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**S-57 to S-101 Conversion Guidance**

**Edition 0.0.1 – April 2021**

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Document Control

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# Introduction

## General

The following clauses specify the conventions that are recommended for preparing and finalising S-57 ENC datasets for conversion to S-101 Edition 1.0.1 ENC compliant data. This document is laid out, as far as possible, along the lines of the IHO publication S-57 Appendix B.1: *ENC Product Specification*, Annex A - *Use of the Object Catalogue for ENC*.

This document describes how to adapt S-57 ENC data so as to optimise the automation of S-57 ENC data conversion to S-101 data. It is important to note that S-101 is not a “clone” or “duplication” of the S-57 Object Catalogue (S-57 Appendix A, Chapters 1 and 2) and the S-57 ENC Product Specification. New functionality introduced in S-100 and improvements from the S-57 data model that have been implemented in S-101 as a result of lessons learned from S-57 ENC operational use mean that there is not a direct “one to one” equivalence between S-57 encoding and the corresponding S-101 encoding in many cases. Also, automated conversion processes differ in their capabilities and operations and the model for co-production of both S-57 and S-101 data from a common database may vary between individual data producers. This may result in an inability for full automated conversion of an operational S-57 ENC dataset to a fully operational and compliant S-101 dataset, resulting in a requirement for the Data Producer to apply further manual changes to the converted dataset. Where manual intervention may be required by the Data Producer after an automated conversion process has been completed, this guidance is also included in this document.

It is important to note the following:

* **The guidance included in this document is intended to optimise S-57 ENC data for initial conversion to S-101.**
* **Where possible, every effort must be made such that the performance of officially published S-57 ENCs in ECDIS is not compromised. For example, this document includes guidance on the population of the S-57 INFORM attribute to facilitate automated conversion. Such attribute population may adversely affect the use of this data in ECDIS (display of unwanted “information” indicators and additional information not required by the mariner for safe navigation).**
* **It is strongly recommended that, where possible, these changes are made at the database or product source dataset level only, and not included in the officially published S-57 ENC dataset for use in ECDIS.**

Annex A to this document includes three Tables intended as quick references to assist in preparing and managing data during the S-57 to S-101 data conversion process:

* Table A.1 is a summary Table of the differences between the S-57 and S-101 data models. This Table provides a quick reference for Data Producers to indicate, by S-57 Object class, where pre-or post-conversion manual cartographic intervention may be required in accordance with the guidance included in the body of this document.
* Table A.2 highlights the differences between S-57 and S-101 in allowable enumerate lists for enumerate type attributes as applicable for the binding Object/Feature. The “allowable enumerate list” for S-57 enumerate type attributes is based on IHO Publication S-58 – *ENC Validation Checks*, Check 2000. This Table also indicates new enumerate values that have been included in S-101.
* Table A.3 summarises extensions included in S-101 by Feature class in regard to geometric primitives and attributes. Application of these extensions to converted S-101 datasets is not a requirement in regard to full equivalency between an S-57 ENC and its corresponding S-101 ENC. However, data Producers may consider application of these extensions in order to produce “full capability” S-101 ENCs.

## Presentation of the document

The following conventions are used:

* Presentation conventions: S-57 Object class: **WRECKS**

S-101 Feature class: **Wreck**

Geometric primitive: (P,A); (P,S)\*

S-57 Attribute: EXPSOU

S-101 Attribute: **exposition of sounding**

Attribute value: *-2.4*

\* For geometric primitives: P = point; [L = line; C = S-100 curve]; [A = area; S = S-100 surface]; N = none. **Data producers should note in particular where allowable geometric primitives for S-57 Object classes are prohibited for the corresponding Feature class(es) in S-101 and consider amending their S-57 data holdings accordingly**.

Guidance is included in this document on the restriction of allowable values for enumerate type attributes by Feature class that has been introduced in S-101. This guidance is only included where the list of allowable values in S-101 differs from the list of recommended allowable values by S-57 Object class as included in S-58 – *ENC Validation Checks*, Check 2000. **Data producers are to note that the failure of any encoded S-57 object against S-58 Check 2000 will result in the instance of the attribute responsible for the Check failure not converting across to the corresponding S-101 attribute instance**. Further information can be found in Annex A, Table A.2.

Where the term “Not applicable” has been used in any clause within this document, this means that there is no impact of this information as presented in S-57 Appendix B.1, Annex A on the S-57 to S-101 conversion process. This is generally because the clause relates to encoding which is prohibited for S-57 ENC.

## Use of language

Within this document:

“Must” indicates a mandatory requirement in order to meet the requirements of the S-101 DCEG or S-101 Feature Catalogue constraints.

“Should” indicates an optional requirement, that is the recommended process to be followed (normally in reference to the S-101 DCEG), but is not mandatory (as required by the S-101 Product Specification or Feature Catalogue).

“May” means “allowed to” or “could possibly”, and is not mandatory in an S-101 context.

This document is intended for guidance only and none of its content should be regarded as “mandatory” in itself. Where the phrase “It is considered that this information is not required for S-101” appears it that a decision has been made during the development of S-101 that this information is not required in ENC.

## Maintenance

Changes to this document are coordinated by ENC Maintenance Working Group (ENCWG). Individuals that wish to make changes to the document must address their comments to the ENCWG.

There are three change proposal types to the S-57 to S-101 Conversion Guidance document. They are:

1. Clarification;
2. Revision; and
3. New Edition.

Any change proposal must be one of these types.

**ALL** proposed changes must be technically assessed before approval.

Approved changes must be issued and entered on the Document Control page of this document.

### Clarification

Clarifications are non-substantive changes to the document. Typically, clarifications: remove ambiguity; correct grammatical and spelling errors; amend or update cross references; and insert improved graphics. A clarification must not cause any substantive semantic change to the document.

### Revision

Revisions are defined as substantive semantic changes to the document. Typically, revisions will change the document to correct factual errors; or introduce necessary changes to ENC data encoding guidance that has become evident as a result of practical experience or changing circumstances. A revision must not also be classified as a clarification. Revisions could have an impact on either existing users or future users of the document. All cumulative clarifications must be included with the release of approved revisions.

### New Edition

New Editions are significant changes to the encoding guidance in the document, noting that such changes must not change or be contrary to the rules and conventions described in all S-57 and S-101 documentation. They can include additional information from the ENCWG or related committees that were not originally included in the document. New Editions result in a new major version of the document. One New Edition may result in multiple related actions. All cumulative clarifications and revisions must be included with the release of an approved New Edition. After approval the New Edition will be available for use at a date specified by the ENCWG.

### Version control

The ENCWG must release new versions of the document as necessary. New versions must include clarifications, corrections and extensions. Each version must contain a change list that identifies the changes between versions of the document.

#### Clarification version control

Clarifications must be denoted as 0.0.x. Each clarification or set of clarifications approved at a single point in time must increment x by 1.

#### Revision version control

Revisions must be denoted as 0.x.0. Each revision or set of revisions approved at a single point in time must increment x by 1. Revision version control will set clarification version control to 0.

#### New Edition version control

New Editions must be denoted as x.0.0. Each New Edition approved at a single point in time must increment x by 1. New Edition version control will set the clarification and revision version control to 0.

# General rules

## Cartographic framework

### Horizontal datum

The value of the horizontal datum encoded in the “Horizontal Geodetic Datum” [HDAT] subfield of the “Data Set Parameter” [DSPM] field for the S-57 dataset is populated to the “Datum Name” [DTNM] subfield of the “Geodetic Datum” [GDAT] field for the S-101 dataset. As for S-57, the horizontal datum for S-101 ENCs must be WGS 84.

S-57 Meta object: Horizontal datum (**M\_HOPA**) (A)

There is no equivalent meta feature in S-101 for the S-57 meta object **M\_HOPA**. It is considered that this information is not required for S-101. However, if a Data Producer wishes to include this information in S-101, it may be done manually using an instance of the information type **Nautical Information**, associated to the relevant **Data Coverage** feature(s).

### Vertical datum

The default vertical datum for the entire data set encoded in the “Vertical Datum” [VDAT] subfield of the “Data Set Parameter” [DSPM] field for the S-57 dataset is populated to the “Datum Identifier” [DTID] subfield of the “Vertical Datum” [VDAT] field for the S-101 dataset.

The vertical datum populated for VDAT and VERDAT on **M\_VDAT** must be taken from the following table in order for the values to be directly converted to S-101:

| **ID** | **Meaning** |
| --- | --- |
| 3 | Mean sea level |
| 16 | Mean high water |
| 17 | Mean high water springs |
| 18 | High water |
| 19 | Approximate mean sea level |
| 20 | High water springs |
| 21 | Mean higher high water |
| 24 | Local datum |
| 25 | International Great Lakes datum 1985 |
| 26 | Mean water level |
| 28 | Higher high water large tide |
| 29 | Nearly highest high water |
| 30 | Highest astronomical tide (HAT) |
|  | *table 2.1* |

All other values in the S-57 VERDAT attribute are prohibited for vertical datum in S-101. Producing Authorities should consider replacing prohibited values with a permitted value before conversion to S-101. Note that other information (typically attribute HEIGHT or VERCLR, etc.) may need to be changed (if relevant) as a consequence of a modification of the vertical datum.

S-57 Meta object: Vertical datum (**M\_VDAT**) (A)

S101 Meta feature: **Vertical Datum** (S) (S-101 DCEG Clause 3.9)

Conversion of these features can be automated only if the value populated for VERDAT is in accordance with table 2.1 above. If a value other than those listed in table 2.1 is populated, Data Producers should consider replacing this value with a permitted value before conversion to S-101. Note that other related encoded information (such as values for the attributes HEIGHT, VERCLR, etc.) may need to be reviewed as a consequence of a modification of the vertical datum.

The following is a list of additional S-57 Object Classes requiring a value for VERDAT populated from the list in table 2.1 above in order for the **vertical datum** attribute for the corresponding S-101 feature(s) to be populated automatically:

**BRIDGE BUISGL CBLOHD CONVYR CRANES GATCON LIGHTS**

**PIPOHD TUNNEL**

### Sounding datum

The default sounding datum for the entire data set encoded in the “Sounding Datum” [SDAT] subfield of the “Data Set Parameter” [DSPM] field for the S-57 dataset is populated to the “Datum Identifier” [DTID] subfield of the “Vertical Datum” [VDAT] field for the S-101 dataset.

The sounding datum populated for SDAT and VERDAT on **M\_SDAT** must be taken from the following table:

| **ID** | **Meaning** |
| --- | --- |
| 1 | Mean low water springs |
| 2 | Mean lower low water springs |
| 3 | Mean sea level |
| 4 | Lowest low water |
| 5 | Mean low water |
| 6 | Lowest low water springs |
| 7 | Approximate mean low water springs |
| 8 | Indian spring low water |
| 9 | Low water springs |
| 10 | Approximate lowest astronomical tide |
| 11 | Nearly lowest low water |
| 12 | Mean lower low water |
| 13 | Low water |
| 14 | Approximate mean low water |
| 15 | Approximate mean lower low water |
| 19 | Approximate mean sea level |
| 22 | Equinoctial spring low water |
| 23 | Lowest astronomical tide |
| 24 | Local datum |
| 25 | International Great Lakes datum 1985 |
| 26 | Mean water level |
| 27 | Lower low water large tide |
|  | *table 2.2* |

All other values in the S-57 VERDAT attribute are prohibited for sounding datum in S-101. Producing Authorities should consider replacing prohibited values with a permitted value before conversion to S-101. Note that other information (such as sounding values and values for attribute VALSOU, etc.) may need to be changed (if relevant) as a consequence of a modification of the vertical datum.

S-57 Meta object: Sounding datum (**M\_SDAT**) (A)

S101 Meta feature: **Sounding Datum** (S) (S-101 DCEG Clause 3.8)

Conversion of these features is automated only if the value populated for VERDAT is in accordance with table 2.1 above. If a value other than those listed in table 2.2 is populated, Data Producers should consider replacing this value with a permitted value before conversion to S-101. Note that other related encoded information (such as sounding values and values for the attribute VALSOU, etc.) may need to be reviewed as a consequence of a modification of the sounding datum.

### Units

Not applicable.

### Dates

The S-57 attributes DATEND, DATSTA, PEREND, PERSTA, SORDAT, SUREND and SURSTA are replaced in S-101 by the complex attributes **fixed date range**, **periodic date range** and **survey date range**; and the attributes **reported date** and **swept date**. Unless otherwise stated against an individual Object class within this document, all encoded dates will be populated against the appropriate S-101 attribute automatically on conversion.

#### Seasonal Objects

Unless otherwise stated against an individual Object class within this document, all instances of encoding of attribute STATUS = *5* (periodic/intermittent) will be populated automatically against the S-101 attribute **status** on conversion.

Unless otherwise stated against an individual Object class within this document, all instances of encoding of the attributes PERSTA and PEREND will be populated automatically against the S-101 complex attribute **periodic date range** on conversion.

The encoding guidance for taking into account leap years (“last day in February”) for PEREND/PERSTA remains unchanged in S-101.

### Times

Not applicable.

### Cells

As for S-57, the coordinate multiplication factor for latitude and longitude coordinates in S-101 is *10000000* (107). The value in the Coordinate Multiplication Factor [COMF] subfield of the Data Set Parameter [DSPM] field in S-57 is populated to the “Coordinate Multiplication Factor for X-coordinate” [CMFX] and “Coordinate Multiplication Factor for Y-coordinate” [CMFY] subfields of the “Dataset Structure Information” [DSSI] field for the S-101 dataset.

### Seamless ENC coverage

The rules regarding ENC coverage (overlaps and gaps in data coverage) remain unchanged for S-101.

#### Feature Object Identifiers

New Feature Object Identifiers (FOID) will be assigned to all S-57 objects during conversion to S-101 features. It is expected that the assigning of new FOIDs within a dataset during conversion will follow the same rules as in S-57 (that is, each feature must have a unique FOID however multiple parts of an individual real-world feature within the cell may have the same FOID). However, assigning the same FOID during the conversion process to identify instances of the same real-world feature in different maximum display scale ENC datasets is not possible during automatic conversion. Data Producers that wish to retain this relationship will be required to manually amend these instances.

#### 180° Meridian of Longitude

The rule prohibiting datasets from crossing the 180° meridian remain unchanged for S-101.

## Data quality description

### Production information

The Producing Authority provided in the “Producing Agency” [AGEN] subfield of the “Data Set Identification” [DSID] field is populated in the mandatory producingAgency field of the Dataset Discovery Metadata for the S-101 dataset.

### Up-to-datedness information

Up-to-datedness information (provided in the “Edition Number” [EDTN], “Update Number” [UPDN], “Update Application Date” [UADT] and “Issue Date” [ISDT] subfields of the “Data Set Identification” [DSID] field) will be automatically reset in the corresponding S-101 file name and Dataset Discovery Metadata fields to reflect the release of a new S-101 dataset during the automated conversion process.

### Quality, reliability and accuracy of bathymetric data

#### Quality of bathymetric data

S-57 Meta object: Quality of data (**M\_QUAL**) (A)

S101 Meta feature: **Quality of Bathymetric Data** (S) (S-101 DCEG Clause 3.7)

The differences in the data modelling between the S-57 **M\_QUAL** Meta object and the S-101 **Quality of Bathymetric Data** Meta feature constitute one of the most significant changes from S-57 to S-101. In the S-101 data model, the defining S-57 CATZOC attribute has been effectively “deconstructed” into its component parts of position and depth accuracies; and seafloor coverage (including feature detection) in addition to the one-to-one translation to the S-101 attribute **category of zone of confidence in data**. This has been done in order to provide the mariner with more detailed information as to the quality of the bathymetric data included in the ENC dataset.

Category of Zone of Confidence in Data: During the automated conversion process, the value populated in the S-57 attribute CATZOC will convert directly to the S-101 attribute **category of zone of confidence in data**; and in addition will be used to populate the S-101 mandatory attributes **data assessment**, **features detected** (complex attribute), **full seafloor coverage achieved**, **horizontal position uncertainty** (complex attribute) and **vertical uncertainty** (complex attribute). These attributes will be populated in accordance with the value populated for CATZOC as described in the “ZOC Table”, as amended (see S-57 Supplement No. 3 (Edition 3.1.3), clause 3.2). The values populated for these attributes will correspond to the values shown in the ZOC table included in S-57 Appendix A, Chapter 2 – *Attributes*, as amended by S-57 Supplement No. 3. Data Producers may choose to re-evaluate these values in order to provide more accurate indications of these individual components of bathymetric data quality to the mariner, given that the automated values populated will correspond to the “worst case” for each component (see also additional comments for the **data assessment** attribute below). For this reason, and also so as to ensure consistent portrayal of the indication of overall bathymetric data quality during the S-57 to S-101 transition period, the S-101 attribute **category of zone of confidence in data** is included as identical to the S-57 CATZOC attribute, from which ECDIS portrayal will be derived.

Where the S-57 attributes POSACC or SOUACC have been populated for **M\_QUAL** to indicate a higher accuracy then the CATZOC indicates, these values will override the CATZOC categorisation of position and depth accuracy in populating the **horizontal position uncertainty** and **vertical uncertainty** complex attributes during the automated conversion process.

Data Assessment: The S-101 mandatory attribute **data assessment** introduces an option to reduce screen clutter in some ECDIS display modes through population of value *2* (assessed (oceanic)). This value is intended for use where an indication of the overall data quality is not considered to be required – generally in depths deeper the 200 metres. However, determination as to when this value may be populated cannot be made during the automated conversion process, therefore for all **M\_QUAL** except those where CATZOC = *6* (zone of confidence U (data not assessed)), the corresponding **Quality of Bathymetric Data** will have **data assessment** populated with value *1* (assessed).

Temporal Variation: The S-101 mandatory attribute **category of temporal variation** introduces the ability for the Data Producer to incorporate the temporal impact on bathymetric data quality in areas where the seabed is likely to change over time, or in the wake of an extreme event such as a hurricane or tsunami. During the automated conversion process, for all **M\_QUAL** except those where CATZOC = *6* (zone of confidence U (data not assessed)), the corresponding **Quality of Bathymetric Data** will have **category of temporal variation** populated with value *5* (unlikely to change). For full S-101 functionality, Data Producers will be required to reassess the value of this attribute as required. For CATZOC = *6* (zone of confidence U (data not assessed)), **category of temporal variation** will be populated with value *6* (unassessed).

~~Feature Detection: The S-101 mandatory complex attribute~~ **~~feature detection~~** ~~introduces the option to include an indication of the minimum size of significant features detected by higher quality hydrographic surveys, using the sub-attribute~~ **~~size of features detected~~**~~. There is no corresponding encoding for this information in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.~~

Survey Data Range: In S-57, the attribute SUREND is not mandatory for M\_QUAL. In S-101, the complex attribute **survey date range**, sub-attribute **date end**, is mandatory for **Quality of Bathymetric Data**. In order to optimise the S-57 to S-101 conversion process, Data Producers should ensure that the attribute SUREND is populated on all **M\_QUAL** objects for their S-57 datasets as required (for example, where the seabed is likely to change over time). If this is not done, **survey date range**, sub-attribute **date end** will be populated as empty (null) during the automated conversion process.

Technique of Sounding Measurement: While the S-57 attribute TECSOU is an allowable attribute for **M\_QUAL** in S-57 data, the corresponding S-101 attribute **technique of vertical measurement** is prohibited for **Quality of Bathymetric Data**. If it is considered important to retain this information when converting to S-101, Data Producers should remove TECSOU from M\_QUAL and populate it on the individual features (wrecks, obstructions etc) as required. Alternatively, an S-101 Meta feature **Quality of Survey** may be manually encoded.

Bathymetric Data Quality and Dataset Compilation Scale: In S-101, **Quality of Bathymetric Data** is not mandatory for data at smaller than 1:700000 maximum display scale. **M\_QUAL** will be converted to **Quality of Bathymetric Data** at all scales during the automated conversion process, however Data Producers may consider removing these features from S-101 data at smaller than 1:700000 maximum display scale, or utilising attribute **data assessment** value *2* (assessed (oceanic)) as appropriate.

~~The S-101 complex attribute~~ **~~zone of confidence~~** ~~introduces the option to encode degrading bathymetric data quality indication over time in areas of changeable seabed. There is no corresponding encoding for this information in S-57 – for full capability S-101 data, Data Producers will be required to encode this information manually, if considered necessary. NOTE: In S-101 DCEG Edition 1.0.1 the indication of degrading quality of bathymetric data over time may be encoded in two ways: through use of~~ **~~zone of confidence~~** ~~as described above; or by associating an instance of the S-101 information type~~ **~~Spatial Quality~~** ~~to the~~ **~~Quality of Bathymetric Data~~** ~~using the association~~ **~~Quality of Bathymetric Data Composition~~** ~~(see S-101 DCEG clause 24.5). This has been done for development and testing purposes – Data Producers should choose which of the options they prefer and consistently encode each instance of~~ **~~Quality of Bathymetric Data~~** ~~accordingly.~~

#### Survey reliability

S-57 Meta object: Survey reliability (**M\_SREL**) (L,A)

S101 Meta feature: **Quality of Survey** (C,S) (S-101 DCEG Clause 3.10)

All populated attributes for **M\_SREL** will be converted to the corresponding **Quality of Survey** attributes during the automated conversion process. However, the S-101 enumerate type attribute **quality of horizontal measurement** for **Quality of Survey** has restricted the list of allowable values from those allowed for the S-57 attribute QUAPOS to the following:

*4* - approximate

Data Producers are advised to review their S-57 data holdings prior to conversion and amend any populated values for QUAPOS to value *4*, if required. Other values for QUAPOS on **M\_SREL** will not be converted across to S-101.

In S-101, the **Quality of Survey** attributes **survey authority** and **survey type**; and complex attribute **survey date range** sub-attribute **date end** are mandatory, while in S-57 the corresponding attributes SURATH, SURTYP and SUREND are optional. During the automated conversion process, these attributes will be populated as empty (null) if they are not included in the S-57 dataset.

**Quality of Survey** includes the attribute **technique of vertical measurement** as an allowable attribute, while for **M\_SREL** the corresponding attribute TECSOU is prohibited. For guidance on the use of **technique of vertical measurement** for **Quality of Survey** in S-101, see clause 2.2.3.1.

#### Quality of sounding

Data Producers are advised that the value QUASOU = *5* (no bottom found at value shown) is prohibited for the corresponding S-101 attribute **quality of vertical measurement**. Where a **SOUNDG** object carries QUASOU = *5*, it will be converted to the S-101 feature **Depth – No Bottom Found**. For any other S-57 objects carrying QUASOU = *5*, the attribute will not be converted across to S-101.

For many feature types in S-101, the allowable list of enumerate values for **quality of vertical measurement** is restricted from the full list allowable for QUASOU in S-57 ENCs, or **quality of vertical measurement** has been prohibited. These restrictions are identified against each of the object class/feature type descriptions in this document. Where appropriate, Data Producers should check their data holdings to ensure that encoded values for QUASOU are allowable values for **quality of vertical measurement** for the relevant binding feature class. During the automated conversion process, prohibited values will not be converted across to S-101.

#### Sounding accuracy

Values populated for the S-57 attribute SOUACC will be converted across to the S-101 complex attribute **vertical uncertainty**, sub-attribute **uncertainty fixed**. Note however that, while SOUACC is allowable for the Object class **SWPARE** in S-57, **vertical uncertainty** has been prohibited for the feature **Swept Area** in S-101 (see clause 5.6).

#### Technique of sounding measurement

The S-101 enumerate type attribute **technique of vertical measurement** has a restricted list of allowable values from those allowed for the S-57 attribute TECSOU for the following Object classes:

**DRGARE** **DWRTCL** **DWRTPT**

See entries for TECSOU in Annex A, Table A.2. All other instances of encoding of TECSOU will be populated automatically against the corresponding **technique of sounding measurement** values on conversion, except for the following:

* The TECSOU value *7* (found by laser) is prohibited in S-101. This value has been replaced by the **technique of vertical measurement** value *15* (found by LIDAR). During the automated conversion process, all instances of TECSOU = *7* will be converted to **technique of vertical measurement** = *15*.
* The TECSOU value *14* (computer generated) is prohibited in S-101. During the automated conversion process, all instances of TECSOU = *14* will be converted to **technique of vertical measurement** = *17* (hyperspectral imagery). Data Producers should check their data holdings and amend as required so as to achieve the required conversion outcome.
* While TECSOU is allowable for the Object class M\_QUAL in S-57, **technique of vertical measurement** has been prohibited for the Meta feature **Quality of Bathymetric Data** in S-101 (see clause 2.2.3.1).

### Accuracy of non-bathymetric data

#### Quality of positions

S-57 Meta object: Accuracy of data (**M\_ACCY**) (A)

S101 Meta feature: **Quality of Non-Bathymetric Data** (S) (S-101 DCEG Clause 3.3)

All instances of encoding of the S-57 Feature object **M\_ACCY** and its binding attributes will be populated automatically against the S-101 feature **Quality of Non-Bathymetric Data** during the automated conversion process.

#### Horizontal accuracy

Values populated for the S-57 attribute HORACC will be converted across to the S-101 attribute **horizontal distance uncertainty**. Note however that **horizontal distance uncertainty** has been prohibited for the following S-101 features for which HORACC is allowable for the corresponding S-57 Object class:

**Dry Dock** [**DRYDOC**]

**Floating Dock** [**FLODOC**]

**Gridiron** [**GRIDRN**]

**Hulk** [**HULKES**]

**Light Float** [**LITFLT**]

**Light Vessel** [**LITVES**]

It is considered that **horizontal distance uncertainty** is not relevant for these features in S-101.

Where HORACC has been populated for an S-57 **BRIDGE** object, this will be converted across to **horizontal distance uncertainty** on an S-101 **Span Fixed** or **Span Opening** feature, noting that **horizontal distance uncertainty** is prohibited for the S-101 feature **Bridge** (see clause 4.8.10).

#### Vertical accuracy

Values populated for the S-57 attribute VERACC will be converted across to the S-101 complex attribute **vertical uncertainty**, sub-attribute **uncertainty fixed** where allowed. Note however that **vertical uncertainty** has been prohibited for most S-101 features for which VERACC is allowable for the corresponding S-57 Object class, as it is considered that **vertical uncertainty** is not relevant for these features in S-101. Where this is the case, it is stated against the individual Object classes within this document.

Where VERACC has been populated for an S-57 **BRIDGE** object, this will be converted across to **vertical uncertainty**/**uncertainty fixed** on an S-101 **Span Fixed** or **Span Opening** feature, noting that **vertical uncertainty** is prohibited for the S-101 feature **Bridge** (see clause 4.8.10).

### Source of data

#### Source of bathymetric data

Values populated for the S-57 attribute SURATH on the **M\_SREL** Meta object will be converted across to the S-101 attribute **survey authority** for the **Quality of Survey** Meta feature.

There is no equivalent S-101 attribute for the S-57 attribute SORIND, as it is considered that this information is not required for S-101 ENCs. During the automated conversion process, SORIND will not be converted across to S-101.

Except for reported dates, there is no equivalent S-101 attribute for the S-57 attribute SORDAT, as it is considered that this information is not required for S-101 ENCs. In S-101, reported dates are encoded using the attribute **reported date**. During the automated conversion process, where an S-57 feature converts to an S-101 feature having **reported date** as an allowable attribute, values populated in SORDAT will be converted across. Data Producers are advised to evaluate their data holdings to ensure that the value populated in SORDAT for these instances is actually the date that the instance was reported.

#### Source of other data

As for clause 2.2.5.1 above.

### Compilation scale

There have been significant changes made in the way that scale information relevant to S-101 compiled data is encoded in comparison to S-57. Data Producers will be required to ensure that, when S-57 datasets are converted across to S-101, the scale information included in the dataset(s) is as intended, in terms of both the dataset itself and the intended performance in terms of dataset loading and unloading in ECDIS for the entire ENC portfolio.

The compilation scale appropriate to the greater part of the data in the cell provided in the “Compilation Scale of Data [CSCL]” subfield of the “Data Set Parameter [DSPM]” field is populated in the mandatory maximumDisplayScale field of the Dataset Discovery Metadata for the S-101 dataset.

For S-101, the primary source of scale information for areas of data coverage within an S-101 dataset comes from the S-101 Meta feature **Data Coverage**. This Meta feature is effectively a combination of the S-57 Meta object classes **M\_COVR** and **M\_CSCL**.

S-57 Meta object: Coverage (**M\_COVR**) (A)

S-57 Meta object: Compilation scale of data (**M\_CSCL**) (A)

S101 Meta feature: **Data Coverage**  (S) (S-101 DCEG Clause 3.4)

See also S-101 DCEG clause 2.5.5 and S-101 Main document clause 4.5.3 for further information regarding S-101 data coverage and dataset loading and unloading.

The entire area of data coverage for the S-101 dataset must be covered by one or more non-overlapping **Data Coverage** features, having values for the mandatory attributes **maximum display scale** and **minimum display scale**. It is important to note that the values for these attributes, and the maximumDisplayScale field of the Dataset Discovery Metadata, must be taken from the following table:

|  |  |
| --- | --- |
| **Maximum display scale** | **Minimum display scale** |
| 10,000,000 | empty (null) |
| 3,500,000 | 10,000,000 |
| 1,500,000 | 3,500,000 |
| 700,000 | 1,500,000 |
| 350,000 | 700,000 |
| 180,000 | 350,000 |
| 90,000 | 180,000 |
| 45,000 | 90,000 |
| 22,000 | 45,000 |
| 12,000 | 22,000 |
| 8,000 | 12,000 |
| 4,000 | 8,000 |
| 3,000 | 4,000 |
| 2,000 | 3,000 |
| 1,000 | 2,000 |
|  | *table 2.3* |

During the automated conversion process, values for the maximumDisplayScale field of the Dataset Discovery Metadata and the **maximum display scale** attribute will be directly converted across from the S-57 dataset. If the S-57 scale value is not equal to one of the values from table 2.3 above, the corresponding S-101 value will be populated as the next largest scale value as taken from table 2.3.

For an S-57 dataset containing no **M\_CSCL** Meta objects, an S-101 **Data Coverage** feature is created for each area of the dataset corresponding to **M\_COVR** having attribute CATCOV = *1* (coverage available), and taking the value populated in the “Compilation Scale of Data” [CSCL] subfield of the “Data Set Parameter” [DSPM] field to populate **maximum display scale** based on the above paragraph.

Where an S-57 dataset contains one or more **M\_CSCL** Meta objects, the **Data Coverage** Meta feature(s) created from **M\_COVR** are effectively “cookie-cut” to create separate disjoint **Data Coverage** Meta feature(s), having **maximum display scale** populated in accordance with the value populated for the attribute CSCALE for the **M\_CSCL**.

In all cases during the automated conversion process, the mandatory attribute **minimum display scale** will be set to an empty (null) value. Data Producers will be required to manually populate this attribute in accordance with the intended ECDIS performance, based on the available S-101 ENC portfolio.

### Use of the attribute SCAMIN

S-57 Attribute: Scale minimum (SCAMIN)

S101 Attribute: **scale minimum**  (S-101 DCEG Clause 2.5.9)

In S-101 a direct relationship has been defined between the display scale of data encoded in the S-101 dataset; the values encoded for the attribute **scale minimum**; and ECDIS data display scales. This has been done in order to ensure optimum performance of S-101 ENC in ECDIS, and has been achieved by:

* Restricting the allowable compilation scales indicated by the values for the attributes **maximum display scale** and **minimum display scale** (see clause 2.2.6);
* Recommending that ECDIS manufacturers use this restricted list of compilation scales as a minimum list of allowable ECDIS display step scales when the mariner zooms in or out; and
* Restricting the allowable values for the attribute **scale minimum** based on harmonisation with dataset compilation scales and recommended ECDIS display scales.

In S-101, values for the attribute **scale minimum** must be taken from the following table:

|  |
| --- |
| 19999999 |
| 9999999 |
| 4999999 |
| 3499999 |
| 1499999 |
| 999999 |
| 699999 |
| 499999 |
| 349999 |
| 259999 |
| 179999 |
| 119999 |
| 89999 |
| 59999 |
| 44999 |
| 29999 |
| 21999 |
| 17999 |
| 11999 |
| 7999 |
| 3999 |
| 2999 |
| 1999 |
| 999 |

*table 2.4 –* ***scale minimum*** *values*

For an optimum outcome during the automated conversion process and to ensure consistent data display in a “dual fuel” ECDIS environment, Data Producers are advised to examine their S-57 ENC portfolios and amend values assigned for the attribute SCAMIN in accordance with table 2.4 above. SCAMIN values other than those in table 2.4 will be converted to the value corresponding to the next smaller scale value in table 2.4 for **scale minimum**.

#### Sample SCAMIN policy

The S-101 sample **scale minimum** policy is consistent with that for the S-57 attribute SCAMIN. There is no requirement to amend SCAMIN in this regard.

## Textual information

Information contained in the S-57 attributes INFORM, NINFOM, TXTDSC and NTXTDS on individual object instances in S-57 is encoded in S-101 using the information type **Nautical Information**. **Nautical Information** is associated to the feature instance for which the information applies using the association **Additional Information**.

S101 Information feature: **Nautical Information** (N) (S-101 DCEG Clause 24.4)

Due to the “one to many” relationship that may exist between an Information type and associated Geo feature(s) in S-101, duplicate instances of **Nautical Information** associated to Geo features on a “one to one” basis should be avoided. Data Producers are advised to review converted data and amend these associations as required.

Information contained in the S-57 attributes INFORM and NINFOM will generally be converted directly to an instance of the S-101 complex attribute **information**, sub-attribute **text** during the automated conversion process. However, the following exceptions and issues must be noted:

* In some cases, information encoded using INFORM/NINFOM in S-57 has been implemented in S-101 as an enhancement to the data model such as a new dedicated feature, attribute or enumerate value. Within this document, this is indicated against the relevant Object class along with any additional guidance to assist in the automated conversion process. This guidance may include instruction as to a standard text string to be populated in INFORM that can be recognised by the S-57 to S-101 converter so as to convert to a new S-101 feature/attribute/enumerate. This may be specific to a particular conversion technology and require Data Producers to check their S-57 ENC portfolio prior to conversion and apply these changes as required. In such cases a **Nautical Information** feature will not be created;
* In relation to the above, Data Producers must note that additional encoded instances of INFORM in an ENC dataset may result in excessive screen clutter (display of “information” symbols) in certain ECDIS display settings. Data Producers should evaluate the impact for the mariner of guidance within this document to populate INFORM additional to existing instances in their S-57 ENC portfolio and consider options to mitigate this impact. This may include population of INFORM (or database specific variant attribute) in the S-57 source database and filtering out these instances on creation of the S-57 product dataset; and
* Information encoded in NINFOM, when converted to S-101, requires an entry in the **information** complex attribute instance, sub-attribute **language** to indicate the language of the text string. There is no corresponding attribute in S-57 to provide this information. Data Producers will be required to manually populate this attribute during the conversion process (see S-101 DCEG clause 2.4.6).

The attributes TXTDSC and NTXTDS will be converted directly to an instance of the S-101 complex attribute **information**, sub-attribute **file reference** during the automated conversion process. However, the following issues must be noted:

* File formats .HTM and .XML are allowable file formats in S-101 in addition to the .TXT format allowable in S-57. For full capability S-101 data, Data Producers may consider amending file references to access files using these formats as appropriate.
* The file naming convention for support files in S-101 is different from the convention used in S-57. Data Producers will be required to revisit automatically populated instances of the **file reference** sub-attribute during the conversion process and apply the new convention for both the **file reference value** and the name of the referenced file itself (see S-101 Main document clause 11.4); and
* Information encoded in NTXTDS, when converted to S-101, requires an entry in the **information** complex attribute instance, sub-attribute **language** to indicate the language of the text in the associated text file. There is no corresponding attribute in S-57 to provide this information. Data Producers will be required to manually populate this attribute during the conversion process (see S-101 DCEG clause 2.4.6).

## Colours and colour patterns

With the exception of the cases described below, all instances of encoding of attribute COLOUR will be populated automatically against the S-101 attribute **colour** during the automated conversion process.

The allowable list of enumerate values for **colour** is restricted from the full list allowable for COLOUR in S-57 ENCs for the following features:

**Coastline** [**COALNE**] (S-101 DCEG clause 5.3)

**Light Air Obstruction** [**LIGHTS**] (S-101 DCEG clause 19.5)

**Light All Around** [**LIGHTS**] (S-101 DCEG clause 19.2)

**Light Fog Detector** [**LIGHTS**] (S-101 DCEG clause 19.4)

**Light Sectored** [**LIGHTS**] (S-101 DCEG clause 19.3)

**Sloping Ground** [**SLOGRD**] (S-101 DCEG clause 5.14)

**Slope Topline** [**SLOTOP**] (S-101 DCEG clause 5.15)

The list of allowable colours for these features can be found in the S-101 DCEG clauses sited against each feature above and Annex A, Table A.2 of this document. Data Producers are advised to check values of COLOUR populated for the corresponding S-57 features, as conversion of these features is automated only if the value populated for COLOUR is an allowable value in S-101.

Note that **colour** has been prohibited for the S-101 feature **Seabed Area**, for which COLOUR is allowable for the corresponding S-57 **SBDARE** Object class. It is considered that **colour** is not relevant for this feature in S-101.

All instances of encoding of attribute COLPAT will be populated automatically against the S-101 attribute **colour pattern** during the automated conversion process.

## Reference to other publications

S-57 Meta object: Nautical publication information (**M\_NPUB**) (P,A)

S101 Geo feature: **Information Area** (P,C,S) (S-101 DCEG Clause 16.11)

Information contained in the S-57 attributes INFORM and NINFOM for **M\_NPUB** will be converted directly to an instance of the S-101 complex attribute **information**, sub-attribute **text** for an instance of the S-101 Information type **Nautical Information**, associated with **Information Area**, during the automated conversion process. See also clause 2.3.

References to nautical publication information contained in the S-57 attribute PUBREF for **M\_NPUB** will be converted directly to an instance of the S-101 complex attribute **information**, sub-attribute **headline** for **Nautical Information**, associated with **Information Area**, during the automated conversion process.

## Updating

The S-101 ENC updating processes and rules for updating ENCs have not changed from S-57. However, a new mechanism has been introduced in S-101 to encode information about the changes made to ENC data by ENC Update or ENC New Edition.

S101 Meta feature: **Update Information** (P,C,S) (S-101 DCEG Clause 3.11)

For full capability S-101 data, Data Producers should consider utilising this Meta feature when updating their S-101 ENC data.

### Issuing Updates in advance

The S-101 encoding guidance for issuing ENC Updates in advance has not changed from S-57.

#### Advance notification of changes to traffic separation schemes

The S-101 encoding guidance for advance notification of changes to traffic separation schemes has not changed from S-57.

### Guidelines for encoding Temporary and Preliminary ENC Updates

The S-101 encoding guidance for the promulgation of the equivalent of paper chart Temporary (T) and Preliminary (P) Notices to Mariners via ENC Updates has not changed from S-57.

## Multiple objects and objects shown out of position on paper charts

The textual indication of the existence of multiple real-world features represented by a single encoded feature instance in S-101 has been enhanced by the introduction of a new complex attribute **multiplicity of features**. However this complex attribute has not been bound to all S-101 geo features.

During the S-57 to S-101 automated conversion process, unless otherwise described against individual Object classes within this document, all instances of encoding of the attributes INFORM will be populated automatically against the S-101 complex attribute **information**, sub-attribute **text** for an associated **Nautical Information** feature. Data Producers will be required to evaluate these incidences manually and, if the information is related to multiplicity of features and the S-101 feature carries **multiplicity of features** as an allowable attribute, populate this attribute accordingly. If no other information is included in the associated **Nautical Information** feature, this feature can be deleted.

## Minimal depiction areas

### Wide blank areas

The S-57 Meta object **M\_COVR** having attribute CATCOV = *2* (no coverage available) will not be converted across to S-101. There is no requirement in S-101 to indicate areas of the ENC dataset that have no data coverage. See also clause 2.2.6.

The requirement to avoid leaving “holes” in data coverage for an ENC dataset on the assumption that the end user also has the larger scale ENC(s) available remains unchanged in S-101.

### Simplified or minimal depiction areas

The S-101 encoding guidance for the encoding of simplified or minimal depiction areas in ENCs has not changed from S-57 (see also clause 6.6).

# Time Varying Objects

## Magnetic data

### Magnetic variation

S-57 Geo object: Magnetic variation (**MAGVAR**) (P,L,A)

S101 Geo feature: **Magnetic Variation** (P,C,S) (S-101 DCEG Clause 4.1)

All instances of encoding of the S-57 Feature object **MAGVAR** and its binding attributes will be populated automatically against the S-101 feature **Magnetic Variation** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes DATEND and DATSTA for **MAGVAR** will not be converted. It is considered that these attributes are not relevant for **Magnetic Variation** in S-101.

### Abnormal magnetic variation

S-57 Geo object: Local magnetic anomaly (**LOCMAG**) (P,L,A)

S101 Geo feature: **Local Magnetic Anomaly** (P,C,S) (S-101 DCEG Clause 4.2)

All instances of encoding of the S-57 Feature object **LOCMAG** and its binding attributes will be populated automatically against the S-101 feature **Local Magnetic Anomaly** during the automated conversion process. However the following exceptions apply:

* The S-57 mandatory attribute VALLMA has been remodelled in S-101 as the mandatory complex attribute **value of local magnetic anomaly**, having sub-attributes **magnetic anomaly value maximum** (mandatory) and **magnetic anomaly value minimum**, where:
  + **magnetic anomaly value maximum** is intended to indicate the positive anomaly value where **magnetic anomaly value minimum** is also populated; or both the positive and negative values where **magnetic anomaly value maximum** only is populated; and
  + **magnetic anomaly value minimum** is intended to indicate the negative anomaly value, but only where the positive and negative values are not equal.

During the automated conversion process, the value populated in VALLMA will be populated across to **magnetic anomaly value maximum**. Data Producers will be required to confirm whether the value populated in VALLMA is intended to indicate both the positive and negative values of the anomaly, or a disparate range; noting that S-57 guidance recommends encoding the values of a range in INFORM for the **LOCMAG**. Where the anomaly is a disparate range, Data producers will be required to adjust the values of **magnetic anomaly value maximum** and **magnetic anomaly value minimum** accordingly; and if the information contained in INFORM relates only to the range of anomaly values, remove the associated instance of **Nautical Information** (see clause 2.3).

## Tidal data

Tidal data is not included in S-101. It is recommended that Data Producers evaluate any tidal information that is included in ENC and consider inclusion of this information in datasets conforming to product Specification S-104 – *Water Level Information for Surface Navigation* (in development 2021).

## Tidal stream data

### Tidal stream (flood/ebb)

S-57 Geo object: Tidal stream-flood/ebb (**TS\_FEB**) (P,A)

S101 Geo feature: **Tidal Stream – Flood/Ebb** (P,S) (S-101 DCEG Clause 10.2)

All instances of encoding of the S-57 Feature object **TS\_FEB** and its binding attributes will be populated automatically against the S-101 feature **Tidal Stream – Flood/Ebb** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes PEREND and PERSTA for **TS\_FEB** will not be converted. It is considered that these attributes are not relevant for **Tidal Stream – Flood/Ebb** in S-101.

### Tidal stream time series

Tidal stream time series data is not included in S-101.

### Prediction by harmonic methods

Parameters for the prediction of tidal streams using harmonic methods are not included in S-101.

### Prediction by non-harmonic methods

Parameters for the prediction of tidal streams using time and rate are not included in S-101.

### Tidal stream panels

S-57 Geo object: Tidal steam panel data (**TS\_PAD**) (P,A)

S101 Geo feature: **Tidal Stream Panel Data** (P,S) (S-101 DCEG Clause 10.5)

All instances of encoding of the S-57 Feature object **TS\_PAD** and its binding attributes will be populated automatically against the S-101 feature **Tidal Stream Panel Data** during the automated conversion process.

It is important to note that the S-57 formatted text type mandatory attribute TS\_TSP has been remodelled in **Tidal Stream Panel Data** to its constituent parts as follows (see also example in DCEG clause 10.5.1 Remarks):

* First value (tidal station number) -> **station number** (optional). This attribute will only be populated in S-101 if the first character of TS\_TSP is not a delimiting comma.
* Second value (tidal station name) -> **station name** (mandatory).
* Third value (reference tide) -> **tidal stream panel values**/**reference tide** (mandatory)
* Fourth to 29th values (stream orientation and rate, 13 x ordered pairs) -> **tidal stream panel values**, ordered instances (x 13) of sub-complex attribute **tidal stream value** (mandatory). Each instance of **tidal stream value** is populated with a single pair of stream orientation (**orientation**/**orientation value**) and stream rate (**speed maximum**) values (mandatory). For each ordered instance of **tidal stream value** the sub-attribute **time relative to tide** will be populated with the hourly rate values from values *-6* to *6* corresponding to the hours before/at (*0*)/after the reference tide time.

The S-101 mandatory attribute **tidal stream panel values**/**reference tide type** will be populated during the automated conversion process with value *1* (springs). If the referenced tide is referenced to neap or mean tides, Data Producers will be required to manually amend this value.

## Current data

S-57 Geo object: Current (**CURENT**) (P)

S101 Geo feature: **Current – Non-Gravitational** (P,C,S) (S-101 DCEG Clause 10.3)

All instances of encoding of the S-57 Feature object **CURENT** and its binding attributes will be populated automatically against the S-101 feature **Current – Non-Gravitational** during the automated conversion process.

Data Producers should note that for S-101 the geometric primitives curve and surface are allowable for **Current – Non-Gravitational**. For full capability S-101 data, Data Producers may evaluate instances of the encoding of **CURENT** and recompile manually as curve or surface as appropriate, if considered necessary.

# Topography

The encoding guidance for level of topographic detail to be included in ENC remains unchanged in S-101.

## Land area

S-57 Geo object: Land area (**LNDARE**) (P,L,A)

S101 Geo feature: **Land Area** (P,C,S) (S-101 DCEG Clause 5.4)

All instances of encoding of the S-57 Feature object **LNDARE** and its binding attributes will be populated automatically against the S-101 feature **Land Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Land Area** in S-101:

**status** (STATUS)

See S-101 DCEG clause 5.4 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **LNDARE** and amend appropriately.

## Vertical measurements

### Vertical datum

See clause 2.1.2.

### Heights and elevations

All instances of encoding of the attribute ELEVAT will be populated automatically against the S-101 attribute **elevation** on conversion.

Unless otherwise stated against an individual Object class within this document, all instances of encoding of the attributes HEIGHT and VERLEN will be populated automatically against the S-101 attributes **height** and **vertical length**, respectively,on conversion.

## Control points

S-57 Geo object: Control point (**CTRPNT**) (P)

For S-101, it is considered that control point information is not required for the navigational ENC. In general, therefore, encoded **CTRPNT** will not convert across to S-101. However, in certain circumstances where a control point may be visible from seaward and therefore used as a navigational fixing mark, this information may be encoded in S-101 using a **Landmark** feature. During the automated conversion process, the following **CTRPNT**/CATCTR encoding instances will be converted to the corresponding **Landmark**/**category of landmark** instances.

CATCTR = *1* (triangulation mark) -> **category of landmark** = *22* (triangulation mark)

CATCTR = *5* (boundary mark) -> **category of landmark** = *23* (boundary mark)

Data Producers are advised to evaluate their data holdings to ensure that any encoded **CTRPNT** objects that may be used as a navigational fixing mark are encoded as **CTRPNT** with CATCTR = *1* or *5*, or re-encode as a **LNDMRK** object, prior to conversion.

## Distance marks

S-57 Geo object: Distance mark (**DISMAR**) (P)

S101 Geo feature: **Distance Mark** (P) (S-101 DCEG Clause 8.9)

All instances of encoding of the S-57 Feature object **DISMAR** and its binding attributes will be populated automatically against the S-101 feature **Distance Mark** during the automated conversion process. However the following exceptions apply:

* In S-57, the value of the measured distance and its unit of measurement is encoded using the attribute INFORM. In S-101 a new complex attribute **measured distance value** having sub-attributes **distance unit of measurement** and **waterway distance** has been introduced to encode this information. The complex also includes an optional sub-attribute **reference location** to encode the reference location from which the distance is measured, if required. During the automated conversion process, encoders will be prompted to populate **distance unit of measurement** and **waterway distance** based on the text included in INFORM for the **DISMAR** object, noting that an associated instance of the **Nautical Information** feature will not be created in this case (see clause 2.3).

## Coastline

### Natural coastline

S-57 Geo object: Coastline (**COALNE**) (L)

S101 Geo feature: **Coastline** (C) (S-101 DCEG Clause 5.3)

All instances of encoding of the S-57 Feature object **COALNE** and its binding attributes will be populated automatically against the S-101 feature **Coastline** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Coastline** in S-101:

**category of coastline** (CATCOA)

**colour** (COLOUR)

See S-101 DCEG clause 5.3 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101, with the following exceptions:

* The attribute **nature of surface** has been included as an allowable attribute for **Coastline** in S-101. During the automated conversion process, the following **COALNE**/CATCOA encoding instances will be converted to the corresponding **Coastline**/**nature of surface** instances.

CATCOA = *3* (sandy shore) -> **nature of surface** = *4* (sand)

CATCTR = *4* (stony shore) -> **nature of surface** = *5* (stone)

CATCTR = *5* (shingly shore) -> **nature of surface** = *7* (pebbles)

CATCTR = *9* (coral reef) -> **nature of surface** = *14* (coral)

CATCTR = *11* (shelly shore) -> **nature of surface** = *17* (shells)

Data Producers are advised to check any populated values for COLOUR on **COALNE** and amend appropriately.

### Artificial coastline

S-57 Geo object: Shoreline construction (**SLCONS**) (P,L,A)

S101 Geo feature: **Shoreline Construction** (P,C,S) (S-101 DCEG Clause 8.6)

All instances of encoding of the S-57 Feature object **SLCONS** and its binding attributes will be populated automatically against the S-101 feature **Shoreline Construction** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Shoreline Construction** in S-101:

**status** (STATUS)

See S-101 DCEG clause 8.6 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **SLCONS** and amend appropriately.

Data Producers are advised that the S-57 attribute CATSLC value *6* (wharf (quay)) has been split into two values for the S-101 attribute **category of shoreline construction** of *6* (wharf) and *22* (quay); and instances of conversion to value *6* in S-101 should be evaluated if considered necessary and amended as appropriate.

## Harbour installations

### Harbour facilities

S-57 Geo object: Harbour facility (**HRBFAC**) (P,A)

S101 Geo feature: **Harbour Facility** (P,S) (S-101 DCEG Clause 22.7)

All instances of encoding of the S-57 Feature object **HRBFAC** and its binding attributes will be populated automatically against the S-101 feature **Harbour Facility** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Harbour Facility** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 22.7 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **HRBFAC** and amend appropriately.

### Berths

S-57 Geo object: Berth (**BERTHS**) (P,L,A)

S101 Geo feature: **Berth** (P,C,S) (S-101 DCEG Clause 8.13)

All instances of encoding of the S-57 Feature object **BERTHS** and its binding attributes will be populated automatically against the S-101 feature **Berth** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Berth** in S-101:

**quality of vertical measurement** (QUASOU)

**status** (STATUS)

See S-101 DCEG clause 8.13 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for QUASOU and STATUS on **BERTHS** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The attribute **maximum permitted draught** has been introduced in S-101 to encode the maximum permitted vessel draught at the berth. This information is encoded in S-57 on **BERTHS** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **BERTHS** must be in the format *Maximum draught permitted = xx.x metres*, where *xx.x* is the value of the maximum permitted vessel draught (decimal part not required if the value is whole metres).

### Harbour offices

See clause 4.8.15.

### Checkpoints

S-57 Geo object: Checkpoint (**CHKPNT**) (P,A)

S101 Geo feature: **Checkpoint** (P,S) (S-101 DCEG Clause 8.2)

All instances of encoding of the S-57 Feature object **CHKPNT** and its binding attributes will be populated automatically against the S-101 feature **Checkpoint** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Checkpoint** in S-101:

**status** (STATUS)

See S-101 DCEG clause 8.2 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **CHKPNT** and amend appropriately.

### Small craft facilities

S-57 Geo object: Small craft facility (**SMCFAC**) (P,A)

S101 Geo feature: **Small Craft Facility** (P,S) (S-101 DCEG Clause 22.8)

All instances of encoding of the S-57 Feature object **SMCFAC** and its binding attributes will be populated automatically against the S-101 feature **Small Craft Facility** during the automated conversion process.

### Docks

#### Dry docks

S-57 Geo object: Dry dock (**DRYDOC**) (A)

S101 Geo feature: **Dry Dock** (S) (S-101 DCEG Clause 8.15)

All instances of encoding of the S-57 Feature object **DRYDOC** and its binding attributes will be populated automatically against the S-101 feature **Dry Dock** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute HORACC for **DRYDOC** will not be converted. It is considered that this attribute is not relevant for **Dry Dock** in S-101.

The following additional requirements for S-57 attribution must be noted:

* The attribute **maximum permitted draught** has been introduced in S-101 to encode the maximum permitted vessel draught at the dock. This information is encoded in S-57 on **DRYDOC** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **DRYDOC** must be in the format *Maximum draught permitted = xx.x metres*, where *xx.x* is the value of the maximum permitted vessel draught (decimal part not required if the value is whole metres).

#### Floating docks

S-57 Geo object: Floating dock (**FLODOC**) (L,A)

S101 Geo feature: **Floating Dock** (P,C,S) (S-101 DCEG Clause 8.16)

All instances of encoding of the S-57 Feature object **FLODOC** and its binding attributes will be populated automatically against the S-101 feature **Floating Dock** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute HORACC for **FLODOC** will not be converted. It is considered that this attribute is not relevant for **Floating Dock** in S-101.

For S-57 **FLODOC** of type area is designated as being part of Group 1 (Skin of the Earth) feature coverage. In S-101, **Floating Dock** has been removed from Group 1 (see S-101 Main document clause 4.3.2.1.1). Data Producers must ensure that appropriate S-101 Skin of the Earth coverage exists under any converted **Floating Dock** feature. Where the attributes INFORM or TXTDSC have been used on **FLODOC** of type area to indicate periodicity of the dock in S-57, the corresponding S-101 instance of the information type **Nautical Information** associated to **Floating Dock** must be examined and amended/deleted as required; and the date information encoded using the complex attribute **fixed date range** on the **Floating Dock**.

Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Floating Dock** in S-101:

**condition** (CONDTN)

See S-101 DCEG clause 8.16 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CONDTN on **FLODOC** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The attribute **maximum permitted draught** has been introduced in S-101 to encode the maximum permitted vessel draught at the dock. This information is encoded in S-57 on **FLODOC** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **FLODOC** must be in the format *Maximum draught permitted = xx.x metres*, where *xx.x* is the value of the maximum permitted vessel draught (decimal part not required if the value is whole metres).

#### Tidal and non-tidal basins

S-57 Geo object: Dock area (**DOCARE**) (A)

S101 Geo feature: **Dock Area** (S) (S-101 DCEG Clause 8.18)

All instances of encoding of the S-57 Feature object **DOCARE** and its binding attributes will be populated automatically against the S-101 feature **Dock Area** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes DATEND, DATSTA and SCAMIN for **DOCARE** will not be converted. In S-101, the **Dock Area** feature has been included as a Skin of the Earth feature (see S-101 Main document clause 4.3.2.1.1), and as such cannot be removed from the data based on date or viewing scale dependency. Date dependency for **Dock Area** in S-101 is indicated by associating an instance of the information type **Nautical Information**, complex attribute **information**.

As **Dock Area** has been included as a Skin of the Earth (Group 1) feature in S-101, the geometry of the S-57 Group 1 coverage will be “cookie cut” to incorporate the geometry of the **Dock Area**, and the associated features amended accordingly.

The following additional requirements for S-57 attribution must be noted:

* The attribute **maximum permitted draught** has been introduced in S-101 to encode the maximum permitted vessel draught at the dock. This information is encoded in S-57 on **DOCARE** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **DOCARE** must be in the format *Maximum draught permitted = xx.x metres*, where *xx.x* is the value of the maximum permitted vessel draught (decimal part not required if the value is whole metres).

#### Gates

S-57 Geo object: Gate (**GATCON**) (P,L,A)

S101 Geo feature: **Gate** (P,C,S) (S-101 DCEG Clause 8.10)

All instances of encoding of the S-57 Feature object **GATCON** and its binding attributes will be populated automatically against the S-101 feature **Gate** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Gate** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 8.10 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **GATCON** and amend appropriately.

#### Locks

S-57 Geo object: Lock basin (**LOKBSN**) (A)

S101 Geo feature: **Lock Basin** (S) (S-101 DCEG Clause 8.20)

All instances of encoding of the S-57 Feature object **LOKBSN** and its binding attributes will be populated automatically against the S-101 feature **Lock Basin** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes DATEND, DATSTA and SCAMIN for **LOKBSN** will not be converted. In S-101, the **Lock Basin** feature has been included as a Skin of the Earth feature (see S-101 Main document clause 4.3.2.1.1), and as such cannot be removed from the data based on date or viewing scale dependency. Date dependency for **Lock Basin** in S-101 is indicated by associating an instance of the information type **Nautical Information**, complex attribute **information**.

As **Lock Basin** has been included as a Skin of the Earth (Group 1) feature in S-101, the geometry of the S-57 Group 1 coverage will be “cookie cut” to incorporate the geometry of the **Lock Basin**, and the associated features amended accordingly.

#### Gridirons

S-57 Geo object: Gridiron (**GRIDRN**) (P,A)

S101 Geo feature: **Gridiron** (S) (S-101 DCEG Clause 8.19)

All instances of encoding of the S-57 Feature object **GRIDRN** and its binding attributes will be populated automatically against the S-101 feature **Gridiron** during the automated conversion process. However the following exceptions apply:

* **GRIDRN** of type point will not be converted. In S-101, the S-101 **Gridiron** feature has allowable primitive surface only as it is considered that this feature is only required for the largest scale ENC data. Data Producers will be required to amend their S-57 data as appropriate.

Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Gridiron** in S-101:

**nature of construction** (NATCON)

**status** (STATUS)

**water level effect** (WATLEV)

See S-101 DCEG clause 8.19 for the listing of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON, STATUS and WATLEV on **GRIDRN** and amend appropriately.

### Mooring / warping facilities and pontoons

#### Mooring / warping facilities

S-57 Geo object: Mooring / warping facility (**MORFAC**) (P,L,A)

S101 Geo feature: **Mooring/Warping Facility** (P,C,S) (S-101 DCEG Clause 8.14)

All instances of encoding of the S-57 Feature object **MORFAC** and its binding attributes will be populated automatically against the S-101 feature **Mooring/Warping Facility** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Mooring/Warping Facility** in S-101:

**nature of construction** (NATCON)

**status** (STATUS)

**water level effect** (WATLEV)

See S-101 DCEG clause 8.14 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON, STATUS and WATLEV on **MORFAC** and amend appropriately.

#### Piles

S-57 Geo object: Pile (**PILPNT**) (P)

S101 Geo feature: **Pile** (P,C,S) (S-101 DCEG Clause 8.4)

All instances of encoding of the S-57 Feature object **PILPNT** and its binding attributes will be populated automatically against the S-101 feature **Pile** during the automated conversion process.

#### Pontoons

S-57 Geo object: Pontoon (**PONTON**) (L,A)

S101 Geo feature: **Pontoon** (P,C,S) (S-101 DCEG Clause 8.17)

All instances of encoding of the S-57 Feature object **PONTON** and its binding attributes will be populated automatically against the S-101 feature **Pontoon** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute NATCON for **PONTON** will not be converted. It is considered that this attribute is not relevant for **Pontoon** in S-101.

For S-57 **PONTON** of geometric primitive area is designated as being part of Group 1 (Skin of the Earth) feature coverage. In S-101, **Pontoon** has been removed from Group 1 (see S-101 Main document clause 4.3.2.1.1). Data Producers must ensure that appropriate S-101 Skin of the Earth coverage exists under any converted **Pontoon** feature. Where the attributes INFORM or TXTDSC have been used on **PONTON** of type area to indicate periodicity of the pontoon in S-57, the corresponding S-101 instance of the information type **Nautical Information** associated to **Pontoon** must be examined and amended/deleted as required; and the date information encoded using the complex attribute **fixed date range** on the **Pontoon**.

### Hulks

S-57 Geo object: Hulk (**HULKES**) (P,A)

S101 Geo feature: **Hulk** (P,S) (S-101 DCEG Clause 8.3)

All instances of encoding of the S-57 Feature object **HULKES** and its binding attributes will be populated automatically against the S-101 feature **Hulk** during the automated conversion process.

### Dockside buildings and structures

#### Transit sheds and warehouses

See clause 4.8.15.

#### Timber yards

See clause 4.8.13.

#### Cranes

S-57 Geo object: Crane (**CRANES**) (P,A)

S101 Geo feature: **Crane** (P,C,S) (S-101 DCEG Clause 8.12)

All instances of encoding of the S-57 Feature object **CRANES** and its binding attributes will be populated automatically against the S-101 feature **Crane** during the automated conversion process.

S-101 includes the system attribute **in the water** to indicate that a crane that is located offshore is to be included in ECDIS Base display. As such, there is no requirement to include an ECDIS Base display feature coincident with the S-101 **Crane** feature so as to ensure display of a feature at the position of the crane in ECDIS Base display. Data Producers should consider removing these features from their S-101 data during the conversion process.

### Works in progress and projected

The encoding guidance for the indication of works in progress or projected remains unchanged in S-101. See S-101 DCEG clause 8.1.

## Natural features

### Natural sceneries

S-57 Geo object: Land region (**LNDRGN**) (P,A)

S101 Geo feature: **Land Region** (P,C,S) (S-101 DCEG Clause 5.11)

All instances of encoding of the S-57 Feature object **LNDRGN** and its binding attributes will be populated automatically against the S-101 feature **Land Region** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute NATQUA for **LNDRGN** will not be converted. It is considered that this attribute is not relevant for **Land Region** in S-101.

Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Land Region** in S-101:

**water level effect** (WATLEV)

See S-101 DCEG clause 5.11 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for WATLEV on **LNDRGN** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **category of land region** includes the new enumerate value *21* (wadi). This information is encoded in S-57 on **LNDRGN** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **LNDRGN** must be in the format *Wadi*.

### Height contours, spot heights

S-57 Geo object: Land elevation (**LNDELV**) (P,L)

S101 Geo feature: **Land Elevation** (P,C) (S-101 DCEG Clause 5.6)

All instances of encoding of the S-57 Feature object **LNDELV** and its binding attributes will be populated automatically against the S-101 feature **Land Elevation** during the automated conversion process.

### Marsh

The guidance for the encoding of marshes remains unchanged in S-101. See S-101 DCEG clause 5.11.1.1.

### Dunes, sand hills

S-57 Geo object: Sloping ground (**SLOGRD**) (P,A)

S101 Geo feature: **Sloping Ground** (P,S) (S-101 DCEG Clause 5.14)

All instances of encoding of the S-57 Feature object **SLOGRD** and its binding attributes will be populated automatically against the S-101 feature **Sloping Ground** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Sloping Ground** in S-101:

**colour** (COLOUR)

**nature of surface** (NATSUR)

See S-101 DCEG clause 5.14 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for COLOUR and NATSUR on **SLOGRD** and amend appropriately.

### Cliffs

S-57 Geo object: Slope topline (**SLOTOP**) (L)

S101 Geo feature: **Slope Topline** (C) (S-101 DCEG Clause 5.15)

All instances of encoding of the S-57 Feature object **SLOTOP** and its binding attributes will be populated automatically against the S-101 feature **Slope Topline** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Slope Topline** in S-101:

**category of slope** (CATSLO)

**colour** (COLOUR)

**nature of surface** (NATSUR)

See S-101 DCEG clause 5.15 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CATSLO, COLOUR and NATSUR on **SLOTOP** and amend appropriately.

### Rivers

S-57 Geo object: River (**RIVERS**) (L,A)

S101 Geo feature: **River** (C,S) (S-101 DCEG Clause 5.7)

All instances of encoding of the S-57 Feature object **RIVERS** and its binding attributes will be populated automatically against the S-101 feature **River** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **River** in S-101:

**status** (STATUS)

See S-101 DCEG clause 5.7 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **RIVERS** and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* S-57 guidance recommends the encoding of intermittent lakes using a **RIVERS** object. Data producers are advised to check all instances of **RIVERS** of type area having attribute STATUS = *5* (periodic/intermittent) and if the real-world feature is a lake to amend to an instance of the S-101 feature **Lake** (see S-101 DCEG clause 5.10).

### Rapids, waterfalls

#### Rapids

S-57 Geo object: Rapids (**RAPIDS**) (P,L,A)

S101 Geo feature: **Rapids** (P,C,S) (S-101 DCEG Clause 5.8)

All instances of encoding of the S-57 Feature object **RAPIDS** and its binding attributes will be populated automatically against the S-101 feature **Rapids** during the automated conversion process.

#### Waterfalls

S-57 Geo object: Waterfall (**WATFAL**) (P,L)

S101 Geo feature: **Waterfall** (P,C) (S-101 DCEG Clause 5.9)

All instances of encoding of the S-57 Feature object **WATFAL** and its binding attributes will be populated automatically against the S-101 feature **Waterfall** during the automated conversion process.

### Lakes

S-57 Geo object: Lake (**LAKARE**) (A)

S101 Geo feature: **Lake** (S) (S-101 DCEG Clause 5.10)

All instances of encoding of the S-57 Feature object **LAKARE** and its binding attributes will be populated automatically against the S-101 feature **Lake** during the automated conversion process.

The S-101 attribute **status** has been added as an allowable attribute for **Lake**, in order to allow for the encoding of intermittent lakes. In S-57, it is recommended that intermittent lakes are encoded using the object class **RIVERS**. Data Producers will be required to evaluate their S-57 data holdings for any intermittent lakes that have been encoded as **RIVERS**, and amend these to **Lake** features during the conversion process as required.

### Salt pans

The guidance for the encoding of salt pans remains unchanged in S-101. See S-101 DCEG clause 5.11.1.2.

### Glaciers

The guidance for the encoding of glaciers remains unchanged in S-101. See S-101 DCEG clause 5.13.1.1.

### Vegetation

S-57 Geo object: Vegetation (**VEGATN**) (P,L,A)

S101 Geo feature: **Vegetation** (P,C,S) (S-101 DCEG Clause 5.12)

All instances of encoding of the S-57 Feature object **VEGATN** and its binding attributes will be populated automatically against the S-101 feature **Vegetation** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Vegetation** in S-101:

**category of vegetation** (CATVEG)

See S-101 DCEG clause 5.12 for the listings of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CATVEG on **VEGATN** and amend appropriately.

### Lava flow

See clause 4.7.1.

## Artificial features

### Canals

S-57 Geo object: Canal (**CANALS**) (L,A)

S101 Geo feature: **Canal** (C,S) (S-101 DCEG Clause 8.8)

All instances of encoding of the S-57 Feature object **CANALS** and its binding attributes will be populated automatically against the S-101 feature **Canal** during the automated conversion process.

### Railways

S-57 Geo object: Railway (**RAILWY**) (L)

S101 Geo feature: **Railway** (C) (S-101 DCEG Clause 6.13)

All instances of encoding of the S-57 Feature object **RAILWY** and its binding attributes will be populated automatically against the S-101 feature **Railway** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Railway** in S-101:

**condition** (CONDTN)

See S-101 DCEG clause 6.13 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CONDTN on **RAILWY** and amend appropriately.

### Tunnels

S-57 Geo object: Tunnel (**TUNNEL**) (P,L,A)

S101 Geo feature: **Tunnel** (C,S) (S-101 DCEG Clause 6.15)

All instances of encoding of the S-57 Feature object **TUNNEL** and its binding attributes will be populated automatically against the S-101 feature **Tunnel** during the automated conversion process. However the following exceptions apply:

* **TUNNEL** of type point will not be converted. Data Producers will be required to check their S-57 data holdings and address as appropriate.

Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Tunnel** in S-101:

**condition** (CONDTN)

**status** (STATUS)

See S-101 DCEG clause 6.15 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CONDTN and STATUS on **TUNNEL** and amend appropriately.

### Cuttings and embankments

See clauses 4.7.4 and 4.7.5.

### Dams

S-57 Geo object: Dam (**DAMCON**) (P,L,A)

S101 Geo feature: **Dam** (C,S) (S-101 DCEG Clause 8.11)

All instances of encoding of the S-57 Feature object **DAMCON** and its binding attributes will be populated automatically against the S-101 feature **Dam** during the automated conversion process. However the following exceptions apply:

* Point is not an allowable geometric primitive for **Dam**, therefore **DAMCON** of type point will convert to the S-101 feature **Landmark** (see S-101 DCEG clause 7.2).

Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Dam** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 8.11 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **DAMCON** and amend appropriately.

### Flood barrages

The guidance for the encoding of flood barrages remains unchanged in S-101. See S-101 DCEG clause 8.11.2.

### Dykes

S-57 Geo object: Dyke (**DYKCON**) (L,A)

S101 Geo feature: **Dyke** (C,S) (S-101 DCEG Clause 8.5)

All instances of encoding of the S-57 Feature object **DYKCON** and its binding attributes will be populated automatically against the S-101 feature **Dyke** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Dyke** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 8.5 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **DYKCON** and amend appropriately.

### Roads and tracks

S-57 Geo object: Road (**ROADWY**) (P,L,A)

S101 Geo feature: **Road** (C,S) (S-101 DCEG Clause 6.14)

All instances of encoding of the S-57 Feature object **ROADWY** and its binding attributes will be populated automatically against the S-101 feature **Road** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Road** in S-101:

**condition** (CONDTN)

**nature of construction** (NATCON)

**status** (STATUS)

See S-101 DCEG clause 6.14 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CONDTN, NATCON and STATUS on **ROADWY** and amend appropriately.

### Causeways

S-57 Geo object: Causeway (**CAUSWY**) (L,A)

S101 Geo feature: **Causeway** (C,S) (S-101 DCEG Clause 8.7)

All instances of encoding of the S-57 Feature object **CAUSWY** and its binding attributes will be populated automatically against the S-101 feature **Causeway** during the automated conversion process.

### Bridges

S-57 Geo object: Bridge (**BRIDGE**) (P,L,A)

S101 Geo feature: **Bridge** (C,S,N) (S-101 DCEG Clause 6.5)

S101 Geo feature: **Span Fixed** (C,S) (S-101 DCEG Clause 6.6)

S101 Geo feature: **Span Opening** (C,S) (S-101 DCEG Clause 6.7)

Significant changes to the modelling of bridges have been made in S-101 in order to improve presentation to the mariner. In order to allow for the encoding of the characteristics of each individual span of a bridge in addition to its overall characteristics, new S-101 features **Span Fixed** and **Span Opening** have been introduced. During the automated conversion process, all instances of encoding of the S-57 Feature object **BRIDGE** and its binding attributes will be populated automatically against the S-101 features **Bridge**, **Span Fixed** or **Span Opening** as appropriate. However the following exceptions apply:

* Point is not an allowable geometric primitive for **Bridge**, therefore **BRIDGE** of type point will convert to the S-101 feature **Landmark** (see S-101 DCEG clause 7.2).

Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for these features in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clauses 6.5-6.7 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **BRIDGE** and amend appropriately.

The following additional requirements for S-57 encoding must be noted:

* It is recommended that each span of a bridge is encoded as a separate **BRIDGE** object where known, and these **BRIDGE** objects are aggregated using the collection object **C\_AGGR**. The attributes COLOUR, COLPAT, CONDTN, CONRAD, CONVIS, DATEND, DATSTA, NATCON, NOBJNM, OBJNAM, INFORM, NINFOM and SCAMIN must be identical for each of the **BRIDGE** objects comprising the bridge.

### Conveyors

S-57 Geo object: Conveyor (**CONVYR**) (L,A)

S101 Geo feature: **Conveyor** (C,S) (S-101 DCEG Clause 6.8)

All instances of encoding of the S-57 Feature object **CONVYR** and its binding attributes will be populated automatically against the S-101 feature **Conveyor** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Conveyor** in S-101:

**product** (PRODCT)

**status** (STATUS)

See S-101 DCEG clause 6.8 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for PRODCT and STATUS on **CONVYR** and amend appropriately.

### Airfields

S-57 Geo object: Airport / airfield (**AIRARE**) (P,A)

S101 Geo feature: **Airport/Airfield** (C,S) (S-101 DCEG Clause 6.3)

All instances of encoding of the S-57 Feature object **AIRARE** and its binding attributes will be populated automatically against the S-101 feature **Airport/Airfield** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Airport/Airfield** in S-101:

**status** (STATUS)

See S-101 DCEG clause 6.3 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **AIRARE** and amend appropriately.

S-57 Geo object: Runway (**RUNWAY**) (P,L,A)

S101 Geo feature: **Runway** (P,C,S) (S-101 DCEG Clause 6.4)

All instances of encoding of the S-57 Feature object **RUNWAY** and its binding attributes will be populated automatically against the S-101 feature **Runway** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Runway** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 6.4 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **RUNWAY** and amend appropriately.

### Production and storage areas

S-57 Geo object: Production / storage area (**PRDARE**) (P,A)

S101 Geo feature: **Production/Storage Area** (P,S) (S-101 DCEG Clause 7.6)

All instances of encoding of the S-57 Feature object **PRDARE** and its binding attributes will be populated automatically against the S-101 feature **Production/Storage Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Production/Storage Area** in S-101:

**status** (STATUS)

See S-101 DCEG clause 7.6 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **PRDARE** and amend appropriately.

### Built-up areas

S-57 Geo object: Built-up area (**BUAARE**) (P,A)

S101 Geo feature: **Built-Up Area** (P,S) (S-101 DCEG Clause 6.1)

All instances of encoding of the S-57 Feature object **BUAARE** and its binding attributes will be populated automatically against the S-101 feature **Built-Up Area** during the automated conversion process.

### Buildings, landmarks, tanks, silos

S-57 Geo object: Building, single (**BUISGL**) (P,A)

S101 Geo feature: **Building** (P,S) (S-101 DCEG Clause 6.2)

All instances of encoding of the S-57 Feature object **BUISGL** and its binding attributes will be populated automatically against the S-101 feature **Building** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Building** in S-101:

**nature of construction** (NATCON)

**status** (STATUS)

See S-101 DCEG clause 6.2 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON and STATUS on **BUISGL** and amend appropriately.

S-101 includes the system attribute **in the water** to indicate that a building that is located offshore is to be included in ECDIS Base display. As such, there is no requirement to include an ECDIS Base display feature coincident with the S-101 **Building** feature so as to ensure display of a feature at the position of the building in ECDIS Base display. Data Producers should consider removing these features from their S-101 data during the conversion process.

S-57 Geo object: Landmark (**LNDMRK**) (P,L,A)

S101 Geo feature: **Landmark** (P,C,S) (S-101 DCEG Clause 7.2)

S101 Geo feature: **Wind Turbine** (P) (S-101 DCEG Clause 7.4)

All instances of encoding of the S-57 Feature object **LNDMRK** and its binding attributes will be populated automatically against the S-101 feature **Landmark** during the automated conversion process. However the following exceptions apply:

* **LNDMRK** objects of type point and having attribute CATLMK = *19* (windmotor) will convert to the new S-101 feature **Wind Turbine**. The S-101 attribute **vertical clearance fixed** introduces the option to encode additional information related to **Wind Turbine**. There is no corresponding encoding for this information on **LNDMRK** in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.

Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Landmark** in S-101:

**nature of construction** (NATCON)

**status** (STATUS)

See S-101 DCEG clauses 7.2 and 7.4 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON and STATUS on **LNDMRK** and amend appropriately.

S-101 includes the system attribute **in the water** to indicate that a landmark that is located offshore is to be included in ECDIS Base display. As such, there is no requirement to include an ECDIS Base display feature coincident with the S-101 **Landmark** feature so as to ensure display of a feature at the position of the landmark in ECDIS Base display. Data Producers should consider removing these features from their S-101 data during the conversion process.

S-57 Geo object: Silo / tank (**SILTNK**) (P,A)

S101 Geo feature: **Silo/Tank** (P,S) (S-101 DCEG Clause 7.3)

All instances of encoding of the S-57 Feature object **SILTNK** and its binding attributes will be populated automatically against the S-101 feature **Silo/Tank** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Silo/Tank** in S-101:

**nature of construction** (NATCON)

**status** (STATUS)

See S-101 DCEG clause 7.3 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON and STATUS on **SILTNK** and amend appropriately.

S-101 includes the system attribute **in the water** to indicate that a silo/tank that is located offshore is to be included in ECDIS Base display. As such, there is no requirement to include an ECDIS Base display feature coincident with the S-101 **Silo/Tank** feature so as to ensure display of a feature at the position of the silo/tank in ECDIS Base display. Data Producers should consider removing these features from their S-101 data during the conversion process.

### Fences and walls

S-57 Geo object: Fence/wall (**FNCLNE**) (L)

S101 Geo feature: **Fence/Wall** (C) (S-101 DCEG Clause 6.12)

All instances of encoding of the S-57 Feature object **FNCLNE** and its binding attributes will be populated automatically against the S-101 feature **Fence/Wall** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Fence/Wall** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 6.12 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **FNCLNE** and amend appropriately.

### Fortified structures

S-57 Geo object: Fortified structure (**FORSTC**) (P,L,A)

S101 Geo feature: **Fortified Structure** (P,C,S) (S-101 DCEG Clause 7.5)

All instances of encoding of the S-57 Feature object **FORSTC** and its binding attributes will be populated automatically against the S-101 feature **Fortified Structure** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Fortified Structure** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 7.5 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **FORSTC** and amend appropriately.

S-101 includes the system attribute **in the water** to indicate that a fortified structure that is located offshore is to be included in ECDIS Base display. As such, there is no requirement to include an ECDIS Base display feature coincident with the S-101 **Fortified Structure** feature so as to ensure display of a feature at the position of the fortified structure in ECDIS Base display. Data Producers should consider removing these features from their S-101 data during the conversion process.

### Pylons and bridge supports

S-57 Geo object: Pylon / bridge support (**PYLONS**) (P,A)

S101 Geo feature: **Pylon/Bridge Support** (P,S) (S-101 DCEG Clause 6.11)

All instances of encoding of the S-57 Feature object **PYLONS** and its binding attributes will be populated automatically against the S-101 feature **Pylon/Bridge Support** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Pylon/Bridge Support** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 6.11 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **PYLONS** and amend appropriately.

### Oil barriers

S-57 Geo object: Oil barrier (**OILBAR**) (L)

S101 Geo feature: **Oil Barrier** (C) (S-101 DCEG Clause 16.21)

All instances of encoding of the S-57 Feature object **OILBAR** and its binding attributes will be populated automatically against the S-101 feature **Oil Barrier** during the automated conversion process.

### Views and sketches, viewpoints

Values populated for the S-57 attribute PICREP will be converted across to an instance of the S-101 Information type **Nautical Information**, attribute **pictorial representation**, however due to the changes to support file naming conventions in S-101 (see S-101 Main document, clause 11.4.1), data producers will be prompted to provide a new name for the picture file. It must also be noted that due to the “one to many” relationship that may exist between an Information type and associated Geo feature(s) in S-101, duplicate instances of **Nautical Information** associated to Geo features on a “one to one” basis should be avoided. Data Producers are advised to review converted data and amend these associations as required.

### Signs and Notice boards

The guidance for the encoding of signs and notice boards remains unchanged in S-101. See S-101 DCEG clause 20.12.2.

# Depth

## Sounding datum

See clause 2.1.3.

## Depth contours

S-57 Geo object: Depth contour (**DEPCNT**) (L)

S101 Geo feature: **Depth Contour** (C) (S-101 DCEG Clause 11.6)

All instances of encoding of the S-57 Feature object **DEPCNT** and its binding attributes will be populated automatically against the S-101 feature **Depth Contour** during the automated conversion process.

## Soundings

S-57 Geo object: Sounding (**SOUNDG**) (P)

S101 Geo feature: **Sounding** (P - Pointset) (S-101 DCEG Clause 11.3)

S101 Geo feature: **Depth – No Bottom Found** (P - Pointset) (S-101 DCEG Clause 11.8)

All instances of encoding of the S-57 Feature object **SOUNDG** and its binding attributes will be populated automatically against the S-101 feature **Sounding** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute EXPSOU will not be converted. It is considered that this attribute is not relevant for **Sounding** in S-101.
* **SOUNDG** with attribute QUASOU = *5* (no bottom found at value shown) will convert to the S-101 feature **Depth – No Bottom Found**. Where this is the case, the attributes EXPSOU, NOBJNM, OBJNAM, SOUACC and STATUS will not be converted. It is considered that these attributes are not relevant for **Depth – No Bottom Found** in S-101.
* The S-57 attribute SOUACC will convert to an instance of the S-101 Information type **Spatial Quality** (see S-101 DCEG clause 24.5), attribute **vertical uncertainty**/**uncertainty fixed**, associated to the geometry of the **Sounding** features using the association **Spatial Association**. This encoding is mandatory in S-101 for all **Sounding** features of depth 30 metres or less. It is recommended that Data Producers evaluate their data holdings and populate values of SOUACC for **SOUNDG** of depth 30 metres or less at their earliest convenience.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **reported date** has been introduced in S-101 to encode the date at which a sounding has been reported. This information is encoded in S-57 on **SOUNDG** using the attribute SORDAT (see clause 2.2.5.1). Unless the date populated in SORDAT is actually a reported date, Data Producers are advised to remove SORDAT from **SOUNDG** objects prior to conversion.

Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Sounding** in S-101:

**quality of vertical measurement** (QUASOU)

**technique of sounding measurement** (TECSOU)

See S-101 DCEG clause 11.3 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CONDTN and STATUS on **SOUNDG** and amend appropriately.

The S-101 Boolean attribute **display uncertainties** introduces the option to encode additional information related to **Sounding**, and is mandatory for all **Sounding** features of depth 30 metres or less. There is no corresponding encoding for this information on **SOUNDG** in S-57 – for full capability S-101 data, Data Producers will be required to evaluate their converted S-101 sounding coverage and populate this attribute appropriately, noting that during the automated conversion process the value of this attribute will be set to *No*.

## Depth areas

### Geo object depth areas

S-57 Geo object: Depth area (**DEPARE**) (A)

S101 Geo feature: **Depth Area** (S) (S-101 DCEG Clause 11.7)

All instances of encoding of the S-57 Feature object **DEPARE** and its binding attributes will be populated automatically against the S-101 feature **Depth Area** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute QUASOU for **DEPARE** will not be converted. It is considered that this attribute are not relevant for **Depth Area** in S-101.

### Geometry of depth areas

The guidance for the geometry of depth areas remains unchanged in S-101. See S-101 DCEG clause 11.7.2.

### Use of attributes DRVAL1 and DRVAL2 for depth areas in general

The guidance for the encoding of depth range values remains unchanged in S-101. See S-101 DCEG clause 11.7.3.

### Not currently used

### Not currently used

### Not currently used

### Not currently used

### Rivers, canals, lakes, basins, locks

The guidance for the encoding of rivers, canals and lakes remains unchanged in S-101. See S-101 DCEG clauses 5.7, 5.10 and 8.8. However, the S-101 Feature classes **Dock Area** (**DOCARE**) and **Lock Basin** (**LOKBSN**) have been designated as Skin of the Earth features. See clauses 4.6.6.3 and 4.6.6.5 in this document.

## Dredged areas

S-57 Geo object: Dredged area (**DRGARE**) (A)

S101 Geo feature: **Dredged Area** (S) (S-101 DCEG Clause 11.4)

All instances of encoding of the S-57 Feature object **DRGARE** and its binding attributes will be populated automatically against the S-101 feature **Dredged Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Dredged Area** in S-101:

**restriction** (RESTRN)

**technique of sounding measurement** (TECSOU)

See S-101 DCEG clause 11.4 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CONDTN and STATUS on **DRGARE** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* Where **SOUNDG** or **SEAARE** features have been encoded in order to display the depth of dredging in ECDIS, these features should be removed from the converted dataset.
* The S-101 attribute **reported date** has been introduced in S-101 to encode the date of dredging or the date of the last control survey for the dredged area. This information is encoded in S-57 on **DRGARE** using the attribute SORDAT (see clause 2.2.5.1). Unless the date populated in SORDAT is actually a dredging date or date of the last control survey, Data Producers are advised to remove SORDAT from **DRGARE** objects prior to conversion.

## Swept areas

S-57 Geo object: Swept area (**SWPARE**) (A)

S101 Geo feature: **Swept Area** (S) (S-101 DCEG Clause 11.5)

All instances of encoding of the S-57 Feature object **SWPARE** and its binding attributes will be populated automatically against the S-101 feature **Swept Area** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes QUASOU, SOUACC and TECSOU for **SWPARE** will not be converted. It is considered that these attributes are not relevant for **Swept Area** in S-101.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **reported date** has been introduced in S-101 to encode the date of sweeping for the swept area. This information is encoded in S-57 on **SWPARE** using the attribute SORDAT (see clause 2.2.5.1). Unless the date populated in SORDAT is actually a date of sweeping, Data Producers are advised to remove SORDAT from **SWPARE** objects prior to conversion.

## Areas of continual change

The indication that an area of encoded bathymetry is changeable over time is provided by the encoding of the S-101 feature **Quality of Bathymetric Data** having attribute **category of temporal variation** carrying the values *2* (likely to change and significant shoaling expected) or *3* (likely to change but significant shoaling not expected). See S-101 DCEG clause 11.7.5. Data Producers should consider removing any **Caution Area** features providing this information from their S-101 data during the conversion process.

The guidance for the encoding of sandwaves and provision of an indication of “Less Water” remains unchanged in S-101. See S-101 DCEG clauses 12.4 and 16.10.

## Areas with inadequate depth information

### Unsurveyed areas

S-57 Geo object: Unsurveyed area (**UNSARE**) (A)

S101 Geo feature: **Unsurveyed Area** (S) (S-101 DCEG Clause 11.10)

All instances of encoding of the S-57 Feature object **UNSARE** will be converted automatically against the S-101 feature **Unsurveyed Area** during the automated conversion process.

#### Satellite imagery as source information

The guidance for the encoding of bathymetry sourced from satellite imagery remains unchanged in S-101. See S-101 DCEG clause 11.9.4, noting the guidance included in this clause for the encoding of underlying **Quality of Bathymetric Data** and **Quality of Survey** features.

### Incompletely surveyed areas

Not applicable.

### Bathymetry in areas of minimal depiction of detail on paper charts

#### Areas of omitted bathymetry

The guidance for the encoding of areas of omitted bathymetry on the source remains unchanged in S-101. See S-101 DCEG clause 11.9.2.1.

#### Areas of very simplified bathymetry

The guidance for the encoding of areas of very simplified bathymetry on the source remains unchanged in S-101. See S-101 DCEG clause 11.9.2.2.

### Depth discontinuities between surveys

The guidance for the encoding of depth discontinuities between source surveys remains unchanged in S-101. See S-101 DCEG clause 11.9.3.

# Dangers

## Rocks and coral reefs

The guidance for the encoding of isolated dangers as isolated nodes remains unchanged in S-101. See S-101 DCEG clause 13.

### Rocks which do not cover (islets)

The guidance for the encoding rocks that do not cover remains unchanged in S-101. See S-101 DCEG clause 5.4.2.

### Rocks which may cover

S-57 Geo object: Underwater / awash rock (**UWTROC**) (P)

S101 Geo feature: **Underwater/Awash Rock** (P) (S-101 DCEG Clause 13.4)

All instances of encoding of the S-57 Feature object **UWTROC** and its binding attributes will be populated automatically against the S-101 feature **Underwater/Awash Rock** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute NATQUA will not be converted. It is considered that this attribute is not relevant for **Underwater/Awash Rock** in S-101.
* The S-57 attribute SOUACC will convert to an instance of the S-101 Information type **Spatial Quality** (see S-101 DCEG clause 24.5), attribute **vertical uncertainty**/**uncertainty fixed**, associated to the geometry of the **Underwater/Awash Rock** features using the association **Spatial Association**. This encoding is mandatory in S-101 for all **Underwater/Awash Rock** features of depth 30 metres or less. It is recommended that Data Producers evaluate their data holdings and populate values of SOUACC for **UWTROC** of depth 30 metres or less at their earliest convenience.

Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Underwater/Awash Rock** in S-101:

**exposition of sounding** (EXPSOU)

**nature of surface** (NATSUR)

**status** (STATUS)

See S-101 DCEG clause 13.4 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for EXPSOU, NATSUR and STATUS on **UWTROC** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **reported date** has been introduced in S-101 to encode the date at which a rock has been reported. This information is encoded in S-57 on **UWTROC** using the attribute SORDAT (see clause 2.2.5.1). Unless the date populated in SORDAT is actually a reported date, Data Producers are advised to remove SORDAT from **UWTROC** objects prior to conversion.

The S-101 Boolean attribute **display uncertainties** introduces the option to encode additional information related to **Underwater/Awash Rock**, and is mandatory for all **Underwater/Awash Rock** features of depth 30 metres or less. There is no corresponding encoding for this information on **UWTROC** in S-57 – for full capability S-101 data, Data Producers will be required to evaluate their converted S-101 data and populate this attribute appropriately, noting that during the automated conversion process the value of this attribute will be set to *No*.

## Wrecks, foul ground and obstructions

### Wrecks

S-57 Geo object: Wreck (**WRECKS**) (P,A)

S101 Geo feature: **Wreck** (P,S) (S-101 DCEG Clause 13.5)

All instances of encoding of the S-57 Feature object **WRECKS** and its binding attributes will be populated automatically against the S-101 feature **Wreck** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute SOUACC will convert to an instance of the S-101 Information type **Spatial Quality** (see S-101 DCEG clause 24.5), attribute **vertical uncertainty**/**uncertainty fixed**, associated to the geometry of the **Wreck** features using the association **Spatial Association**. This encoding is mandatory in S-101 for **Wreck** features of type point and depth 30 metres or less. It is recommended that Data Producers evaluate their data holdings and populate values of SOUACC for **WRECKS** of type point and depth 30 metres or less at their earliest convenience.

The S-101 Boolean attribute **display uncertainties** introduces the option to encode additional information related to **Wreck**, and is mandatory for all **Wreck** features of type point and depth 30 metres or less. There is no corresponding encoding for this information on **WRECKS** in S-57 – for full capability S-101 data, Data Producers will be required to evaluate their converted S-101 data and populate this attribute appropriately, noting that during the automated conversion process the value of this attribute will be set to *No*.

### Obstructions, foul areas and foul ground

S-57 Geo object: Obstruction (**OBSTRN**) (P,L,A)

S101 Geo feature: **Obstruction** (P,C,S) (S-101 DCEG Clause 13.6)

S101 Geo feature: **Foul Ground** (P,C,S) (S-101 DCEG Clause 13.7)

All instances of encoding of the S-57 Feature object **OBSTRN** and its binding attributes will be populated automatically against the S-101 feature **Obstruction** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes NATCON and NATQUA will not be converted. It is considered that these attributes are not relevant for **Obstruction** in S-101.
* **OBSTRN** with attribute CATOBS = *7* (foul ground) will convert to the S-101 feature **Foul Ground**. Where this is the case, the attributes CONDTN, EXPSOU, HEIGHT, NATCON, NATQUA, NATSUR PRODCT and VERLEN will not be converted. It is considered that these attributes are not relevant for **Foul Ground** in S-101.
* The S-57 attribute SOUACC will convert to an instance of the S-101 Information type **Spatial Quality** (see S-101 DCEG clause 24.5), attribute **vertical uncertainty**/**uncertainty fixed**, associated to the geometry of the **Obstruction** features using the association **Spatial Association**. This encoding is mandatory in S-101 for all **Obstruction** features of type point and depth 30 metres or less. It is recommended that Data Producers evaluate their data holdings and populate values of SOUACC for **OBSTRN** of type point and depth 30 metres or less at their earliest convenience.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **category of obstruction** includes the new enumerate value *21* (active submarine volcano). This information is encoded in S-57 on **OBSTRN** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **OBSTRN** must be in the format *Active submarine volcano*.

The S-101 Boolean attribute **display uncertainties** introduces the option to encode additional information related to **Obstruction**, and is mandatory for all **Obstruction** features of type point and depth 30 metres or less. There is no corresponding encoding for this information on **OBSTRN** in S-57 – for full capability S-101 data, Data Producers will be required to evaluate their converted S-101 data and populate this attribute appropriately, noting that during the automated conversion process the value of this attribute will be set to *No*.

## Danger lines

### Danger line around a point danger or an isolated sounding

Not applicable.

### Danger line limiting an area of wrecks or obstructions

The guidance for the encoding of danger lines limiting areas of wrecks or obstructions remains unchanged in S-101. See S-101 DCEG clause 13.1.

### Danger line bordering an area through which navigation is not safe

The guidance for the encoding of danger lines through which navigation is not safe remains unchanged in S-101. See S-101 DCEG clause 13.2.

## Overfalls, races, breakers, eddies

S-57 Geo object: Water turbulence (**WATTUR**) (P,L,A)

S101 Geo feature: **Water Turbulence** (P,C,S) (S-101 DCEG Clause 10.4)

All instances of encoding of the S-57 Feature object **WATTUR** and its binding attributes will be populated automatically against the S-101 feature **Water Turbulence** during the automated conversion process.

## Doubtful dangers

S101 Geo feature: **Discoloured Water** (P,S) (S-101 DCEG Clause 13.8)

The guidance for the encoding of doubtful dangers unchanged in S-101. See S-101 DCEG clause 13.3. However the following requirements for S-57 attribution must be noted:

* The S-101 feature **Discoloured Water** has been introduced in S-101 to encode areas of discoloured water. This information is encoded in S-57 as a **CTNARE** feature, using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **CTNARE** must be in the format *Discoloured water*.

## Caution areas

S-57 Geo object: Caution area (**CTNARE**) (P,A)

S101 Geo feature: **Caution Area** (P,S) (S-101 DCEG Clause 16.10)

All instances of encoding of the S-57 Feature object **CTNARE** and its binding attributes will be populated automatically against the S-101 feature **Caution Area** during the automated conversion process.

# Nature of the seabed

## Description of the bottom

S-57 Geo object: Seabed area (**SBDARE**) (P,L,A)

S101 Geo feature: **Seabed Area** (P,C,S) (S-101 DCEG Clause 12.1)

All instances of encoding of the S-57 Feature object **SBDARE** and its binding attributes will be populated automatically against the S-101 feature **Seabed Area** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute COLOUR for **SBDARE** will not be converted. It is considered that this attribute is not relevant for **Seabed Area** in S-101.

## Special bottom types

### Sandwaves

S-57 Geo object: Sandwaves (**SNDWAV**) (P,L,A)

S101 Geo feature: **Sandwave** (P,C,S) (S-101 DCEG Clause 12.4)

All instances of encoding of the S-57 Feature object **SNDWAV** and its binding attributes will be populated automatically against the S-101 feature **Sandwave** during the automated conversion process.

### Weed - Kelp

S-57 Geo object: Weed / kelp (**WEDKLP**) (P,A)

S101 Geo feature: **Weed/Kelp** (P,S) (S-101 DCEG Clause 12.2)

S101 Geo feature: **Seagrass** (P,S) (S-101 DCEG Clause 12.3)

All instances of encoding of the S-57 Feature object **WEDKLP** and its binding attributes will be populated automatically against the S-101 feature **Weed/Kelp** during the automated conversion process. However the following exceptions apply:

* **WEDKLP** with attribute CATWED = *3* (sea grass) will convert to the S-101 feature **Seagrass**.

### Springs in the seabed

S-57 Geo object: Spring (**SPRING**) (P)

S101 Geo feature: **Spring** (P) (S-101 DCEG Clause 12.5)

All instances of encoding of the S-57 Feature object **SPRING** and its binding attributes will be populated automatically against the S-101 feature **Spring** during the automated conversion process.

### Tideways

S-57 Geo object: Tideway (**TIDEWY**) (L,A)

S101 Geo feature: **Tideway** (C,S) (S-101 DCEG Clause 5.16)

All instances of encoding of the S-57 Feature object **TIDEWY** and its binding attributes will be populated automatically against the S-101 feature **Tideway** during the automated conversion process.

# Sea areas

S-57 Geo object: Sea area (**SEAARE**) (P,A)

S101 Geo feature: **Sea Area/Named Water Area** (P,S) (S-101 DCEG Clause 9.1)

All instances of encoding of the S-57 Feature object **SEAARE** and its binding attributes will be populated automatically against the S-101 feature **Sea Area/Named Water Area** during the automated conversion process.

# Harbour regulations

## Regulations within harbour limits

### Administrative harbour areas

S-57 Geo object: Harbour area (**HRBARE**) (A)

S101 Geo feature: **Harbour Area (Administrative)** (S) (S-101 DCEG Clause 16.19)

All instances of encoding of the S-57 Feature object **HRBARE** and its binding attributes will be populated automatically against the S-101 feature **Harbour Area (Administrative)** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Harbour Area (Administrative)** in S-101:

**status** (STATUS)

See S-101 DCEG clause 16.19 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **HRBARE** and amend appropriately.

### Speed limits

The guidance for the encoding of speed limits remains unchanged in S-101. See S-101 DCEG clause 17.4.

## Anchorages and prohibited/restricted anchorages; moorings

### Anchorages

S-57 Geo object: Anchorage area (**ACHARE**) (P,A)

S101 Geo feature: **Anchorage Area** (P,S) (S-101 DCEG Clause 16.3)

All instances of encoding of the S-57 Feature object **ACHARE** and its binding attributes will be populated automatically against the S-101 feature **Anchorage Area** during the automated conversion process.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **category of anchorage** includes the new enumerate value *15* (reported anchorage). This information is encoded in S-57 on **ACHARE** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **ACHARE** must be in the format *Reported anchorage*.

### Anchor berths

S-57 Geo object: Anchor berth (**ACHBRT**) (P,A)

S101 Geo feature: **Anchor Berth** (P,S) (S-101 DCEG Clause 16.4)

All instances of encoding of the S-57 Feature object **ACHBRT** and its binding attributes will be populated automatically against the S-101 feature **Anchor Berth** during the automated conversion process.

### Anchoring restricted

The guidance for the encoding of the indication that anchorage is restricted remains unchanged in S-101. See S-101 DCEG clause 17.5.

### Mooring buoys

The guidance for the encoding of mooring buoys remains unchanged in S-101. See S-101 DCEG clause 8.14.1.1.

### Mooring trots

S101 Geo feature: **Mooring Trot** (N) (S-101 DCEG Clause 8.21)

The guidance for the encoding of the individual components of a mooring trot remains unchanged in S-101. See S-101 DCEG clause 8.21.1.

Where the components of a mooring trot have been aggregated using the S-57 collection object **C\_AGGR**, this will be converted during the automated conversion process to an instance of the S-101 feature **Mooring Trot**. The **Mooring Trot** and its individual components will be aggregated using the named association **Mooring Trot Aggregation** (see S-101 DCEG clause 25.10).

### Anchorage - relationships

Not applicable.

# Recommended tracks and routes

## Leading, clearing and transit lines and recommended tracks

### Navigation lines and recommended tracks

S-57 Geo object: Navigation line (**NAVLNE**) (L)

S101 Geo feature: **Navigation Line** (C) (S-101 DCEG Clause 15.4)

All instances of encoding of the S-57 Feature object **NAVLNE** and its binding attributes will be populated automatically against the S-101 feature **Navigation Line** during the automated conversion process.

S-57 Geo object: Recommended track (**RECTRC**) (L,A)

S101 Geo feature: **Recommended Track** (C) (S-101 DCEG Clause 15.5)

All instances of encoding of the S-57 Feature object **RECTRC** of type line and its binding attributes will be populated automatically against the S-101 feature **Recommended Track** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Recommended Track** in S-101:

**quality of vertical measurement** (QUASOU)

**technique of vertical measurement** (TECSOU)

See S-101 DCEG clause 15.5 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for QUASOU and TECSOU on **RECTRC** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **maximum permitted draught** has been introduced in S-101 to encode the maximum permitted vessel draught at the berth. This information is encoded in S-57 on **RECTRC** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **RECTRC** must be in the format *Maximum draught permitted = xx.x metres*, where *xx.x* is the value of the maximum permitted vessel draught (decimal part not required if the value is whole metres).

Data Producers must note that in S-101 the type surface is not included as an allowable geometric primitive for **Recommended Track**, therefore **RECTRC** of type area will not be converted across to S-101. Where **RECTRC** has been encoded as type area in a S-57 dataset, Data Producers should re-encode these objects to be of type line prior to conversion to S-101.

### Range systems - relationship

S101 Geo feature: **Range System** (C) (S-101 DCEG Clause 15.6)

The guidance for the encoding of range systems remains unchanged in S-101. See S-101 DCEG clause 15.1.1.

Where the components of a range system have been aggregated using the S-57 collection object **C\_AGGR**, this will be converted during the automated conversion process to an instance of the S-101 feature **Range System**. The **Range System** and its individual components will be aggregated using the named association **Range System Aggregation** (see S-101 DCEG clause 25.13).

Where a **C\_ASSO** has been created to associate a range system with the dangers that it marks, this will not be converted. It is considered that this relationship is not relevant for S-101.

### Measured distances

The guidance for the encoding of measured distances remains unchanged in S-101. See S-101 DCEG clause 15.4.2.

The components of each transit of the measured distance that have been aggregated using the S-57 collection object **C\_AGGR** will be converted during the automated conversion process to an instance of the S-101 feature **Range System**. Each **Range System** and its individual components will be aggregated using the named association **Range System Aggregation** (see S-101 DCEG clause 25.13). These range systems and the track to be followed will be further aggregated using **Range System Aggregation** to create the hierarchical relationship.

## Routeing measures

### Traffic separation schemes

#### Traffic separation scheme lanes

S-57 Geo object: Traffic separation scheme lane part (**TSSLPT**) (A)

S101 Geo feature: **Traffic Separation Scheme Lane Part** (S) (S-101 DCEG Clause 15.18)

All instances of encoding of the S-57 Feature object **TSSLPT** and its binding attributes will be populated automatically against the S-101 feature **Traffic Separation Scheme Lane Part** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute CATTSS will convert to an instance of the S-101 Feature type **Traffic Separation Scheme** (see clause 10.2.3 and S-101 DCEG clause 15.24), Boolean attribute **IMO adopted**.

#### Traffic separation scheme boundaries

S-57 Geo object: Traffic separation scheme boundary (**TSSBND**) (L)

S101 Geo feature: **Traffic Separation Scheme Boundary** (C) (S-101 DCEG Clause 15.21)

All instances of encoding of the S-57 Feature object **TSSBND** and its binding attributes will be populated automatically against the S-101 feature **Traffic Separation Scheme Boundary** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute CATTSS will convert to an instance of the S-101 Feature type **Traffic Separation Scheme** (see clause 10.2.3 and S-101 DCEG clause 15.24), Boolean attribute **IMO adopted**.

#### Traffic separation lines

S-57 Geo object: Traffic separation line (**TSELNE**) (L)

S101 Geo feature: **Traffic Separation Line** (C) (S-101 DCEG Clause 15.20)

All instances of encoding of the S-57 Feature object **TSELNE** and its binding attributes will be populated automatically against the S-101 feature **Traffic Separation Line** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute CATTSS will convert to an instance of the S-101 Feature type **Traffic Separation Scheme** (see clause 10.2.3 and S-101 DCEG clause 15.24), Boolean attribute **IMO adopted**.

#### Traffic separation zones

S-57 Geo object: Traffic separation zone (**TSEZNE**) (A)

S101 Geo feature: **Traffic Separation Zone** (S) (S-101 DCEG Clause 15.19)

All instances of encoding of the S-57 Feature object **TSEZNE** and its binding attributes will be populated automatically against the S-101 feature **Traffic Separation Zone** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute CATTSS will convert to an instance of the S-101 Feature type **Traffic Separation Scheme** (see clause 10.2.3 and S-101 DCEG clause 15.24), Boolean attribute **IMO adopted**.

#### Traffic separation scheme crossings

S-57 Geo object: Traffic separation scheme crossing (**TSSCRS**) (A)

S101 Geo feature: **Traffic Separation Scheme Crossing** (S) (S-101 DCEG Clause 15.22)

All instances of encoding of the S-57 Feature object **TSSCRS** and its binding attributes will be populated automatically against the S-101 feature **Traffic Separation Scheme Crossing** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute CATTSS will convert to an instance of the S-101 Feature type **Traffic Separation Scheme** (see clause 10.2.3 and S-101 DCEG clause 15.24), Boolean attribute **IMO adopted**.

#### Traffic separation scheme roundabouts

S-57 Geo object: Traffic separation scheme roundabout (**TSSRON**) (A)

S101 Geo feature: **Traffic Separation Scheme Roundabout** (S) (S-101 DCEG Clause 15.23)

All instances of encoding of the S-57 Feature object **TSSRON** and its binding attributes will be populated automatically against the S-101 feature **Traffic Separation Scheme Roundabout** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute CATTSS will convert to an instance of the S-101 Feature type **Traffic Separation Scheme** (see clause 10.2.3 and S-101 DCEG clause 15.24), Boolean attribute **IMO adopted**.

#### Inshore traffic zones

S-57 Geo object: Inshore traffic zone (**ISTZNE**) (A)

S101 Geo feature: **Inshore Traffic Zone** (S) (S-101 DCEG Clause 15.16)

All instances of encoding of the S-57 Feature object **ISTZNE** and its binding attributes will be populated automatically against the S-101 feature **Inshore Traffic Zone** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute CATTSS will convert to an instance of the S-101 Feature type **Traffic Separation Scheme** (see clause 10.2.3 and S-101 DCEG clause 15.24), Boolean attribute **IMO adopted**.

#### Precautionary areas

S-57 Geo object: Precautionary area (**PRCARE**) (P,A)

S101 Geo feature: **Precautionary Area** (P,S) (S-101 DCEG Clause 15.17)

All instances of encoding of the S-57 Feature object **PRCARE** and its binding attributes will be populated automatically against the S-101 feature **Precautionary Area** during the automated conversion process. However the following exceptions apply:

* The relevant cautionary information encoded in the mandatory attributes INFORM and TXTDSC will be converted to an instance of the Information type **Nautical Information** (see DCEG clause 24.4), complex attribute **information**. See also clause 2.3.

### Deep water routes

S101 Geo feature: **Deep Water Route** (N) (S-101 DCEG Clause 15.15)

Where the components of a deep water route have been aggregated using the S-57 collection object **C\_AGGR**, this will be converted during the automated conversion process to an instance of the S-101 feature **Deep Water Route**. The **Deep Water Route** and its individual components will be aggregated using the named association **Deep Water Route Aggregation** (see S-101 DCEG clause 25.6). Data Producers are to note that where a **Deep Water Route** has been created in the conversion process, it will be required to populate the attribute **IMO Adopted** manually, if considered necessary.

#### Deep water route parts

S-57 Geo object: Deep water route part (**DWRTPT**) (A)

S101 Geo feature: **Deep Water Route Part** (S) (S-101 DCEG Clause 15.14)

All instances of encoding of the S-57 Feature object **DWRTPT** and its binding attributes will be populated automatically against the S-101 feature **Deep Water Route Part** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Deep Water Route Part** in S-101:

**technique of vertical measurement** (TECSOU)

See S-101 DCEG clause 15.14 for the listing of allowable values. Values populated in S-57 for this attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for TECSOU on **DWRTPT** and amend appropriately.

#### Deep water route centrelines

S-57 Geo object: Deep water route centreline (**DWRTCL**) (L)

S101 Geo feature: **Deep Water Route Centreline** (C) (S-101 DCEG Clause 15.13)

All instances of encoding of the S-57 Feature object **DWRTCL** and its binding attributes will be populated automatically against the S-101 feature **Deep Water Route Centreline** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Deep Water Route Centreline** in S-101:

**technique of vertical measurement** (TECSOU)

See S-101 DCEG clause 15.13 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for TECSOU on **DWRTCL** and amend appropriately.

### Traffic separation scheme systems

S101 Geo feature: **Traffic Separation Scheme** (N) (S-101 DCEG Clause 15.24)

Where the components of a traffic separation scheme (TSS) have been aggregated using the S-57 collection object **C\_AGGR**, this will be converted during the automated conversion process to an instance of the S-101 feature **Traffic Separation Scheme**. The **Traffic Separation Scheme** and its individual components will be aggregated using the named association **Traffic Separation Scheme Aggregation** (see S-101 DCEG clause 25.17). Data Producers are to note that where a **Traffic Separation Scheme** has been created in the conversion process, it will be required to populate the attributes **IMO Adopted** and **maximum permitted draught** manually, if considered necessary.

The following additional requirements for S-57 encoding must be noted:

* Where the name of the TSS has been encoded in the S-57 dataset using a **SEAARE** object or by populating OBJNAM for the most representative object in the TSS, Data producers are advised to also populate the name using OBJNAM on the **C\_AGGR** prior to conversion. The **Sea Area/Named Water Area** or **feature name** for the most representative feature in the TSS should be removed from the converted S-101 dataset in this case.

### Recommended routes

S-57 Geo object: Recommended route centreline (**RCRTCL**) (L)

S101 Geo feature: **Recommended Route Centreline** (C) (S-101 DCEG Clause 15.9)

All instances of encoding of the S-57 Feature object **RCRTCL** and its binding attributes will be populated automatically against the S-101 feature **Recommended Route Centreline** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Recommended Route Centreline** in S-101:

**technique of vertical measurement** (TECSOU)

See S-101 DCEG clause 15.9 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for TECSOU on **RCRTCL** and amend appropriately.

### Recommended direction of traffic flow

S-57 Geo object: Recommended traffic lane part (**RCTLPT**) (P,A)

S101 Geo feature: **Recommended Traffic Lane Part** (P,S) (S-101 DCEG Clause 15.12)

All instances of encoding of the S-57 Feature object **RCTLPT** and its binding attributes will be populated automatically against the S-101 feature **Recommended Traffic Lane Part** during the automated conversion process.

### Two-way routes

S-57 Geo object: Two-way route part (**TWRTPT**) (P,A)

S101 Geo feature: **Two-Way Route Part** (P,S) (S-101 DCEG Clause 15.10)

S101 Geo feature: **Two-Way Route** (N) (S-101 DCEG Clause 15.11)

All instances of encoding of the S-57 Feature object **TWRTPT** and its binding attributes will be populated automatically against the S-101 feature **Two-Way Route Part** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Two-Way Route Part** in S-101:

**technique of vertical measurement** (TECSOU)

See S-101 DCEG clause 15.10 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for TECSOU on **TWRTPT** and amend appropriately.

Where the components of a two-way route have been aggregated using the S-57 collection object **C\_AGGR**, this will be converted during the automated conversion process to an instance of the S-101 feature **Two-Way Route**. The **Two-Way Route** and its individual components will be aggregated using the named association **Two-Way Route Aggregation** (see S-101 DCEG clause 25.18). Data Producers are to note that where a **Two-Way Route** has been created in the conversion process, it will be required to populate the attribute **maximum permitted draught** manually, if considered necessary.

The following additional requirements for S-57 encoding must be noted:

* Where the name of the two-way route has been encoded in the S-57 dataset using a **SEAARE** object or by populating OBJNAM for the most representative object in the two-way route, Data producers are advised to also populate the name using OBJNAM on the **C\_AGGR** prior to conversion. The **Sea Area/Named Water Area** or **feature name** for the most representative feature in the two-way route should be removed from the converted S-101 dataset in this case.

### Areas to be avoided

The guidance for the encoding an IMO Area to be Avoided remains unchanged in S-101. See S-101 DCEG clause 17.6.

## Ferries

S-57 Geo object: Ferry route (**FERYRT**) (L,A)

S101 Geo feature: **Ferry Route** (C,S) (S-101 DCEG Clause 15.29)

All instances of encoding of the S-57 Feature object **FERYRT** and its binding attributes will be populated automatically against the S-101 feature **Ferry Route** during the automated conversion process.

## Fairways

S-57 Geo object: (**FAIRWY**) (A)

S101 Geo feature: **Fairway** (S) (S-101 DCEG Clause 15.7)

S101 Geo feature: **Fairway System** (N) (S-101 DCEG Clause 15.8)

All instances of encoding of the S-57 Feature object **FAIRWY** and its binding attributes will be populated automatically against the S-101 feature **Fairway** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Fairway** in S-101:

**quality of vertical measurement** (QUASOU)

See S-101 DCEG clause 15.10 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for QUASOU on **FAIRWY** and amend appropriately.

Where the components of a fairway have been aggregated using the S-57 collection object **C\_AGGR**, this will be converted during the automated conversion process to an instance of the S-101 feature **Fairway System**. The **Fairway System** and its individual components will be aggregated using the named association **Fairway Aggregation** (see S-101 DCEG clause 25.7). Data Producers are to note that where a **Fairway System** has been created in the conversion process, it will be required to populate the attributes **fixed date range**, **maximum permitted draught** and **periodic date range** manually, if considered necessary.

The following additional requirements for S-57 encoding must be noted:

* Where the name of the fairway has been encoded in the S-57 dataset using a **SEAARE** object or by populating OBJNAM for the most representative object in the fairway, Data producers are advised to also populate the name using OBJNAM on the **C\_AGGR** prior to conversion. The **Sea Area/Named Water Area** or **feature name** for the most representative feature in the fairway should be removed from the converted S-101 dataset in this case.

## Archipelagic Sea Lane

### Archipelagic Sea Lanes

S-57 Geo object: Archipelagic Sea Lane (**ARCSLN**) (A)

S101 Geo feature: **Archipelagic Sea Lane Area** (S) (S-101 DCEG Clause 15.25)

All instances of encoding of the S-57 Feature object **ARCSLN** and its binding attributes will be populated automatically against the S-101 feature **Archipelagic Sea Lane Area** during the automated conversion process.

### Archipelagic Sea Lane Axis

S-57 Geo object: Archipelagic Sea Lane Axis (**ASLXIS**) (L)

S101 Geo feature: **Archipelagic Sea Lane Axis** (C) (S-101 DCEG Clause 15.26)

All instances of encoding of the S-57 Feature object **ASLXIS** and its binding attributes will be populated automatically against the S-101 feature **Archipelagic Sea Lane Axis** during the automated conversion process.

### Archipelagic Sea Lane systems

S101 Geo feature: **Archipelagic Sea Lane** (N) (S-101 DCEG Clause 15.27)

Where the components of an Archipelagic Sea Lane (ASL) have been aggregated using the S-57 collection object **C\_AGGR**, this will be converted during the automated conversion process to an instance of the S-101 feature **Archipelagic Sea Lane**. The **Archipelagic Sea Lane** and its individual components will be aggregated using the named association **ASL Aggregation** (see S-101 DCEG clause 25.3). Data Producers are to note that where an **Archipelagic Sea Lane** has been created in the conversion process, it will be required to populate the attributes **fixed date range** and **nationality** manually, if considered necessary.

The following additional requirements for S-57 encoding must be noted:

* Where the name of the ASL has been encoded in the S-57 dataset using a **SEAARE** object or by populating OBJNAM for the most representative object in the ASL, Data producers are advised to also populate the name using OBJNAM on the **C\_AGGR** prior to conversion. The **Sea Area/Named Water Area** or **feature name** for the most representative feature in the ASL should be removed from the converted S-101 dataset in this case.

# Regulated areas

## Restricted areas in general

S-57 Geo object: Restricted area (**RESARE**) (A)

S101 Geo feature: **Restricted Area Navigational** (S) (S-101 DCEG Clause 17.8)

S101 Geo feature: **Restricted Area Regulatory** (S) (S-101 DCEG Clause 17.9)

All instances of encoding of the S-57 Feature object **RESARE** and its binding attributes will be populated automatically against one of the S-101 features **Restricted Area Navigational** or **Restricted Area Regulatory** during the automated conversion process. The following requirements for S-57 encoding must be noted:

* The determination as to which of the features **Restricted Area Navigational** or **Restricted Area Regulatory** is created is dependent on the value of the attribute RESTRN on the S-57 **RESARE** object. Where RESTRN is not present or is populated with an empty (null) value, the **RESARE** will be converted to a **Restricted Area Regulatory** feature. Data Producers are advised to check encoded instances of **RESARE** in their ENC portfolio and ensure that RESTRN is populated as required.

## Maritime jurisdiction areas

The general guidance for the encoding of maritime jurisdiction areas remains unchanged in S-101. See S-101 DCEG clause 16.2.

### National territories

S-57 Geo object: Administration area (**ADMARE**) (A)

S101 Geo feature: **Administration Area** (S) (S-101 DCEG Clause 16.8)

All instances of encoding of the S-57 Feature object **ADMARE** and its binding attributes will be populated automatically against the S-101 feature **Administration Area** during the automated conversion process, with the following exceptions:

* **ADMARE** encoded to indicate a marine pollution regulations area (see clause 11.16).
* **ADMARE** encoded to indicate a vessel traffic service area (see clause 12.13).
* **ADMARE** encoded to indicate a pilotage district (see clause 13.1.2).

The following requirements for S-57 attribution must be noted:

* The S-101 attribute **in dispute** has been introduced in S-101 to provide an indication to the mariner that an administration is in dispute. This information may be encoded in S-57 using a **CTNARE** object covering the area that is in dispute. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **CTNARE** must be in the format *In dispute*. The S-101 **Caution Area** feature resulting from the conversion of the **CTNARE** should be removed from the converted S-101 dataset in this case.

### Custom zones

S-57 Geo object: Custom zone (**CUSZNE**) (A)

S101 Geo feature: **Custom Zone** (S) (S-101 DCEG Clause 16.14)

All instances of encoding of the S-57 Feature object **CUSZNE** and its binding attributes will be populated automatically against the S-101 feature **Custom Zone** during the automated conversion process.

### Free port areas

S-57 Geo object: Free port area (**FRPARE**) (A)

S101 Geo feature: **Free Port Area** (S) (S-101 DCEG Clause 16.18)

All instances of encoding of the S-57 Feature object **FRPARE** and its binding attributes will be populated automatically against the S-101 feature **Free Port Area** during the automated conversion process.

### Territorial Seas

S-57 Geo object: Straight Territorial Sea Baseline (**STSLNE**) (L)

S101 Geo feature: **Straight Territorial Sea Baseline** (C) (S-101 DCEG Clause 16.22)

All instances of encoding of the S-57 Feature object **STSLNE** and its binding attributes will be populated automatically against the S-101 feature **Straight Territorial Sea Baseline** during the automated conversion process.

S-57 Geo object: Territorial Sea area (**TESARE**) (A)

S101 Geo feature: **Territorial Sea Area** (S) (S-101 DCEG Clause 16.23)

All instances of encoding of the S-57 Feature object **TESARE** and its binding attributes will be populated automatically against the S-101 feature **Territorial Sea Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Territorial Sea Area** in S-101:

**restriction** (RESTRN)

See S-101 DCEG clause 16.23 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for RESTRN on **TESARE** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **in dispute** has been introduced in S-101 to provide an indication to the mariner that a territorial sea area is in dispute. This information may be encoded in S-57 using a **CTNARE** object covering the area that is in dispute. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **CTNARE** must be in the format *In dispute*. The S-101 **Caution Area** feature resulting from the conversion of the **CTNARE** should be removed from the converted S-101 dataset in this case.

### Contiguous Zones

S-57 Geo object: Contiguous Zone (**CONZNE**) (A)

S101 Geo feature: **Contiguous Zone** (S) (S-101 DCEG Clause 16.12)

All instances of encoding of the S-57 Feature object **CONZNE** and its binding attributes will be populated automatically against the S-101 feature **Contiguous Zone** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute STATUS for **CONZNE** will not be converted. It is considered that this attribute is not relevant for **Contiguous Zone** in S-101.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **in dispute** has been introduced in S-101 to provide an indication to the mariner that a contiguous zone is in dispute. This information may be encoded in S-57 using a **CTNARE** object covering the area that is in dispute. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **CTNARE** must be in the format *In dispute*. The S-101 **Caution Area** feature resulting from the conversion of the **CTNARE** should be removed from the converted S-101 dataset in this case.

### Fishery zones

S-57 Geo object: Fishery zone (**FSHZNE**) (A)

S101 Geo feature: **Fishery Zone** (S) (S-101 DCEG Clause 16.16)

All instances of encoding of the S-57 Feature object **FSHZNE** and its binding attributes will be populated automatically against the S-101 feature **Fishery Zone** during the automated conversion process.

The following requirements for S-57 attribution must be noted:

* For S-57 ENC it is recommended that the seaward extent of the limit of a fishery zone (6 or 12 NM) is encoded using the attribute INFORM. For S-101 this has been amended to recommend the encoding of this information using the complex attribute **feature name**. Data Producers are advised to evaluate their S-57 data holdings and emend the encoding of this information as required.

### Continental Shelves

S-57 Geo object: Continental Shelf area (**COSARE**) (A)

S101 Geo feature: **Continental Shelf Area** (S) (S-101 DCEG Clause 16.13)

All instances of encoding of the S-57 Feature object **COSARE** and its binding attributes will be populated automatically against the S-101 feature **Continental Shelf Area** during the automated conversion process.

### Exclusive Economic Zones

S-57 Geo object: Exclusive Economic Zone (**EXEZNE**) (A)

S101 Geo feature: **Exclusive Economic Zone** (S) (S-101 DCEG Clause 16.15)

All instances of encoding of the S-57 Feature object **EXEZNE** and its binding attributes will be populated automatically against the S-101 feature **Exclusive Economic Zone** during the automated conversion process.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **in dispute** has been introduced in S-101 to provide an indication to the mariner that an Exclusive Economic Zone is in dispute. This information may be encoded in S-57 using a **CTNARE** object covering the area that is in dispute. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **CTNARE** must be in the format *In dispute*. The S-101 **Caution Area** feature resulting from the conversion of the **CTNARE** should be removed from the converted S-101 dataset in this case.

## Military practice areas; submarine transit lanes; minefields

### Military practice areas

S-57 Geo object: Military practice area (**MIPARE**) (P,A)

S101 Geo feature: **Military Practice Area** (P,S) (S-101 DCEG Clause 16.7)

All instances of encoding of the S-57 Feature object **MIPARE** and its binding attributes will be populated automatically against the S-101 feature **Military Practice Area** during the automated conversion process.

The S-101 attribute **nationality** introduces the option to encode additional information related to **Military Practice Area**. There is no corresponding encoding for this information on **MIPARE** in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.

### Submarine transit lanes

S-57 Geo object: Submarine transit lane (**SUBTLN**) (A)

S101 Geo feature: **Submarine Transit Lane** (S) (S-101 DCEG Clause 16.24)

All instances of encoding of the S-57 Feature object **SUBTLN** and its binding attributes will be populated automatically against the S-101 feature **Submarine Transit Lane** during the automated conversion process.

### Minefields

The guidance for the encoding of minefields remains unchanged in S-101. See S-101 DCEG clause 17.1.

## Dumping grounds

S-57 Geo object: Dumping ground (**DMPGRD**) (P,A)

S101 Geo feature: **Dumping Ground** (P,S) (S-101 DCEG Clause 16.6)

All instances of encoding of the S-57 Feature object **DMPGRD** and its binding attributes will be populated automatically against the S-101 feature **Dumping Ground** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Dumping Ground** in S-101:

**restriction** (RESTRN)

See S-101 DCEG clause 16.6 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for RESTRN on **DMPGRD** and amend appropriately.

## Cables and cable areas

### Submarine cables

S-57 Geo object: Cable, submarine (**CBLSUB**) (L)

S101 Geo feature: **Cable Submarine** (C) (S-101 DCEG Clause 14.2)

All instances of encoding of the S-57 Feature object **CBLSUB** and its binding attributes will be populated automatically against the S-101 feature **Cable Submarine** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes DRVAL1 and DRVAL2 for **CBLSUB** will not be converted. It is considered that these attributes are not relevant for **Cable Submarine** in S-101.

### Overhead cables

S-57 Geo object: Cable, overhead (**CBLOHD**) (L)

S101 Geo feature: **Cable Overhead** (C) (S-101 DCEG Clause 6.9)

All instances of encoding of the S-57 Feature object **CBLOHD** and its binding attributes will be populated automatically against the S-101 feature **Cable Overhead** during the automated conversion process.

### Submarine cable areas

S-57 Geo object: Cable area (**CBLARE**) (A)

S101 Geo feature: **Cable Area** (S) (S-101 DCEG Clause 14.3)

All instances of encoding of the S-57 Feature object **CBLARE** and its binding attributes will be populated automatically against the S-101 feature **Cable Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Cable Area** in S-101:

**restriction** (RESTRN)

See S-101 DCEG clause 14.3 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for RESTRN on **CBLARE** and amend appropriately.

## Pipelines and pipeline areas

### Pipelines, submarine or on land

S-57 Geo object: Pipeline, submarine / on land (**PIPSOL**) (P,L)

S101 Geo feature: **Pipeline Submarine/On Land** (C) (S-101 DCEG Clause 14.4)

All instances of encoding of the S-57 Feature object **PIPSOL** and its binding attributes will be populated automatically against the S-101 feature **Pipeline Submarine/On Land** during the automated conversion process. However the following exceptions apply:

* **PIPSOL** of type point will not be converted. Data Producers will be required to check their S-57 data holdings and address as appropriate.

Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Pipeline Submarine/On Land** in S-101:

**product** (PRODCT)

**restriction** (RESTRN)

See S-101 DCEG clause 14.4 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for PRODCT and RESTRN on **PIPSOL** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **category of pipeline/pipe** includes the new enumerate value *7* (bubble curtain). This information is encoded in S-57 on **PIPSOL** using the attribute CATPIP value *5* (bubbler system). Data Producers will be required to evaluate their converted S-101 data and amend this attribution if considered necessary.

### Diffusers, cribs

The guidance for the encoding of diffusers and cribs remains unchanged in S-101. See S-101 DCEG clause 14.4.2.

### Overhead pipelines

S-57 Geo object: Pipeline overhead (**PIPOHD**) (L)

S101 Geo feature: **Pipeline Overhead** (C) (S-101 DCEG Clause 6.10)

All instances of encoding of the S-57 Feature object **PIPOHD** and its binding attributes will be populated automatically against the S-101 feature **Pipeline Overhead** during the automated conversion process.

### Pipeline areas

S-57 Geo object: Pipeline area (**PIPARE**) (P,A)

S101 Geo feature: **Submarine Pipeline Area** (P,S) (S-101 DCEG Clause 14.5)

All instances of encoding of the S-57 Feature object **PIPARE** and its binding attributes will be populated automatically against the S-101 feature **Pipeline Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Pipeline Area** in S-101:

**product** (PRODCT)

**restriction** (RESTRN)

See S-101 DCEG clause 14.5 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for PRODCT and RESTRN on **PIPARE** and amend appropriately.

## Oil and Gas fields

### Wellheads

The guidance for the encoding of wellheads remains unchanged in S-101. See S-101 DCEG clause 14.1.2.

### Offshore platforms

S-57 Geo object: Offshore platform (**OFSPLF**) (P,A)

S101 Geo feature: **Offshore Platform** (P,S) (S-101 DCEG Clause 14.1)

All instances of encoding of the S-57 Feature object **OFSPLF** and its binding attributes will be populated automatically against the S-101 feature **Offshore Platform** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute NATCON for **OFSPLF** will not be converted. It is considered that this attribute is not relevant for **Offshore Platform** in S-101.

Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Offshore Platform** in S-101:

**status** (STATUS)

See S-101 DCEG clause 14.1 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **OFSPLF** and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 Boolean type attribute **flare stack** has been introduced in S-101 to encode the existence of a flare stack on the offshore platform. This information is encoded in S-57 as a **LNDMRK** object with attribute CATLMK = *6* (flare stack). Data producers will be required to manually amend this encoding by populating **flare stack** = *True* and removing the **Landmark** feature in the converted S-101 dataset.

### Offshore safety zones

The guidance for the encoding of offshore safety zones remains unchanged in S-101. See S-101 DCEG clause 14.1.3.

### Offshore production areas

S-57 Geo object: Offshore production area (**OSPARE**) (A)

S101 Geo feature: **Offshore Production Area** (S) (S-101 DCEG Clause 14.6)

All instances of encoding of the S-57 Feature object **OSPARE** and its binding attributes will be populated automatically against the S-101 feature **Offshore Production Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Offshore Production Area** in S-101:

**condition** (CONDTN)

See S-101 DCEG clause 14.6 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **OSPARE** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The S-57 attribute CATPRA (category of production area) should be converted to the S-101 attribute **category of offshore production area**, which does not exist in S-57. Data Producers must note that there is only a direct correlation to S-101 with CATPRA values *8* (tank farm) and *9* (wind farm), and should therefore evaluate their S-101 converted datasets to ensure that an appropriate value for **category of offshore production area**, is required.
* Individual wind turbines within offshore wind farms encoded in S-57 as **LNDMRK** objects will be converted to the S-101 feature **Wind Turbine** (see clause 4.8.15).
* The S-101 attribute **category of offshore production area** values *2* (wave farm) and *3* (current farm) have been introduced to encode wave and current farms. This information is encoded in S-57 on **OSPARE** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **OSPARE** must be in the format *Wave farm* or *Current farm*.

### Offshore tanker loading systems

The guidance for the encoding of offshore tanker loading systems remains unchanged in S-101. See S-101 DCEG clause 14.6.2.

### Flare stacks

The guidance for the encoding of flare stacks on land remains unchanged in S-101. See S-101 DCEG clause 7.2. For the conversion of flare stacks located on offshore platforms, see clause 11.7.2 above.

## Spoil grounds, dredging areas

The guidance for the encoding of spoil grounds and dredging areas remains unchanged in S-101. See S-101 DCEG clause 16.6.2.

## Fishing equipment and aquaculture areas

### Fishing facilities

S-57 Geo object: Fishing facility (**FSHFAC**) (P,L,A)

S101 Geo feature: **Fishing Facility** (P,C,S) (S-101 DCEG Clause 13.9)

All instances of encoding of the S-57 Feature object **FSHFAC** and its binding attributes will be populated automatically against the S-101 feature **Fishing Facility** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Fishing Facility** in S-101:

**status** (STATUS)

See S-101 DCEG clause 13.9 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **FSHFAC** and amend appropriately.

### Marine farms

S-57 Geo object: Marine farm / culture (**MARCUL**) (P,L,A)

S101 Geo feature: **Marine Farm/Culture** (P,C,S) (S-101 DCEG Clause 13.10)

All instances of encoding of the S-57 Feature object **MARCUL** and its binding attributes will be populated automatically against the S-101 feature **Marine Farm/Culture** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Marine Farm/Culture** in S-101:

**exposition of sounding** (EXPSOU)

See S-101 DCEG clause 13.10 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **MARCUL** and amend appropriately.

### Fish havens

The guidance for the encoding of fish havens remains unchanged in S-101. See S-101 DCEG clause 13.10.2.

### Fishing grounds

S-57 Geo object: Fishing ground (**FSHGRD**) (A)

S101 Geo feature: **Fishing Ground** (S) (S-101 DCEG Clause 16.17)

All instances of encoding of the S-57 Feature object **FSHGRD** and its binding attributes will be populated automatically against the S-101 feature **Fishing Ground** during the automated conversion process.

## Degaussing ranges

The guidance for the encoding of degaussing ranges remains unchanged in S-101. See S-101 DCEG clause 17.2.

## Historic wrecks

The guidance for the encoding of historic wrecks remains unchanged in S-101. See S-101 DCEG clause 13.5.2.

## Seaplane landing areas

S-57 Geo object: Seaplane landing area (**SPLARE**) (P,A)

S101 Geo feature: **Seaplane Landing Area** (P,S) (S-101 DCEG Clause 16.5)

All instances of encoding of the S-57 Feature object **SPLARE** and its binding attributes will be populated automatically against the S-101 feature **Seaplane Landing Area** during the automated conversion process.

## Various maritime areas

### Ice areas

S-57 Geo object: Ice area (**Ice Area**) (A)

S101 Geo feature: **Ice Area** (S) (S-101 DCEG Clause 5.13)

All instances of encoding of the S-57 Feature object **ICEARE** and its binding attributes will be populated automatically against the S-101 feature **Ice Area** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Ice Area** in S-101:

**status** (STATUS)

See S-101 DCEG clause 5.13 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **ICEARE** and amend appropriately.

### Log ponds

S-57 Geo object: Log pond (**LOGPON**) (P,A)

S101 Geo feature: **Log Pond** (P,S) (S-101 DCEG Clause 16.20)

All instances of encoding of the S-57 Feature object **LOGPON** and its binding attributes will be populated automatically against the S-101 feature **Log Pond** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Log Pond** in S-101:

**status** (STATUS)

See S-101 DCEG clause 16.20 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for STATUS on **LOGPON** and amend appropriately.

### Incineration areas

S-57 Geo object: Incineration area (**ICNARE**) (P,A)

S101 Geo feature: None

The S-57 feature **ICNARE** will not be converted.

### Cargo transhipment areas

S-57 Geo object: Cargo transhipment area (**CTSARE**) (P,A)

S101 Geo feature: **Cargo Transhipment Area** (P,S) (S-101 DCEG Clause 16.9)

All instances of encoding of the S-57 Feature object **CTSARE** and its binding attributes will be populated automatically against the S-101 feature **Cargo Transhipment Area** during the automated conversion process.

### Collision regulations

S101 Geo feature: **Collision Regulations Limit** (C) (S-101 DCEG Clause 16.26)

The S-101 feature **Collision Regulations Limit** has been introduced in S-101 to encode collision regulations (COLREGS) demarcation lines. This information is encoded in S-57 using the Object class **CTNARE**. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **CTNARE** must be include the text string *Collision regulations limit*. Data Producers are advised to examine any **Collision Regulations Limit** features created during the automated conversion process and confirm the attribution for these features as required, including any attributes and text files referenced in the associated instance of the S-101 Information type **Nautical Information**.

## Nature reserves

The guidance for the encoding of nature reserves remains unchanged in S-101. See S-101 DCEG clause 17.3.

## Environmentally Sensitive Sea Areas

The guidance for the encoding of Environmentally Sensitive Sea Areas remains unchanged in S-101. See S-101 DCEG clause 17.7.

## Marine pollution regulations

S101 Geo feature: **Marine Pollution Regulations Area** (S) (S-101 DCEG Clause 16.27)

The S-101 feature **Marine Pollution Regulations Area** has been introduced in S-101 to encode areas subject to marine pollution regulations. This information is encoded in S-57 using the Object class **ADMARE**. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **ADMARE** must be include the text string *Marine pollution regulations area*. Data Producers are advised to examine any **Marine Pollution Regulations Area** features created during the automated conversion process and confirm the attribution for these features as required, including any attributes and text files referenced in the associated instance of the S-101 Information type **Nautical Information**.

# Aids to navigation

## Lighthouses, navigational marks - relationships

### Geo objects forming parts of navigational aids

The guidance regarding geo objects forming parts of navigational aids remains unchanged in S-101. See S-101 DCEG clause 18.1.

### Relationships

The guidance regarding relationships for components of navigational aids remains unchanged in S-101. See S-101 DCEG clauses 18.2 and 19.1.8.

## Buoyage systems and direction of buoyage

S-57 Geo object: Navigational system of marks (**M\_NSYS**) (A)

S101 Geo feature: **Navigational System of Marks** (S) (S-101 DCEG Clause 3.5)

S101 Geo feature: **Local Direction of Buoyage** (S) (S-101 DCEG Clause 3.6)

All instances of encoding of the S-57 Feature object **M\_NSYS** and its binding attributes will be populated automatically against the S-101 features **Navigational System of Marks** or **Local Direction of Buoyage** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Navigational System of Marks** or **Local Direction of Buoyage** in S-101:

**marks navigational – system of** (MARSYS)

See S-101 DCEG clause 3.5 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for MARSYS on **M\_NSYS** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* Instances of **M\_NSYS** and having a value encoded in the attribute ORIENT will convert to a **Local Direction of Buoyage** feature during the automated conversion process.

The general guidance regarding buoyage systems and direction of buoyage remains unchanged in S-101. See S-101 DCEG clauses 18.3.

## Fixed structures

### Beacons

S-57 Geo object: Beacon, cardinal (**BCNCAR**) (P)

S101 Geo feature: **Beacon Cardinal** (P) (S-101 DCEG Clause 20.9)

S-57 Geo object: Beacon, isolated danger (**BCNISD**) (P)

S101 Geo feature: **Beacon Isolated Danger** (P) (S-101 DCEG Clause 20.10)

S-57 Geo object: Beacon, lateral (**BCNLAT**) (P)

S101 Geo feature: **Beacon Lateral** (P) (S-101 DCEG Clause 20.8)

S-57 Geo object: Beacon, safe water (**BCNSAW**) (P)

S101 Geo feature: **Beacon Safe Water** (P) (S-101 DCEG Clause 20.11)

All instances of encoding of the above S-57 beacon Feature objects and their binding attributes will be populated automatically against the corresponding above S-101 beacon features during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for these beacon features in S-101:

**marks navigational – system of** (MARSYS)

**nature of construction** (NATCON)

See S-101 DCEG clauses 20.8-11 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for MARSYS and NATCON on beacon objects and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 complex attribute **topmark** has been introduced in S-101 to encode topmarks on aids to navigation features. This information is encoded in S-57 using the Object class **TOPMRK**. All instances of **TOPMRK** will be converted to **topmark** for the corresponding aid to navigation structure feature during the automated conversion process. However it must be noted that the **TOPMRK** attributes COLPAT, DATEND, DATSTA, HEIGHT, PEREND, PERSTA and STATUS will not be converted. Additional topmark shape information populated in the S-57 attribute INFORM will be converted to the S-101 complex attribute **shape information**.

S-57 Geo object: Beacon, special purpose (**BCNSPP**) (P)

S101 Geo feature: **Beacon Special Purpose/General** (P) (S-101 DCEG Clause 20.12)

All instances of encoding of the S-57 Feature object **BCNSPP** and its binding attributes will be populated automatically against the S-101 feature **Beacon Special Purpose/General** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Beacon Special Purpose/General** in S-101:

**category of special purpose mark** (CATSPM)

**marks navigational – system of** (MARSYS)

**nature of construction** (NATCON)

See S-101 DCEG clause 20.12 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CATSPM, MARSYS and NATCON on **BCNSPP** and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 complex attribute **topmark** has been introduced in S-101 to encode topmarks on aids to navigation features. This information is encoded in S-57 using the Object class **TOPMRK**. All instances of **TOPMRK** associated with **BCNSPP** will be converted to **topmark** for the corresponding **Beacon Special Purpose/General** during the automated conversion process. However it must be noted that the **TOPMRK** attributes COLPAT, DATEND, DATSTA, HEIGHT, PEREND, PERSTA and STATUS will not be converted. Additional topmark shape information populated in the S-57 attribute INFORM will be converted to the S-101 complex attribute **shape information**.

### Lighthouses

The guidance for the encoding of lighthouses remains unchanged in S-101. See S-101 DCEG clause 19.1.6.

### Daymarks

S-57 Geo object: Daymark (**DAYMAR**) (P)

S101 Geo feature: **Daymark** (P) (S-101 DCEG Clause 20.13)

All instances of encoding of the S-57 Feature object **DAYMAR** and its binding attributes will be populated automatically against the S-101 feature **Daymark** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Daymark** in S-101:

**category of special purpose mark** (CATSPM)

**nature of construction** (NATCON)

See S-101 DCEG clause 20.13 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CATSPM and NATCON on **DAYMAR** and amend appropriately.

## Floating structures

### Buoys

S-57 Geo object: Buoy, cardinal (**BOYCAR**) (P)

S101 Geo feature: **Buoy Cardinal** (P) (S-101 DCEG Clause 20.2)

S-57 Geo object: Buoy, isolated danger (**BOYISD**) (P)

S101 Geo feature: **Buoy Isolated Danger** (P) (S-101 DCEG Clause 20.3)

S-57 Geo object: Buoy, lateral (**BOYLAT**) (P)

S101 Geo feature: **Buoy Lateral** (P) (S-101 DCEG Clause 20.1)

S-57 Geo object: Buoy, safe water (**BOYSAW**) (P)

S101 Geo feature: **Buoy Safe Water** (P) (S-101 DCEG Clause 20.4)

All instances of encoding of the above S-57 buoy Feature objects and their binding attributes will be populated automatically against the corresponding above S-101 buoy features during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for these buoy features in S-101:

**marks navigational – system of** (MARSYS)

**nature of construction** (NATCON)

See S-101 DCEG clauses 20.1-4 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for MARSYS and NATCON on buoy objects and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 complex attribute **topmark** has been introduced in S-101 to encode topmarks on aids to navigation features. This information is encoded in S-57 using the Object class **TOPMRK**. All instances of **TOPMRK** will be converted to **topmark** for the corresponding aid to navigation structure feature during the automated conversion process. However it must be noted that the **TOPMRK** attributes COLPAT, DATEND, DATSTA, HEIGHT, PEREND, PERSTA and STATUS will not be converted. Additional topmark shape information populated in the S-57 attribute INFORM will be converted to the S-101 complex attribute **shape information**.

S-57 Geo object: Buoy, special purpose (**BOYSPP**) (P)

S101 Geo feature: **Buoy Special Purpose/General** (P) (S-101 DCEG Clause 20.5)

All instances of encoding of the S-57 Feature object **BOYSPP** and its binding attributes will be populated automatically against the S-101 feature **Buoy Special Purpose/General** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Buoy Special Purpose/General** in S-101:

**category of special purpose mark** (CATSPM)

**marks navigational – system of** (MARSYS)

**nature of construction** (NATCON)

See S-101 DCEG clause 20.5 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CATSPM, MARSYS and NATCON on **BOYSPP** and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 complex attribute **topmark** has been introduced in S-101 to encode topmarks on aids to navigation features. This information is encoded in S-57 using the Object class **TOPMRK**. All instances of **TOPMRK** associated with **BOYSPP** will be converted to **topmark** for the corresponding **Buoy Special Purpose/General** during the automated conversion process. However it must be noted that the **TOPMRK** attributes COLPAT, DATEND, DATSTA, HEIGHT, PEREND, PERSTA and STATUS will not be converted. Additional topmark shape information populated in the S-57 attribute INFORM will be converted to the S-101 complex attribute **shape information**.

S-57 Geo object: Buoy, installation (**BOYINB**) (P)

S101 Geo feature: **Buoy Installation** (P) (S-101 DCEG Clause 20.7)

All instances of encoding of the S-57 Feature object **BOYINB** and its binding attributes will be populated automatically against the S-101 feature **Buoy Installation** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes MARSYS and VERLEN for **BOYINB** will not be converted. It is considered that these attributes are not relevant for **Buoy Installation** in S-101.

Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Buoy Installation** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 20.7 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **BOYINB** and amend appropriately.

#### Emergency wreck marking buoys

S101 Geo feature: **Buoy New Danger Marking** (P) (S-101 DCEG Clause 20.6)

The S-101 feature **Buoy New Danger Marking** has been introduced in S-101 to encode the new IALA classification of buoys intended to mark newly identified dangers. This information is encoded in S-57 on **BOYSPP** using the attribute CATSPM value *27* (general warning mark). Instances of **BOYSPP** having CATSPM = *27* will be converted to a **Buoy New Danger Marking** during the automated conversion process. Data Producers are advised to check these instances and, if the purpose of the buoy is not to mark a newly identified danger, amend the encoding as required.

Any equipment features associated with the **BOYSPP** will, on conversion, be associated with the **Buoy New danger Marking**.

### Light floats and light vessels

S-57 Geo object: Light float (**LITFLT**) (P)

S101 Geo feature: **Light Float** (P) (S-101 DCEG Clause 20.14)

S-57 Geo object: Light vessel (**LITVES**) (P)

S101 Geo feature: **Light Vessel** (P) (S-101 DCEG Clause 20.15)

All instances of encoding of the S-57 Feature object **LITFLT** and **LITVES**, and their binding attributes, will be populated automatically against the S-101 features **Light Float** and **Light Vessel** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Light Float** and **Light Vessel** in S-101:

**nature of construction** (NATCON)

See S-101 DCEG clause 20.14-15 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for NATCON on **LITFLT** and **LITVES** and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 complex attribute **topmark** has been introduced in S-101 to encode topmarks on aids to navigation features. This information is encoded in S-57 using the Object class **TOPMRK**. All instances of **TOPMRK** associated with **LITFLT** will be converted to **topmark** for the corresponding **Light Float** during the automated conversion process. However it must be noted that the **TOPMRK** attributes COLPAT, DATEND, DATSTA, HEIGHT, PEREND, PERSTA and STATUS will not be converted. Additional topmark shape information populated in the S-57 attribute INFORM will be converted to the S-101 complex attribute **shape information**.

## Fog signals

S-57 Geo object: Fog signal (**FOGSIG**) (P)

S101 Geo feature: **Fog Signal** (P) (S-101 DCEG Clause 20.18)

All instances of encoding of the S-57 Feature object **FOGSIG** and its binding attributes will be populated automatically against the S-101 feature **Fog Signal** during the automated conversion process.

The following additional requirements for S-57 attribution must be noted:

* The S-101 attribute **signal generation** includes the new enumerate values *5* (radio activated) and *6* (call activated). This information is encoded in S-57 on **FOGSIG** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **FOGSIG** must be in the format *Radio activated* or *Call activated*.

## Topmarks

All instances of encoding of the S-57 Feature object **TOPMAR** will be converted automatically to the complex attribute **topmark** on the associated S-101 navigational aid structure feature during the automated conversion process. See clauses 12.3.1, 12.4.1 and 12.4.2.

## Retroreflectors

S-57 Geo object: Retroreflector (**RETRFL**) (P)

S101 Geo feature: **Retroreflector** (P) (S-101 DCEG Clause 20.16)

All instances of encoding of the S-57 Feature object **RETRFL** and its binding attributes will be populated automatically against the S-101 feature **Retroreflector** during the automated conversion process.

## Lights

### Description of lights

The S-57 Object class **LIGHTS** has been remodelled in S-101 to four discrete light Feature types as described in the following clauses. During the automated conversion process, encoded **LIGHTS** objects will be converted to an instance of one of the S-101 light features based on the following encoding combinations:

**LIGHTS**: Attributes ORIENT or SECTR1 and SECTR2 not present; and/or attribute CATLIT ≠ *1* (directional function), *6* (air obstruction light), *7* (fog detector light) or *16* (moiré effect) -> **Light All Around**

**LIGHTS**: Attributes ORIENT or SECTR1 and SECTR2 present; and/or attribute CATLIT = *1* (directional function) or *16* (moiré effect) -> **Light Sectored**

**LIGHTS**: Attribute CATLIT = *6* (air obstruction light) -> **Light Air Obstruction**

**LIGHTS**: Attribute CATLIT = *7* (fog detector light) -> **Light Fog Detector**

For **Light Sectored**, see clause 12.8.6.1.

S-57 Geo object: Light (**LIGHTS**) (P)

S101 Geo feature: **Light All Around** (P) (S-101 DCEG Clause 19.2)

All instances of encoding of the S-57 Feature object **LIGHTS** having:

* attributes ORIENT or SECTR1 and SECTR2 not present; and/or
* attribute CATLIT ≠ *1* (directional function), *6* (air obstruction light), *7* (fog detector light) or *16* (moiré effect)

and its binding attributes will be populated automatically against the S-101 feature **Light All Around** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Light All Around** in S-101:

**marks navigational – system of** (MARSYS)

**light characteristic** (LITCHR)

See S-101 DCEG clause 19.2 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for MARSYS and LITCHR on **LIGHTS** and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 Boolean type attribute **major light** has been introduced in S-101 to aid in improved portrayal of lights in ECDIS. This attribute will be populated as *True* during the automated conversion process for all lights having a nominal range of 10 Nautical Miles or greater. Data producers are advised to examine their converted ENCs and amend this encoding as required.

S-57 Geo object: Light (**LIGHTS**) (P)

S101 Geo feature: **Light Fog Detector** (P) (S-101 DCEG Clause 19.4)

All instances of encoding of the S-57 Feature object **LIGHTS** having attribute CATLIT = *7* (fog detector light) and its binding attributes will be populated automatically against the S-101 feature **Light Fog Detector** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Light Fog Detector** in S-101:

**light characteristic** (LITCHR)

See S-101 DCEG clause 19.4 for the listings of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for LITCHR on **LIGHTS** and amend appropriately.

The S-101 attribute **signal generation** introduces the option to encode additional information related to **Light Fog Detector**. There is no corresponding encoding for this information on **LIGHTS** in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.

S-57 Geo object: Light (**LIGHTS**) (P)

S101 Geo feature: **Light Air Obstruction** (P) (S-101 DCEG Clause 19.5)

All instances of encoding of the S-57 Feature object **LIGHTS** having attribute CATLIT = *6* (air obstruction light) and its binding attributes will be populated automatically against the S-101 feature **Light Air Obstruction** during the automated conversion process. However, Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Light Air Obstruction** in S-101:

**light characteristic** (LITCHR)

See S-101 DCEG clause 19.5 for the listings of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for LITCHR on **LIGHTS** and amend appropriately.

### Types and functions of lights

The guidance for the encoding types and functions of lights remains unchanged in S-101. See S-101 DCEG clause 19.1.2.

### Rhythms of lights

The guidance for the encoding the rhythm of lights remains unchanged in S-101. See S-101 DCEG clause 19.1.1.

### Elevations of lights

The guidance for the encoding the elevation of lights remains unchanged in S-101. See S-101 DCEG clause 19.1.3.

### Times of exhibition and exhibition conditions

#### Night lights

The guidance for the encoding of night lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.1.

#### Unwatched lights

The guidance for the encoding of unwatched lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.2.

#### Occasional lights

The guidance for the encoding of occasional lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.3.

#### Daytime lights

The guidance for the encoding of daytime lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.4.

#### Fog lights

The guidance for the encoding of fog lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.5.

#### Manually-activated lights

The S-101 attribute **signal generation** includes the new enumerate values *5* (radio activated) and *6* (call activated). This information is encoded in S-57 on **LIGHTS** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **LIGHTS** must be in the format *Radio activated light* or *Call activated light*. See S-101 DCEG clause 19.1.4.6.

### Sector lights and lights not visible all round

#### Sector lights

S-57 Geo object: Light (**LIGHTS**) (P)

S101 Geo feature: **Light Sectored** (P) (S-101 DCEG Clause 19.3)

All instances of encoding of the S-57 Feature object **LIGHTS** having:

* attributes ORIENT or SECTR1 and SECTR2 present; and/or
* attribute CATLIT = *1* (directional function) or *16* (moiré effect)

and its binding attributes will be populated automatically against the S-101 feature **Light Sectored** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Light All Around** in S-101:

**marks navigational – system of** (MARSYS)

**light characteristic** (LITCHR)

See S-101 DCEG clause 19.3 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for MARSYS and LITCHR on **LIGHTS** and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

* For S-57 ENC each light sector of a sectored light is required to be encoded as an individual **LIGHTS** object. For S-101 ENC all sectors of a sectored light are encoded within a single **Light Sectored** feature using the complex attribute **sector characteristics**, sub-complex attribute **light sector**. During the automated conversion process, all **LIGHTS** objects with ORIENT, SECTR1, SECTR2 and/or CATLIT populated as described above, sharing the same spatial object and included in the same structure/equipment relationship will be concatenated into a single **Light Sectored** feature. Data Producers are advised to check their converted S-101 data and ensure that converted sector lights have been structured and attributed as intended.
* The guidance for the encoding of oscillating light sectors remains unchanged in S-101, however Data Producers should note that the text populated in the INFORM attribute for the S-57 **LIGHTS** object will convert to the sub-complex attribute **sector information**, sub-attribute **text** for the relevant instance of the **sector limit** complex on **Light Sectored**. See S-101 DCEG clause 19.3.1.3.

The S-101 attribute **sector line length** introduces the option to encode additional information related to **Light Sectored**. There is no corresponding encoding for this information on **LIGHTS** in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary. This new encoding should be noted in particular for assisting with the provision of a clearer indication in ECDIS of an area of intersecting light sectors that are intended to indicate the existence of isolated and sometimes substantial dangers to navigation, through use of the attribute **sector line length**.

#### Lights obscured by obstructions

The guidance for the encoding of lights obscured by obstructions remains unchanged in S-101. See S-101 DCEG clause 19.3.1.1.

#### White fairway sectors

The guidance for the encoding of fairways defined by a succession of white light sectors remains unchanged in S-101. See S-101 DCEG clause 19.3.1.

#### Leading lights

The guidance for the encoding of leading lights remains unchanged in S-101. See S-101 DCEG clause 19.1.5.

#### Directional lights

The guidance for the encoding of leading lights remains unchanged in S-101. See S-101 DCEG clause 19.3.1.2.

#### Moiré effect lights

The guidance for the encoding of moiré effect lights remains unchanged in S-101. See S-101 DCEG clause 19.3.1.2.

### Various special types of lights

The guidance for the encoding various special types of remains unchanged in S-101. See S-101 DCEG clause 19.1.7.

### Light structures

The guidance for the encoding of light structures remains unchanged in S-101. See S-101 DCEG clause 19.1.8.

S-101 includes the system attribute **in the water** to indicate that particular light supporting structures that are located offshore are to be included in ECDIS Base display. As such, there is no requirement to include an ECDIS Base display feature coincident with these features in S-101 so as to ensure display of a feature at the position of the feature in ECDIS Base display. Data Producers should consider removing any redundant Base display features from their S-101 data during the conversion process.

## Radio stations

S-57 Geo object: Radio station (**RDOSTA**) (P)

S101 Geo feature: **Radio Station** (P) (S-101 DCEG Clause 21.4)

All instances of encoding of the S-57 Feature object **RDOSTA** and its binding attributes will be populated automatically against the S-101 feature **Radio Station** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute ORIENT for **RDOSTA** will not be converted. It is considered that this attribute is not relevant for **Radio Station** in S-101.

Data Producers are advised that the following enumerate type attribute has restricted allowable enumerate values for **Radio Station** in S-101:

**category of radio station** (CATROS)

See S-101 DCEG clause 21.4 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CATROS on **RDOSTA** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

* The S-101 complex attribute **frequency pair** has been introduced in S-101 to enable the encoding of the frequency that a shore station both transmits and receives radio signals. During the automated conversion process instances of the S-57 attribute SIGFRQ will convert to the sub-attribute **frequency shore station transmits**. For full capability S-101 data, Data Producers will be required to populate manually the sub-attribute **frequency shore station receives**, if considered necessary.

### Marine and aero-marine radiobeacons

Not applicable.

### Aeronautical radiobeacons

Not applicable.

### Radio direction-finding stations

The guidance for the encoding of radio direction-finding stations remains unchanged in S-101. See S-101 DCEG clause 21.4.2.

### Coast radio stations providing QTG service

Not applicable.

## Radar beacons

S-57 Geo object: Radar transponder beacon (**RTPBCN**) (P)

S101 Geo feature: **Radar Transponder Beacon** (P) (S-101 DCEG Clause 21.5)

All instances of encoding of the S-57 Feature object **RTPBCN** and its binding attributes will be populated automatically against the S-101 feature **Radar Transponder Beacon** during the automated conversion process.

## Radar surveillance systems

### Radar ranges

S-57 Geo object: Radar range (**RADRNG**) (A)

S101 Geo feature: **Radar Range** (S) (S-101 DCEG Clause 15.31)

All instances of encoding of the S-57 Feature object **RADRNG** and its binding attributes will be populated automatically against the S-101 feature **Radar Range** during the automated conversion process.

### Radar reference lines

S-57 Geo object: Radar line (**RADLNE**) (L)

S101 Geo feature: **Radar Line** (C) (S-101 DCEG Clause 15.30)

All instances of encoding of the S-57 Feature object **RADLNE** and its binding attributes will be populated automatically against the S-101 feature **Radar Line** during the automated conversion process.

### Radar station

S-57 Geo object: Radar station (**RADSTA**) (P)

S101 Geo feature: **Radar Station** (P) (S-101 DCEG Clause 15.32)

All instances of encoding of the S-57 Feature object **RADSTA** and its binding attributes will be populated automatically against the S-101 feature **Radar Station** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes DATEND and DATSTA for **RADSTA** will not be converted. It is considered that these attributes are not relevant for **Radar Station** in S-101.

## Radar conspicuous objects

The guidance for the encoding of radar conspicuous objects remains unchanged in S-101. See S-101 DCEG clause 2.4.11.

S-57 Geo object: Radar reflector (**RADRFL**) (P)

S101 Geo feature: **Radar Reflector** (P) (S-101 DCEG Clause 20.17)

All instances of encoding of the S-57 Feature object **RADRFL** and its binding attributes will be populated automatically against the S-101 feature **Radar Reflector** during the automated conversion process.

## Radio reporting (calling-in) points

S-57 Geo object: Radio calling-in point (**RDOCAL**) (P,L)

S101 Geo feature: **Radio Calling-In Point** (P,C) (S-101 DCEG Clause 15.28)

All instances of encoding of the S-57 Feature object **RDOCAL** and its binding attributes will be populated automatically against the S-101 feature **Radio Calling-In Point** during the automated conversion process. However the following exceptions apply:

* The S-57 attribute COMCHA will convert to an instance of the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the **Radio Calling-In Point** feature using the association **Additional Information**. Because of the capability to encode these relationships in a “one to many” manner in S-101, Data Producers are advised to check identical instances of **Additional Information** within a converted dataset and rationalise these instances accordingly.

The following additional requirements for S-57 dataset conversion must be noted:

* For S-57 ENCs a two-way radio-calling-in point having non-reciprocal directions of traffic flow required the encoding of separate instances of **RDOCAL** for each direction. For S-101 ENCs it is possible to encode both directions using a single instance of **Radio Calling-In Point**. Data producers will be required to examine their converted S-101 datasets and amend the encoding as required.

S101 Geo feature: **Vessel Traffic Service Area** (S) (S-101 DCEG Clause 22.2)

The S-101 feature **Vessel Traffic Service Area** has been introduced in S-101 as a dedicated feature to encode such areas. This information is encoded in S-57 using the Object class **ADMARE**. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **ADMARE** must be include the text string *Vessel traffic service area*. Data Producers are advised to examine any **Vessel Traffic Service Area** features created during the automated conversion process and confirm the attribution for these features as required, including any attributes and text files referenced in the associated instance of the S-101 Information type **Nautical Information**.

## Automatic Identification Systems (AIS)

### AIS equipped aids to navigation

S101 Geo feature: **Physical AIS Aid to Navigation** (P) (S-101 DCEG Clause 21.2)

The S-101 feature **Physical AIS Aid to Navigation** has been introduced in S-101 to provide the capability to encode a dedicated feature to indicate the presence of an AIS signal that is actually transmitted from a physical aid to navigation, or appears to be transmitted from a physical aid to navigation but is actually transmitted from an AIS base station. This information may be encoded in S-57 using the attribute INFORM on the physical aid to navigation structure object. In order for this information to be converted across to S-101, the text string encoded in INFORM on the navigation aid structure must be in the format *Automatic Identification System (AIS) aid to navigation*.

Data Producers will be required to evaluate each instance of the feature **Physical AIS Aid to Navigation** created during the automated conversion process and populate allowable attributes as required.

#### Virtual AIS aids to navigation

S-57 Geo object: New object (**NEWOBJ**) (P)

S101 Geo feature: **Virtual AIS Aid to Navigation** (P) (S-101 DCEG Clause 21.3)

The encoding of Virtual AIS aids to navigation using the Object class **NEWOBJ** is the only approved application of **NEWOBJ** in S-57. As such, all instances of encoding of the S-57 Feature object **NEWOBJ** will be converted to an instance of the S-101 feature **Virtual AIS Aid to Navigation** during the automated conversion process.

The following additional requirements for S-57 dataset conversion must be noted:

* The S-101 mandatory attribute **virtual AIS aid to navigation type** will be automatically populated according to the value populated for the S-57 mandatory attribute CLSNAM on **NEWOBJ**.
* Similarly, values populated for the **NEWOBJ** attributes DATEND, DATSTA, NOBJNM, OBJNAM, SCAMIN and STATUS will be converted to the corresponding attributes for **Virtual AIS Aid to Navigation**. Note however that the STATUS has restricted allowable enumerate values for **Virtual AIS Aid to Navigation** in S-101 (see S-101 DCEG clause 21.3); Data Producers are advised to check any populated values for STATUS on **NEWOBJ** and amend appropriately.
* Data Producers will be required to evaluate each instance of the feature **Virtual AIS Aid to Navigation** created during the automated conversion process and populate other allowable attributes as required.
* The S-57 attribute INFORM for **NEWOBJ** will not be converted, as information populated in INFORM in this case is intended to allow for ECDIS backward compatibility.

# Marine services and signal stations

## Pilot stations

### Pilot stations ashore

The guidance for the encoding of pilot stations ashore remains unchanged in S-101. See S-101 DCEG clause 22.1.2.

### Pilot boarding places

S-57 Geo object: Pilot boarding place (**PILBOP**) (P,A)

S101 Geo feature: **Pilot Boarding Place** (P,S) (S-101 DCEG Clause 22.1)

All instances of encoding of the S-57 Feature object **PILBOP** and its binding attributes will be populated automatically against the S-101 feature **Pilot Boarding Place** during the automated conversion process. However the following exceptions apply:

* The S-57 attributes NPLDST and PILDST for **PILBOP** will not be converted. See guidance on new S-101 feature **Pilotage District** below.
* The S-57 attribute COMCHA will convert to an instance of the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the **Pilot Boarding Place** feature using the association **Additional Information**. Because of the capability to encode these relationships in a “one to many” manner in S-101, Data Producers are advised to check identical instances of **Additional Information** within a converted dataset and rationalise these instances accordingly.

S101 Geo feature: **Pilotage District** (S) (S-101 DCEG Clause 16.25)

The S-101 feature **Pilotage District** has been introduced in S-101 as a dedicated feature to encode such areas. This information is encoded in S-57 using the Object class **ADMARE**. In order for this information to be converted across to S-101, the text string encoded in INFORM on the **ADMARE** must be include the text string *Pilotage district*. Data Producers are advised to examine any **Pilotage District** features created during the automated conversion process and confirm the attribution for these features as required, including any attributes and text files referenced in the associated instance of the S-101 Information type **Nautical Information**.

## Coastguard stations

S-57 Geo object: Coastguard station (**CGUSTA**) (P)

S101 Geo feature: **Coast Guard Station** (P,S) (S-101 DCEG Clause 22.3)

All instances of encoding of the S-57 Feature object **CGUSTA** and its binding attributes will be populated automatically against the S-101 feature **Coast Guard Station** during the automated conversion process.

The following additional requirements for S-57 attribution must be noted:

* The S-101 Boolean attribute **is MRCC** has been introduced in S-101 to indicate that a coast guard station also performs the function of a Maritime Rescue and Coordination Centres (MRCC). This information is encoded in S-57 on **CGUSTA** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **CGUSTA** must be in the format *Maritime Rescue and Coordination Centre*.

## Rescue stations

S-57 Geo object: Rescue station (**RSCSTA**) (P)

S101 Geo feature: **Rescue Station** (P,S) (S-101 DCEG Clause 22.6)

All instances of encoding of the S-57 Feature object **RSCSTA** and its binding attributes will be populated automatically against the S-101 feature **Rescue Station** during the automated conversion process.

## Signal stations

S-57 Geo object: Signal station, traffic (**SISTAT**) (P)

S101 Geo feature: **Signal Station Warning** (P,S) (S-101 DCEG Clause 22.4)

All instances of encoding of the S-57 Feature object **SISTAT** and its binding attributes will be populated automatically against the S-101 feature **Signal Station Traffic** during the automated conversion process.

S-57 Geo object: Signal station, warning (**SISTAW**) (P)

S101 Geo feature: **Signal Station Traffic** (P,S) (S-101 DCEG Clause 22.5)

All instances of encoding of the S-57 Feature object **SISTAW** and its binding attributes will be populated automatically against the S-101 feature **Signal Station Warning** during the automated conversion process.

# Geographic names

S101 Geo feature: **Island Group** (N) (S-101 DCEG Clause 5.5)

In general, the guidance for the encoding of geographic names remains unchanged in S-101. See S-101 DCEG clause 2.5.8. However, the following additional requirements for S-57 attribution must be noted:

* The S-101 feature **Island group** has been introduced in S-101 to provide an dedicated method for trhe encoding of named groups of islands and archipelagos. This information may be encoded in S-57 using a **LNDRGN** object covering or centred in the group of islands. In order for this information to be converted across to an incidence of **Island Group** S-101, the attribute INFORM on the **LNDRGN** must be populated with a text string in the format *Island group*, noting that this should be done at the source database level only so as to avoid unwanted additional clutter in ECDIS (see clause 2.3). The S-101 **Land Region** feature resulting from the conversion of the **LNDRGN** should be removed from the converted S-101 dataset in this case.
* Information encoded in the attribute NOBJNM, when converted to S-101, requires an entry in the **feature name** complex attribute instance, sub-attribute **language** to indicate the language of the name. There is no corresponding attribute in S-57 to provide this information. Data Producers will be required to manually populate this attribute during the conversion process (see S-101 DCEG clause 2.5.8).

# Collection objects

For a description of the Named Associations that may be encoded in S-101, see S-101 DCEG Section 25. Data Producers are advised to check all relationships created during the automated conversion process to ensure all relevant features are included as required.

The most common examples of the application of collection objects as described in S-57 Appendix B.1, Annex A – *Use of the Object Catalogue for ENC* will be converted during the automated conversion process as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Relationships** | **S-57 Collection object** | **S-101 Association** | **Comments** |
| Mooring trots | **C\_AGGR** | **Mooring Trot Aggregation** | S-101 DCEG clause 8.21.1 |
| Measured distances | **C\_AGGR** | **Range System** | S-101 DCEG clause 15.4.2 |
| Traffic Separation Schemes systems | **C\_AGGR** | **Traffic Separation Scheme Aggregation** | S-101 DCEG clause 15.3 |
| Navigation lines and tracks | **C\_AGGR** | **Range System Aggregation** | S-101 DCEG clause 15.1.1 |
| Navigation lines, tracks and dangers | **C\_ASSO** | - | Not in S-101 |
| Synchronised lights | **C\_ASSO** | **Range System Aggregation** | S-101 DCEG clause 19.1.7 |
| Airfield, airport, (runway, control etc.) | **C\_ASSO** | - | Not in S-101 |
| Tide, tidal stream (non-harmonic prediction – time series or harmonic prediction) | **C\_ASSO** | - | Tide and tidal stream features not included in S-101. |
| Anchorage | **C\_ASSO** | - | Not in S-101 |
| Fairway | **C\_ASSO**/**C\_AGGR** | **Fairway Aggregation** | S-101 DCEG clause 15.8.1 |
| Radar beacon | **C\_AGGR** | **Range System Aggregation** | S-101 DCEG clause 21.5.1 |
|  |  |  | *table 15.1* |

# New Object

See clause 12.14.1.1.

# Masking

The guidance for masking remains unchanged in S-101. See S-101 DCEG clause 2.5.10.

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# Annex A: S-57 to S-101 conversion quick references

1. Summary of differences

The following conventions apply for Table A.1 below:

* Column 3 provides an overall indication as to whether S-57 data may require some examination and/or intervention prior to or after conversion to S-101 in order to ensure that the converted S-101 dataset is at a minimum the equivalent, in terms of content and impact on safety of navigation, to the original S-57 dataset. If there is no “**x**” in this column, there will be direct “one for one” conversion of the S-57 Object class from S-57 to S-101.
* Columns 4 and 5 provide further qualification as to possible action required of the Data Producer:
  + Attribution: Indicates possible action required in S-57 attribute population, such as population of a standardised text string in the S-57 attribute INFORM (indicated by “x”); or information regarding conversion of attributes, such as allowable S-57 attributes that are not allowed in S-101, may be relevant (indicated by “x\*”).
  + Enumerates: Indicates that an enumeration type attribute(s) has allowable values in S-57 that are not allowable in S-101 and as such will not be converted. The list of S-57 “allowable” values is in accordance with the values listed in S-58 Check 2000. Further information can be found in Table A.2.
* Columns 6 to 8 provide indications of extensions to S-57 included in S-101. Undertaking additional S-101 encoding based on these extensions is optional (see also Tables A.2 and A.3).
  + New Attributes: Indicates that new attribute binding has been included in S-101 for the Feature class corresponding to the relevant S-57 Object class. New attributes may be either attributes that are new in S-101; or new allowable binding of existing S-57 attributes to the feature. However, this does not include new attributes that may be populated based on standardised S-57 to S-101 conversion rules, such as standardised text strings populated in the S-57 attribute INFORM. For lists of new attributes by Feature class in S-101, see Table A.3.
  + New Enumerates: Indicates that the enumerate list for at least one of the binding attributes for the Feature class corresponding to the relevant S-57 Object class has new enumerate values. New enumerate values may be either values that are new in S-101; or new allowable S-57 enumerate values other than those listed for the attribute in S-58 Check 2000. Further information can be found in Table A.2. Data Producers will be required to refer to the relevant clause(s) of the S-101 DCEG.

Additional guidance within this document can be found in the clause numbers listed in column 2. NOTE: Where there are multiple clause numbers listed against an S-57 Object class, the clause number listed in **bold** is the principle reference.

NOTE 1: All converted instances of the S-57 attributes NINFOM, NOBJNM and NTXTDS will require manual intervention in the S-101 converted dataset to provide an indication of the national language used. This is not indicated in the table below. See clauses 2.3 and 14.

NOTE 2: All S-101 Feature classes corresponding to S-57 **BCN\*\*\*** and **BOY\*\*\*** Object classes have the new complex attribute **topmark** as an allowable attribute. Automatic population of this complex attribute during the S-57 to S-101 conversion process will be based on incidences of the S-57 Object **TOPMAR** associated with the beacon or buoy structure. For impacts of this new S-101 modelling, see the table entry for **TOPMAR** and clauses 12.3.1, 12.4.1 and 12.4.2.

NOTE 3: The S-57 Object class **BRIDGE** has been remodelled in S-101 to allow for the encoding of individual bridge spans as separate features. Data Producers should check all converted instances of bridges to ensure desirable S-101 representation. See clause 4.8.10.

NOTE 4: For additional manual intervention required during the S057 to S-101 conversion process regarding the population of the S-101 system attribute **in the water**, refer to the referenced clause in this document.

| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S-57 Object Class** | **Clause** | **Examination Required** | **Attribution** | **Enumerates** | **New Geo Primitive(s)** | **New Attributes** | **New Enumerates** |
| **ACHARE** | 9.2.1 | **x** | x |  |  |  | x |
| **ACHBRT** | 9.2.2 |  |  |  |  |  |  |
| **ADMARE** | **11.2.1** 11.16 12.13 13.1.2 | **x** | x |  |  |  |  |
| **AIRARE** | 4.8.12 | **x** |  | x |  |  | x |
| **BCNCAR** | 12.3.1 | **x** |  | x |  | Note 2 | x |
| **BCNISD** | 12.3.1 | **x** |  | x |  | Note 2 | x |
| **BCNLAT** | 12.3.1 | **x** |  | x |  | Note 2 | x |
| **BCNSAW** | 12.3.1 | **x** |  | x |  | Note 2 | x |
| **BCNSPP** | 12.3.1 | **x** |  | x |  | Note 2 | x |
| **BERTHS** | 4.6.2 |  |  |  |  | x |  |
| **BOYCAR** | 12.4.1 | **x** |  | x |  | Note 2 |  |
| **BOYINB** | 12.4.1 | **x** | x\* | x |  |  |  |
| **BOYISD** | 12.4.1 | **x** |  | x |  | Note 2 |  |
| **BOYLAT** | 12.4.1 | **x** |  | x |  | Note 2 |  |
| **BOYSAW** | 12.4.1 | **x** |  | x |  | Note 2 |  |
| **BOYSPP** | 12.4.1 | **x** |  | x |  | Note 2 | x |
| **BRIDGE** | 4.8.10 | **x** | Note 3 | x |  | x | x |
| **BUAARE** | 4.8.14 |  |  |  |  |  | x |
| **BUISGL** | 4.8.15 | **x** |  | x |  | x, Note 4 | x |
| **CANALS** | 4.8.1 |  |  |  |  | x |  |
| **CAUSWY** | 4.8.9 |  |  |  |  |  | x |
| **CBLARE** | 11.5.3 | **x** |  | x |  |  | x |
| **CBLOHD** | 11.5.2 |  |  |  |  | x | x |
| **CBLSUB** | 11.5.1 |  | x\* |  |  | x |  |
| **CGUSTA** | 13.2 | **x** | x |  | x |  |  |
| **CHKPNT** | 4.6.4 | **x** |  | x |  |  |  |
| **COALNE** | 4.5.1 | **x** | x | x |  | x | x |
| **CONVYR** | 4.8.11 | **x** |  | x |  |  | x |
| **CONZNE** | 11.2.5 | **x** | x, x\* |  |  | x |  |
| **COSARE** | 11.2.7 |  |  |  |  |  |  |
| **CRANES** | 4.6.9.3 | **x** |  |  | x | Note 4 | x |
| **CTNARE** | 6.5 **6.6** 11.2.1 11.2.4 11.2.5 11.2.8 11.13.5 | **x** | x |  |  | x |  |
| **CTRPNT** | 4.3 | **x** | x | x |  | x |  |
| **CTSARE** | 11.13.4 |  |  |  |  | x | x |
| **CURENT** | 3.4 |  |  |  | x |  |  |
| **CUSZNE** | 11.2.2 |  |  |  |  |  |  |
| **C\_AGGR** | 9.2.5 10.1.2 10.1.3 10.2.2 10.2.3 10.2.6 10.4 10.5.3 **15** | **x** | x |  |  |  |  |
| **C\_ASSO** | 10.1.2 **15** | **x** | x |  |  |  |  |
| **DAMCON** | 4.8.5 | **x** |  | x |  | x | x |
| **DAYMAR** | 12.3.3 | **x** |  | x |  |  | x |
| **DEPARE** | 5.4.1 |  | x\* |  |  |  |  |
| **DEPCNT** | 5.2 |  |  |  |  |  |  |
| **DISMAR** | 4.4 | **x** | x |  |  | x |  |
| **DOCARE** | 4.6.6.3 | **x** | x, x\* |  |  | x |  |
| **DMPGRD** | 11.4 | **x** |  | x |  | x |  |
| **DRGARE** | 5.5 | **x** | x | x |  | x | x |
| **DRYDOC** | 4.6.6.1 | **x** | x, x\* |  |  | x |  |
| **DYKCON** | 4.8.7 | **x** |  | x |  | x | x |
| **DWRTCL** | 10.2.2.2 | **x** |  | x |  | x | x |
| **DWRTPT** | 10.2.2.1 | **x** |  | x |  | x | x |
| **EXEZNE** | 11.2.8 |  |  |  |  | x |  |
| **FAIRWY** | 10.4 | **x** |  | x |  | x | x |
| **FERYRT** | 10.3 |  |  |  |  |  | x |
| **FLODOC** | 4.6.6.2 | **x** | x, x\* | x |  | x | x |
| **FNCLNE** | 4.8.16 | **x** |  | x |  |  | x |
| **FOGSIG** | 12.5 | **x** | x |  |  |  | x |
| **FORSTC** | 4.8.17 | **x** |  | x |  | x, Note 4 | x |
| **FRPARE** | 11.2.3 |  |  |  |  |  |  |
| **FSHFAC** | 11.9.1 | **x** |  | x |  | x | x |
| **FSHGRD** | 11.9.4 |  |  |  |  | x | x |
| **FSHZNE** | 11.2.6 | **x** | x |  |  |  |  |
| **GATCON** | 4.6.6.4 | **x** |  | x |  |  |  |
| **GRIDRN** | 4.6.6.6 | **x** | x\* | x |  |  | x |
| **HRBARE** | 9.1.1 | **x** |  | x |  |  |  |
| **HRBFAC** | 4.6.1 | **x** |  | x |  | x | x |
| **HULKES** | 4.6.8 |  | x\* |  |  |  | x |
| **ICEARE** | 11.13.1 | **x** |  | x |  |  | x |
| **ICNARE** | 11.13.3 |  | Will not convert to S-101. | | | | |
| **ISTZNE** | 10.2.1.7 |  |  |  |  |  |  |
| **LAKARE** | 4.7.8 |  |  |  |  | x |  |
| **LNDARE** | 4.1 | **x** |  | x |  |  |  |
| **LNDELV** | 4.7.2 |  |  |  |  |  | x |
| **LNDMRK** | 4.3 **4.8.15** 11.7.2 11.7.4 | **x** |  | x |  | x, Note 4 | x |
| **LNDRGN** | 4.7.1 | **x** | x, x\* | x |  |  | x |
| **LIGHTS** | **12.8.1** 12.8.5.6 **12.8.6.1** | **x** | x | x |  | x |  |
| **LITFLT** | 12.4.2 | **x** | x\* | x |  | Note 2 | x |
| **LITVES** | 12.4.2 | **x** | x\* | x |  |  | x |
| **LOCMAG** | 3.1.2 | **x** | x |  |  | x |  |
| **LOGPON** | 11.13.2 | **x** |  | x |  | x |  |
| **LOKBSN** | 4.6.6.5 |  | x\* |  |  |  |  |
| **MAGVAR** | 3.1.1 |  | x\* |  |  |  |  |
| **MARCUL** | 11.9.2 | **x** |  | x |  |  | x |
| **MIPARE** | 11.3.1 |  |  |  |  | x |  |
| **MORFAC** | 4.6.7.1 | **x** |  | x |  | x | x |
| **M\_ACCY** | 2.2.4.1 |  |  |  |  | x |  |
| **M\_COVR** | **2.2.6** 2.8.1 | **x** | x |  |  | x |  |
| **M\_CSCL** | 2.2.6 | **x** | x |  |  | x |  |
| **M\_HOPA** | 2.1.1 |  | Will not convert to S-101. | | | | |
| **M\_NPUB** | 2.5 | **x** | x |  |  | x |  |
| **M\_NSYS** | 12.2 | **x** |  | x |  |  |  |
| **M\_QUAL** | 2.2.3.1 | **x** | x |  |  | x |  |
| **M\_SDAT** | 2.1.3 |  |  |  |  |  |  |
| **M\_SREL** | 2.2.3.2 | **x** | x | x |  | x | x |
| **M\_VDAT** | 2.1.2 |  |  |  |  |  |  |
| **NAVLNE** | 10.1.1 |  |  |  |  |  |  |
| **OBSTRN** | 6.2.2 | **x** | x, x\* |  |  | x | x |
| **OFSPLF** | 11.7.2 | **x** | x\* | x |  | x | x |
| **OSPARE** | 11.7.4 | **x** | x | x |  | x | x |
| **OILBAR** | 4.8.19 |  |  |  |  |  | x |
| **PILBOP** | 13.1.2 | **x** | x, x\* |  |  | x | x |
| **PILPNT** | 4.6.7.2 |  |  |  | x | x |  |
| **PIPARE** | 11.6.4 | **x** |  | x |  |  | x |
| **PIPOHD** | 11.6.3 |  |  |  |  | x |  |
| **PIPSOL** | 11.6.1 | **x** |  | x |  | x | x |
| **PONTON** | 4.6.7.3 | **x** | x, x\* |  | x |  | x |
| **PRCARE** | 10.2.1.8 |  |  |  |  |  | x |
| **PRDARE** | 4.8.13 | **x** |  | x |  |  | x |
| **PYLONS** | 4.8.18 | **x** |  | x |  | x | x |
| **RADLNE** | 12.11.2 |  |  |  |  |  | x |
| **RADRNG** | 12.11.1 |  |  |  |  |  |  |
| **RADRFL** | 12.12 |  |  |  |  | x |  |
| **RADSTA** | 12.11.3 |  | x\* |  |  | x |  |
| **RAILWY** | 4.8.2 | **x** |  | x |  |  | x |
| **RAPIDS** | 4.7.7.1 |  |  |  |  |  |  |
| **RCRTCL** | 10.2.4 | **x** |  | x |  |  | x |
| **RCTLPT** | 10.2.5 |  |  |  |  |  |  |
| **RDOCAL** | 12.13 | **x** | x |  |  |  | x |
| **RDOSTA** | 12.9 | **x** | x, x\* | x |  | x |  |
| **RECTRC** | 10.1.1 | **x** | x | x |  | x |  |
| **RESARE** | 11.1 | **x** | x |  |  | x | x |
| **RETRFL** | 12.7 |  |  |  |  |  |  |
| **RIVERS** | 4.7.6 | **x** | x | x |  |  |  |
| **ROADWY** | 4.8.8 | **x** |  | x |  |  | x |
| **RSCSTA** | 13.3 |  |  |  | x | x |  |
| **RTPBCN** | 12.10 |  |  |  |  |  |  |
| **RUNWAY** | 4.8.12 | **x** |  | x |  |  | x |
| **SBDARE** | 7.1 |  | x\* |  |  | x |  |
| **SEAARE** | 5.5 **8** 10.2.3 10.2.6 10.4 10.5.3 | **x** |  |  |  |  | x |
| **SILTNK** | 4.8.15 | **x** |  | x |  | x, Note 4 | x |
| **SISTAT** | 13.4 |  |  |  | x |  |  |
| **SISTAW** | 13.4 |  |  |  | x |  |  |
| **SLCONS** | 4.5.2 | **x** |  | x |  |  | x |
| **SLOTOP** | 4.7.5 | **x** |  | x |  |  | x |
| **SLOGRD** | 4.7.4 | **x** |  | x |  |  | x |
| **SMCFAC** | 4.6.5 |  |  |  |  |  |  |
| **SOUNDG** | **5.3** 5.5 | **x** | x | x |  | x | x |
| **SNDWAV** | 7.2.1 |  |  |  |  |  |  |
| **SPLARE** | 11.12 |  |  |  |  |  | x |
| **SPRING** | 7.2.3 |  |  |  |  |  |  |
| **STSLNE** | 11.2.4 |  |  |  |  |  |  |
| **SUBTLN** | 11.3.2 |  |  |  |  | x |  |
| **SWPARE** | 5.6 |  | x\* |  |  | x |  |
| **TESARE** | 11.2.4 | **x** | x | x |  |  |  |
| **TIDEWY** | 7.2.4 |  |  |  |  |  |  |
| **TOPMAR** | 12.3.1 12.4.1 12.4.2 **12.6** | **Note 2** |  |  |  |  |  |
| **TSELNE** | 10.2.1.3 |  |  |  |  |  | x |
| **TSEZNE** | 10.2.1.4 |  |  |  |  |  | x |
| **TSSBND** | 10.2.1.2 |  |  |  |  |  | x |
| **TSSCRS** | 10.2.1.5 |  |  |  |  |  |  |
| **TSSLPT** | 10.2.1.1 |  |  |  |  |  | x |
| **TSSRON** | 10.2.1.6 |  |  |  |  |  |  |
| **TUNNEL** | 4.8.3 | **x** |  | x |  | x |  |
| **TWRTPT** | 10.2.6 | **x** |  | x |  |  | x |
| **T\_HMON** | 3.2 |  | Will not convert to S-101. | | | | |
| **T\_NHMN** | 3.2 |  | Will not convert to S-101. | | | | |
| **T\_TIMS** | 3.2 |  | Will not convert to S-101. | | | | |
| **TS\_FEB** | 3.3.1 |  | x\* |  |  |  |  |
| **TS\_PAD** | 3.3.5 |  |  |  |  | x |  |
| **TS\_PNH** | 3.3.4 |  | Will not convert to S-101. | | | | |
| **TS\_PRH** | 3.3.3 |  | Will not convert to S-101. | | | | |
| **TS\_TIS** | 3.3.2 |  | Will not convert to S-101. | | | | |
| **UNSARE** | 5.8.1 |  |  |  |  |  |  |
| **UWTROC** | 6.1.2 | **x** | x, x\* | x |  | x | x |
| **VEGATN** | 4.7.11 | **x** |  | x |  |  | x |
| **WATFAL** | 4.7.7.2 |  |  |  |  |  | x |
| **WATTUR** | 6.4 |  |  |  |  |  |  |
| **WEDKLP** | 7.2.2 |  |  |  |  |  |  |
| **WRECKS** | 6.2.1 |  | x\* |  |  | x | x |
| *Table A.1* | | | | | | | |

1. Allowable S-101 enumerate value changes

Table A.2 below provides an indication of the changes in the allowable values that may be populated for enumerate type attributes in S-101 when converting S-57 datasets to S-101. The Table has been derived from IHO Publication S-58 – *ENC Validation Checks*, Check 2000.

Within the Table, the following conventions apply:

* Colour:
  + Black text, with the exception of text within “squared” brackets ([ ]), indicates a direct one-for-one relationship between the allowable S-57 object/attribute/enumerate encoding combinations as listed in S-58 Check 2000 and the corresponding allowable feature/attribute/enumerate encoding combinations in S-101.
  + **Red** text indicates differences between the allowable S-57 object/attribute/enumerate encoding combinations as listed in S-58 Check 2000 and the corresponding allowable feature/attribute/enumerate encoding combinations in S-101. These may be new allowable values in S-101; or values permitted in S-57 but not permitted in S-101 (indicated by double strike-through) that as such will not be converted.
  + **Blue** text indicates new enumerate values introduced in S-101 for which there is no directly corresponding enumerate value in S-57.
  + **Grey** text indicates S-57 object/attribute/enumerate encoding combinations that will convert to S-101, but not on a direct one-for-one basis. General conversion conventions are indicated within “squared” brackets ([ ]) in the “Allowable Attribute Values” column.
* **Attribute** column: Where an attribute that is listed in S-58 Check 2000 is not listed in Table A.2, this indicates that all instances of encoding of this attribute in S-57 will convert one-to-one directly to the corresponding encoding combinations in S-101.
* **Object** column: Where an Object class that is listed against an attribute in S-58 Check 2000 is not listed in Table A.2, this indicates that all instances of encoding of the attribute for this Object class in S-57 will convert one-to-one directly to the corresponding encoding combination in S-101. Where no Object class is listed against an attribute in Table A.2, this indicates that all instances of the encoding of this attribute will be converted as indicated in the “Allowable Attribute Values” column (that is, some values will convert one-to-one while some values will not convert or will convert but not one-for-one); or there are new values available for consideration in S-101.
* **Allowable Attribute Values** column: Values will (or will not) be converted in accordance with the colour conventions described above. Values listed against the S-57 attribute itself indicate the full list of allowable values in S-101 (as included in S-101 DCEG Sections 27 and 28). Values listed against the associated S-57 Object Class indicate the allowable constricted S-101 attribute list for this object/attribute combination. It is important for Data Producers to note that allowable S-57 object/attribute/enumerate encoding combinations indicated in Table A.2 with red double strike-through text will not convert to S-101. Values shown in red (not struck-though) or blue colour may be considered for additional manual encoding in S-101 as required.

| **Attribute** | **Object** | **Allowable Attribute Values** |
| --- | --- | --- |
| BCNSHP |  | 1-2-3-**4-**5-6-7 [Value 4 converts to new value 11 for attribute **nature of construction**] |
|  |  |  |
| CATAIR |  | 1-2-3-4-5-6-8**-9** |
|  |  |  |
| CATACH |  | 1-2-3-4-5-6-7-8-9-10**-14-15** |
|  |  |  |
| CATCBL |  | 1-3**-4-5**-6**-7-8** [Values 4 and 5 converts to new value 8] |
|  | **CBLARE** | 1**-4-5-7-8** |
|  | **CBLSUB** | 1**-4-5**-6**-7-8** |
|  |  |  |
| CATCOA | **COALNE** | 1-2**-3-4-5-**6-7-8**-9**-10**-11** [See new binding of attribute **nature of surface** to **Coastline** – clause 4.5.1] |
|  |  |  |
| CATCTR |  | **1-2-3-4**-**5-6-7** [No equivalent attribute in S-101] |
|  | **CTRPNT** | **1-2-3-4**-**5-6-7** [No equivalent feature in S-101. Values 1 and 5 convert to new values for **category of landmark** – see clause 4.3] |
|  |  |  |
| CATCON |  | 1-2**-3-4** |
|  |  |  |
| CATCOV |  | **1-2** [**M\_COVR** having CATCOV = 1 converts to **Data Coverage** – see clause 2.2.6] |
|  |  |  |
| CATCRN |  | 2-3-4-5**-6** |
|  |  |  |
| CATFRY |  | 1-2-3**-5** |
|  |  |  |
| CATFOR |  | 1-2-3-4-5-6**-8-9** |
|  |  |  |
| CATHAF |  | 1-3-4-5-6-7-8-9-10-11-12-13**-14-15** |
|  |  |  |
| CATHLK |  | 1-2-3-4-5**-6-7** |
|  |  |  |
| CATLND |  | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20**-21** |
|  |  |  |
| CATLMK |  | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18**-19**-20-21**-22-23-24-25** [Value 19 converts to new feature **Wind Turbine** – see clause 4.15] |
|  |  |  |
| CATLIT |  | **1**-4-5**-6-7**-8-9-10-11-12-13-14-15**-16**-17-18-19-20 [Values 1 and 16 convert to new feature **Light Sectored**, complex attribute **directional character**. Values 6 and 7 convert to new features **Light Air Obstruction** and **Light Fog Detector** respectively – see clause 12.8] |
|  |  |  |
| CATOBS |  | 1-2-3-4-5-6**-7**-8-9-10**-12-13-14-15-16-17-18-19-20-21** [Value 7 converts to new feature **Foul Ground** – see clause 6.2.2] |
|  |  |  |
| CATOFP |  | 1-2-3-4-5-6-7-8-9-10**-11** |
|  |  |  |
| CATPLE |  | 1-3-4**-5-6-7** |
|  |  |  |
| CATPIP | **PIPSOL** | 2-3-4-5-6-**7** |
|  |  |  |
| CATPRA |  | 1-2-3-4-5-6-7-8-9-10**-11** |
|  | **OSPARE** | **1-2-5-8-9** [**category of production area** is not bound to **Offshore Production Area**. Values 8 and 9 convert to new attribute **category of offshore production area** – see clause 11.7.4] |
|  | **PRDARE** | 1-2-3-4-5-6-7-8-9-10**-11** |
|  |  |  |
| CATROS |  | **1-2-3-4**-5**-6-7-8-9**-10-11**-12-13**-14**-19-20** |
|  |  |  |
| CATTRK |  | **1-2** [Converts to new Boolean attribute **based on fixed marks**] |
|  |  |  |
| CATREA |  | 1-4-5-6-7-8-9-10-12-14-18-19-20-21-22-23-24-25**-26**-**27-28-29-30-31-32** [Value 26 converts to new value 32] |
|  |  |  |
| CATSEA |  | 2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54**-55-56** |
|  |  |  |
| CATSLC |  | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17**-20-22** |
|  |  |  |
| CATSLO |  | 1-2-3-4-5-6-7 |
|  | **SLOTOP** | 1-2**-3-4-5**-6**-7** |
|  |  |  |
| CATSPM |  | 1-2-3-4-5-6-7-8-9-10-11-12**-13**-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56**-57-58-60-61-62-63** |
|  | **BCNSPP** | 1-2-3-4-5-6-7-8**-9**-10-11-12**-13**-14**-15**-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56**-57-58-60-61-62-63** |
|  | **BOYSPP** | 1-2-3-4-5-6-7-8-9-10-11-12**-13**-14-15**-16**-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40**-41**-42-43**-44**-45-46-47-48-49-50-51-52-53-54-55-56**-57-58-59-60-61-62-63** |
|  | **DAYMAR** | 1-2-3-4-5-6-7-8**-9**-10-11-12**-13**-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56**-57-58-60-61-62-63** |
|  |  |  |
| CATTSS |  | **1-2** [Converts to new Boolean attribute **IMO adopted** for new feature **Traffic Separation Scheme** – see clause 10.2.1] |
|  |  |  |
| CATVEG |  | **1**-3-4-5-6-7**-10**-11**-12**-13-14-15-16-17-18-19-20-21-22 |
|  |  |  |
| CATWED |  | 1-2**-3**-4 [Value 3 converts to new feature **Seagrass** – see clause 7.2.2] |
|  |  |  |
| COLOUR |  | 1-2-3-4-5-6-7-8-9-10-11-12-13 |
|  | **COALNE** | 1-2-3-4**-5**-6-7-8**-9-10**-11**-12**-13 |
|  | **NEWOBJ** | **1-2-3-4-5-6-7-8-9-10-11-12-13** [**colour** is not a valid attribute for **Virtual AIS Aid to Navigation**] |
|  | **RETRFL** | 1**-2**-3-4-5-6-7-8-9-10-11-12-13 |
|  | **SBDARE** | **1-2-3-4-5-6-7-8-9-10-11-12-13** [**colour** is not a valid attribute for **Seabed Area**] |
|  | **SLOTOP** | 1-2-3-4**-5**-6-7-8**-9-10**-11**-12**-13 |
|  | **SLOGRD** | 1-2-3-4**-5**-6-7-8**-9-10**-11**-12**-13 |
|  |  |  |
| COLPAT |  | 1-2-3-4-5-6 |
|  | **NEWOBJ** | **1-2-3-4-5-6** [**colour pattern** is not a valid attribute for **Virtual AIS Aid to Navigation**] |
|  | **TOPMAR** | **1-2-3-4-5-6** [**colour pattern** is not a valid sub-attribute for complex attribute **topmark**] |
|  |  |  |
| CONDTN |  | 1-2-3-4-5 |
|  | **FLODOC** | 1-2**-3**-5 |
|  | **FORSTC** | 1-2**-5** |
|  | **NEWOBJ** | **1-2-3-4-5** [**condition** is not a valid attribute for **Virtual AIS Aid to Navigation**] |
|  | **OSPARE** | 1-2**-3-4**-5 |
|  | **RAILWY** | 1**-2-3**-5 |
|  | **ROADWY** | 1-2**-3**-5 |
|  | **TUNNEL** | 1-2**-3**-5 |
|  |  |  |
| CONRAD |  | **1-2** [Converts to new Boolean attribute **radar conspicuous**] |
|  |  |  |
| CONVIS |  | 1-2**-3** |
|  |  |  |
| EXPSOU |  | 1-2-3 |
|  | **MARCUL** | 1-2**-3** |
|  | **SOUNDG** | **1-2-3** [**exposition of sounding** is not a valid attribute for **Sounding**] |
|  | **UWTROC** | 1-2**-3** |
|  |  |  |
| FUNCTN |  | 2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42**-44-45-46-47-48** |
|  | **BUISGL** | 2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42**-44-45-46-47-48** |
|  | **LNDMRK** | 2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42**-44-45-46-47-48** |
|  |  |  |
| LITCHR | **LIGHTS** | 1-2-3-4-5-6-7-8**-9-10**-11-12-13-14-15-16-17-18-19**-20**-25-26-27-28-29 |
|  |  |  |
| LITVIS |  | 1-2-3-4-5-6-7-8**-9** |
|  | **LIGHTS** | 1-2**-3-4-5-6-7-8** [for **Light All Around**]  1-2-3-4-5-6**-7**-8**-9** [for **Light Sectored**]  1-2-3-4-5-6-7-8**-9** [for **Light Air Obstruction**]  **1-2-3-4-5-6-7-8** [**light visibility** is not a valid attribute for **Light Fog Detector**] |
| MARSYS |  | 1-2-9**-10-11** |
|  |  |  |
| NATCON |  | 1-2-3-4-5-6-7-8**-9-11-12** |
|  | **BCNCAR** | 1-2-6-7-8**-9-11** [Value 11 is populated from BCNSHP = 4] |
|  | **BCNISD** | 1-2-6-7-8**-9-11** [Value 11 is populated from BCNSHP = 4] |
|  | **BCNLAT** | 1-2-6-7-8**-9-11** [Value 11 is populated from BCNSHP = 4] |
|  | **BCNSAW** | 1-2-6-7-8**-9-11** [Value 11 is populated from BCNSHP = 4] |
|  | **BCNSPP** | 1-2-6-7-8**-9-11** [Value 11 is populated from BCNSHP = 4] |
|  | **BRIDGE** | 1-2**-4-5**-6-7**-8-9-11** |
|  | **BUISGL** | 1-2-6-7-8**-12** |
|  | **BOYCAR** | 6-7-8**-9-11** |
|  | **BOYINB** | **6-**7**-8-9-11** |
|  | **BOYISD** | 6-7-8**-9-11** |
|  | **BOYLAT** | 6-7-8**-9-11** |
|  | **BOYSAW** | 6-7-8**-9-11** |
|  | **BOYSPP** | 6-7-8**-9-11** |
|  | **DAMCON** | 1-2-3**-4-5**-6-7**-9** |
|  | **DAYMAR** | 1-2-4-6-7-8**-9-11** |
|  | **FNCLNE** | 1-2-3-6-7**-9-11** |
|  | **GRIDRN** | 1-2-6-7**-9-11** |
|  | **LNDMRK** | 1-2-3-6-7-8**-9-11-12** |
|  | **LITFLT** | 6-7**-9-11** |
|  | **OBSTRN** | **1-2-3-6-7-9** [**nature of construction** is not a valid attribute for **Obstruction**] |
|  | **OFSPLF** | **1-2-6-7-9** [**nature of construction** is not a valid attribute for **Offshore Platform**] |
|  | **PONTON** | **1-2-6-7-9** [**nature of construction** is not a valid attribute for **Pontoon**] |
|  | **PYLONS** | 1-2-6-7**-9-11** |
|  | **ROADWY** | **1-2-**4-5**-6-9** |
|  | **SLCONS** | 1-2-3-4-5-6-7-8**-9-11** |
|  |  |  |
| NATSUR |  | 1-2-3-4-5-6-7-8-9-11-14-17-18 |
|  | **SLOTOP** | **1-2-3-**4-5-6-7**-8**-9-11**-14-17-18** |
|  | **SLOGRD** | **1-2-3-**4-5-6-7**-8**-9-11**-14-17-18** |
|  | **UWTROC** | **9-**14**-18** |
|  |  |  |
| NATQUA |  | 1-2-3-4-5-6-7-8-9-10 |
|  | **LNDRGN** | **1-2-3-4-5-6-7-8-9-10** [**nature of surface – qualifying terms** is not a valid attribute for **Land Region**] |
|  | **OBSTRN** | **1-2-3-4-5-6-7-8-9-10** [**nature of surface – qualifying terms** is not a valid attribute for **Obstruction**] |
|  | **UWTROC** | **4-8-9-10** [**nature of surface – qualifying terms** is not a valid attribute for **Underwater/Awash Rock**] |
|  |  |  |
| PRODCT |  | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22**-23-24-25** |
|  | **CONVYR** | 4-5-6**-7**-10-11-12-13-14-15-16-17**-21**-22**-25** |
|  | **OBSTRN** | 1-2-3-8**-23** |
|  | **OFSPLF** | 1-2**-3-18-19-23** |
|  | **OSPARE** | 1-2-4-6-10-14**-23** |
|  | **PIPARE** | 1-2-3-7-8-18-19**-20** |
|  | **PIPSOL** | 1-2-3-7-8-9-18-19**-20-22** |
|  | **PRDARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22**-23-25** |
|  | **SILTNK** | 1-2-3**-5**-7-8-9**-13**-14-**16**-18-19-20-21-22**-24** |
|  |  |  |
| QUASOU |  | 1-2-3-4**-5**-6-7-8-9-10-11 [Value 5 converts to new feature **Depth – No Bottom Found**] |
|  | **BERTHS** | 1-2**-3-4** |
|  | **DWRTCL** | 1-2-3-4**-6-7** |
|  | **DWRTPT** | 1-2-3-4**-6-7** |
|  | **DEPARE** | **1-2-3-4** [**quality of vertical measurement** is not a valid attribute for **Depth Area**] |
|  | **FAIRWY** | 1-2**-3-4-6** |
|  | **RCRTCL** | 1-2-3-4**-6** |
|  | **RECTRC** | 1-2**-3-4**-6 |
|  | **SOUNDG** | 1-3-4-**5-**8-9**-10-11** |
|  | **SWPARE** | **1-3-4-5-8-9-10-11** [**quality of vertical measurement** is not a valid attribute for **Swept Area**] |
|  | **TWRTPT** | 1-2-3-4**-6** |
|  |  |  |
| RESTRN |  | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27**-39** |
|  | **ACHARE** | 2-3-4-5-6-8-9-10-11-12-13-15-16-17-18-19-20-21-23-24-27**-39** |
|  | **CBLARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13**-14**-16-17-18**-19**-20**-21-22**-23-24-25-27**-39** |
|  | **DRGARE** | 1-2-3-4-5-6**-7**-8-11-12-13-16-17-18-19-20-21**-22**-23-25-27**-39** |
|  | **DMPGRD** | 1-2-3-4-5-6-7-8-9-10-11-12-13**-16**-17-18-19-20-21-22-23-24-25-27 |
|  | **FAIRWY** | 1-2-3-4-5-6-8-9-10-11-12-13-15-16-17-18-19-20-21-22-23-24-25-27**-39** |
|  | **ICNARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13-16-17-18-19-20-21-22-23-24-25**-26**-27**-39** |
|  | **ISTZNE** | 1-2-3-4-5-6-8-9-10-11-12-13**-16-17**-18-19-20-21-22-23-24-25-27 |
|  | **MARCUL** | 1-2-3-4-5-6**-7**-8-9-10-11-12-13**-14**-15-16-17-18-19-20-21-22-23-24-25-27 |
|  | **MIPARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13-15-16-17-18-19-20-21-22-23-24-25**-26**-27**-39** |
|  | **NEWOBJ** | **1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27** [**restriction** is not a valid attribute for **Virtual AIS Aid to Navigation**] |
|  | **OSPARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13**-14**-15-16-17-18-19-20-21-22-23-24-25**-26**-27**-39** |
|  | **PIPARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13**-14**-15-16-17-18-19-20-21-22-23-24-25**-26-27-39** |
|  | **PRCARE** | 1-2-3-4-5-6-8-9-10-11-12**-13-14**-16-17-18-19-20-21-22-23-24-25-27 |
|  | **RESARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27**-39** |
|  | **SPLARE** | 1-2-3-4-5-6-7-8-9-10-11-12-13-15-16-17-18-19-20-21-22-23-24-25-27**-39** |
|  | **TESARE** | **1-**2**-3**-4**-5**-6**-7**-8-9-10**-11**-12**-13-16**-17-18-19-20-21-22-23-24**-25-26**-27 |
|  |  |  |
| SIGGEN |  | 1-2-3-4**-5-6** |
|  |  |  |
| STATUS |  | 1-2-3-4-5-6-7-8-9-11-12-13-14-15-16-17-18**-28** |
|  | **AIRARE** | 1-2-4-5-6-7-8-12-14**-16-17** |
|  | **BERTHS** | 1-2**-3**-5**-6**-7**-8**-9-12**-14** |
|  | **BUISGL** | **1-**4**-6**-7-8-12-13-14**-16-17** |
|  | **CBLOHD** | 1-4-5-7-12**-28** |
|  | **CBLSUB** | 1-4-13**-18** |
|  | **CAUSWY** | 1**-7**-8-12-14 |
|  | **CHKPNT** | 1-2-5-7-9-12**-16-17** |
|  | **CONZNE** | **1** [**status** is not a valid attribute for **Contiguous Zone**] |
|  | **CONVYR** | **1-**4**-6**-12 |
|  | **DWRTPT** | 1-3-6-9**-28** |
|  | **FAIRWY** | 1-3-6-7-9**-28** |
|  | **FNCLNE** | 1**-7**-12**-13** |
|  | **FERYRT** | 1-2-4-5-6-7-8-9**-14** |
|  | **FSHFAC** | 1-4-5-6-7-8-12**-16-17-18-28** |
|  | **FSHGRD** | 1-5-6-7-8-14-16-17**-28** |
|  | **GRIDRN** | 1-4-6-8-14**-16-17-28** |
|  | **HRBARE** | 1-4-6-8-14**-16-17** |
|  | **ICEARE** | 1**-2**-5**-16-17-18** |
|  | **ICNARE** | **1-2-5-6-7-16-17** [No equivalent feature in S-101] |
|  | **LNDARE** | **6-7-8-12-14-16-17-**18 |
|  | **LNDMRK** | 1-2-4-5-7-8-12-13-14**-16-17** |
|  | **LOGPON** | 1-2**-4**-5-6-7-8 |
|  | **MARCUL** | 1-2-4-5-6-7-8-14-16-17**-28** |
|  | **MORFAC** | 1-2-3-4-5-6-7-8**-9**-12-14-18 |
|  | **NEWOBJ** | 1**-2-3-4**-5**-6**-7**-8-9-11-12-13-14-15-16-17-18** [Converts to **status** for new feature **Virtual AIS Aid to Navigation**] |
|  | **OBSTRN** | 1-4-5-7-8-13-18**-28** |
|  | **OFSPLF** | 1-2-4-7-8-12**-16-17-28** |
|  | **OSPARE** | 1-4-7-8-12**-28** |
|  | **OILBAR** | 1-2-4**-5**-7-8 |
|  | **PILBOP** | 1-2**-3**-5-6-9-16-17**-28** |
|  | **PRCARE** | 1-9**-28** |
|  | **PRDARE** | **1-**4**-8-12** |
|  | **RADLNE** | 1-2**-3**-4-7 |
|  | **RAILWY** | 1-4-6-12**-13-14** |
|  | **RECTRC** | 1-2-5**-6-7-8**-9**-12-14-16-17** |
|  | **RESARE** | 1-2-3-4-5-6-7-9-18**-28** |
|  | **RIVERS** | **1-2-**5**-8-14** |
|  | **ROADWY** | 1**-2**-4-6**-7**-8-12**-13**-14 |
|  | **RUNWAY** | 1-2-4-5-6**-7**-8-12-14 |
|  | **SLCONS** | 1-2-3-4-6-7-8**-9**-12**-13**-14**-16-17-28** |
|  | **SILTNK** | **1-**4-12**-13** |
|  | **TS\_PRH** | **1-2-5-7-18** [No equivalent feature in S-101] |
|  | **TS\_PNH** | **1-2-5-7-18** [No equivalent feature in S-101] |
|  | **TS\_TIS** | **1-2-5-7-18** [No equivalent feature in S-101] |
|  | **T\_HMON** | **5** [No equivalent feature in S-101] |
|  | **T\_NHMN** | **5** [No equivalent feature in S-101] |
|  | **T\_TIMS** | **5** [No equivalent feature in S-101] |
|  | **TOPMAR** | **1-5-7-8-12-14** [**status** is not a valid sub-attribute for complex attribute **topmark**] |
|  | **TSELNE** | 1-3-9**-28** |
|  | **TSSBND** | 1-3-9**-28** |
|  | **TSSLPT** | 1-3-6-9**-28** |
|  | **TSEZNE** | 1-3-9**-28** |
|  | **TUNNEL** | 1-3-4-6-8-14**-16-17** |
|  | **UWTROC** | **13-**18 |
|  |  |  |
| SURTYP |  | 1-2-4-5-6**-7-8-9-10-11-12-13** |
|  |  |  |
| TECSOU |  | 1-2-3-4-5-6-**7**-8-9-10-11-12-13**-14-15-16-17** [Value 7 converts to new value 15. Value 14 is not valid for **technique of vertical measurement** in S-101] |
|  | **DWRTCL** | 1**-2**-3**-5**-6**-7**-8-9**-11**-13**-15-16-17** |
|  | **DWRTPT** | 1**-2**-3**-5**-6**-7**-8-9**-11**-13**-15-16-17** |
|  | **DRGARE** | 1-2-3-6**-7**-8-9-11-13**-15-16-17** |
|  | **OBSTRN** | 1-2-3-4-5-6**-7**-8-9-10-11-12-13**-15-16-17** |
|  | **RCRTCL** | 1**-2**-3-6**-7**-8-9**-11**-13**-15-16-17** |
|  | **RECTRC** | 1-2-3-6**-7**-8-9**-11**-13**-15-16-17** |
|  | **SOUNDG** | 1-2-3**-4-5**-6-**7**-8-9**-10-11-12**-13**-14-15-16-17** |
|  | **SWPARE** | **6-8-13** [**technique of vertical measurement** is not a valid attribute for **Swept Area**] |
|  | **TWRTPT** | 1**-2**-3**-5**-6**-7**-8-9**-10-11**-13**-15-16-17** |
|  | **UWTROC** | 1-2-3-4-5-6**-7**-8-9-10-11-12-13**-15-16-17** |
|  | **WRECKS** | 1-2-3-4-5-6**-7**-8-9-10-11-12-13**-15-16-17** |
|  | **M\_QUAL** | **1-2-3-4-5-6-7-8-9-10-11-12-13-14** [Converts to **technique of vertical measurement** for feature **Quality of Survey**] |
|  |  |  |
| T\_ACWL |  | [No equivalent attribute in S-101] |
|  |  |  |
| T\_MTOD |  | [No equivalent attribute in S-101] |
|  |  |  |
| TOPSHP |  | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33 [Converts to sub-attribute **topmark shape** on new complex attribute **topmark**] |
|  |  |  |
| VERDAT |  | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-**44** |
|  | **BRIDGE** | 3-16-17-18-19-20-21-24-25-26-28-29-30 [Converts to **vertical datum** on new features **Span Fixed** or **Span Opening**] |
|  | **M\_SDAT** | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-19-22-23-24-25-26-27**-44** |
|  |  |  |
| WATLEV |  | 1-2-3-4-5-6-7 |
|  | **GRIDRN** | 1**-2-3**-4-5 |
|  | **LNDRGN** | 1**-2-4**-6 |
|  | **MORFAC** | 1-2-3-4-5-6**-7** |
|  | **NEWOBJ** | **1-2-3-4-5-6-7** [**water level effect** is not a valid attribute for **Virtual AIS Aid to Navigation**] |
|  |  |  |
| HORDAT |  | [No equivalent attribute in S-101] |
|  |  |  |
| QUAPOS |  | **1-2-3-**4-5**-6-7-8-9-10-11** |
|  |  | *Table A.2* |

1. Enhanced S-101 encoding

Table A.3 below provides a summary of additional manual encoding that may be considered for converted S-101 ENC datasets post-conversion in order to produce “full capability” S-101 ENCs. However, for new enumerate values introduced in S-101, see Table A.2 above.

NOTE: The additional encoding summarised below is not a requirement in order to produce “S-57 equivalent” S-101 datasets.

| **S-101 Feature** | **S-57 Object** | **Remarks** |
| --- | --- | --- |
|  |  |  |
| **Archipelagic Sea Lane** |  | New S-101 Feature type. See clause 10.5.3 and S-101 DCEG clause 15.27. |
| **Berth** | **BERTHS** | New S-101 attributes **horizontal clearance length**, **horizontal clearance width** and **maximum permitted draught**. See clause 4.6.2 and S-101 DCEG clause 8.13. |
| **Bridge** | **BRIDGE** | Attributes **height** and **status** added. See S-101 DCEG clause 6.5. See also new S-101 features **Span Fixed** and **Span Opening** (clause 4.8.10 and S-101 DCEG clauses 6.6 and 6.7) |
| **Building** | **BUISGL** | Attributes **vertical clearance fixed** (VERCLR) and **vertical datum** (VERDAT) added; new S-101 attribute **multiplicity of features**. See S-101 DCEG clause 6.2. |
| **Cable Overhead** | **CBLOHD** | New S-101 attribute **multiplicity of features**. See S-101 DCEG clause 6.9. |
| **Canal** | **CANALS** | Attribute **horizontal width** (HORWID) added. See S-101 DCEG clause 8.8. |
| **Cargo Transhipment Area** | **CTSARE** | Attribute **restriction** (RESTRN) added. See S-101 DCEG clause 16.9. |
| **Caution Area** | **CTNARE** | Attributes **condition** (CONDTN) and **status** (STATUS) added. See S-101 DCEG clause 16.10. |
| **Coast Guard Station** | **CGUSTA** | New allowable geometric primitive Surface. Attribute **communication channel** (COMCHA) added. See S-101 DCEG clause 22.3. |
| **Coastline** | **COALNE** | Attribute **nature of surface** (NATSUR) added. See clause 4.5.1 and S-101 DCEG clause 5.3. |
| **Collision Regulations Limit** |  | New S-101 Feature type. See clause 11.13.5 and S-101 DCEG clause 16.9. |
| **Crane** | **CRANES** | New allowable geometric primitive Surface. |
| **Current – Non-Gravitational** | **CURENT** | New allowable geometric primitives Curve and Surface. |
| **Dam** | **DAMCON** | Attributes **status** (STATUS) and **water level effect** (WATLEV) added. See S-101 DCEG clause 8.11. |
| **Data Coverage** | **M\_COVR** | New S-101 attribute **minimum display scale**. See clause 2.2.6 and S-101 DCEG clause 3.4. |
| **Deep Water Route** |  | New S-101 Feature type. See clause 10.2.1.8 and S-101 DCEG clause 15.17. |
| **Deep Water Route Centreline** | **DWRTPT** | New S-101 attribute **IMO adopted**. See clause 10.2.2.2 and S-101 DCEG clause 15.13. |
| **Deep Water Route Part** | **DWRTPT** | New S-101 attribute **IMO adopted**. See clause 10.2.2.1 and S-101 DCEG clause 15.14. |
| **Discoloured Water** |  | New S-101 Feature type. See clause 6.5 and S-101 DCEG clause 13.8. |
| **Dock Area** | **DOCARE** | New S-101 attributes **horizontal clearance length**, **horizontal clearance width** and **maximum permitted draught**. See clause 4.6.6.3 and S-101 DCEG clause 8.18. |
| **Dredged Area** | **DRGARE** | New S-101 attribute **maximum permitted draught**. See S-101 DCEG clause 5.5. |
| **Dry Dock** | **DRYDOC** | New S-101 attributes **horizontal clearance length**, **horizontal clearance width** and **maximum permitted draught**. See clause 4.6.6.1 and S-101 DCEG clause 8.15. |
| **Dumping Ground** | **DMPGRD** | New S-101 attribute **date disused**. See S-101 DCEG clause 16.6. |
| **Dyke** | **DYKCON** | Attribute **visual prominence** (CONVIS) added. See S-101 DCEG clause 8.5. |
| **Fairway** | **FAIRWY** | New S-101 attribute **maximum permitted draught**. See S-101 DCEG clause 10.4. |
| **Fairway System** |  | New S-101 Feature type. See clause 10.4 and S-101 DCEG clause 15.8. |
| **Fishing Facility** | **FSHFAC** | Attribute **condition** (CONDTN) added. See S-101 DCEG clause 13.9. |
| **Fishing Ground** | **FSHGRD** | Attribute **restriction** (RESTRN) added. See S-101 DCEG clause 16.17. |
| **Floating Dock** | **FLODOC** | New allowable geometric primitive Point. New S-101 attributes **horizontal clearance length**, **horizontal clearance width** and **maximum permitted draught**. See clause 4.6.6.2 and S-101 DCEG clause 8.16. |
| **Fortified Structure** | **FORSTC** | Attribute **status** (STATUS) added. See S-101 DCEG clause 7.5. |
| **Harbour Facility** | **HRBFAC** | Attributes **product** (PRODCT) and **restriction** (RESTRN) added. See S-101 DCEG clause 22.7. |
| **Information Area** |  | New S-101 Feature type. See clause 2.5 and S-101 DCEG clause 16.11. |
| **Lake Area** | **LAKARE** | Attribute **status** (STATUS) added. See S-101 DCEG clause 5.10. |
| **Land Region** | **LNDRGN** | New allowable geometric primitive Curve. |
| **Landmark** | **LNDMRK** | New S-101 attribute **multiplicity of features**. See S-101 DCEG clause 7.2. See also new S-101 feature **Wind Turbine** (see clause 4.8.15 and DCEG clause 7.4). |
| **Light All Around** | **LIGHTS** | Attribute **signal generation** (SIGGEN) added. See S-101 DCEG clause 19.2. |
| **Light Sectored** | **LIGHTS** | Attribute **signal generation** (SIGGEN) added; New S-101 attribute **sector line length**. See clause 12.8.6.1 and S-101 DCEG clause 19.3. |
| **Local Magnetic Anomaly** | **LOCMAG** | New S-101 attribute **magnetic anomaly value minimum**. See S-101 DCEG clause 4.2. |
| **Log Pond** | **LOGPON** | Complex attribute **periodic date range** (PEREND/PERSTA) added. See S-101 DCEG clause 16.20. |
| **Marine Pollution Regulations Area** |  | New S-101 Feature type. See clause 11.16 and S-101 DCEG clause 16.27. |
| **Mooring Trot** |  | New S-101 Feature type. See clause 9.2.5 and S-101 DCEG clause 8.21. |
| **Mooring/Warping Facility** | **MORFAC** | Attribute **quality of vertical measurement** (QUASOU) added. See S-101 DCEG clause 8.14. |
| **Nautical Information** |  | New S-101 Feature type. See clause 2.4 and S-101 DCEG clause 24.4. |
| **Obstruction** | **OBSTRN** | New S-101 mandatory attribute **display uncertainties**; new S-101 attribute **maximum permitted draught**. See clause 6.2.1 and S-101 DCEG clause 13.5. |
| **Offshore Platform** | **OFSPLF** | Attribute **water level effect** (WATLEV) added. See S-101 DCEG clause 14.1. |
| **Pile** | **PILPNT** | New allowable geometric primitives Curve and Surface. Attribute **status** (STATUS) added. See S-101 DCEG clause 8.4. |
| **Pilot Boarding Place** | **PILBOP** | New S-101 attributes **category of preference**, **destination** and **pilot movement**. See S-101 DCEG clause 13.1.2. |
| **Pilotage District** |  | New S-101 Feature type. See clause 13.1.2 and S-101 DCEG clause 22.1. |
| **Pipeline Overhead** | **PIPOHD** | New S-101 attribute **multiplicity of features**. See S-101 DCEG clause 6.10. |
| **Pipeline Submarine/On Land** | **PIPSOL** | New S-101 attribute **multiplicity of features**. See S-101 DCEG clause 14.4. |
| **Pontoon** | **PONTON** | New allowable geometric primitive Point. |
| **Pylon/Bridge Support** | **PYLONS** | Attribute **status** (STATUS) added. See S-101 DCEG clause 6.11. |
| **Quality of Bathymetric Data** | **M\_QUAL** | New S-101 attributes **category of temporal variation**, **data assessment**, **feature detection** (complex) and **full seafloor coverage achieved**; attribute **technique of vertical measurement** (TECSOU) prohibited; attribute **survey date end** (SUREND) mandatory; capability to encode degrading quality over time; capability to encode overlapping features in accordance with varying quality of bathymetric data in the water column. See clause 2.2.3.1 and S-101 DCEG clause 3.7. |
| **Quality of Non-Bathymetric Data** | **M\_ACCY** | Attributes **horizontal position uncertainty** (HORACC), **survey date range** (SUREND, SURSTA) and **vertical uncertainty**/**uncertainty fixed** (VERACC) added; new S-101 attributes **category of temporal variation** and **orientation uncertainty**. See S-101 DCEG clause 3.3. |
| **Quality of Survey** | **M\_SREL** | Attribute **technique of vertical measurement** (TECSOU) added; new S-101 attributes **features detected** (complex), **full seafloor coverage achieved**, **measurement distance maximum** and **measurement distance minimum**. See clause 2.2.3.2 and S-101 DCEG clause 3.10. |
| **Radar Reflector** | **RADRFL** | Complex attributes **fixed date range** (DATEND/DATSTA) and **periodic date range** (PEREND/PERSTA) added. See S-101 DCEG clause 20.17. |
| **Radar Station** | **RADSTA** | Attribute **call sign** (CALSGN) added. See S-101 DCEG clause 15.32. |
| **Radio Station** | **RDOSTA** | New S-101 attribute **frequency shore station receives**. See clause 12.9 and S-101 DCEG clause 21.4. |
| **Range System** |  | New S-101 Feature type. See clause 10.1.2 and S-101 DCEG clause 15.6. |
| **Rescue Station** | **CGUSTA** | New allowable geometric primitive Surface. Attribute **communication channel** (COMCHA) added. See S-101 DCEG clause 22.6. |
| **Restricted Area Navigational** | **RESARE** | New S-101 attribute **vessel speed limit**. See clause 11.1 and S-101 DCEG clause 17.8. |
| **Seabed Area** | **SBDARE** | New S-101 attribute **underlying layer**. See S-101 DCEG clause 12.1. |
| **Seagrass** |  | New S-101 Feature type. See clause 7.2.2 and S-101 DCEG clause 12.3. |
| **Signal Station Traffic** | **SISTAT** | New allowable geometric primitive Surface. |
| **Signal Station Warning** | **SISTAW** | New allowable geometric primitive Surface. |
| **Silo/Tank** | **SILTNK** | New S-101 attribute **multiplicity of features**. See S-101 DCEG clause 7.3. |
| **Sounding** | **SOUNDG** | New S-101 mandatory attribute **display uncertainties**. See clause 5.3 and S-101 DCEG clause 11.3. See also new S-101 feature **Depth – No Bottom Found** (see clause 5.3 and S-101 DCEG clause 11.8). |
| **Submarine Transit Lane** | **SUBTLN** | Attribute **nationality** (NATION) added. See S-101 DCEG clause 16.24. |
| **Traffic Separation Scheme** |  | New S-101 Feature type. See clause 10.2.3 and S-101 DCEG clause 15.24. |
| **Tunnel** | **TUNNEL** | Attribute **vertical datum** (VERDAT) added. See S-101 DCEG clause 6.15. |
| **Two-Way Route** |  | New S-101 Feature type. See clause 10.2.6 and S-101 DCEG clause 15.11. |
| **Underwater/Awash Rock** | **UWTROC** | New S-101 mandatory attribute **display uncertainties**. See clause 6.1.2 and S-101 DCEG clause 13.4. |
| **Update Information** |  | New S-101 Meta feature type. See S-101 DCEG clause 3.11. |
| **Vessel Traffic Service** |  | New S-101 Feature type. See clause 12.13 and S-101 DCEG clause 22.2. |
| **Wreck** | **WRECKS** | New S-101 mandatory attribute **display uncertainties**. See clause 6.2.1 and S-101 DCEG clause 13.5. |
|  |  | *Table A.3* |

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