandatory attributes should be populated with an empty (null) value.
- When **Quality of Bathymetric Data** and the meta feature **Quality of Non-bathymetric Data** are encoded in a dataset, they should not overlap.
- When both **Quality of Bathymetric Data** and **Quality of Non-bathymetric Data** features are used in a dataset, the area covered by these features should equal the area of data coverage for the dataset.
- **Positional uncertainty** on the **Quality of Bathymetric Data** applies to bathymetric data situated within the surface, while **quality of position** or **positional uncertainty** on the associated spatial types qualifies the location of the **Quality of Bathymetric Data** feature itself.

3.5.1.1 Feature detection

In the context of bathymetry, a feature is any object, whether manmade or not, projecting above the sea floor, which may be considered to be a danger to surface navigation. Refer to S-44.

The ability to detect bathymetric features must be encoded using the complex attribute **features detected**. The sub-attribute **significant features detected** indicates whether the survey was capable of detecting features of a size indicated by the sub-attribute **size of features detected**. The sub-attribute **least depth of detected features measured** indicates whether the least depth of detected features was found. For instance, if a wreck was found, but it is not certain that the least depth of that wreck was measured, **least depth of detected features measured** must be set to *False*.

3.5.1.2 Temporal variation

The changeability of the bathymetry must be encoded using **category of temporal variation**. In order for a

time reference to be given for the expression of temporal variation, the relevant dates of the bathymetric data must be encoded using the complex attribute **survey date range**.

3.5.1.3 Sounding accuracy

Sounding accuracy is encoded using the attribute **sounding uncertainty** on **Quality of Bathymetric Data**. If it is required to encode additional sounding accuracy information, it must be done using the attribute **sounding uncertainty** on individual geo features (e.g. **Sounding**).

The accuracy of sounding must not be encoded using **sounding uncertainty** on the depth geo feature, unless it is different to the value of **sounding uncertainty** encoded on **Quality of Bathymetric Data**.

3.5.1.4 Technique of sounding measurement

If it is required to encode the technique of sounding measurement, it must be done using the attribute **technique of sounding measurement** on either **Quality of Bathymetric Data** or on individual geo features (e.g. **Sounding**).

The technique of sounding measurement must not be encoded using **technique of sounding measurement** on the depth geo feature, unless it is different to the value of **technique of sounding measurement** encoded on **Quality of Bathymetric Data**.

Distinction: Accuracy of data; quality of survey.

3.7 Quality of survey

IHO Definition: **QUALITY OF SURVEY**. An area within which a uniform assessment of the reliability of source survey information exists. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.218, November 2000).

S-101 Geo Feature: Quality of survey (M_SREL)

Primitives: Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Features detected			C	0,1
Least depth of detected features measured			(S) BO	0,1
Significant features detected			(S) BO	1,1
Size of features detected			(S) RE	0,1
Full seafloor coverage			BO	1,1
Line spacing maximum	(SDISMX)		IN	0,1
Line spacing minimum	(SDISMN)		IN	0,1
Measurement distance maximum			RE	0,1
Measurement distance minimum			RE	0,1
Quality of position	(QUAPOS)	1 : surveyed 2 : unsurveyed 3 : inadequately surveyed	EN	0,1

		4 : approximate 5 : position doubtful 6 : unreliable 7 : reported (not surveyed) 8 : reported (not confirmed) 9 : estimated 10 : precisely known 11 : calculated		
Quality of sounding measurement	(QUASOU)	1 : depth known 2 : depth or least depth unknown 3 : doubtful sounding 4 : unreliable sounding 6 : least depth known 7 : least depth unknown, safe clearance at value shown 8 : value reported (not surveyed) 9 : value reported (not confirmed) 10 : maintained depth 11 : not regularly maintained	EN	0,*
Scale value maximum	(SCVAL1)	scale value maximum < scale value minimum	IN	0,1
Scale value minimum	(SCVAL2)	scale value minimum > scale value maximum	IN	0,1
~~Sounding distance maximum~~	~~(SDISMX)~~		~~IN~~	~~0,1~~
~~Sounding distance minimum~~	~~(SDISMN)~~		~~IN~~	~~0,1~~
Survey authority	(SURATH)		TE	1,1
Survey date range			C	0,1
Date end	(SUREND)	ISO 8601:1988	(S) DA	1,1
Date start	(SURSTA)	ISO 8601:1988	(S) DA	1,1
Survey type	(SURTYP)	1 : reconnaissance / sketch survey 2 : controlled survey 4 : examination survey 5 : passage survey 6 : remotely sensed 7 : full coverage 8 : systematic survey 9 : non-systematic survey 10 : inadequately surveyed 11 : spot-sounding survey 12 : acoustically swept	EN	1,*

		survey 13 : mechanically swept survey		
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	(INFORM)		(S) TE	1,1
Textual description			C	0,*
File reference	(TXTDSC)		(S) TE	1,1
Language		ISO 639-3	(S) TE	0,1
~~Recording date~~	~~(RECDAT)~~	~~ISO 8601:1988~~	~~DA~~	~~0,1~~
~~Recording indication~~	~~(RECIND)~~		~~TE~~	~~0,1~~
~~Source indication~~			~~C~~	~~0,*~~
~~Authority~~			~~(S) TE~~	~~1,1~~
~~Nationality~~			~~(S) TE~~	~~1,1~~
~~ID code~~			~~(S) TE~~	~~0,1~~
~~Source~~			~~(S) TE~~	~~0,1~~
~~Source date~~	~~(SORDAT)~~	~~ISO 8601:1988~~	~~(S) DA~~	~~1,1~~

INT 1 Reference:

3.7.1 Survey reliability and source of bathymetric data

The survey reliability and/or details of the source surveys used in compilation may be encoded using the meta feature **Quality of Survey**.

Remarks:

- To express completeness of bathymetric data, the complex attribute **features detected** should be encoded. **features detected** indicates that a systematic method of exploring the sea floor was undertaken to detect significant features. The sub-attributes **size of features detected** and **least depth of detected features measured** must not be encoded unless the sub-attribute **significant features detected** is set to *True*.
- If the attributes **sounding uncertainty** and **technique of sounding measurement** are required, they must be encoded on either the meta feature **Quality of Bathymetric Data** or on individual geo features (e.g. **Sounding**).
- ~~If it is required to encode details of the survey authority, it must be done using the attribute **survey authority**, and must not be encoded using the attribute **source indication**.~~
- ~~If a feature has a source different to that given by the underlying **Quality of Survey**, this other source should be encoded using both the attributes **source indication** and **source date** on the feature, but only if this information is considered to be useful to the mariner.~~
- If the attribute **measurement distance maximum** is set to *0* (zero) for the full area of the survey, the attribute **full seafloor coverage achieved** should be set to *yes*.
- Where populated, the value for the attribute **measurement distance minimum** must not be larger than the value populated for **measurement distance maximum**.
- **Quality of position** on the **Quality of Survey** applies to bathymetric data situated within the area, while **quality of position** or **positional uncertainty** on the associated spatial types qualifies the location of the **Quality of Survey** feature itself.

3.7.2 Quality of sounding

If it is required to encode the quality of sounding, it must be done using the attribute **quality of sounding measurement** on either the **Quality of Survey** or on individual geo features (e.g. **Sounding**).

The quality of sounding must not be encoded using **quality of sounding measurement** on the depth geo feature, unless it is different to the value of **quality of sounding measurement** encoded on **Quality of Survey**

(see tables at clauses X.X and X.X).

Remarks:

- No remarks.

Distinction: Accuracy of data; quality of bathymetric data

11.7.5 Areas of continual change (see S-4 – B-416)

If it is required to encode an area of continually changing depth, it must be done using the feature **Caution Area** (see clause X.X). Caution notes in such areas must be encoded using the complex attributes **information** or **textual description**.

Such areas must always overlap **Depth Area** features.

An area on the source with the indication "Less water" should be encoded using this method.

If it is required to encode sandwaves, this must be done using the feature **Sandwave** (see clause X.X).

Distinction: Depth contour; dredged area; obstruction; sea area/named water area; sounding; unsurveyed area; wreck.

11.9 Areas with inadequate depth information

IHO Definition: **UNSURVEYED AREA**. An area where hydrographic survey data is non-existent. (IHO Dictionary – S-32).

S-101 Geo Feature: Unsurveyed area (UNSARE)

Primitives: Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	(INFORM)		(S) TE	1,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1
Textual description			C	0,*
File reference	(TXTDSC)		(S) TE	1,1
Language		ISO 639-3	(S) TE	0,1
~~Recording date~~	~~(RECDAT)~~	~~ISO 8601:1988~~	~~DA~~	~~0,1~~
~~Recording indication~~	~~(RECIND)~~		~~TE~~	~~0,1~~
~~Source indication~~			~~C~~	~~0,*~~
~~Authority~~			~~(S) TE~~	~~1,1~~
~~Nationality~~			~~(S) TE~~	~~1,1~~
~~ID code~~			~~(S) TE~~	~~0,1~~

~~Source~~			~~(S) TE~~	~~0,1~~
~~Source date~~	~~(SORDAT)~~	~~ISO 8601:1988~~	~~(S) DA~~	~~1,1~~

INT 1 Reference: I 25

Unsurveyed areas (see S-4 – B-418)

Unsurveyed areas may be defined as those within which there is no available data derived from a systematic hydrographic survey. This may include areas which only have lines of passage soundings and/or other miscellaneous data such as isolated ship's reports.

Areas with little or no bathymetric survey information, and falling within a meta feature **Data Coverage** surface with attribute **category of coverage** = *1* (coverage available), must be encoded using the feature **Unsurveyed Area**.

The area must also be covered by **Quality of Bathymetric Data** features (see clause X.X), with suitably defined attribute **category of zone of confidence in data** value, usually value *5* (zone of confidence D).

Remarks:

- **Unsurveyed Area** features are part of the Skin of the Earth.

Satellite imagery as source information

In some areas source information may be limited to shallow water depth information derived from satellite imagery. Where defined depths can be interpolated from satellite imagery (e.g. the drying line, 5 metre or 10 metre depth contours), and little or no reliable source survey information exists in the area, consideration should be given to showing this information in ENCs.

If it is required to encode shoal areas which have been derived from satellite imagery, **Depth Area** and **Depth Contour** features of an appropriate depth range should be used. This should only be done in areas which have not been systematically surveyed. Areas of depth information derived from satellite imagery should be covered by **Quality of Bathymetric Data** meta features (see clause X.X) having the appropriate value for the attribute **category of zone of confidence** (i.e. *4* (zone of confidence C) or *5* (zone of confidence D)), and having attribute **technique of sounding measurement** populated as *11* (satellite imagery).

Inadequately surveyed areas (see S-4 – B-417)

Inadequately surveyed areas may be defined as those areas where bathymetry is based on older lead line surveys or other surveys which are either open in nature (e.g. reconnaissance surveys), or are not hydrographic surveys (e.g. seismic surveys). These types of surveys are inadequate for identifying all shoals that may exist between lines of soundings, or may not be "shoal-biased" in their selection of recorded depths.

An inadequately surveyed area should be encoded using either an **Unsurveyed Area** feature, within which soundings and contours may be encoded (but not depth areas), or using **Depth Area** features. The attributes **depth range minimum value** and **depth range maximum value** for such depth areas should have explicit values.

The area must also be covered by **Quality of Bathymetric Data** features (see clause X.X), with suitably defined attribute **category of zone of confidence in data** values, usually value *5* (zone of confidence D). Further information may be given using the meta feature **Quality of Survey**, where appropriate.

A cautionary note should also be encoded using a **Caution Area** feature of type surface (see clause X.X).

Bathymetry in areas of minimal depiction of detail on paper charts

Where areas of little or no depth information exist within a specified ENC usage, they should be encoded using one of the following options:

Areas of omitted bathymetry

Encoders are advised that when encoding areas of bathymetry from paper charts containing minimal depth detail at scales that correspond to the maximum display scale for the data, to consult larger scale paper charts or maximum display scale ENC datasets and generalise the bathymetry from this data. This is done to ensure that sufficient information is encoded so as not to conflict with larger maximum display scale coverage. The following is the recommended minimum encoding requirement in such cases:

Where larger maximum display scale ENC coverage is available, the larger scale datasets should be examined to determine the shallowest **Depth Area** feature, other than the intertidal area, within the whole of the area. Intertidal areas should then be generalised from the larger maximum display scale coverage, and one **Depth Area** feature may then be created, with attributes **depth range minimum value** and **depth range maximum value** encoded from the values obtained from the larger scale, corresponding to the remaining area of bathymetry.

Where larger maximum display scale coverage does not exist, a single **Depth Area** feature may be created to cover the area of omitted bathymetry. The **depth range minimum value** of the **Depth Area** feature should be set to the shallowest value appropriate to the colour tint that is applied to it (e.g. if blue tint is used for 5-20m areas, the **depth range minimum value** for the area of omitted bathymetry should be set to *5*). The **depth range maximum value** should be set to the shallowest value of the surrounding Skin of the Earth polygons.

In either case, the areas should be covered by a **Caution Area** feature, the boundary of which follows exactly the surrounding Skin of the Earth features (see clause X.X).

Encoders should consider the effect of over-generalising areas of omitted bathymetry on the ECDIS display as the mariner "zooms out" through the ENC display scales.

Areas of very simplified bathymetry

In these areas, information relating to bathymetry (e.g. depth contours, dangers, rocky areas, isolated rocks, nature of the seabed, dredged areas, unsurveyed areas) should be individually encoded as normal.

A **Caution Area** feature should be created covering the **Depth Area** features, within the area of simplified bathymetry, in order to encode a cautionary note (see clause X.X).

Distinction: