S-65

Annex B

S-57 ENC to S-101 Conversion Guidance

Edition 2.0.1 – October 2026

[Aligned with S-101 Edition 2.0.0]

IHO

International Hydrographic Organization

Published by the
International Hydrographic Organization
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Document Control

Version	Version Type	Date	Approved By	Signed Off By	Role
0.0.1	Initial Draft	Apr 2021		J. Wootton	Editor
0.0.2	Draft for ENCWG	Mar 2022	S-57 to S-101 Conversion Sub-Group	C. Mouden; J. Pritchard	Sub-Group Co-Leads
1.0.0	Initial version for HSSC approval	Mar 2022	ENCWG	T. Mellor	ENCWG Chair
1.0.0	Initial published version for evaluation and testing	May 2022	HSSC	T. Mellor	ENCWG Chair
1.1.0	Revision to align with S-101 Edition 1.1.0	Aug 2023	ENCWG	T. Mellor	ENCWG Chair
1.2.0	Revision to align with S-101 Edition 1.2.0	Apr 2024	ENCWG	T. Mellor	ENCWG Chair
2.0.0	First operational Edition, aligned to S-101 Edition 2.0.0	Oct 2025	IHO CL 41/2025	T. Mellor	ENCWG Chair
2.0.1	Clarification to align with S-101 Edition 2.0.0	Oct 2026	ENCWG	K. Östergren	ENCWG Chair

Summary of Substantive Changes in Edition 2.0.0

Change Summary	Clauses Effected
Corrected guidance for conversion of S-57 feature **M_QUAL** covering unsurveyed areas to have S-101 attribute **category of temporal variation** on **Quality of Bathymetric Data** populated with value *6* (unassessed).	2.2.3.1
Improved guidance for conversion to S-101 complex attribute **multiplicity of features**.	2.7, A-3
Clarified that an encoded S-57 **TOPMAR** object associated with a **MORFAC** object (when converting to S-101 feature **Mooring Buoy**) will convert to the S-101 Feature **Daymark**.	4.6.7.1, A-1
Clarified that an encoded S-57 **TOPMAR** object associated with a **PILPNT** object will convert to the S-101 Feature **Daymark**.	4.6.7.2, 12.6, A-1
Corrected guidance to indicate that encoding of periodicity is encoded using the complex attribute **periodic date range**.	4.6.7.3
Add new guidance related to conversion of attributes INFORM and TXTDSC for bridges.	4.8.10, A-1
Added cross-reference to guidance on the conversion of a single encoded S-57 object instance representing multiple real-world features.	4.8.11, 4.8.15, 4.8.18, 11.5.2, 11,6,1, 11.6.3
Added new guidance and example for the conversion of multiple seabed characteristics, including mixed natures of surface and underlying layers, indicated by the encoding of the S-57 formatted attributes NATSUR and NATQUA.	7.1, A-1

Clarified that the S-101 attribute **vessel class** is included as a sub-attribute of the complex attribute **vessel speed limit**. Added missing S-101 Feature types to the list of features that **vessel speed limit** is bound to.	9.1.2
Clarified that S-57 attribute CATREA value *26* (water skiing area) will convert to S-101 attribute **category of restricted area** value *32* (recreation area).	11.1
Corrected guidance to add that S-57 attribute CATCBL value *5* (telegraph) will be converted to S-101 attribute **category of cable** value *10* (telecommunications).	11.5.1, 11.5.3, A-1, A-2
Added S-101 attributes **marks navigational – system of** and **nature of construction** as attributes having allowable values in S-57 that are not allowed in S-101 for S-101 feature **Emergency Wreck Marking Buoy**.	12.4.1.1, A-1
Corrected guidance such that an encoded S-57 **TOPMAR** object associated with a **LITVES** object will convert to the S-101 feature **Daymark**.	12.4.2, 12.6, A-1
Added new guidance for conversion of S-57 attribute SIGGRP for **FOGSIG** and **RTPBCN** to account for erroneous assignment of multiplicity [0..1] to S-101 attribute **signal group** on features **Fog Signal** and **Radar Transponder Beacon**.	12.5, 12.10
Added new guidance for conversion of sets of light sectors used for different range systems defined using multiple instances of the S-57 Collection object **C_AGGR**.	12.8.6.1
Enhanced guidance for the conversion of the S-57 attribute COMCHA.	12.9, 12.11.1, 12.11.3, 12.13, 13.1.2, 13.4
Added S-57 attributes PEREND and PERSTA as attributes that will not be converted when **BOYSPP** is converted to S-101 feature **Emergency Wreck Marking Buoy**.	A-1
Added the requirement for a standardised text string in INFORM for the conversion of an indication of multiplicity of features for S-57 Object classes **BUISGL**, **CBLOHD**, **CONVYR**, **LNDMRK**, **PIPOHD**, **PIPSOL**, **PYLONS**, **SILTNK**	A-1
Corrected Table A-3 to add S-101 feature **Depth – No Bottom Found** as new feature included in S-101.	A-3
Removed reference to complex attribute **periodic date range** being added as a new allowable attribute for feature **Floating Dock** in S-101.	A-3
Corrected Table A-3 to add S-101 feature **Foul Ground** as new feature included in S-101.	A-3
Corrected Table A-3 to add S-101 feature **Physical AIS Aid to Navigation** as new feature included in S-101.	A-3
Corrected Table A-3 to add S-101 features **Span Fixed** and **Span Opening** as new features included in S-101.	A-3

1 Introduction

1.1 General

The following clauses specify the conventions that are recommended for preparing and finalising S-57 ENC datasets for conversion to S-101 Edition 2.0.0 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 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, thus requiring 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, such 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.**

Because of the differences between the S-57 and S-101 data models, there are instances where an S-57 Object class, attribute or enumerate value will not be converted to S-101 during the automated conversion process due to an equivalent concept not being included in S-101. These instances are identified individually throughout this document in the relevant S-57 Object class-specific clauses, along with any recommendations for pre- and post-conversion encoding. Conversely, there have been enhancements made in the S-101 data model that have no equivalency in S-57 and therefore cannot be implemented as part of the automated S-57 to S-101 conversion process. This document does not provide guidance as to how these enhancements may be manually implemented post-conversion, however references to these enhancements and the recommended encoding guidance included in S-101 Annex A – *Data Classification and Encoding Guide*, is included in Appendix A-3 to this document. Data Producers should also note that conversion tools may be customised so as to adapt to their specific data encoding policies and practices (for example, variations in national spelling conventions and conventions for the encoding of specific text strings in the attribute INFORM). Where such customisation has been implemented, Data Producers should take this into account when implementing the guidance included in this document.

Appendix A 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 possible pre- or post-conversion work that may be required. This Table provides a quick reference for Data Producers to indicate, by S-57 Object class, where pre-or post-conversion manual Data Producer 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 enumeration type attributes as applicable for the binding Object/Feature. The “Allowable Attribute Values” for S-57 enumeration 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 type in regard to geometric primitives and attributes; and new features included in S-101 for which there is no S-57 equivalent. 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.

1.2 Presentation of the document

The following conventions are used:

- Presentation conventions:

S-57 Object class:	**WRECKS**
S-101 Feature type:	**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 type(s) 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 enumeration type attributes by Feature type 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 IHO Publication 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 Appendix 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-101 ENC; or is not relevant in relation to the conversion of S-57 base datasets.

1.3 Use of language

Within this document:

> "Must" indicates a mandatory requirement in order to for Data Producers to meet the requirements of the S-101 DCEG or S-101 Feature Catalogue constraints. It must be noted that where a requirement is for a particular text string to be encoded (for example, using the S-57 attribute INFORM) minor national variations in spelling may be accounted for in conversion software.
>
> "Should" indicates an optional requirement, that is the recommended process to be followed by Data Producers (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.

The above terms relate to the requirements for the preparation of S-57 data and post-conversion requirements so as to create S-101 datasets that satisfy SOLAS requirements for the S-101 data to be at least the equivalent of S-57 data.

> "Will" indicates an expected outcome of the automated conversion process. However, it must be noted that S-57 to S-101 automated conversion results may differ between conversion software manufacturers; and Producing Authorities may utilise additional functionality within conversion applications (if available) to enhance conversion output.

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 indicates that a decision has been made during the development of S-101 that this information is not required in ENC.

1.4 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.

1.4.1 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.

1.4.2 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.

1.4.3 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 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.

1.4.4 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.

1.4.4.1 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.

1.4.4.2 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.

1.4.4.3 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.

2 General rules

2.1 Cartographic framework

2.1.1 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 in the “CRS Name” [CRNM] subfield of the “Coordinate Reference System Header field” [CRSH] 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 type in S-101 for the S-57 Meta Object **M_HOPA**. It is considered that this information is not required for S-101. Data Producers should consider removing instances of **M_HOPA** from their S-57 data for consistency.

2.1.2 Vertical datum

The default vertical datum for the entire dataset encoded in the “Vertical Datum” [VDAT] subfield of the “Data Set Parameter” [DSPM] field for the S-57 dataset will be included in an instance of the S-101 Meta Feature **Vertical Datum of Data**.

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
13 [1]	Low water
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 VDAT subfield and VERDAT attribute are prohibited for vertical datum in S-101. Data Producers 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 reviewed (if relevant) as a consequence of a modification of the vertical datum.

S-57 Meta Object: Vertical datum (**M_VDAT**) (A)

S-101 Meta Feature: **Vertical Datum of Data** (S) (S-101 DCEG Clause 3.10)

Conversion of these features can be automated only if the value populated for VDAT and 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

[1] Value *13* (low water) for VDAT and attribute VERDAT is not included as a value in table 2-1 of the S-57 UOC. It is only used for some enclosed (inland) waterways; and must not be used for tidal waters.

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 converted automatically:

BRIDGE CBLOHD CONVYR CRANES GATCON LIGHTS PIPOHD

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

- As stated above, an instance of **Vertical Datum of Data** covering the entire area of data coverage for the dataset is created during the automated conversion process to indicate the default vertical datum for the dataset, having the mandatory attribute **vertical datum** populated with the value populated for the VDAT subfield of the S-57 dataset. Where an area of the S-57 dataset is additionally covered by one or more **M_VDAT** Meta Objects, the default **Vertical Datum of Data** will be "cookie cut" to exclude the area(s) of the **M_VDAT**, which will be automatically converted to instance(s) of **Vertical Datum of Data** having **vertical datum** populated with the value populated for the S-57 attribute VERDAT.
- The S-101 attribute **vertical datum** includes the new enumerate value *44* (Baltic Sea chart datum 2000). This information is encoded in S-57 on **M_VDAT** 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 **M_VDAT** should be in a standardised format, such as *Baltic Sea chart datum 2000*.

2.1.3 Sounding datum

The default sounding datum for the entire area of the dataset covered by **M_QUAL** Meta Objects encoded in the "Sounding Datum" [SDAT] subfield of the "Data Set Parameter" [DSPM] field for the S-57 dataset will be populated in the "Datum Identifier" [DTID] subfield of the "Vertical Datum" [VDAT] field for the S-101 dataset; and included in an instance of the S-101 Meta feature **Sounding Datum**.

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

ID	Meaning
27	Lower low water large tide

Table 2-2

All other values in the S-57 SDAT subfield and 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)

S-101 Meta Feature: **Sounding Datum** (S) (S-101 DCEG Clause 3.9)

Conversion of these features is automated only if the value populated for VERDAT is in accordance with Table 2-2 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.

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

- As stated above, an instance of **Sounding Datum** covering the entire area of coverage of **Quality of Bathymetric Data** for the dataset is created during the automated conversion process to indicate the default sounding datum for the dataset, having the mandatory attribute **vertical datum** populated with the value populated for the SDAT subfield of the S-57 dataset. Where an area of the S-57 dataset is additionally covered by one or more **M_SDAT** Meta Objects, the default **Sounding Datum** will be "cookie cut" to exclude the area(s) of the **M_SDAT**, which will be automatically converted to instance(s) of **Sounding Datum** having **vertical datum** populated with the value populated for the S-57 attribute VERDAT.
- The S-101 attribute **vertical datum** includes the new enumerate value *44* (Baltic Sea chart datum 2000). This information is encoded in S-57 on **M_SDAT** 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 **M_SDAT** should be in a standardised format, such as *Baltic Sea chart datum 2000*.

2.1.4 Units

Not applicable.

2.1.5 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 **dredged date**, **reported date** and **swept date** (see S-101 DCEG clause 2.4.8). Unless otherwise stated against an individual Object class within this document, all encoded dates will be converted to the appropriate S-101 attribute automatically on conversion. This includes the mandatory S-101 requirement to include the dashes (-) to indicate that the day and/or month are not needed, which are not required in S-57 ENCs.

Data Producers should consider interrogating their S-57 data holdings and deleting any objects where the date indicated by the attribute DATEND means that the object is time expired (that is, the date in DATEND is earlier than the date of conversion).

S-101 Information type: **Non-Standard Working Day** (N) (S-101 DCEG Clause 24.3)

2.1.5.1 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 converted to the S-101 attribute **status** on conversion. See also Appendix A, Table A-2.

Unless otherwise stated against an individual Object class within this document, all instances of encoding of the attributes PERSTA and PEREND will be converted to 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.

2.1.6 Times

Not applicable.

S-101 Information type: **Service Hours** (N) (S-101 DCEG Clause 24.2)

2.1.7 Cells

In S-57, the recommended coordinate multiplication factor for latitude and longitude coordinates is *10000000* (10^7). This has been mandated in S-101. The value in the Coordinate Multiplication Factor [COMF] subfield of the Data Set Parameter [DSPM] field in S-57 will be populated in 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.

2.1.8 Seamless ENC coverage

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

The rules regarding ENC data overlaps are now described in terms of the optimum display scale for the data and the new S-101 attribute **drawing index** rather than Navigational Purpose, and are out of scope for this document. See S-101 DCEG clause 2.5.5 and S-101 Main document clause 4.5.3.

2.1.8.1 Feature Object Identifiers

The value for Feature Object Identifiers (FOIDs) may be retained for all S-57 objects during conversion to S-101 features where a one-to-one Object/Feature relationship exists, if it is considered that this may aid in data management. The encoding guidance for assigning FOIDs to representations of real-world features (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) remains unchanged in S-101.

2.1.8.2 180° Meridian of Longitude

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

2.2 Data quality description

2.2.1 Production information

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

2.2.2 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) may be automatically reset in the corresponding S-101 file, ISO 8211 and Dataset Discovery Metadata fields, to reflect the release of a new S-101 dataset during the automated conversion process. The population of this information is at the discretion of the Data Producer, noting that there is no requirement for this information to be aligned between S-57 ENCs and the corresponding S-101 ENCs in ECDIS.

2.2.3 Quality, reliability and accuracy of bathymetric data

S-101 Information type: **Spatial Quality** (N) (S-101 DCEG Clause 24.5)

Instances of encoding of attributes QUAPOS or POSACC on the S-57 spatial Objects will be converted to an instance of the S-101 Information type **Spatial Quality** (see DCEG clause 24.5), attribute **quality of horizontal measurement** (for QUAPOS) or complex attribute **spatial accuracy**, sub-attribute **horizontal position uncertainty**/**uncertainty fixed** (for POSACC), during the automated conversion process. The **Spatial Quality** instance will be associated to the geometry of the relevant Geo feature(s) using the association **Spatial Association**.

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

quality of horizontal measurement (QUAPOS)

During the automated conversion process, the following spatial Object/QUAPOS encoding instances will be converted to the corresponding **Spatial Quality**/**quality of horizontal measurement** instances.

QUAPOS = *1* (surveyed) -> will not be converted
QUAPOS = *2* (unsurveyed) -> will not be converted
QUAPOS = *3* (inadequately surveyed) -> **quality of horizontal measurement** = *4* (approximate)
QUAPOS = *4* (approximate) -> **quality of horizontal measurement** = *4* (approximate)
QUAPOS = *5* (position doubtful) -> **quality of horizontal measurement** = *4* (approximate)
QUAPOS = *6* (unreliable) -> **quality of horizontal measurement** = *4* (approximate)
QUAPOS = *7* (reported (not surveyed)) -> **quality of horizontal measurement** = *4* (approximate)
QUAPOS = *8* (reported (not confirmed)) -> **quality of horizontal measurement** = *4* (approximate)
QUAPOS = *9* (estimated) -> **quality of horizontal measurement** = *4* (approximate)
QUAPOS = *10* (precisely known) -> will not be converted
QUAPOS = *11* (calculated) -> **quality of horizontal measurement** = *4* (approximate)

Data Producers will be required to ensure that, when S-57 datasets are converted across to S-101, the **quality of horizontal measurement** values included in the dataset are as intended.

2.2.3.1 Quality of bathymetric data

S-57 Meta Object:	Quality of data (**M_QUAL**)	(A)	
S-101 Meta Feature:	**Quality of Bathymetric Data**	(S)	(S-101 DCEG Clause 3.8)
S-101 Information type:	**Spatial Quality**	(N)	(S-101 DCEG Clause 24.5)
S-101 Association:	**Quality of Bathymetric Data Composition**	(N)	(S-101 DCEG Clause 25.12)

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. For an indication of optional enhanced encoding available in S-101, see Appendix A, Table A-3.

Category of Zone of Confidence in Data: During the automated conversion process, the value populated in the S-57 attribute CATZOC will be converted 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) and **full seafloor coverage achieved**; and **horizontal position uncertainty** (complex attribute) and **vertical uncertainty** (complex attribute) on an associated **Spatial Quality** Information type (see clause 2.2.3). 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 than 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 on the associated **Spatial Quality** during the automated conversion process.

The complex attributes **horizontal position uncertainty** and **vertical uncertainty** may alternatively be encoded on the converted **Quality of Bathymetric Data** itself. This is normally only done where the uncertainties apply to a single **Quality of Bathymetric Data** instance, such as an area of changeable

bathymetry over time or varying bathymetric data quality in the water column. Where this occurs, Data Producers may consider population of **horizontal position uncertainty** and **vertical uncertainty** on the **Quality of Bathymetric Data** feature itself; and removing the associated **Spatial Quality** instance.

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)) or **M_QUAL** covering unsurveyed areas, 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)) or **M_QUAL** covering unsurveyed areas, **category of temporal variation** will be populated with value *6* (unassessed).

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 with appropriate values, if available, on all **M_QUAL** Meta Objects for their S-57 datasets (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 may populate it on the individual features (wrecks, obstructions etc) as required. Alternatively, an S-101 Meta Feature **Quality of Survey** may be manually encoded (see clause 2.2.3.2).

Bathymetric Data Quality and Dataset Compilation Scale: In S-101, **Quality of Bathymetric Data** is not mandatory for data at smaller than 1:700000 optimum 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 converted S-101 data at smaller than 1:700000 optimum display scale, or utilising attribute **data assessment** value *2* (assessed (oceanic)) as appropriate.

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

- In S-57 it is allowable for **M_QUAL** features to overlap land areas, however in S-101 this is prohibited. During the automated conversion process, the converter will use the geometry of any converted S-101 **Land Area** features of geometric primitive surface to remove any overlap in the converted **Quality of Bathymetric Data** features.

2.2.3.2 Survey reliability

S-57 Meta Object:	Survey reliability (**M_SREL**)	(L,A)	
S-101 Meta Feature:	**Quality of Survey**	(C,S)	(S-101 DCEG Clause 3.11)

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 enumeration 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.

2.2.3.3 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 an instance of the S-101 Feature type **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 type. During the automated conversion process, prohibited values will not be converted across to S-101.

2.2.3.4 Sounding accuracy

Unless otherwise stated against an individual Object class within this document, values populated for the S-57 attribute SOUACC will be converted 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 type **Swept Area** in S-101 (see clause 5.6).

2.2.3.5 Technique of sounding measurement

The S-101 enumeration 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:

DWRTCL DWRTPT RCRTCL RECTRC SOUNDG TWRTPT M_QUAL

See entries for TECSOU in Appendix A, Table A-2. All other instances of encoding of TECSOU will be converted to the corresponding **technique of sounding measurement** values on conversion, except for the following:

- The TECSOU value *6* (swept by wire-drag) is prohibited in S-101. This value has been replaced by the **technique of vertical measurement** value *18* (mechanically swept). During the automated conversion process, all instances of TECSOU = *6* will be converted to **technique of vertical measurement** = *18*.
- 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).
- While TECSOU is allowable for the Object class **SWPARE** in S-57, **technique of vertical measurement** has been prohibited for the Meta Feature **Swept Area** in S-101 (see clause 5.6).

2.2.4 Accuracy of non-bathymetric data

2.2.4.1 Quality of positions

S-57 Meta Object: Accuracy of data (**M_ACCY**) (A)

S-101 Meta Feature: **Quality of Non-Bathymetric Data** (S) (S-101 DCEG Clause 3.4)

All instances of encoding of the S-57 Meta Object **M_ACCY** and its binding attributes will be converted to an instance of the S-101 Meta Feature **Quality of Non-Bathymetric Data** during the automated conversion process.

2.2.4.2 Horizontal accuracy

Values populated for the S-57 attribute HORACC will be converted to the S-101 sub-attribute **horizontal distance uncertainty**. Note, however, that while HORACC is an allowable attribute for the following S-57 Object classes, **horizontal distance uncertainty** is prohibited for the corresponding S-101 features, and will therefore not be converted:

[**DRYDOC**]	**Dry Dock**
[**FLODOC**]	**Floating Dock**
[**GRIDRN**]	**Gridiron**
[**HULKES**]	**Hulk**
[**LITFLT**]	**Light Float**
[**LITVES**]	**Light Vessel**

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

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

2.2.4.3 Vertical accuracy

Values populated for the S-57 attribute VERACC will be converted 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 instance of the S-57 Object class **BRIDGE**, this will be converted to **vertical uncertainty**/**uncertainty fixed** on an instance of the S-101 Feature type **Span Fixed** or **Span Opening**, noting that **vertical uncertainty** is prohibited for the S-101 Feature type **Bridge** (see clause 4.8.10).

2.2.5 Source of data

2.2.5.1 Source of bathymetric data

Values populated for the S-57 attribute SURATH on the **M_SREL** Meta Object will be converted 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 Object class converts to an S-101 Feature type having **reported date** as an allowable attribute, values populated in SORDAT will be converted to **reported date**. 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.

2.2.5.2 Source of other data

As for clause 2.2.5.1 above.

2.2.6 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 will be converted to the mandatory optimumDisplayScale 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)

S-101 Meta Feature: **Data Coverage** (S) (S-101 DCEG Clause 3.5)

See also S-101 DCEG clause 2.5.5 and S-101 Main document clauses 4.5 and 4.7 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 scale denominator values for the mandatory attributes **maximum display scale**, **optimum display scale** and **minimum display scale**. It is important to note that the values for these attributes, and the optimumDisplayScale field of the Dataset Discovery Metadata, must be taken from the following Table:

Maximum display scale	Optimum display scale	Minimum display scale
Any value	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 optimumDisplayScale field of the Dataset Discovery Metadata and the **optimum display scale** attribute will be directly converted across from the S-57 dataset. If the S-57 compilation 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 smallest scale denominator value as taken from Table 2-3.

For an S-57 dataset containing no **M_CSCL** Meta Objects, an S-101 **Data Coverage** Meta 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 convert to **optimum 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 **optimum display scale** converted in accordance with the scale denominator value populated for the attribute CSCALE for the **M_CSCL** based on Table 2-3 and above paragraphs.

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 and noting that common values of **minimum display scale** in adjoining datasets is an indicator in ECDIS that the datasets are intended to be displayed seamlessly.

During the automated conversion process, the mandatory attribute **maximum display scale** should be set to a value corresponding to half the value populated for **optimum display scale** (for example if **optimum display scale** is populated as *45000* then **maximum display scale** should be automatically populated as *22500*). However, a suitably configured converter may populate **maximum display scale** in accordance with the policy/convention of the Data Producer.

The S-101 attribute **drawing index** has been introduced to provide the additional optional capability to identify a series of ENC datasets that are intended to be displayed seamlessly in ECDIS. During the automated conversion process, if the Data Producer wishes to have this attribute populated, the value is to be populated with the Navigational Purpose of the S-57 dataset (included as the third character of the ENC dataset file name) for all converted **Data Coverage** features. Data Producers will be required to ensure that, where populated, the values of **drawing index** are correct for the S-101 ENC portfolio in order to provide the required ECDIS performance.

2.2.7 Use of the attribute SCAMIN

S-57 Attribute: Scale minimum (SCAMIN)

S-101 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 **optimum 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 – S-101 **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 largest scale denominator value in Table 2-4 for **scale minimum**.

2.2.7.1 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.

2.3 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 attribute **information** (complex attribute) on the feature instance; or by using the information type **Nautical Information**. **Nautical Information** is associated to the feature instance for which the information applies using the association **Additional Information**.

S-101 Information type:	**Nautical Information**	(N)	(S-101 DCEG Clause 24.4)
S-101 Information type:	**Contact Details**	(N)	(S-101 DCEG Clause 24.1)
S-101 Association:	**Additional Information**	(N)	(S-101 DCEG Clause 25.1)

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** for the corresponding S-101 feature instance 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 will require Data Producers to check their S-57 ENC portfolio prior to conversion and apply these changes as required; noting, however, that data conversion tools may include the capability to customise the conversion process in accordance with national encoding practices. In such cases an instance of **information** may not be created;
- In relation to the above, Data Producers must note that additional encoded instances of INFORM in an ENC dataset so as to aid in the conversion process may result in excessive screen clutter (display of “information” symbols) in certain S-57 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 attributes) 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, mandatory 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 may be required to manually populate this attribute during the conversion process, however a suitably configured converter may populate this attribute as part of the automated 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** for the corresponding S-101 feature instance during the automated conversion process. However, the following issues must be noted:

- 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 converted 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, mandatory 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 may be required to manually populate this attribute during the conversion process, however a suitably configured converter may populate this attribute as part of the automated conversion process (see S-101 DCEG clause 2.4.6).

Where information contained in INFORM, NINFOM, TXTDSC and NTXTDS is duplicated for multiple Object instances in an S-57 dataset, this may be encoded more economically in the corresponding S-101 dataset by associating an instance of the S-101 Information type **Nautical Information** to the relevant S-101 Geo Features (see S-101 DCEG clause 24.4) using the association **Additional Information** (see S-101 DCEG clause 25.1). Where this is considered to be the preferred encoding, Data Producers will be required to manually encode the **Nautical Information**; associate this feature to the relevant S-101 Geo Features using the association **Additional Information**; and remove the complex attribute **information** from these Geo Features. Note that this encoding may also be considered where textual information is duplicated across multiple datasets within the S-57/S-101 ENC portfolio.

2.4 Colours and colour patterns

With the exception of the cases described below, all instances of encoding of the S-57 attribute COLOUR will be converted to the S-101 attribute **colour** during the automated conversion process.

The allowable list of enumerate values for **colour** is restricted in S-101 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 in Appendix A, Table A-2 of this document. Data Producers are advised to check values of COLOUR populated for the corresponding S-57 objects, as conversion of this attribute 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 type **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 converted to the S-101 attribute **colour pattern** during the automated conversion process. However, where COLPAT has more than one value, Data Producers should evaluate this encoding and populate only the most important value required for

marine navigation, noting that **colour pattern** has multiplicity [0..1] in S-101 (see S-101 DCEG clause 2.4.10).

2.5 Reference to other publications

S-57 Meta Object: Nautical publication information (**M_NPUB**) (P,A)

S-101 Geo Feature: **Information Area** (P,S) (S-101 DCEG Clause 16.12)

Information contained in the S-57 attributes INFORM and NINFOM for **M_NPUB** will be converted to the S-101 complex attribute **information**, sub-attribute **text** for an instance of the S-101 Feature type **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 to the S-101 complex attribute **information**, sub-attribute **headline** on **Information Area** during the automated conversion process.

2.6 Updating

Not applicable.

2.6.1 Issuing Updates in advance

Not applicable.

2.6.1.1 Advance notification of changes to traffic separation schemes

Not applicable.

2.6.2 Guidelines for encoding Temporary and Preliminary ENC Updates

Not applicable.

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

In S-101, the textual indication of the existence of multiple real-world features represented by a single encoded feature instance 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, where **multiplicity of features** is included as an allowable complex attribute for a S-101 feature type, the text string encoded in INFORM for the corresponding S-57 Object instance to indicate that multiple real-world features are represented by that instance should be in a standardised format. The text string format will be dependant on whether the actual number of real-world features is known or unknown as follows:

- Number of real-world features known: Standardised text string such as "*3 chimneys*". This will be converted to **multiplicity of features**, sub-attributes **multiplicity known** = *True* and **number of features** populated with the numeric value quoted in the text string.
- Number of real-world features unknown: Standardised text string such as "*More than one*". This will be converted to **multiplicity of features**, sub-attribute **multiplicity known** = *False*.

Where **multiplicity of features** is not included as an allowable complex attribute for a S-101 feature type, the text string encoded in INFORM for the corresponding S-57 Object instance to indicate that multiple real-world features are represented by that instance will be converted automatically to the S-101 complex attribute **information**, sub-attribute **text** (see clause 2.3).

2.8 Minimal depiction areas

2.8.1 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.

2.8.2 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).

3 Time Varying Objects

3.1 Magnetic data

3.1.1 Magnetic variation

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

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

All instances of encoding of the S-57 Object class **MAGVAR** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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.

3.1.2 Abnormal magnetic variation

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

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

All instances of encoding of the S-57 Object class **LOCMAG** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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** (mandatory) and **reference direction**, where:
  - **magnetic anomaly value** is intended to indicate both the positive (easterly) and negative (westerly) values where only a single instance of **value of local magnetic anomaly** is encoded, having no populated value for **reference direction**; or
  - **magnetic anomaly value** is intended to indicate an anomaly in a single direction, where only a single instance of **value of local magnetic anomaly** is encoded and **reference direction** is populated; or
  - **magnetic anomaly value** is intended to indicate an anomaly that is different in a positive (easterly) and negative (westerly) direction, where two instances of **value of local magnetic anomaly** are encoded and **reference direction** is populated for both instances.

  During the automated conversion process, the value populated in VALLMA will be converted across to **magnetic anomaly value**, noting that the value of VALLMA will be converted from decimal minutes to decimal degrees for **magnetic anomaly value**. Data Producers will be required to confirm whether the value populated in VALLMA is intended to indicate both the positive (easterly) and negative (westerly) 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 **value of local magnetic anomaly** in accordance with the guidance above; and if the information contained in INFORM relates only to the range of anomaly values, remove the associated instance of the complex attribute **information** (see clause 2.3).

3.2 Tidal data

Tidal data is not included in S-101. It is recommended that Data Producers evaluate any tidal information that is included in S-57 ENCs and consider inclusion of this information in datasets conforming to Product Specification S-104 – *Water Level Information for Surface Navigation*.

3.3 Tidal stream data

3.3.1 Tidal stream (flood/ebb)

S-57 Geo Object: Tidal stream-flood/ebb (**TS_FEB**) (P,A)

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

All instances of encoding of the S-57 Object class **TS_FEB** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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.

3.3.2 Tidal stream time series

Not applicable.

3.3.3 Prediction by harmonic methods

Not applicable.

3.3.4 Prediction by non-harmonic methods

Not applicable.

3.3.5 Tidal stream panels

S-57 Geo Object: Tidal steam panel data (**TS_PAD**) (P,A)

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

All instances of encoding of the S-57 Object class **TS_PAD** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 at minimum) of sub-complex attribute **tidal stream value** (mandatory). Each instance of **tidal stream value** is converted to 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 to neap or mean tides, Data Producers may populate this information using a standardised text string in the attribute INFORM, for instance "*Neaps*" or "*Mean*" for customised conversion; or will be required to manually amend this value after conversion.

3.4 Current data

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

S-101 Geo Feature: **Current – Non-Gravitational** (P) (S-101 DCEG Clause 10.3)

All instances of encoding of the S-57 Object class **CURENT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Current – Non-Gravitational** during the automated conversion process.

4 Topography

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

4.1 Land area

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

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

All instances of encoding of the S-57 Object class **LNDARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Land Area** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

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 land reclamation has been reported to be planned, in progress or completed. This information is encoded in S-57 on **LNDARE** using the attribute SORDAT (see S-57 UOC clause 4.6.10). Unless the date populated in SORDAT is actually a reported date, Data Producers are advised to remove SORDAT from **LNDARE** objects prior to conversion. See also clause 2.2.5.1.

4.2 Vertical measurements

4.2.1 Vertical datum

See clause 2.1.2.

4.2.2 Heights and elevations

All instances of encoding of the attribute ELEVAT will be converted automatically to an instance of the S-101 attribute **elevation** during the automated conversion process.

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

4.3 Control points

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

For S-101, it is considered that control point information is not required for ENC. In general, therefore, encoded **CTRPNT** will not be converted. 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, along with any other common **CTRPNT**/**Landmark** attributes.

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.

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

- When converting the S-57 **CTRPNT** Object class the S-101 mandatory attribute **visual prominence** on the converted **Landmark** feature will be populated during the automated conversion process with value *2* (not visually conspicuous). Data Producers will be required to amend this value as appropriate.

4.4 Distance marks

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

S-101 Geo Feature: **Distance Mark** (P) (S-101 DCEG Clause 8.10)

All instances of encoding of the S-57 Object class **DISMAR** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Distance Mark** during the automated conversion process.

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

- 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 mandatory complex attribute **measured distance value** having mandatory sub-attributes **distance unit of measurement** and **waterway distance** has been introduced to encode this information. In order for the attributes **distance unit of measurement** and **waterway distance** to be populated during the automated conversion process, the text string encoded in INFORM on the **DISMAR** should be in a standardised format, such as "*Waterway distance = [xxx] [yyyy]*", where *[xxx]* is the value of the distance relevant to the mark and *[yyyy]* is the units of measure for the measured distance which must correspond to one of the allowable values for the attribute **distance unit of measurement** (see S-101 DCEG clause 8.10). For example, *Waterway distance = 300 metres*.
- The S-57 attribute CATDIS has been replaced in S-101 by the mandatory Boolean type attribute **distance mark visible**. Where CATDIS has not been populated, or has been populated with value *1* (distance mark not physically installed) or an empty (null) value, **distance mark visible** will be set to *False*. Where CATDIS has been populated with a value other than *1*, **distance mark visible** will be set to *True*.

4.5 Coastline

4.5.1 Natural coastline

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

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

All instances of encoding of the S-57 Object class **COALNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Coastline** during the automated conversion process. However, Data Producers are advised that the following enumeration 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)
  CATCOA = *4* (stony shore) -> **nature of surface** = *5* (stone)
  CATCOA = *5* (shingly shore) -> **nature of surface** = *7* (pebbles)
  CATCOA = *9* (coral reef) -> **nature of surface** = *14* (coral)
  CATCOA = *11* (shelly shore) -> **nature of surface** = *17* (shells)

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

4.5.2 Artificial coastline

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

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

All instances of encoding of the S-57 Object class **SLCONS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Shoreline Construction** during the automated

conversion process. However, Data Producers are advised that the following enumeration 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 new value *22* (quay); and instances of conversion to value *6* in S-101 should be evaluated if considered necessary and amended as appropriate.

4.6 Harbour installations

4.6.1 Harbour facilities

S-57 Geo Object:	Harbour facility (**HRBFAC**)	(P,A)	
S-101 Geo Feature:	**Harbour Facility**	(P,S)	(S-101 DCEG Clause 22.7)
S-101 Geo Feature:	**Structure Over Navigable Water**	(S)	(S-101 DCEG Clause 8.7)

All instances of encoding of the S-57 Object class **HRBFAC** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Harbour Facility** or **Structure Over Navigable Water** during the automated conversion process.

Data Producers are advised that the following enumeration 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.

In S-57, a roofed structure erected, or partly erected, over a body of water to provide protection for a vessel or its cargo may be encoded using **HRBFAC**. In S-101 a new feature **Structure Over Navigable Water** has been introduced to encode these features, noting however that point is not an allowable geometric primitive for **Structure Over Navigable Water**. Data Producers are advised to amend any converted **Harbour Facility** features that are roofed structures extending over navigable water and amend as appropriate. Alternately, Data Producers may consider encoding INFORM on the **HRBFAC** to contain a standardised text string, such as *Structure over navigable water*, to facilitate customized conversion of **HRBFAC** to **Structure Over Navigable Water**, 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). Where this is done, the converted **Structure Over Navigable Water** should have:

- Attribute **category of structure** populated with values based on values populated for the S-57 attribute CATHAF as follows:
  - CATHAF = *3* (ferry terminal) -> **category of structure** = *5* (covered passenger terminal).
  - CATHAF = *8* (passenger terminal) -> **category of structure** = *5* (covered passenger terminal).
  - CATHAF = *11* (bulk terminal) -> **category of structure** = *2* (covered bulk terminal).

  Other values of CATHAF will not be converted.
- Mandatory attributes **horizontal clearance fixed**/**horizontal clearance value** and **vertical clearance fixed**/**vertical clearance value** populated with values based on standardized text strings encoded in INFORM, such as *Horizontal clearance = [xx.x] metres* and *Vertical clearance = [yy.y] metres*, where *[xx.x]* and *[yy.y]* are the values of the horizontal and vertical clearances, respectively (decimal part not required if the value is whole metres). If no standardized text strings are encoded in INFORM, **horizontal clearance fixed**/**horizontal clearance value** and **vertical clearance fixed**/**vertical clearance value** will be populated with an empty (null) value.

Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Structure Over Navigable Water** in S-101:

condition (CONDTN)
nature of construction (NATCON)

status (STATUS)

Data Producers are advised to check any populated values for CONDTN, NATCON and STATUS on **HRBFAC** and amend appropriately.

4.6.2 Berths

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

S-101 Geo Feature: **Berth** (P,C,S) (S-101 DCEG Clause 8.14)

All instances of encoding of the S-57 Object class **BERTHS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Berth** during the automated conversion process. However, Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Berth** in S-101:

quality of vertical measurement (QUASOU)
status (STATUS)

See S-101 DCEG clause 8.14 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 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 S-57 UOC clause 4.6.2). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **BERTHS** should be in a standardised format, such as *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). For example, *Maximum draught permitted = 11.5 metres*. See clause 2.3.
- The attribute **category of cargo** has been introduced in S-101 to encode the type of vessel cargo allowed at the berth, in particular the fact that a berth is designated as a berth for dangerous or hazardous cargo (**category of cargo** = 7). 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** should be in a standardised format, such as *Dangerous or hazardous cargo*.

4.6.3 Harbour offices

See clause 4.8.15.

4.6.4 Checkpoints

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

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

All instances of encoding of the S-57 Object class **CHKPNT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Checkpoint** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

4.6.5 Small craft facilities

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

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

All instances of encoding of the S-57 Object class **SMCFAC** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Small Craft Facility** during the automated conversion process. However, the following exceptions apply:

- **SMCFAC** with attribute CATSCF = *29* (visitors mooring) will convert to an instance of the S-101 Feature type **Mooring Buoy** with Boolean attribute **visitors mooring** = *True*. The S-101 mandatory attribute **buoy shape** on the converted **Mooring Buoy** feature will be populated during the automated conversion process with value *3* (spherical). Data Producers will be required to amend this value as appropriate.

4.6.6 Docks

4.6.6.1 Dry docks

S-57 Geo Object:	Dry dock (**DRYDOC**)	(A)	
S-101 Geo Feature:	**Dry Dock**	(S)	(S-101 DCEG Clause 8.17)

All instances of encoding of the S-57 Object class **DRYDOC** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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** should be in a standardised format, such as *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). For example, *Maximum draught permitted = 11.5 metres*.

4.6.6.2 Floating docks

S-57 Geo Object:	Floating dock (**FLODOC**)	(L,A)	
S-101 Geo Feature:	**Floating Dock**	(C,S)	(S-101 DCEG Clause 8.18)

All instances of encoding of the S-57 Object class **FLODOC** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 geometric primitive 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 DCEG clause 2.5.1.1). Data Producers must ensure that appropriate S-101 Skin of the Earth feature coverage exists under any converted **Floating Dock** feature; for example, an **Unsurveyed Area** feature that shares the geometry of the **Floating Dock**. Where an instance of the Object class **CTNARE** has been encoded in S-57 to indicate periodicity of the dock using the attributes INFORM or TXTDSC, the corresponding S-101 instance of the Feature type **Caution Area** must be examined and amended/deleted as required; and the date information encoded using the complex attribute **fixed date range** for the **Floating Dock**.

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

condition (CONDTN)

See S-101 DCEG clause 8.18 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** should be in a standardised format, such as *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). For example, *Maximum draught permitted = 11.5 metres*.

4.6.6.3 Tidal and non-tidal basins

S-57 Geo Object:	Dock area (**DOCARE**)	(A)	
S-101 Geo Feature:	**Dock Area**	(S)	(S-101 DCEG Clause 8.20)

All instances of encoding of the S-57 Object class **DOCARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Dock Area** during the automated conversion process.

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** should be in a standardised format, such as *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). For example, *Maximum draught permitted = 11.5 metres*.

4.6.6.4 Gates

S-57 Geo Object:	Gate (**GATCON**)	(P,L,A)	
S-101 Geo Feature:	**Gate**	(P,C,S)	(S-101 DCEG Clause 8.11)

All instances of encoding of the S-57 Object class **GATCON** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Gate** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Gate** 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 **GATCON** and amend appropriately.

4.6.6.5 Locks

S-57 Geo Object:	Lock basin (**LOKBSN**)	(A)	
S-101 Geo Feature:	**Lock Basin**	(S)	(S-101 DCEG Clause 8.22)

All instances of encoding of the S-57 Object class **LOKBSN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Lock Basin** during the automated conversion process.

4.6.6.6 Gridirons

S-57 Geo Object:	Gridiron (**GRIDRN**)	(P,A)	
S-101 Geo Feature:	**Gridiron**	(S)	(S-101 DCEG Clause 8.21)

All instances of encoding of the S-57 Object class **GRIDRN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Gridiron** during the automated conversion process. However, the following exceptions apply:

- **GRIDRN** of geometric primitive 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 enumeration 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 8.21 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.

4.6.7 Mooring / warping facilities and pontoons

4.6.7.1 Mooring / warping facilities

S-57 Geo Object:	Mooring / warping facility (**MORFAC**)	(P,L,A)	
S-101 Geo Feature:	**Dolphin**	(P,S)	(S-101 DCEG Clause 8.15)
S-101 Geo Feature:	**Bollard**	(P)	(S-101 DCEG Clause 8.16)
S-101 Geo Feature:	**Shoreline Construction**	(P,C,S)	(S-101 DCEG Clause 8.6)
S-101 Geo Feature:	**Pile**	(P,C,S)	(S-101 DCEG Clause 8.4)
S-101 Geo Feature:	**Cable Submarine**	(C)	(S-101 DCEG Clause 14.2)
S-101 Geo Feature:	**Mooring Buoy**	(P)	(S-101 DCEG Clause 20.8)

The S-57 Object Class **MORFAC** has been re-modelled for S-101. All instances of encoding of the **MORFAC** and its binding attributes will be converted automatically to an instance of the following S-101 Feature type and attribute combinations, in accordance with the values populated for the S-57 attribute CATMOR, as follows:

CATMOR = *1* (dolphin) -> S-101 Feature type **Dolphin**, attribute **category of dolphin** = *1* (mooring dolphin)
CATMOR = *2* (deviation dolphin) -> S-101 Feature type **Dolphin**, attribute **category of dolphin** = *2* (deviation dolphin)
CATMOR = *3* (bollard) -> S-101 Feature type **Bollard**
CATMOR = *4* (tie-up wall) -> S-101 Feature type **Shoreline Construction**, attribute **category of shoreline construction** = *23* (tie-up wall)
CATMOR = *5* (post or pile) -> S-101 Feature type **Pile**, attribute **category of pile** = *8* (mooring post)
CATMOR = *6* (chain/wire/cable) -> S-101 Feature type **Cable Submarine**, attribute **category of cable** = *9* (junction cable). (NOTE: This is so as to facilitate conversion of mooring trots (see S-101 DCEG clause 8.23). Data Producers may be required to evaluate their converted data and amend the value of **category of cable** to a more suitable value if the feature is not part of a mooring trot.)
CATMOR = *7* (mooring buoy) -> S-101 Feature type **Mooring Buoy** (NOTE: If BOYSHP has not been populated for the **MORFAC**, the mandatory S-101 attribute **buoy shape** will be populated with value *3* (spherical) during the automated conversion process).

The following exceptions for Feature/attribute combination conversion must be noted:

- For **MORFAC** converted to **Dolphin**, the attributes BOYSHP, QUASOU and WATLEV will not be converted. It is considered that these attributes are not relevant for **Dolphin** in S-101.
- For **MORFAC** converted to **Bollard**, the attributes BOYSHP, COLOUR, COLPAT, CONRAD, CONVIS, ELEVAT, HEIGHT, NATCON, QUASOU, VERLEN and WATLEV will not be converted. It is considered that these attributes are not relevant for **Bollard** in S-101.
- For **MORFAC** converted to **Shoreline Construction**, the attributes BOYSHP, ELEVAT, PEREND, PERSTA and QUASOU will not be converted. These attributes are not relevant for **Shoreline Construction** in S-101.
- For **MORFAC** converted to **Pile**, the attributes BOYSHP, ELEVAT, NATCON, PEREND, PERSTA, QUASOU and WATLEV will not be converted. These attributes are not relevant for **Pile** in S-101.
- For **MORFAC** converted to **Cable Submarine**, the attributes BOYSHP, COLOUR, COLPAT, CONRAD, CONVIS, ELEVAT, HEIGHT, NATCON, PEREND, PERSTA, QUASOU, VERLEN and WATLEV will not be converted. These attributes are not relevant for **Cable Submarine** in S-101.
- For **MORFAC** converted to **Mooring Buoy**, the attributes CONDTN, CONRAD, CONVIS, ELEVAT, HEIGHT, QUASOU and WATLEV will not be converted. It is considered that these attributes are not relevant for **Mooring Buoy** in S-101. Additionally, the S-101 complex attribute **topmark** is not an

allowable attribute for **Mooring Buoy**. **TOPMAR**, when associated to an instance of **MORFAC**, will be converted automatically to an instance of the S-101 Feature type **Daymark** during the automated conversion process (see clause 12.3.3). Where the S-57 attribute COLOUR has not been populated for the **TOPMAR**, the mandatory S-101 attribute **colour** on the converted **Daymark** will be populated with an empty (null) value.

Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for the converted S-101 Feature as follows:

buoy shape	(BOYSHP)	for **Mooring Buoy**
condition	(CONDTN)	for **Cable Submarine**
nature of construction	(NATCON)	for **Dolphin**, **Shoreline Construction**, **Mooring Buoy**
status	(STATUS)	for **Dolphin**, **Bollard**, **Shoreline Construction**, **Pile**, **Cable Submarine**

See S-101 DCEG clause 8.4, 8.6, 8.15, 8.16, 14.2 and 20.8 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 BOYSHP, CONDTN, NATCON and STATUS on **MORFAC** in regard to conversion to the Features listed above and amend appropriately.

4.6.7.2 Piles

S-57 Geo Object:	Pile (**PILPNT**)	(P)	
S-101 Geo Feature:	**Pile**	(P,C,S)	(S-101 DCEG Clause 8.4)

All instances of encoding of the S-57 Object class **PILPNT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Pile** during the automated conversion process.

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

- Instances of the S-57 Object class **TOPMAR**, when associated to an instance of **PILPNT**, will be converted automatically to an instance of the S-101 Feature type **Daymark** during the automated conversion process (see clause 12.3.3). Where the S-57 attribute COLOUR has not been populated for the **TOPMAR**, the mandatory S-101 attribute **colour** on the converted **Daymark** will be populated with an empty (null) value. See also clause 12.6

4.6.7.3 Pontoons

S-57 Geo Object:	Pontoon (**PONTON**)	(L,A)	
S-101 Geo Feature:	**Pontoon**	(C,S)	(S-101 DCEG Clause 8.19)

All instances of encoding of the S-57 Object class **PONTON** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 DCEG clause 2.5.1.1). Data Producers must ensure that appropriate S-101 Skin of the Earth coverage exists under any converted **Pontoon** feature; for example, an **Unsurveyed Area** feature that shares the geometry of the **Pontoon**. Where an instance of the S-57 Object class **CTNARE** has been encoded in S-57 to indicate periodicity of the pontoon using the attributes INFORM or TXTDSC, the corresponding S-101 instance of the Feature type **Caution Area** must be examined and amended/deleted as required; and the date information encoded using the complex attribute **periodic date range** for the **Pontoon**.

4.6.8 Hulks

S-57 Geo Object:	Hulk (**HULKES**)	(P,A)	
S-101 Geo Feature:	**Hulk**	(P,S)	(S-101 DCEG Clause 8.3)

All instances of encoding of the S-57 Object class **HULKES** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Hulk** during the automated conversion process.

For S-57 **HULKES** of geometric primitive area is designated as being part of Group 1 (Skin of the Earth) feature coverage. In S-101, **Hulk** has been removed from Group 1 (see S-101 DCEG clause 2.5.1.1). Data Producers must ensure that appropriate S-101 Skin of the Earth coverage exists under any converted **Hulk** feature; for example, an **Unsurveyed Area** feature that shares the geometry of the **Hulk**. Where an instance of the S-57 Object class **CTNARE** has been encoded in to indicate periodicity of the hulk using the attributes INFORM or TXTDSC, the corresponding S-101 instance of the Feature type **Caution Area** must be examined and amended/deleted as required; and the date information encoded using the complex attribute **periodic date range** for the **Hulk**.

4.6.9 Dockside buildings and structures

4.6.9.1 Transit sheds and warehouses

See clause 4.8.15.

4.6.9.2 Timber yards

See clause 4.8.13.

4.6.9.3 Cranes

S-57 Geo Object:	Crane (**CRANES**)	(P,A)	
S-101 Geo Feature:	**Crane**	(P,S)	(S-101 DCEG Clause 8.13)

All instances of encoding of the S-57 Object class **CRANES** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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. This attribute is populated automatically during the conversion process based on the underlying Skin of the Earth feature. 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.

4.6.10 Works in progress and projected

The encoding guidance for the indication of works in progress or projected remains unchanged in S-101, and as such all indications of works in progress or projected in S-57 data will be included in the converted S-101 dataset. See S-101 DCEG clause 8.1.

4.7 Natural features

4.7.1 Natural sceneries

S-57 Geo Object:	Land region (**LNDRGN**)	(P,A)	
S-101 Geo Feature:	**Land Region**	(P,C,S)	(S-101 DCEG Clause 5.11)

All instances of encoding of the S-57 Object class **LNDRGN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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.
- The S-101 Feature type **Island Group** has been introduced in S-101 to provide a dedicated method for the encoding of named groups of islands and archipelagos (see S-101 DCEG clause 5.5). This information may be encoded in S-57 using an instance of the S-57 Object class **LNDRGN** covering or centred in the group of islands. In order for this information to be converted across to an incidence of **Island Group**, the text string encoded in INFORM on the **LNDRGN** should be in a standardised format, such as *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). In S-101, a named group of islands should be encoded as **Island Group** of geometric primitive surface. Data Producers may be required to manually create this surface during the conversion process, however a suitably configured converter may create the surface using the geometry of the **LNDRGN** if of geometric

primitive area. If required, any S-101 **Land Region** feature resulting from the conversion of the **LNDRGN** should be removed from the converted S-101 dataset.

Data Producers are advised that the following enumeration 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.

4.7.2 Height contours, spot heights

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

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

All instances of encoding of the S-57 Object class **LNDELV** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Land Elevation** during the automated conversion process.

4.7.3 Marsh

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

4.7.4 Dunes, sand hills

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

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

All instances of encoding of the S-57 Object class **SLOGRD** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Sloping Ground** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

4.7.5 Cliffs

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

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

All instances of encoding of the S-57 Object class **SLOTOP** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Slope Topline** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

4.7.6 Rivers

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

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

All instances of encoding of the S-57 Object class **RIVERS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **River** during the automated conversion process. However, Data Producers are advised that the following enumeration 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 allows for **RIVERS** of geometric primitive area to be covered by the Group 1 objects **LNDARE** or **UNSARE**, however in S-101 all **Rivers** of geometric primitive area must be covered by the Skin of the Earth feature **Land Area**. During the automated conversion process, the converter may have the capability to convert **UNSARE** covering **RIVERS** to **Land Area** (taking into account the attribution of any adjoining **LNDARE** objects) and merge with any adjoining **Land Area** features. If the converter does not have this capability, Data Producers are advised to check their S-57 data holdings and amend their Group 1 coverage to have **RIVERS** of geometric primitive area covered by **LNDARE** (and merge with adjoining **LNDARE** as appropriate).
- S-57 guidance recommends the encoding of intermittent lakes using an instance of the S-57 Object class **RIVERS**. Data Producers are advised to check all instances of **RIVERS** of geometric primitive 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 type **Lake** (see S-101 DCEG clause 5.10).

4.7.7 Rapids, waterfalls

4.7.7.1 Rapids

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

S-101 Geo Feature: **Rapids** (C,S) (S-101 DCEG Clause 5.8)

All instances of encoding of the S-57 Object class **RAPIDS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Rapids** during the automated conversion process. However, the following exceptions apply:

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

4.7.7.2 Waterfalls

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

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

All instances of encoding of the S-57 Object class **WATFAL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Waterfall** during the automated conversion process.

4.7.8 Lakes

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

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

All instances of encoding of the S-57 Object class **LAKARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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.

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

- S-57 allows for **LAKARE** to be covered by the Group 1 objects **LNDARE** or **UNSARE**, however in S-101 all **Lake** features must be covered by the Skin of the Earth feature **Land Area**. During the automated conversion process, the converter may have the capability to convert **UNSARE** covering **LAKARE** to **Land Area** (taking into account the attribution of any adjoining **LNDARE** objects) and merge with any adjoining **Land Area** features. If the converter does not have this capability, Data Producers are advised to check their S-57 data holdings and amend their Group 1 coverage to have **LAKARE** covered by **LNDARE** (and merge with adjoining **LNDARE** as appropriate).

4.7.9 Salt pans

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

4.7.10 Glaciers

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

4.7.11 Vegetation

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

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

All instances of encoding of the S-57 Object class **VEGATN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Vegetation** during the automated conversion process. However, the following exceptions apply:

- **VEGATN** with attribute CATVEG = *7* (mangroves) or *21* (mangrove tree) will convert to an instance of the S-101 Feature type **Obstruction** with attribute **category of obstruction** = *23* (mangrove), mandatory attribute **water level effect** = *1* (partially submerged at high water) and conditional mandatory attribute **height** = empty (null) if no value is populated for the attribute HEIGHT on the **VEGATN** object.

Data Producers are advised that the following enumeration 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.

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

- S-57 contains values for the mandatory attribute CATVEG of *1* (grass), *10* (mixed crops) and *12* (moss). For S-101 it has been determined that these types of vegetation are not required for the navigational ENC and therefore these values have been removed as allowable values for the mandatory attribute **category of vegetation**. Data Producers are advised to remove instances of **VEGATN** having these values for VEGATN from their S-57 portfolio prior to conversion.
- S-57 guidance recommends the encoding of an instance of the S-57 Object class **COALNE** along the seaward edge of encoded mangrove (**VEGATN**) areas located in the intertidal area. Where a **COALNE** object has been encoded in S-57 to indicate the seaward edge of the mangrove area located within the intertidal area, the corresponding S-101 instance of the Feature type **Coastline**, if created during the conversion process, must be deleted where it is coincident with the seaward edge of the converted **Obstruction** feature.

4.7.12 Lava flow

See clause 4.7.1.

4.8 Artificial features

4.8.1 Canals

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

S-101 Geo Feature: **Canal** (C,S) (S-101 DCEG Clause 8.9)

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

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

- S-57 allows for **CANALS** of geometric primitive area to be covered by the Group 1 objects **LNDARE** or **UNSARE**, however in S-101 all **Canal** features of geometric primitive area must be covered by the Skin of the Earth feature **Land Area**. During the automated conversion process, the converter may have the capability to convert **UNSARE** covering **CANALS** to **Land Area** and merge with any adjoining **Land Area** features (taking into account the attribution of the adjoining **LNDARE** objects). If the converter does not have this capability, Data Producers are advised to check their S-57 data holdings and amend their Group 1 coverage to have **CANALS** of geometric primitive area covered by **LNDARE** (and merge with adjoining **LNDARE** as appropriate).

4.8.2 Railways

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

S-101 Geo Feature: **Railway** (C) (S-101 DCEG Clause 6.14)

All instances of encoding of the S-57 Object class **RAILWY** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Railway** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Railway** in S-101:

condition (CONDTN)

See S-101 DCEG clause 6.14 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.

4.8.3 Tunnels

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

S-101 Geo Feature: **Tunnel** (C,S) (S-101 DCEG Clause 6.16)

All instances of encoding of the S-57 Object class **TUNNEL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Tunnel** during the automated conversion process. However, the following exceptions apply:

- **TUNNEL** of geometric primitive 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 enumeration type attributes have restricted allowable enumerate values for **Tunnel** in S-101:

condition (CONDTN)
status (STATUS)

See S-101 DCEG clause 6.16 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.

4.8.4 Cuttings and embankments

See clauses 4.7.4 and 4.7.5.

4.8.5 Dams

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

S-101 Geo Feature: **Dam** (C,S) (S-101 DCEG Clause 8.12)

All instances of encoding of the S-57 Object class **DAMCON** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Dam** during the automated conversion process. However, the following exceptions apply:

- Point is not an allowable geometric primitive for **Dam**, therefore **DAMCON** of geometric primitive point will convert to an instance of the S-101 Feature type **Landmark** with attribute **category of landmark** = *27* (dam) (see S-101 DCEG clause 7.2).

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

nature of construction (NATCON)

See S-101 DCEG clause 8.12 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 **DAMCON** and amend appropriately.

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

- When converting the S-57 **DAMCON** Object class of geometric primitive point the S-101 mandatory attribute **visual prominence** on the converted **Landmark** feature will be populated during the automated conversion process with value *2* (not visually conspicuous). Data Producers will be required to evaluate their converted datasets and amend this value as appropriate.

4.8.6 Flood barrages

The guidance for the encoding of flood barrages remains unchanged in S-101. See S-101 DCEG clause 8.12.2.

4.8.7 Dykes

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

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

All instances of encoding of the S-57 Object class **DYKCON** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Dyke** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

4.8.8 Roads and tracks

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

S-101 Geo Feature: **Road** (C,S) (S-101 DCEG Clause 6.15)

All instances of encoding of the S-57 Object class **ROADWY** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Road** during the automated conversion process. However, the following exceptions apply:

- **ROADWY** of geometric primitive 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 enumeration 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 6.15 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, NATCON and STATUS on **ROADWY** and amend appropriately.

4.8.9 Causeways

S-57 Geo Object:	Causeway (**CAUSWY**)	(L,A)	
S-101 Geo Feature:	**Causeway**	(C,S)	(S-101 DCEG Clause 8.8)

All instances of encoding of the S-57 Object class **CAUSWY** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Causeway** during the automated conversion process.

4.8.10 Bridges

S-57 Geo Object:	Bridge (**BRIDGE**)	(P,L,A)	
S-101 Geo Feature:	**Bridge**	(C,S,N)	(S-101 DCEG Clause 6.6)
S-101 Geo Feature:	**Span Fixed**	(C,S)	(S-101 DCEG Clause 6.7)
S-101 Geo Feature:	**Span Opening**	(C,S)	(S-101 DCEG Clause 6.8)
S-101 Association:	**Bridge Aggregation**	(N)	(S-101 DCEG Clause 25.4)

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 Feature types **Span Fixed** and **Span Opening** have been introduced. During the automated conversion process, all instances of encoding of the S-57 Object class **BRIDGE** and its binding attributes will be converted automatically to an instance of the S-101 Feature types **Bridge** and **Span Fixed** or **Span Opening** as appropriate; and these features aggregated using the S-101 association **Bridge Aggregation**. However, the following exceptions apply:

- Bridges encoded over non-navigable water in S-101 do not require the associated encoding and aggregation of bridge span(s). As such, during the automated conversion process a bridge that, in its entirety, does not cross navigable water in an ENC dataset will be converted automatically to an instance of the S-101 Feature type **Bridge** and its corresponding binding attributes only.
- Point is not an allowable geometric primitive for **Bridge**, therefore **BRIDGE** of geometric primitive point will convert to an instance of the S-101 Feature type **Landmark** with attribute **category of landmark** = *26* (bridge) (see S-101 DCEG clause 7.2).

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

nature of construction (NATCON)

See S-101 DCEG clauses 6.6-6.8 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:

- The S-57 list type attribute CATBRG has been remodelled in S-101 to a combination of the enumeration type attributes **bridge construction**, **bridge function**, **category of opening bridge** and the mandatory Boolean type attribute **opening bridge**. The attribute **category of opening bridge** is mandatory if **opening bridge** is populated as *True*; otherwise these attributes are not mandatory for **Bridge**. During the automated conversion process, CATBRG will be converted as follows:
  - CATBRG = *1* (fixed bridge) -> No corresponding enumerate value – enumeration type attributes not populated; **opening bridge** = *False*.
  - CATBRG = *2* (opening bridge) -> **opening bridge** = *True*; if no other listed value, or additional listed values for CATBRG other than CATBRG = *3*, *4*, *5*, or *7* (see below), conditional mandatory attribute **category of opening bridge** = empty (null).
  - CATBRG = *3* (swing bridge) -> **category of opening bridge** = *3* (swing bridge); **opening bridge** = *True*.

- CATBRG = *4* (lifting bridge) -> **category of opening bridge** = *4* (lifting bridge); **opening bridge** = *True*.
- CATBRG = *5* (bascule bridge) -> **category of opening bridge** = *5* (bascule bridge); **opening bridge** = *True*.
- CATBRG = *6* (pontoon bridge) -> **bridge construction** = *3* (pontoon bridge); **opening bridge** = *False* (however, see below).
- CATBRG = *7* (draw bridge) -> **category of opening bridge** = *7* (drawbridge); **opening bridge** = *True*.
- CATBRG = *8* (transporter bridge) -> **bridge construction** = *5* (transporter bridge); **opening bridge** = *False*.
- CATBRG = *9* (footbridge) -> **bridge function** = *3* (pedestrian); **opening bridge** = *False* or *True* (see below).
- CATBRG = *10* (viaduct) -> **bridge construction** = *2* (viaduct); **opening bridge** = *False*.
- CATBRG = *11* (aqueduct) -> **bridge function** = *4* (aqueduct); **opening bridge** = *False*.
- CATBRG = *12* (suspension bridge) -> **bridge construction** = *4* (suspension bridge); **opening bridge** = *False*.

It is recommended that Data Producers check all converted **Bridge** features to ensure that the required attribute encoding combinations are present, including the association of the appropriate span features (if required) and their binding clearance attributes. Data Producers should note, in particular:

- In S-101 only swing, lifting, bascule and draw bridges are classified as opening types of bridges. If any associated span of the bridge is a **Span Opening** feature, the **Bridge** must be encoded as an opening bridge (**category of bridge** = *3*, *4*, *5*, *7* or empty (null) and **opening bridge =** *True*). Conversely, a fixed bridge must not have an associated **Span Opening** feature.
- Transporter bridges are considered to be a type of fixed bridge.
- Pontoon bridges may have a section of the bridge that is temporarily removed or rotated so as to allow passage of vessels. In such cases the bridge should be encoded as an opening bridge; that is, CATBRG = *2,6* (opening bridge, pontoon bridge). During the automated conversion process, the conditional mandatory attribute **category of opening bridge** will be set to value *3* (swing bridge). If the opening bridge is a type other than a swing bridge, Data Producers will be required to amend **category of opening bridge** as required.
- For opening footbridges (that is, CATBRG = *2,9* (opening bridge, footbridge)), the conditional mandatory attribute **category of opening bridge** will be set to value *3* (swing bridge) during the automated conversion process. If the opening footbridge is a type other than a swing bridge, Data Producers will be required to manually amend **category of opening bridge** as required.

- It is strongly recommended that each span of a bridge crossing navigable water in an ENC dataset is encoded as a separate **BRIDGE** object where known. This includes those spans of a bridge that may fall partly or entirely over the land. Where each component of a single bridge is encoded as a separate **BRIDGE** object, these **BRIDGE** objects and any associated encoded bridge pylons or pontoons must be aggregated using the Collection Object **C_AGGR** in order to ensure the correct representation and aggregation of the bridge components in the converted S-101 dataset. The attributes COLOUR, COLPAT, CONDTN, CONRAD, CONVIS, DATEND, DATSTA, NATCON and SCAMIN must be identical for each of the **BRIDGE** objects comprising the bridge. Where the attributes INFORM or TXTDSC relate only to a particular span of a bridge, these attributes should only be populated only for the **BRIDGE** object representing that span, which will then be automatically populated only for the converted span feature during the automated conversion process. The attributes NOBJNM and OBJNAM should only be populated for the most representative (or opening if the bridge has only one opening span) of the **BRIDGE** features; and on the **C_AGGR**, noting that named bridges should be encoded using geometric primitive curve or surface and a suitably configured converter should create a single **Bridge** feature using the geometry of the S-57 aggregate features and populate the name appropriately. Similarly, if an encoded bridge crossing navigable water is not separated into separate **BRIDGE** objects corresponding to each span of the bridge, the **BRIDGE** object and any encoded bridge pylons should be aggregated using the Collection Object **C_AGGR** in order to ensure the correct aggregation of the bridge components in the converted S-101 dataset. Where the attributes INFORM or TXTDSC have been populated for the **BRIDGE** object, these will be automatically populated for the converted **Bridge** feature during the automated conversion process. Data Producers should check their converted S-101 datasets to ensure that any populated instance of the complex attribute **information** for a bridge and associated spans have been populated for the appropriate feature(s), and amend as required.

- For bridges that do not cross navigable water in an ENC dataset there is no requirement to encode each span of the bridge as a separate **BRIDGE** object. However, a separate **BRIDGE** object may be encoded for a bridge span falling entirely over the land where the bridge in its entirety crosses navigable water.
- For opening bridges/bridge spans the attribute VERCOP is only mandatory where there is a limited vertical clearance when the bridge is open. Where VERCOP is not present for an opening bridge/bridge span, the mandatory complex attribute **vertical clearance open**, mandatory sub-attribute **vertical clearance unlimited** will be populated as *True* during the automated conversion process. Where VERCOP has a value or is populated with an empty (null) value, **vertical clearance unlimited** will be populated as *False*.

4.8.11 Conveyors

S-57 Geo Object:	Conveyor (**CONVYR**)	(L,A)	
S-101 Geo Feature:	**Conveyor**	(C,S)	(S-101 DCEG Clause 6.9)

All instances of encoding of the S-57 Object class **CONVYR** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Conveyor** during the automated conversion process. However, Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Conveyor** in S-101:

product	(PRODCT)
status	(STATUS)

See S-101 DCEG clause 6.9 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.

For converting information indicating that the encoding of a single conveyor feature instance is representative of multiple real-world features, see clause 2.7.

4.8.12 Airfields

S-57 Geo Object:	Airport / airfield (**AIRARE**)	(P,A)	
S-101 Geo Feature:	**Airport/Airfield**	(P,S)	(S-101 DCEG Clause 6.3)

All instances of encoding of the S-57 Object class **AIRARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Airport/Airfield** during the automated conversion process. However, Data Producers are advised that the following enumeration 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)	
S-101 Geo Feature:	**Runway**	(C,S)	(S-101 DCEG Clause 6.4)
S-101 Geo Feature:	**Helipad**	(P)	(S-101 DCEG Clause 6.5)

All instances of encoding of the S-57 Object class **RUNWAY** and its binding attributes will be converted automatically to an instance of the S-101 Feature types **Runway** or **Helipad** during the automated conversion process. However, the following exceptions apply:

- During the automated conversion process, only **RUNWAY** of geometric primitive point and having attribute CATRUN = *2* (helicopter landing pad) will be converted to an instance of the new S-101 Feature type **Helipad**.
- Point is not an allowable geometric primitive for **Runway**. Instances of **RUNWAY** of geometric primitive point and having attribute CATRUN = *1* (aeroplane runway) or not populated will not be converted. Data Producers will be required to evaluate their S-57 datasets and amend as appropriate.

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

nature of construction (NATCON)

See S-101 DCEG clauses 6.4 and 6.5 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 **RUNWAY** and amend appropriately.

4.8.13 Production and storage areas

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

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

All instances of encoding of the S-57 Object class **PRDARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Production/Storage Area** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

4.8.14 Built-up areas

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

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

All instances of encoding of the S-57 Object class **BUAARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Built-Up Area** during the automated conversion process.

S-101 includes the system attribute **in the water** to indicate that a built-up area that is located offshore is to be included in ECDIS Base display. This attribute is populated automatically during the conversion process based on the underlying Skin of the Earth feature. As such, there is no requirement to include an ECDIS Base display feature coincident with the S-101 **Built-Up Area** feature so as to ensure display of a feature at the position of the built-up area in ECDIS Base display. Data Producers should consider removing these features from their S-101 data during the conversion process.

4.8.15 Buildings, landmarks, tanks, silos

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

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

All instances of encoding of the S-57 Object class **BUISGL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Building** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

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

- The S-101 attribute **function** includes the new enumerate value *47* (boathouse). This information is encoded in S-57 on **BUISGL** 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 **BUISGL** should be in a standardised format, such as *Boathouse* or *Boatshed*. If it is considered that horizontal and vertical clearances for the boathouse or boatshed are important to be included in the converted

S-101 dataset, Data Producers should consider amending the converted **Building** feature to the new S-101 feature **Structure Over Navigable Water** (see clause 4.6.1 and S-101 DCEG clause 8.7).

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. This attribute is populated automatically during the conversion process based on the underlying Skin of the Earth feature. 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)	
S-101 Geo Feature:	**Landmark**	(P,C,S)	(S-101 DCEG Clause 7.2)
S-101 Geo Feature:	**Wind Turbine**	(P)	(S-101 DCEG Clause 7.4)

All instances of encoding of the S-57 Object class **LNDMRK** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Landmark** during the automated conversion process. However, the following exceptions apply:

- **LNDMRK** objects of geometric primitive point and having attribute CATLMK = *19* (windmotor) will convert to an instance of the new S-101 Feature type **Wind Turbine**. The S-101 attributes **fixed date range**, **vertical clearance fixed**, **vertical datum** and **water level effect** introduce 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 these attributes manually, if considered necessary.
- There are some allowable S-57 encoding combinations that do not display in ECDIS. Guidance has been included in the S-57 UOC for encoding "work-arounds" such that the required "real-world" features will be displayed, including options to encode as **LNDMRK**. Where these "work-arounds" have been applied, a suitably configured converter may be capable of implementing the following conversion requirements (noting that the text string encoded in INFORM on the **LNDMRK** should be in a standardised format in order to convert to the appropriate S-101 Feature, such as *Waterfall* for **LNDMRK** of geometric primitive point encoded to represent a waterfall):
  - **LNDMRK** of geometric primitive area encoded to represent a **SLOGRD** object of geometric primitive area and having attributes CATSLO ≠ *6* (cliff) and CONRAD ≠ *1* (radar conspicuous); or CATSLO = empty (null) should be converted to an instance of the S-101 Feature type **Sloping Ground** (see clause 4.7.4).
  - **LNDMRK** of geometric primitive point encoded to represent a **RAPIDS** object of geometric primitive point should not be converted (see clause 4.7.7.1).
  - **LNDMRK** of geometric primitive point encoded to represent a **WATFAL** object of geometric primitive point should be converted to an instance of the S-101 Feature type **Waterfall** (see clause 4.7.7.2).
  - **LNDMRK** of geometric primitive point or area encoded to represent a **VEGATN** object of geometric primitive point or area and having attribute CATVEG = *11* (reed) or empty (null) value should be converted to an instance of the S-101 Feature type **Vegetation** (see clause 4.7.11).
  - **LNDMRK** of geometric primitive point encoded to represent a **DAMCON** object of geometric primitive point should be converted to an instance of the S-101 Feature type **Landmark** having attribute **category of landmark** = *27* (dam).
  - **LNDMRK** of geometric primitive point encoded to represent a **ROADWY** object of geometric primitive point should not be converted (see clause 4.8.8).
  - **LNDMRK** of geometric primitive point encoded to represent a **RUNWAY** object of geometric primitive point should be converted to an instance of the S-101 Feature type **Helipad** (see clause 4.8.12).
  - **LNDMRK** of geometric primitive point encoded to represent a **PIPSOL** object of geometric primitive point should be converted to an instance of the S-101 Feature type **Landmark**.

Data Producers are advised that the following enumeration 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. This attribute is populated automatically during the conversion process based on the underlying Skin of the Earth feature. 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)	
S-101 Geo Feature:	**Silo/Tank**	(P,S)	(S-101 DCEG Clause 7.3)

All instances of encoding of the S-57 Object class **SILTNK** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Silo/Tank** during the automated conversion process. However, Data Producers are advised that the following enumeration 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. This attribute is populated automatically during the conversion process based on the underlying Skin of the Earth feature. 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.

For converting information indicating that the encoding of a single building, landmark or silo/tank feature instance is representative of multiple real-world features, see clause 2.7.

4.8.16 Fences and walls

S-57 Geo Object:	Fence/wall (**FNCLNE**)	(L)	
S-101 Geo Feature:	**Fence/Wall**	(C)	(S-101 DCEG Clause 6.13)

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

nature of construction (NATCON)

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 NATCON on **FNCLNE** and amend appropriately.

4.8.17 Fortified structures

S-57 Geo Object:	Fortified structure (**FORSTC**)	(P,L,A)	
S-101 Geo Feature:	**Fortified Structure**	(P,C,S)	(S-101 DCEG Clause 7.5)

All instances of encoding of the S-57 Object class **FORSTC** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Fortified Structure** during the automated conversion process. However, Data Producers are advised that the following enumeration 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. This attribute is populated automatically during the conversion process based on the underlying Skin of the Earth feature. 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.

4.8.18 Pylons and bridge supports

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

S-101 Geo Feature: **Pylon/Bridge Support** (P,S) (S-101 DCEG Clause 6.12)

All instances of encoding of the S-57 Object class **PYLONS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Pylon/Bridge Support** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Pylon/Bridge Support** 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 **PYLONS** and amend appropriately.

For converting information indicating that the encoding of a single pylon/bridge support feature instance is representative of multiple real-world features, see clause 2.7.

4.8.19 Oil barriers

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

S-101 Geo Feature: **Oil Barrier** (C) (S-101 DCEG Clause 16.22)

All instances of encoding of the S-57 Object class **OILBAR** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Oil Barrier** during the automated conversion process.

4.8.20 Views and sketches, viewpoints

Values populated for the S-57 attribute PICREP will be converted to the S-101 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.

Where support file names contained in PICREP are duplicated for multiple object instances in an S-57 dataset, this may be encoded more economically in the corresponding S-101 dataset by associating an instance of the S-101 Information type **Nautical Information** to the relevant S-101 geo features (see S-101 DCEG clause 24.4) using the association **Additional Information** (see S-101 DCEG clause 25.1). Where this is considered to be the preferred encoding, Data Producers will be required to manually encode the **Nautical Information** feature; associate this feature to the relevant S-101 geo features using the association **Additional Information**; and remove the complex attribute **pictorial representation** from these geo features. Note that this encoding may also be considered where pictorial information is duplicated across multiple datasets within the S-57/S-101 ENC portfolio.

4.8.21 Signs and Notice boards

The guidance for the encoding of signs and notice boards remains unchanged in S-101. See S-101 DCEG clause 20.13.2.

5 Depth

5.1 Sounding datum

See clause 2.1.3.

5.2 Depth contours

S-57 Geo Object:	Depth contour (**DEPCNT**)	(L)	
S-101 Geo Feature:	**Depth Contour**	(C)	(S-101 DCEG Clause 11.6)

All instances of encoding of the S-57 Object class **DEPCNT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Depth Contour** during the automated conversion process.

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

- **DEPCNT** with attribute QUAPOS = *4* (approximate) will also be converted to an instance of the S-101 Information type **Spatial Quality** (see S-101 DCEG clause 24.5), attribute **quality of horizontal measurement** = *4* (approximate), associated to the geometry of the **Depth Contour** feature using the association **Spatial Association**.

5.3 Soundings

S-57 Geo Object:	Sounding (**SOUNDG**)	(P)	
S-101 Geo Feature:	**Sounding**	(P – Pointset)	(S-101 DCEG Clause 11.3)
S-101 Geo Feature:	**Depth – No Bottom Found**	(P – Pointset)	(S-101 DCEG Clause 11.8)

All instances of encoding of the S-57 Object class **SOUNDG** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 be converted to an instance of the S-101 Feature type **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 following additional requirements for S-57 attribution must be noted:

- **SOUNDG** with attribute QUAPOS = *4* (approximate) will also be converted to an instance of the S-101 Information type **Spatial Quality** (see S-101 DCEG clause 24.5), having attribute **quality of horizontal measurement** = *4* (approximate), associated to the geometry of the **Sounding** feature using the association **Spatial Association**.
- The S-57 attribute SOUACC will be converted 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**.
- 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 attributes QUASOU = *9* (reported, not confirmed) and 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 having QUASOU = *9* (reported, not confirmed) prior to conversion.

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

quality of vertical measurement	(QUASOU)
technique of vertical 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 QUASOU and TECSOU on **SOUNDG** and amend appropriately.

5.4 Depth areas

5.4.1 Geo object depth areas

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

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

All instances of encoding of the S-57 Object class **DEPARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 is not relevant for **Depth Area** in S-101.

5.4.2 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.

5.4.3 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.

5.4.4 Not applicable.

5.4.5 Not applicable.

5.4.6 Not applicable.

5.4.7 Not applicable.

5.4.8 Rivers, canals, lakes, basins, locks

The guidance for the encoding of rivers and canals remains unchanged in S-101. See S-101 DCEG clauses 5.7 and 8.9. The guidance for the encoding of lakes remains unchanged in S-101, except for the encoding of intermittent lakes. See S-57 UOC clause 4.7.8, S-101 DCEG clause 5.10 and clause 4.7.6.

Data Producers must note, however, the change in guidance from S-57 to S-101 in regard to the allowable underlying Skin of the Earth features for encoded non-navigable rivers, canals and lakes (see clauses 4.7.6, 4.7.8 and 4.8.1).

The guidance for the encoding of basins and locks remains unchanged in S-101. See S-101 DCEG clauses 8.20 and 8.22.

5.5 Dredged areas

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

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

All instances of encoding of the S-57 Object class **DRGARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Dredged Area** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Dredged Area** in S-101:

restriction (RESTRN)

See S-101 DCEG clause 11.4 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 RESTRN 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 S-101 dataset.

- The S-101 attribute **dredged 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.

For converting vessel speed limit information within a dredged area, see clause 9.1.2.

5.6 Swept areas

S-57 Geo Object:	Swept area (**SWPARE**)	(A)	
S-101 Geo Feature:	**Swept Area**	(S)	(S-101 DCEG Clause 11.5)

All instances of encoding of the S-57 Object class **SWPARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 **swept 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.

5.7 Areas of continual change

The indication that an area of encoded bathymetry is changeable over time is provided by the encoding of an instance of the S-101 Feature type **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 11.7.

5.8 Areas with inadequate depth information

5.8.1 Unsurveyed areas

S-57 Geo Object:	Unsurveyed area (**UNSARE**)	(A)	
S-101 Geo Feature:	**Unsurveyed Area**	(S)	(S-101 DCEG Clause 11.10)

All instances of encoding of the S-57 Object class **UNSARE** will be converted automatically to an instance of the S-101 Feature type **Unsurveyed Area** during the automated conversion process. However, the following exceptions apply:

- S-57 allows for **RIVERS**, **CANALS** and **LAKARE** objects of geometric primitive area to be covered by the Group 1 objects **LNDARE** or **UNSARE**, however in S-101 all **River**, **Canal** and **Lake** features must be covered by the Skin of the Earth feature **Land Area**. During the automated conversion process, **UNSARE** covering objects **RIVERS**, **CANALS** or **LAKARE** may be converted to an instance of the S-101 Feature type **Land Area** (taking into account the attribution of any adjoining **LNDARE** objects). Data Producers will be required to ensure that these converted **Land Area** features are merged with any adjoining **Land Area** features as appropriate in order to avoid data validation errors. If the data converter does not have the capability to convert **UNSARE** covering **RIVERS**, **CANALS** or **LAKARE** to **Land Area**, Data Producers are advised to check their S-57 data holdings and amend their Group 1 coverage to have **RIVERS**, **CANALS** or **LAKARE** of geometric primitive area covered by **LNDARE** (and merge with adjoining **LNDARE** as appropriate).

5.8.1.1 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.

5.8.2 Incompletely surveyed areas

Not applicable.

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

5.8.3.1 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.

5.8.3.2 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.

5.8.4 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.

6 Dangers

6.1 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.

6.1.1 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.

6.1.2 Rocks which may cover

S-57 Geo Object:	Underwater / awash rock (**UWTROC**)	(P)	
S-101 Geo Feature:	**Underwater/Awash Rock**	(P)	(S-101 DCEG Clause 13.4)

All instances of encoding of the S-57 Object class **UWTROC** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 be converted 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**.

Data Producers are advised that the following enumeration 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 “system” attribute **default clearance depth** has been introduced to replace the S-52 Conditional Symbology Procedure for the display in ECDIS of an encoded underwater hazard as an isolated danger, based on the Mariner’s selected safety depth, if the depth of the hazard is unknown. This attribute is mandatory for all **Underwater/Awash Rock** having mandatory attribute **value of sounding** populated with an empty (null) value. During the automated conversion process, if VALSOU for the **UWTROC** feature is populated with an empty (null) value, **default clearance depth** will be populated with a value based on the attribution of the **UWTROC** and the DRVAL1 for the **DEPARE** feature within which the **UWTROC** is located (see S-101 DCEG clause 30.1). This converted value for **default clearance depth** may be amended by the Data Producer if the resulting isolated danger indication in the ECDIS is not considered appropriate.
- The S-101 mandatory “system” attribute **surrounding depth** (see S-101 DCEG clause 30.4) has been introduced to replace the S-52 Conditional Symbology Procedure for the determination of the depth of the seabed around an underwater hazard. During the automated conversion process, **surrounding depth** will be populated with the value of the attribute **depth range minimum value** for the **Depth Area** feature within which the **Underwater/Awash Rock** is located.
- 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 attributes QUASOU = *9* (reported, not confirmed) and 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 having QUASOU = *9* (reported, not confirmed) prior to conversion.

6.2 Wrecks, foul ground and obstructions

6.2.1 Wrecks

S-57 Geo Object:	Wreck (**WRECKS**)	(P,A)	
S-101 Geo Feature:	**Wreck**	(P,S)	(S-101 DCEG Clause 13.5)

All instances of encoding of the S-57 Object class **WRECKS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Wreck** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute SOUACC will be converted 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**.

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

- In S-57 at least one of the attributes CATWRK or VALSOU are mandatory for **WRECKS** and therefore must be populated, while in S-101 exactly one of the attributes **category of wreck** or **value of sounding** are mandatory for **Wreck**, meaning that only one of these attributes can be populated and not both. During the automated conversion process, if both CATWRK and VALSOU are populated for a **WRECKS** Object, only VALSOU will be converted, unless VALSOU is populated with an empty (null) value in which case CATWRK will be converted. If both CATWRK and VALSOU are populated with an empty (null) value, **category of wreck** on the converted **Wreck** Feature will be populated with an empty (null) value.
- The S-101 "system" attribute **default clearance depth** has been introduced to replace the S-52 Conditional Symbology Procedure for the display in ECDIS of an encoded underwater hazard as an isolated danger, based on the Mariner's selected safety depth, if the depth of the hazard is unknown. This attribute is mandatory for all **Wreck** having mandatory attributes **height** not populated and **value of sounding** populated with an empty (null) value. During the automated conversion process, if HEIGHT is not populated and VALSOU is populated with an empty (null) value for the **WRECK** feature, **default clearance depth** will be populated with a value based on the attribution of the **WRECK** and the DRVAL1 for the **DEPARE** feature within which the **WRECK** is located (or the shoalest of the DRVAL1 values if a wreck area crosses multiple **DEPARE** features) (see S-101 DCEG clause 30.1). This converted value for **default clearance depth** may be amended by the Data Producer if the resulting isolated danger indication in the ECDIS is not considered appropriate (if, for example, it is known that vessels having a draught deeper than 20.1 metres are able to navigate safely in the area; or if the Data Producer wishes to indicate that only vessels to a specified draught that is less than 20 metres may navigate safely in the area).
- The S-101 mandatory "system" attribute **surrounding depth** (see S-101 DCEG clause 30.4) has been introduced to replace the S-52 Conditional Symbology Procedure for the determination of the depth of the seabed around an underwater hazard. During the automated conversion process, **surrounding depth** will be populated with the value of the attribute **depth range minimum value** for the **Depth Area** feature within which the **WRECK** is located (or the deepest of the **depth range minimum value** values if a wreck area crosses multiple **Depth Area** features).
- The S-101 attribute **reported date** has been introduced in S-101 to encode the date at which a wreck has been reported. This information is encoded in S-57 on **WRECKS** using the attributes QUASOU = *9* (reported, not confirmed) and 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 **WRECKS** objects having QUASOU = *9* (reported, not confirmed) prior to conversion.

6.2.2 Obstructions, foul areas and foul ground

S-57 Geo Object:	Obstruction (**OBSTRN**)	(P,L,A)	
S-101 Geo Feature:	**Obstruction**	(P,C,S)	(S-101 DCEG Clause 13.6)
S-101 Geo Feature:	**Foul Ground**	(P,S)	(S-101 DCEG Clause 13.7)

All instances of encoding of the S-57 Object class **OBSTRN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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** of geometric primitive point or area with attribute CATOBS = *7* (foul ground) will be converted to an instance of the S-101 Feature type **Foul Ground**. Where this is the case, the attributes CONDTN, EXPSOU, NATCON, NATQUA, NATSUR, PRODCT, VERLEN and WATLEV will not be converted. It is considered that these attributes are not relevant for **Foul Ground** in S-101. **OBSTRN** of geometric primitive line with attribute CATOBS = *7* will not be converted. Data Producers will be required to amend their S-57 data as appropriate.
- **OBSTRN** of geometric primitive area or line with attribute INFORM = *Submerged weir* will be converted to an instance of the S-101 Feature type **Dam** (see clause 4.8.5). Where this is the case, the attributes CATOBS, EXPSOU, NATQUA, NATSUR, PRODCT, QUASOU, SOUACC, TECSOU and VALSOU will not be converted. It is considered that these attributes are not relevant for **Dam** in S-101.
- The S-57 attribute SOUACC will be converted 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**.
- There are some allowable S-57 encoding combinations that do not display in ECDIS. Guidance has been included in the S-57 UOC for encoding “work-arounds” such that the required “real-world” features will be displayed, including options to encode as **OBSTRN**. Where these “work-arounds” have been applied, a suitably configured converter may be capable of implementing the following conversion requirements:
  - **OBSTRN** of geometric primitive point encoded to represent a **GRIDRN** object of geometric primitive point should not be converted (see clause 4.6.6.6).
  - **OBSTRN** of geometric primitive point encoded to represent a **DAMCON** object of geometric primitive point should be converted to an instance of the S-101 Feature type **Landmark** having attribute **category of landmark** = *27* (dam) (see clause 4.8.15). If the converted **Landmark** feature is covered by a **Depth Area** or **Dredged Area** feature, the attribute **in the water** must be set to *True*.
  - **OBSTRN** of geometric primitive point encoded to represent a **ROADWY** object of geometric primitive point should not be converted (see clause 4.8.8).
  - **OBSTRN** of geometric primitive point encoded to represent a **PIPSOL** object of geometric primitive point should be converted to an instance of the S-101 Feature type **Obstruction**.

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

- The S-101 attribute **category of obstruction** includes the new enumerate values *12* (wave energy device), *20* (underwater turbine) and *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** should be in a standardised format, such as *Wave energy device*, *Underwater turbine* or *Active submarine volcano*. (NOTE: In S-101 submarine volcanoes must only be encoded using point primitive).
- The S-101 “system” attribute **default clearance depth** has been introduced to replace the S-52 Conditional Symbology Procedure for the display in ECDIS of an encoded underwater hazard as an isolated danger, based on the Mariner’s selected safety depth, if the depth of the hazard is unknown. This attribute is mandatory for all **Obstruction** having mandatory attributes **height** not populated and **value of sounding** populated with an empty (null) value. During the automated conversion process, if HEIGHT is not populated and VALSOU is populated with an empty (null) value for the **OBSTRN** feature, **default clearance depth** will be populated with a value based on the attribution of the **OBSTRN** and the DRVAL1 for the **DEPARE** feature within which the **OBSTRN** is located (or the shoalest of the DRVAL1 values if an obstruction area crosses multiple **DEPARE** Objects) (see S-101 DCEG clause 30.1). This converted value for **default clearance depth** may be amended by the Data Producer if the resulting isolated danger indication in the ECDIS is not considered appropriate.
- The S-101 mandatory “system” attribute **surrounding depth** (see S-101 DCEG clause 30.4) has been introduced to replace the S-52 Conditional Symbology Procedure for the determination of the depth of the seabed around an underwater hazard. During the automated conversion process, **surrounding depth** will be populated with the value of the attribute **depth range minimum value** for the **Depth Area** feature within which the **OBSTRN** is located (or the deepest of the **depth range minimum value** values if a linear or area obstruction crosses multiple **Depth Area** features).
- The S-101 attribute **reported date** has been introduced in S-101 to encode the date at which a wreck has been reported. This information is encoded in S-57 on **OBSTRN** using the attributes QUASOU = *9* (reported, not confirmed) and 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 **OBSTRN** objects having QUASOU = *9* (reported, not confirmed) prior to conversion.

6.3 Danger lines

6.3.1 Danger line around a point danger or an isolated sounding

Not applicable.

6.3.2 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.

6.3.3 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.

6.4 Overfalls, races, breakers, eddies

S-57 Geo Object:	Water turbulence (**WATTUR**)	(P,L,A)	
S-101 Geo Feature:	**Water Turbulence**	(P,C,S)	(S-101 DCEG Clause 10.4)

All instances of encoding of the S-57 Object class **WATTUR** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Water Turbulence** during the automated conversion process.

6.5 Doubtful dangers

S-57 Geo Object:	Caution area (**CTNARE**)	(P,A)	
S-101 Geo Feature:	**Discoloured Water**	(P,S)	(S-101 DCEG Clause 13.8)

The guidance for the encoding of doubtful dangers is 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 type **Discoloured Water** has been introduced in S-101 to encode areas of discoloured water. This information is encoded in S-57 as an instance of the S-57 Object class **CTNARE**, 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** should be in a standardised format, such as *Discoloured water*.

6.6 Caution areas

S-57 Geo Object:	Caution area (**CTNARE**)	(P,A)	
S-101 Geo Feature:	**Caution Area**	(P,S)	(S-101 DCEG Clause 16.11)
S-101 Association:	**Caution Area Association**	(N)	(S-101 DCEG Clause 25.5)

All instances of encoding of the S-57 Object class **CTNARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Caution Area** during the automated conversion process, with the following exceptions:

- **CTNARE** encoded to indicate discoloured water (see clause 6.5).
- **CTNARE** encoded to indicate a collision regulations limit (see clause 11.13.5).

For guidance on the conversion of **CTNARE** encoded to indicate an area that is in dispute, see clauses 11.2.1, 11.2.4, 11.2.5 and 11.2.8.

For guidance on the conversion of **CTNARE** encoded to indicate periodicity of S-57 Skin of the Earth Objects for which the corresponding S-101 Features are not part of the Skin of the Earth, see clauses 4.6.6.2, 4.6.7.3 and 4.6.8.

7 Nature of the seabed

7.1 Description of the bottom

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

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

All instances of encoding of the S-57 Object class **SBDARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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.

The following additional requirements for S-101 dataset conversion must be noted:

- Where multiple seabed characteristics, including mixed natures of surface and underlying layers, are indicated for the S-57 formatted attributes NATSUR and NATQUA, corresponding instances of the S-101 complex attribute **surface characteristics** are populated (in the same order) for the converted **Seabed Area**.

EXAMPLE: Nature of seabed: fine sand and mud over rock (*fS M/R*)

S-57 encoding: NATSUR = *4,1/9* NATQUA = *1,/*

Converts to:

surface characteristics (1): **nature of surface** = *4* (sand); **nature of surface – qualifying terms** = *1* (fine); **underlying layer** = *0*

surface characteristics (2): **nature of surface** = *1* (mud); **nature of surface – qualifying terms** (not populated); **underlying layer** = *0*

surface characteristics (3): **nature of surface** = *9* (rock); **nature of surface – qualifying terms** (not populated); **underlying layer** = *1*

7.2 Special bottom types

7.2.1 Sandwaves

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

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

All instances of encoding of the S-57 Object class **SNDWAV** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Sandwave** during the automated conversion process.

7.2.2 Weed - Kelp

S-57 Geo Object: Weed / Kelp (**WEDKLP**) (P,A)

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

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

All instances of encoding of the S-57 Object class **WEDKLP** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Weed/Kelp** during the automated conversion process. However, the following exceptions apply:

- **WEDKLP** with attribute CATWED = *3* (sea grass) will convert to an instance of the S-101 Feature type **Seagrass**.

7.2.3 Springs in the seabed

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

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

All instances of encoding of the S-57 Object class **SPRING** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Spring** during the automated conversion process.

7.2.4 Tideways

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

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

All instances of encoding of the S-57 Object class **TIDEWY** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Tideway** during the automated conversion process.

8 Sea areas

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

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

All instances of encoding of the S-57 Object class **SEAARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Sea Area/Named Water Area** during the automated conversion process.

9 Harbour regulations

9.1 Regulations within harbour limits

9.1.1 Administrative harbour areas

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

S-101 Geo Feature: **Harbour Area (Administrative)** (S) (S-101 DCEG Clause 16.20)

All instances of encoding of the S-57 Object class **HRBARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Harbour Area (Administrative)** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Harbour Area (Administrative)** 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 **HRBARE** and amend appropriately.

9.1.2 Speed limits

The S-101 Feature type **Restricted Area** includes the new complex attribute **vessel speed limit**, having mandatory sub-attributes **speed limit** and **speed units**, and optional sub-attribute **vessel class**, for the encoding of the speed limit and its unit of measure for different classes of vessels (see S-101 DCEG clauses 17.4 and 17.8). This information is encoded in S-57 using the Object class **RESARE**, 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 **RESARE** should be in a standardised format, such as *Speed limit is 5 knots*. While a suitably configured converter may be capable of parsing the speed limit (for **speed limit**) and units of measure (for **speed units**), Data Producers are advised to evaluate their converted S-101 data and confirm the correct attribution.

The complex attribute **vessel speed limit** has also been included as an allowable attribute for the S-101 features **Anchorage Area**, **Cargo Transhipment Area**, **Dredged Area**, **Dumping Ground**, **Fishing Ground**, **Inshore Traffic Zone**, **Military Practice Area**, **Seaplane Landing Area**, **Submarine Transit Lane**, **Territorial Sea Area**, **Traffic Separation Scheme Crossing**, **Traffic Separation Scheme Lane Part** and **Traffic Separation Scheme Roundabout**. Where a **RESARE** object has been encoded in order to define the speed limit within these areas in accordance with the above paragraph, Data Producers may consider populating INFORM on the corresponding S-57 instances as described above so as to have **vessel speed limit** populated on the corresponding converted S-101 feature(s). Where this has been done, the converted **Restricted Area** feature should be deleted.

9.2 Anchorages and prohibited/restricted anchorages; moorings

9.2.1 Anchorages

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

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

S-101 Geo Feature: **Mooring Area** (P,S) (S-101 DCEG Clause 16.4)

All instances of encoding of the S-57 Object class **ACHARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Anchorage Area** during the automated conversion process. However, the following exceptions apply:

- Attribute CATACH = *4* (explosives anchorage) will convert to new S-101 attribute **category of cargo** value *7* (dangerous or hazardous).
- **ACHARE** objects having attribute CATACH = *8* (small craft mooring area) will convert to an instance of the new S-101 Feature type **Mooring Area**.

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) (NOTE: In S-101 reported anchorages must only be encoded using point primitive). 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** should be in a standardised format, such as *Reported anchorage*.

For converting vessel speed limit information within an anchorage area, see clause 9.1.2.

9.2.2 Anchor berths

S-57 Geo Object:	Anchor berth (**ACHBRT**)	(P,A)	
S-101 Geo Feature:	**Anchor Berth**	(P,S)	(S-101 DCEG Clause 16.5)
S-101 Geo Feature:	**Mooring Area**	(P,S)	(S-101 DCEG Clause 16.4)

All instances of encoding of the S-57 Object class **ACHBRT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Anchor Berth** during the automated conversion process. However, the following exceptions apply:

- **ACHBRT** objects having attribute CATACH = *8* (small craft mooring area) will convert to an instance of the new S-101 Feature type **Mooring Area**.

9.2.3 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.

9.2.4 Mooring buoys

Mooring buoys are encoded in S-57 using the Object class **MORFAC** having attribute CATMOR = *7* (mooring buoy). In S-101, mooring buoys are encoded using the Feature type **Mooring Buoy**. During the automated conversion process, all instances of **MORFAC** having attribute CATMOR = *7* will be converted to an instance of **Mooring Buoy**. See clause 4.6.7.1 and S-101 DCEG clause 20.8.

9.2.5 Mooring trots

S-57 Collection Object:	Aggregation (**C_AGGR**)	(N)	
S-101 Geo Feature:	**Mooring Trot**	(S,N)	(S-101 DCEG Clause 8.23)
S-101 Association:	**Mooring Trot Aggregation**	(N)	(S-101 DCEG Clause 25.10)

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 type **Mooring Trot**. The **Mooring Trot** and its individual components will be aggregated using the named association **Mooring Trot Aggregation**.

In S-101, a named mooring trot should be encoded as **Mooring Trot** of geometric primitive surface. Data Producers may be required to manually create this surface during the conversion process, however a suitably configured converter may create the surface by referencing the geometry of the components of the mooring trot to identify its extent (see S-101 DCEG clause 8.23).

9.2.6 Anchorage - relationships

Not applicable.

10 Recommended tracks and routes

10.1 Leading, clearing and transit lines and recommended tracks

10.1.1 Navigation lines and recommended tracks

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

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

All instances of encoding of the S-57 Object class **NAVLNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Navigation Line** during the automated conversion process.

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

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

All instances of encoding of the S-57 Object class **RECTRC** of geometric primitive line and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Recommended Track** during the automated conversion process. However, Data Producers are advised that the following enumeration 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 along the track. 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** should be in a standardised format, such as *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). For example, *Maximum draught permitted = 11.5 metres*.
- The S-101 attribute **measured distance** has been introduced in S-101 to encode the specified measured distance along a track to be followed. This information is encoded in S-57 on **NAVLNE** 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 **NAVLNE** should be in a standardised format, such as *Measured distance = xxxx metres*, where *xxxx* is the value of the measured distance

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 geometric primitive 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 evaluate their data holdings and re-encode these objects as another appropriate routeing object of geometric primitive area (for example, **FAIRWY**, **TWRTPT**, **DWRTPT**) or as **RECTRC** of geometric primitive line prior to conversion to S-101.

10.1.2 Range systems - relationship

S-101 Geo Feature: **Range System** (C,S,N) (S-101 DCEG Clause 15.6)

S-101 Association: **Range System Aggregation** (N) (S-101 DCEG Clause 25.13)

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 type **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).

In S-101, a named range system should be encoded as **Range System** of geometric primitive curve or surface. Data Producers may be required to manually create the curve or surface geometry during the

conversion process, however a suitably configured converter may create the curve or surface geometry by referencing the geometry of the components of the range system to identify its extent (see S-101 DCEG clause 15.6). Data Producers may enhance the presentation of the curve or surface by utilizing the geometry of only the navigable sections of the range system.

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.

10.1.3 Measured distances

S-101 Geo Feature: **Range System** (C,S,N) (S-101 DCEG Clause 15.6)

S-101 Association: **Range System Aggregation** (N) (S-101 DCEG Clause 25.13)

The guidance for the encoding of measured distances remains unchanged in S-101. See S-101 DCEG clause 15.4.2. However, the following additional requirements for S-57 attribution must be noted:

- The S-101 attribute **measured distance** has been introduced in S-101 to encode the specified measured distance along the track to be followed. See clause 10.1.1.

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 type **Range System**. Each **Range System** and its individual components will be aggregated using the named association **Range System Aggregation**. These range systems and the track to be followed will be further aggregated using **Range System Aggregation** to create the hierarchical relationship.

10.2 Routeing measures

10.2.1 Traffic separation schemes

NOTE: The S-57 attribute CATTSS for the individual components of a traffic separation scheme has been remodelled in S-101 to the Boolean type attribute **IMO adopted** on the Feature type **Traffic Separation Scheme** (see clause 10.2.3). In order for an instance of **Traffic Separation Scheme** to be created during the automated conversion process, Data Producers are advised to ensure that all the components of a traffic separation scheme have been aggregated using the S-57 Collection Object **C_AGGR**; and all components have the same value populated for CATTSS.

10.2.1.1 Traffic separation scheme lanes

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

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

All instances of encoding of the S-57 Object class **TSSLPT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Traffic Separation Scheme Lane Part** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute CATTSS for **TSSLPT** will not be converted. See clause 10.2.1.

For converting vessel speed limit information within a traffic separation scheme, see clause 9.1.2.

10.2.1.2 Traffic separation scheme boundaries

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

S-101 Geo Feature: **Traffic Separation Scheme Boundary** (C) (S-101 DCEG Clause 15.20)

All instances of encoding of the S-57 Object class **TSSBND** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Traffic Separation Scheme Boundary** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute CATTSS for **TSSBND** will not be converted. See clause 10.2.1.

10.2.1.3 Traffic separation lines

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

S-101 Geo Feature: **Separation Zone or Line** (C,S) (S-101 DCEG Clause 15.19)

All instances of encoding of the S-57 Object class **TSELNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Separation Zone or Line** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute CATTSS for **TSELNE** will not be converted. See clause 10.2.1.

10.2.1.4 Traffic separation zones

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

S-101 Geo Feature: **Separation Zone or Line** (C,S) (S-101 DCEG Clause 15.19)

All instances of encoding of the S-57 Object class **TSEZNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Separation Zone or Line** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute CATTSS for **TSEZNE** will not be converted. See clause 10.2.1.

10.2.1.5 Traffic separation scheme crossings

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

S-101 Geo Feature: **Traffic Separation Scheme Crossing** (S) (S-101 DCEG Clause 15.21)

All instances of encoding of the S-57 Object class **TSSCRS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Traffic Separation Scheme Crossing** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute CATTSS for **TSSCRS** will not be converted. See clause 10.2.1.

For converting vessel speed limit information within a traffic separation scheme, see clause 9.1.2.

10.2.1.6 Traffic separation scheme roundabouts

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

S-101 Geo Feature: **Traffic Separation Scheme Roundabout** (S) (S-101 DCEG Clause 15.22)

All instances of encoding of the S-57 Object class **TSSRON** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Traffic Separation Scheme Roundabout** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute CATTSS for **TSSRON** will not be converted. See clause 10.2.1.

For converting vessel speed limit information within a traffic separation scheme, see clause 9.1.2.

10.2.1.7 Inshore traffic zones

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

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

All instances of encoding of the S-57 Object class **ISTZNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Inshore Traffic Zone** during the automated conversion process. However, the following exceptions apply:

- The S-57 attribute CATTSS for **ISTZNE** will not be converted. See clause 10.2.1.

For converting vessel speed limit information within an inshore traffic zone, see clause 9.1.2.

10.2.1.8 Precautionary areas

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

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

All instances of encoding of the S-57 Object class **PRCARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Precautionary Area** during the automated conversion process.

For converting vessel speed limit information within a precautionary area, see clause 9.1.2.

10.2.2 Deep water routes

S-101 Geo Feature: **Deep Water Route** (S,N) (S-101 DCEG Clause 15.15)

S-101 Association: **Deep Water Route Aggregation** (N) (S-101 DCEG Clause 25.6)

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 type **Deep Water Route**. The **Deep Water Route** and its individual components will be aggregated using the named association **Deep Water Route Aggregation**. Data Producers are to note that where a **Deep Water Route** has been created during the automated conversion process, it will be required to populate the attribute **IMO adopted** manually, if considered necessary.

In S-101, a named deep water route should be encoded as **Deep Water Route** of geometric primitive surface. Data Producers may be required to manually create this surface during the conversion process, however a suitably configured converter may create the surface by utilising the geometry of the components of the route to identify its extent (see S-101 DCEG clause 15.15).

10.2.2.1 Deep water route parts

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

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

All instances of encoding of the S-57 Object class **DWRTPT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Deep Water Route Part** during the automated conversion process. However, Data Producers are advised that the following enumeration 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 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 **DWRTPT** and amend appropriately.

For converting vessel speed limit information within a dep water route, see clause 9.1.2.

10.2.2.2 Deep water route centrelines

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

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

All instances of encoding of the S-57 Object class **DWRTCL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Deep Water Route Centreline** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

10.2.3 Traffic separation scheme systems

S-101 Geo Feature: **Traffic Separation Scheme** (S,N) (S-101 DCEG Clause 15.23)

S-101 Association: **Traffic Separation Scheme Aggregation** (N) (S-101 DCEG Clause 25.18)

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 type **Traffic Separation Scheme**. The **Traffic Separation Scheme** and its individual components will be aggregated using the named association **Traffic Separation Scheme Aggregation**. Data Producers are to note that where a **Traffic Separation Scheme** has been created during the automated conversion process, it may 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 an instance of the S-57 Object class **SEAARE** 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. In order for this information to be converted across to an incidence of **Traffic Separation Scheme**, the text string encoded in INFORM on the **SEAARE** should be in a standardised format, such as *Traffic separation scheme*, 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). In S-101, a named TSS should be encoded as **Traffic Separation Scheme** of geometric primitive surface. Data Producers may be required to manually create this surface during the conversion process, however a suitably configured converter may create the surface using the geometry of the **SEAARE** if of geometric primitive area. If required, any **Sea Area/Named Water Area** or **feature name** for the most representative feature in the TSS should then be removed from the converted S-101 dataset.

10.2.4 Recommended routes

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

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

All instances of encoding of the S-57 Object class **RCRTCL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Recommended Route Centreline** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

10.2.5 Recommended direction of traffic flow

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

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

All instances of encoding of the S-57 Object class **RCTLPT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Recommended Traffic Lane Part** during the automated conversion process.

10.2.6 Two-way routes

S-57 Geo Object: Two-way route part (**TWRTPT**) (A)

S-101 Geo Feature: **Two-Way Route Part** (S) (S-101 DCEG Clause 15.10)

S-101 Geo Feature: **Two-Way Route** (S,N) (S-101 DCEG Clause 15.11)

S-101 Association: **Two-Way Route Aggregation** (N) (S-101 DCEG Clause 25.19)

All instances of encoding of the S-57 Object class **TWRTPT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Two-Way Route Part** during the automated conversion process. However, Data Producers are advised that the following enumeration 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 type **Two-Way Route**. The **Two-Way Route** and its individual components will be aggregated using the named association **Two-Way Route Aggregation**. 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.

In S-101, a named two-way route should be encoded as **Two-Way Route** of geometric primitive surface. Data Producers may be required to manually create this surface during the conversion process, however a suitably configured converter may create the surface by utilising the geometry of the components of the route to identify its extent (see S-101 DCEG clause 15.11).

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 an instance of the S-57 Object class **SEAARE** 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 then be removed from the converted S-101 dataset in this case.

10.2.7 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.

10.3 Ferries

S-57 Geo Object:	Ferry route (**FERYRT**)	(L,A)	
S-101 Geo Feature:	**Ferry Route**	(C,S)	(S-101 DCEG Clause 15.28)

All instances of encoding of the S-57 Object class **FERYRT** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Ferry Route** during the automated conversion process.

10.4 Fairways

S-57 Geo Object:	Fairway (**FAIRWY**)	(A)	
S-101 Geo Feature:	**Fairway**	(S)	(S-101 DCEG Clause 15.7)
S-101 Geo Feature:	**Fairway System**	(S,N)	(S-101 DCEG Clause 15.8)
S-101 Association:	**Fairway Aggregation**	(N)	(S-101 DCEG Clause 25.7)
S-101 Association:	**Fairway Auxiliary**	(N)	(S-101 DCEG Clause 25.8)

All instances of encoding of the S-57 Object class **FAIRWY** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Fairway** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Fairway** in S-101:

quality of vertical measurement (QUASOU)

See S-101 DCEG clause 15.7 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 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 type **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.

In S-101, a named fairway should be encoded as **Fairway System** of geometric primitive surface. Data Producers may be required to manually create this surface during the conversion process, however a suitably configured converter may create the surface by utilising the geometry of the components of the system to identify its extent (see S-101 DCEG clause 15.8).

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 an instance of the S-57 Object class **SEAARE** 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.

For converting vessel speed limit information within a fairway, see clause 9.1.2.

10.5 Archipelagic Sea Lane

10.5.1 Archipelagic Sea Lanes

S-57 Geo Object:	Archipelagic Sea Lane (**ARCSLN**)	(A)	
S-101 Geo Feature:	**Archipelagic Sea Lane Area**	(S)	(S-101 DCEG Clause 15.24)

All instances of encoding of the S-57 Object class **ARCSLN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Archipelagic Sea Lane Area** during the automated conversion process.

10.5.2 Archipelagic Sea Lane Axis

S-57 Geo Object:	Archipelagic Sea Lane Axis (**ASLXIS**)	(L)	
S-101 Geo Feature:	**Archipelagic Sea Lane Axis**	(C)	(S-101 DCEG Clause 15.25)

All instances of encoding of the S-57 Object class **ASLXIS** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Archipelagic Sea Lane Axis** during the automated conversion process.

10.5.3 Archipelagic Sea Lane systems

S-101 Geo Feature:	**Archipelagic Sea Lane**	(S,N)	(S-101 DCEG Clause 15.26)
S-101 Association:	**ASL Aggregation**	(N)	(S-101 DCEG Clause 25.3)

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 type **Archipelagic Sea Lane**. The **Archipelagic Sea Lane** and its individual components will be aggregated using the named association **ASL Aggregation**. Data Producers are to note that where an **Archipelagic Sea Lane** has been created in the automated 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 an instance of the S-57 Object class **SEAARE** 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. In order for this information to be converted across to an incidence of **Archipelagic Sea Lane**, the text string encoded in INFORM on the **SEAARE** should be in a standardised format, such as *Archipelagic sea lane*, 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). In S-101, a named ASL should be encoded as **Archipelagic Sea Lane** of geometric primitive surface. Data Producers may be required to manually create this surface during the conversion process, however a suitably configured converter may create the surface using the geometry of the **SEAARE** if of geometric primitive area. If required, any **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.

11 Regulated areas

11.1 Restricted areas in general

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

S-101 Geo Feature: **Restricted Area** (S) (S-101 DCEG Clause 17.8)

All instances of encoding of the S-57 Object class **RESARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature types **Restricted Area** during the automated conversion process.

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

- S-57 attribute CATREA value *26* (water skiing area) will convert to S-101 attribute **category of restricted area** value *32* (recreation area).

For converting vessel speed limit information within a restricted area and other S-101 Features having complex attribute **vessel speed limit**, see clause 9.1.2.

11.2 Maritime jurisdiction areas

The general guidance for the encoding of maritime jurisdiction areas remains unchanged in S-101. However, in S-101 Curve has been introduced as an allowable geometric primitive for several maritime jurisdiction area Feature types, thus removing the requirement to encode a “very narrow area” instance of these Features in order to indicate a linear feature. Where Curve has been introduced as an allowable geometric primitive in S-101, this is indicated in the following clauses, along with any additional ENC conversion guidance. See also S-101 DCEG clause 16.2.

11.2.1 National territories

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

S-101 Geo Feature: **Administration Area** (C,S) (S-101 DCEG Clause 16.9)

All instances of encoding of the S-57 Object class **ADMARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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:

- Curve has been introduced as an allowable geometric primitive for **Administration Area** in S-101, thus removing the requirement to encode a “very narrow area” instance of **ADMARE** in S-57 in order to indicate a linear feature. While a suitably configured converter may be capable of creating a Curve feature during the automated conversion process (for example, along one of the long edges or approximating the centreline of the “very narrow area”), Data Producers will be required to evaluate their converted S-101 data and amend these Features as required.
- The S-101 attribute **in dispute** has been introduced to provide an indication to the mariner that an administration area is in dispute. This information may be encoded in S-57 using an instance of the S-57 Object class **CTNARE** 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** should be in a standardised format, such as *In dispute*. Where this occurs, the **ADMARE** should be partitioned into two discrete **Administration Area** features during the conversion process. One **Administration Area** should be created coincident with the **CTNARE**, with **in dispute** set to *True*; and the other **Administration Area** created to cover the remaining **ADMARE**, with **in dispute** not populated or set to *False*. 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.

11.2.2 Custom zones

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

S-101 Geo Feature: **Custom Zone** (S) (S-101 DCEG Clause 16.15)

All instances of encoding of the S-57 Object class **CUSZNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Custom Zone** during the automated conversion process.

11.2.3 Free port areas

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

S-101 Geo Feature: **Free Port Area** (S) (S-101 DCEG Clause 16.19)

All instances of encoding of the S-57 Object class **FRPARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Free Port Area** during the automated conversion process.

11.2.4 Territorial Seas

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

S-101 Geo Feature: **Straight Territorial Sea Baseline** (C) (S-101 DCEG Clause 16.23)

All instances of encoding of the S-57 Object class **STSLNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Straight Territorial Sea Baseline** during the automated conversion process.

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

S-101 Geo Feature: **Territorial Sea Area** (C,S) (S-101 DCEG Clause 16.24)

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

restriction (RESTRN)

See S-101 DCEG clause 16.24 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:

- Curve has been introduced as an allowable geometric primitive for **Territorial Sea Area** in S-101, thus removing the requirement to encode a “very narrow area” instance of **TESARE** in S-57 in order to indicate a linear feature. While a suitably configured converter may be capable of creating a Curve feature during the automated conversion process (for example, along one of the long edges or approximating the centreline of the “very narrow area”), Data Producers will be required to evaluate their converted S-101 data and amend these Features as required.
- The S-101 attribute **in dispute** has been introduced to provide an indication to the mariner that a Territorial Sea area is in dispute. This information may be encoded in S-57 using an instance of the S-57 Object class **CTNARE** 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** should be in a standardised format, such as *In dispute*. Where this occurs, the **TESARE** should be partitioned into two discrete **Territorial Sea Area** features during the conversion process. One **Territorial Sea Area** should be created coincident with the **CTNARE**, with **in dispute** set to *True*; and the other **Territorial Sea Area** created to cover the remaining **TESARE**, with **in dispute** not populated or set to *False*. 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.

For converting vessel speed limit information within a Territorial Sea area, see clause 9.1.2.

11.2.5 Contiguous Zones

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

S-101 Geo Feature: **Contiguous Zone** (C,S) (S-101 DCEG Clause 16.13)

All instances of encoding of the S-57 Object class **CONZNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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:

- Curve has been introduced as an allowable geometric primitive for **Contiguous Zone** in S-101, thus removing the requirement to encode a "very narrow area" instance of **CONZNE** in S-57 in order to indicate a linear feature. While a suitably configured converter may be capable of creating a Curve feature during the automated conversion process (for example, along one of the long edges or approximating the centreline of the "very narrow area"), Data Producers will be required to evaluate their converted S-101 data and amend these Features as required.
- The S-101 attribute **in dispute** has been introduced to provide an indication to the mariner that a contiguous zone is in dispute. This information may be encoded in S-57 using an instance of the S-57 Object class **CTNARE** 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** should be in a standardised format, such as *In dispute*. Where this occurs, the **CONZNE** should be partitioned into two discrete **Contiguous Zone** features during the conversion process. One **Contiguous Zone** should be created coincident with the **CTNARE**, with **in dispute** set to *True*; and the other **Contiguous Zone** created to cover the remaining **CONZNE**, with **in dispute** not populated or set to *False*. 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.

11.2.6 Fishery zones

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

S-101 Geo Feature: **Fishery Zone** (S) (S-101 DCEG Clause 16.17)

All instances of encoding of the S-57 Object class **FSHZNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 M* or *12 M*) 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**, with sub-attribute **name** populated as *6 miles* or *12 miles* as appropriate. During the automated conversion process, INFORM containing *6 M* or *12 M* will be converted to the corresponding **feature name**/**name** instance.

11.2.7 Continental Shelves

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

S-101 Geo Feature: **Continental Shelf Area** (C,S) (S-101 DCEG Clause 16.14)

All instances of encoding of the S-57 Object class **COSARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Continental Shelf Area** during the automated conversion process.

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

- Curve has been introduced as an allowable geometric primitive for **Continental Shelf Area** in S-101, thus removing the requirement to encode a "very narrow area" instance of **COSARE** in S-57 in order to indicate a linear feature. While a suitably configured converter may be capable of creating a Curve feature during the automated conversion process (for example, along one of the long edges or approximating the centreline of the "very narrow area"), Data Producers will be required to evaluate their converted S-101 data and amend these Features as required.

11.2.8 Exclusive Economic Zones

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

S-101 Geo Feature: **Exclusive Economic Zone** (C,S) (S-101 DCEG Clause 16.16)

All instances of encoding of the S-57 Object class **EXEZNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Exclusive Economic Zone** during the automated conversion process.

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

- Curve has been introduced as an allowable geometric primitive for **Exclusive Economic Zone** in S-101, thus removing the requirement to encode a “very narrow area” instance of **EXEZNE** in S-57 in order to indicate a linear feature. While a suitably configured converter may be capable of creating a Curve feature during the automated conversion process (for example, along one of the long edges or approximating the centreline of the “very narrow area”), Data Producers will be required to evaluate their converted S-101 data and amend these Features as required.
- The S-101 attribute **in dispute** has been introduced to provide an indication to the mariner that an Exclusive Economic Zone is in dispute. This information may be encoded in S-57 using an instance of the S-57 Object class **CTNARE** 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** should be in a standardised format, such as *In dispute*. Where this occurs, the **EXEZNE** should be partitioned into two discrete **Exclusive Economic Zone** features during the conversion process. One **Exclusive Economic Zone** should be created coincident with the **CTNARE**, with **in dispute** set to *True*; and the other **Exclusive Economic Zone** created to cover the remaining **EXEZNE**, with **in dispute** not populated or set to *False*. 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.

11.3 Military practice areas; submarine transit lanes; minefields

11.3.1 Military practice areas

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

S-101 Geo Feature: **Military Practice Area** (P,S) (S-101 DCEG Clause 16.8)

All instances of encoding of the S-57 Object class **MIPARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Military Practice Area** during the automated conversion process.

For converting vessel speed limit information within a military practice area, see clause 9.1.2.

11.3.2 Submarine transit lanes

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

S-101 Geo Feature: **Submarine Transit Lane** (S) (S-101 DCEG Clause 16.25)

All instances of encoding of the S-57 Object class **SUBTLN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Submarine Transit Lane** during the automated conversion process.

For converting vessel speed limit information within a submarine transit lane, see clause 9.1.2.

11.3.3 Minefields

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

11.4 Dumping grounds

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

S-101 Geo Feature: **Dumping Ground** (P,S) (S-101 DCEG Clause 16.7)

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

restriction (RESTRN)

See S-101 DCEG clause 16.7 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 RESTRN on **DMPGRD** and amend appropriately.

For converting vessel speed limit information within a dumping ground, see clause 9.1.2.

11.5 Cables and cable areas

11.5.1 Submarine cables

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

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

All instances of encoding of the S-57 Object class **CBLSUB** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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.

S-57 attribute CATCBL values *4* (telephone) and *5* (telegraph) will convert to **category of cable** value *10* (telecommunications cable).

11.5.2 Overhead cables

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

S-101 Geo Feature: **Cable Overhead** (C) (S-101 DCEG Clause 6.10)

All instances of encoding of the S-57 Object class **CBLOHD** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Cable Overhead** during the automated conversion process.

S-57 attribute CATCBL values *4* (telephone) and *5* (telegraph) will convert to S-101 attribute **category of cable** value *10* (telecommunications cable).

For converting information indicating that the encoding of a single overhead cable feature instance is representative of multiple real-world features, see clause 2.7.

11.5.3 Submarine cable areas

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

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

All instances of encoding of the S-57 Object class **CBLARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Cable Area** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

S-57 attribute CATCBL values *4* (telephone) and *5* (telegraph) will convert to **category of cable** value *10* (telecommunications cable).

For converting vessel speed limit information within a submarine cable area, see clause 9.1.2.

11.6 Pipelines and pipeline areas

11.6.1 Pipelines, submarine or on land

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

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

All instances of encoding of the S-57 Object class **PIPSOL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Pipeline Submarine/On Land** during the automated conversion process. However, the following exceptions apply:

- **PIPSOL** of geometric primitive point will convert to an instance of the S-101 Feature type **Obstruction** if extending from the seabed; or to an instance of the S-101 Feature type **Landmark** if

located on land. Data Producers will be required to evaluate their converted S-101 data and review the attribution of these features as required.

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

product (PRODCT)

See S-101 DCEG clause 14.4 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 PRODCT 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.

For converting information indicating that the encoding of a single pipeline feature instance is representative of multiple real-world features, see clause 2.7.

11.6.2 Diffusers, cribs

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

11.6.3 Overhead pipelines

S-57 Geo Object:	Pipeline overhead (**PIPOHD**)	(L)	
S-101 Geo Feature:	**Pipeline Overhead**	(C)	(S-101 DCEG Clause 6.11)

All instances of encoding of the S-57 Object class **PIPOHD** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Pipeline Overhead** during the automated conversion process.

For converting information indicating that the encoding of a single overhead pipeline feature instance is representative of multiple real-world features, see clause 2.7.

11.6.4 Pipeline areas

S-57 Geo Object:	Pipeline area (**PIPARE**)	(P,A)	
S-101 Geo Feature:	**Submarine Pipeline Area**	(P,S)	(S-101 DCEG Clause 14.5)

All instances of encoding of the S-57 Object class **PIPARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Submarine Pipeline Area** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Submarine Pipeline Area** in S-101:

product (PRODCT)

See S-101 DCEG clause 14.5 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 PRODCT on **PIPARE** and amend appropriately.

For converting vessel speed limit information within a submarine pipeline area, see clause 9.1.2.

11.7 Oil and Gas fields

11.7.1 Wellheads

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

11.7.2 Offshore platforms

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

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

All instances of encoding of the S-57 Object class **OFSPLF** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 enumeration 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 an instance of the S-57 Object class **LNDMRK** 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.

11.7.3 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.

11.7.4 Offshore production areas

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

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

All instances of encoding of the S-57 Object class **OSPARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Offshore Production Area** during the automated conversion process. However, Data Producers are advised that the following enumeration 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 CONDTN 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 have a corresponding attribute 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 populated.
- Individual wind turbines within offshore wind farms encoded in S-57 as an instance of the S-57 Object class **LNDMRK** will be converted to an instance of the S-101 Feature type **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** should be in a standardised format, such as *Wave farm* or *Current farm*.

For converting vessel speed limit information within an offshore production area, see clause 9.1.2.

11.7.5 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.

11.7.6 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.

11.8 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 16.7.2.

11.9 Fishing equipment and aquaculture areas

11.9.1 Fishing facilities

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

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

All instances of encoding of the S-57 Object class **FSHFAC** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Fishing Facility** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

11.9.2 Marine farms

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

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

All instances of encoding of the S-57 Object class **MARCUL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Marine Farm/Culture** during the automated conversion process. However, Data Producers are advised that the following enumeration 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 EXPSOU on **MARCUL** and amend appropriately.

For converting vessel speed limit information within a marine farm, see clause 9.1.2.

11.9.3 Fish havens

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

11.9.4 Fishing grounds

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

S-101 Geo Feature: **Fishing Ground** (S) (S-101 DCEG Clause 16.18)

All instances of encoding of the S-57 Object class **FSHGRD** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Fishing Ground** during the automated conversion process.

For converting vessel speed limit information within a fishing ground, see clause 9.1.2.

11.10 Degaussing ranges

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

11.11 Historic wrecks

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

11.12 Seaplane landing areas

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

S-101 Geo Feature: **Seaplane Landing Area** (P,S) (S-101 DCEG Clause 16.6)

All instances of encoding of the S-57 Object class **SPLARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Seaplane Landing Area** during the automated conversion process.

For converting vessel speed limit information within a seaplane landing area, see clause 9.1.2.

11.13 Various maritime areas

11.13.1 Ice areas

S-57 Geo Object: Ice area (**ICEARE**) (A)

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

All instances of encoding of the S-57 Object class **ICEARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Ice Area** during the automated conversion process. However, Data Producers are advised that the following enumeration 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.

11.13.2 Log ponds

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

S-101 Geo Feature: **Log Pond** (P,S) (S-101 DCEG Clause 16.21)

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

status (STATUS)

See S-101 DCEG clause 16.21 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.

11.13.3 Incineration areas

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

S-101 Geo Feature: None

The S-57 Object class **ICNARE** will not be converted.

11.13.4 Cargo transhipment areas

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

S-101 Geo Feature: **Cargo Transhipment Area** (P,S) (S-101 DCEG Clause 16.10)

All instances of encoding of the S-57 Object class **CTSARE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Cargo Transhipment Area** during the automated conversion process.

For converting vessel speed limit information within a cargo transhipment area, see clause 9.1.2.

11.13.5 Collision regulations

S-57 Geo Object: Caution area (**CTNARE**) (A)

S-101 Geo Feature: **Collision Regulations Limit** (C) (S-101 DCEG Clause 16.27)

The S-101 Feature type **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** should be in a standardised format, such as *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 values populated for the complex attribute **information**.

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

- The S-101 Feature **Collision Regulations Limit** can only be encoded using geometric primitive curve. During the automated conversion process, the boundary of the **CTNARE** of geometric primitive area will be used to construct the curve geometry of the **Collision Regulations Limit**. While a suitably configured converter may be capable of approximating a “median” of the area to determine the geometry of the converted curve in S-101, Data Producers will be required to check all converted instances of **Collision Regulations Limit** and amend the geometry as required.

11.14 Nature reserves

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

11.15 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.

11.16 Marine pollution regulations

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

S-101 Geo Feature: **Marine Pollution Regulations Area** (S) (S-101 DCEG Clause 16.28)

The S-101 Feature type **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** should be in a standardised format, such as *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 values populated for the complex attribute **information**.

12 Aids to navigation

12.1 Lighthouses, navigational marks - relationships

12.1.1 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.

12.1.2 Relationships

S-101 Association: **Structure/Equipment** (N) (S-101 DCEG Clause 25.16)

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.

12.2 Buoyage systems and direction of buoyage

S-57 Meta Object:	Navigational system of marks (**M_NSYS**)	(A)	
S-101 Meta Feature:	**Navigational System of Marks**	(S)	(S-101 DCEG Clause 3.6)
S-101 Meta Feature:	**Local Direction of Buoyage**	(S)	(S-101 DCEG Clause 3.7)

All instances of encoding of the S-57 Meta Object **M_NSYS** and its binding attributes will be converted automatically to an instance of the S-101 Meta Features **Navigational System of Marks** or **Local Direction of Buoyage** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Navigational System of Marks** and **Local Direction of Buoyage** in S-101:

marks navigational – system of (MARSYS)

See S-101 DCEG clause 3.6 for the listing of allowable values. Values populated in S-57 for this attribute other than the allowable values will be converted to an empty (null) value. 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 be converted to an instance of the S-101 Feature type **Local Direction of Buoyage** during the automated conversion process.

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

12.3 Fixed structures

12.3.1 Beacons

S-57 Geo Object:	Beacon, cardinal (**BCNCAR**)	(P)	
S-101 Geo Feature:	**Cardinal Beacon**	(P)	(S-101 DCEG Clause 20.10)
S-57 Geo Object:	Beacon, isolated danger (**BCNISD**)	(P)	
S-101 Geo Feature:	**Isolated Danger Beacon**	(P)	(S-101 DCEG Clause 20.11)
S-57 Geo Object:	Beacon, lateral (**BCNLAT**)	(P)	
S-101 Geo Feature:	**Lateral Beacon**	(P)	(S-101 DCEG Clause 20.9)
S-57 Geo Object:	Beacon, safe water (**BCNSAW**)	(P)	
S-101 Geo Feature:	**Safe Water Beacon**	(P)	(S-101 DCEG Clause 20.12)

All instances of encoding of the above S-57 beacon Object classes and their binding attributes will be converted automatically to an instance of the above corresponding S-101 beacon Feature types during the automated conversion process. However, Data Producers are advised that the following

enumeration 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 20.9-12 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 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 **TOPMAR**. All instances of **TOPMAR** 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 **TOPMAR** attributes DATEND, DATSTA, 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**. See also clause 12.6.

S-57 Geo Object: Beacon, special purpose (**BCNSPP**) (P)

S-101 Geo Feature: **Special Purpose/General Beacon** (P) (S-101 DCEG Clause 20.13)

All instances of encoding of the S-57 Object class **BCNSPP** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Special Purpose/General Beacon** during the automated conversion process. However, Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Special Purpose/General Beacon** in S-101:

category of special purpose mark (CATSPM)
marks navigational – system of (MARSYS)
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, MARSYS and NATCON on **BCNSPP** and amend appropriately.

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

- The S-57 attribute CATSPM value *9* (ODAS (Ocean Data Acquisition System)) will convert to **category of special purpose mark** value *10* (recording mark) during the automated conversion process.
- 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 **TOPMAR**. All instances of **TOPMAR** associated with **BCNSPP** will be converted to **topmark** for the corresponding **Special Purpose/General Beacon** during the automated conversion process. However, it must be noted that the **TOPMAR** attributes DATEND, DATSTA, 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**. See also clause 12.6.

12.3.2 Lighthouses

The guidance for the encoding of lighthouses remains unchanged in S-101. See S-101 DCEG clause 19.1.6.

12.3.3 Daymarks

S-57 Geo Object: Daymark (**DAYMAR**) (P)

S-101 Geo Feature: **Daymark** (P) (S-101 DCEG Clause 20.14)

All instances of encoding of the S-57 Object class **DAYMAR** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Daymark** during the automated conversion process. However, Data Producers are advised that the following enumeration 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 20.14 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 CATSPM and NATCON on **DAYMAR** and amend appropriately.

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

- Additional daymark shape information populated in the S-57 attribute INFORM will be converted to the S-101 complex attribute **shape information**. However, noting that INFORM may contain other information relevant to the daymark that is not related to the shape, the contents of INFORM may also be converted to the complex attribute **information** in addition to **shape information**. Data Producers are advised to check all instances of the population of **shape information** and **information** on **Daymark** during the automated conversion process and amend as appropriate. Alternatively, Data Producers may consider separating discrete information incidences in INFORM by, for instance, semicolons such that the converter may be customised to recognise particular standardised text strings and parse these strings to appropriate S-101 attributes as required.

12.4 Floating structures

12.4.1 Buoys

S-57 Geo Object:	Buoy, cardinal (**BOYCAR**)	(P)	
S-101 Geo Feature:	**Cardinal Buoy**	(P)	(S-101 DCEG Clause 20.2)
S-57 Geo Object:	Buoy, isolated danger (**BOYISD**)	(P)	
S-101 Geo Feature:	**Isolated Danger Buoy**	(P)	(S-101 DCEG Clause 20.3)
S-57 Geo Object:	Buoy, lateral (**BOYLAT**)	(P)	
S-101 Geo Feature:	**Lateral Buoy**	(P)	(S-101 DCEG Clause 20.1)
S-57 Geo Object:	Buoy, safe water (**BOYSAW**)	(P)	
S-101 Geo Feature:	**Safe Water Buoy**	(P)	(S-101 DCEG Clause 20.4)

All instances of encoding of the above S-57 buoy Object classes and their binding attributes will be converted automatically to an instance of the above corresponding S-101 buoy Feature types during the automated conversion process. However, Data Producers are advised that the following enumeration 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 **TOPMAR**. All instances of **TOPMAR** 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 **TOPMAR** attributes DATEND, DATSTA, 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**. See also clause 12.6.

S-57 Geo Object:	Buoy, special purpose (**BOYSPP**)	(P)	
S-101 Geo Feature:	**Special Purpose/General Buoy**	(P)	(S-101 DCEG Clause 20.5)

All instances of encoding of the S-57 Object class **BOYSPP** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Special Purpose/General Buoy** during the

automated conversion process. However, the following exceptions apply:

- Instances of **BOYSPP** having attributes CATSPM = *27*, COLOUR = *5,6* or *6,5* and COLPAT = *2* will be converted to an instance of **Emergency Wreck Marking Buoy** (see clause 12.4.1.1).

Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Special Purpose/General Buoy** 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 **TOPMAR**. All instances of **TOPMAR** 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 **TOPMAR** attributes DATEND, DATSTA, 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**. See also clause 12.6.

S-57 Geo Object: Buoy, installation (**BOYINB**) (P)

S-101 Geo Feature: **Installation Buoy** (P) (S-101 DCEG Clause 20.7)

All instances of encoding of the S-57 Object class **BOYINB** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Installation Buoy** 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 **Installation Buoy** in S-101.

Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Installation Buoy** 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.

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

- The S-101 complex attribute **topmark** is not an allowable attribute for **Installation Buoy**, therefore the S-57 Object class **TOPMAR**, when associated to an instance of **BOYINB**, will not be converted (see clause 12.6).

12.4.1.1 Emergency wreck marking buoys

S-101 Geo Feature: **Emergency Wreck Marking Buoy** (P) (S-101 DCEG Clause 20.6)

The S-101 Feature type **Emergency Wreck Marking Buoy** has been introduced in S-101 to encode the new IALA classification of buoys intended to mark newly identified wrecks. This information is encoded in S-57 on **BOYSPP** using the attribute CATSPM value *27* (general warning mark). Instances of **BOYSPP** having attributes BOYSHP = *1*, *2*, *3*, *4*, *5* or *6*, CATSPM = *27*, COLOUR = *5,6* or *6,5* and COLPAT = *2* will be converted to an instance of **Emergency Wreck Marking Buoy** during the automated conversion process; noting, however, that the **BOYSPP** attributes PEREND and PERSTA will not be converted.

The conversion of **BOYSPP** to **Emergency Wreck Marking Buoy** is dependent on the **BOYSPP** attribution being in accordance with an IALA compliant emergency wreck marking buoy (colour and colour pattern). Data Producers are advised to check converted instances of **Special Purpose/General Buoy** having attribute **category of special purpose mark** = *27* (general warning mark) and, if the purpose of the buoy is to perform the function of an emergency wreck marking buoy but the

characteristics of the buoy do not conform with this IALA purpose, amend to an instance of **Emergency Wreck Marking Buoy**.

Any equipment features associated with the **BOYSPP** will, on conversion, be associated with the **Emergency Wreck Marking Buoy** (see clause 12.1.2).

Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Emergency Wreck Marking Buoy** in S-101:

buoy shape (BOYSHP)
marks navigational – system of (MARSYS)
nature of construction (NATCON)

See S-101 DCEG clause 20.6 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 BOYSHP, MARSYS and NATCON on **BOYSPP** and amend appropriately.

12.4.2 Light floats and light vessels

S-57 Geo Object:	Light float (**LITFLT**)	(P)	
S-101 Geo Feature:	**Light Float**	(P)	(S-101 DCEG Clause 20.15)
S-57 Geo Object:	Light vessel (**LITVES**)	(P)	
S-101 Geo Feature:	**Light Vessel**	(P)	(S-101 DCEG Clause 20.16)

All instances of encoding of the S-57 Object classes **LITFLT** and **LITVES**, and their binding attributes, will be converted automatically to an instance of the S-101 Feature types **Light Float** and **Light Vessel** during the automated conversion process. However, Data Producers are advised that the following enumeration type attribute has restricted allowable enumerate values for **Light Float** and **Light Vessel** in S-101:

nature of construction (NATCON)

See S-101 DCEG clauses 20.15-16 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 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 **TOPMAR**. All instances of **TOPMAR** 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 **TOPMAR** attributes DATEND, DATSTA, 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**. See also clause 12.6.
- The S-101 complex attribute **topmark** is not an allowable attribute for **Light Vessel**. Therefore, instances of **TOPMAR**, when associated to an instance of **LITVES**, will be converted automatically to an instance of the S-101 Feature type **Daymark** during the automated conversion process (see clause 12.3.3). Where the S-57 attribute COLOUR has not been populated for the **TOPMAR**, the mandatory S-101 attribute **colour** on the converted **Daymark** will be populated with an empty (null) value. See also clause 12.6.

12.5 Fog signals

S-57 Geo Object:	Fog signal (**FOGSIG**)	(P)	
S-101 Geo Feature:	**Fog Signal**	(P)	(S-101 DCEG Clause 20.19)

All instances of encoding of the S-57 Object class **FOGSIG** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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** should be in a standardised format, such as *Radio activated* or *Call activated*.

- For S-101 Edition 2.0.0, the attribute **signal group**, which is intended to have multiplicity [0..*] with each group included in the rhythm of the light to be encoded as separate instances of **signal group**, has been erroneously been assigned as multiplicity [0..1] for **Fog Signal**. As a result of this error in S-101 Edition 2.0.0, values for SIGGRP on **FOGSIG** must be converted to **signal group** on a "one to one" basis, and the guidance for the population of multiple values of **signal group** as included in S-101 DCEG clause 27.162 should be ignored.

12.6 Topmarks

All instances of encoding of the S-57 Object class **TOPMAR** will be converted automatically to an instance of 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. However, the following exceptions apply:

- **TOPMAR** associated to an instance of the S-57 Object class **BOYINB** will not be converted.
- **TOPMAR** associated to an instance of the S-57 Object classes **LITVES**, **MORFAC** or **PILPNT** will be converted automatically to an instance of the S-101 Feature type **Daymark** during the automated conversion process (see clause 12.3.3). Where the S-57 attribute COLOUR has not been populated for the **TOPMAR**, the mandatory S-101 attribute **colour** on the converted **Daymark** will be populated with an empty (null) value.

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

- Additional topmark shape information populated in the S-57 attribute INFORM will be converted to the S-101 sub-complex attribute **shape information**. However, noting that INFORM may contain other information relevant to the topmark that is not related to the shape, Data Producers are advised to check all instances of the population of **shape information** for the **topmark** complex attribute during the automated conversion process and amend as appropriate. This may include moving a relevant portion of the information from **shape information** to the complex attribute **information** on the navigational aid structure feature. Alternatively, Data Producers may consider separating discrete information incidences in INFORM by, for instance, semicolons ";" such that the converter may be customised to recognise particular standardised text strings and parse these strings to appropriate S-101 attributes as required.

12.7 Retroreflectors

S-57 Geo Object: Retroreflector (**RETRFL**) (P)

S-101 Geo Feature: **Retroreflector** (P) (S-101 DCEG Clause 20.17)

All instances of encoding of the S-57 Object class **RETRFL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Retroreflector** during the automated conversion process.

12.8 Lights

12.8.1 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 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 SECTR1 and SECTR2 present; and/or attribute CATLIT = *1* (directional function) or *16* (moiré effect) -> **Light Sectored**

LIGHTS: Attribute CATLIT contains value *6* (air obstruction light) -> **Light Air Obstruction**

LIGHTS: Attribute CATLIT contains value *7* (fog detector light) -> **Light Fog Detector**

For **Light Sectored**, see clause 12.8.6.1.

S-57 Geo Object: Light (**LIGHTS**) (P)

S-101 Geo Feature: **Light All Around** (P) (S-101 DCEG Clause 19.2)

All instances of encoding of the S-57 Object class **LIGHTS** having:

- attributes 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 converted automatically to an instance of the S-101 Feature type **Light All Around** during the automated conversion process. However, Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Light All Around** in S-101:

colour (COLOUR)
light characteristic (LITCHR)
marks navigational – system of (MARSYS)

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 COLOUR, LITCHR and MARSYS 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.
- The S-101 attribute **vertical length** has been introduced to encode the height of a light above the sea surface for **Light All Around** attached to floating structures. 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** should be in a standardised format, such as *Height of light xx metres*, where *xx* is the height of the light.

S-57 Geo Object: Light (**LIGHTS**) (P)

S-101 Geo Feature: **Light Fog Detector** (P) (S-101 DCEG Clause 19.4)

All instances of encoding of the S-57 Object class **LIGHTS** having attribute CATLIT containing value *7* (fog detector light) and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Light Fog Detector** during the automated conversion process. However, Data Producers are advised that the following enumeration type attributes have restricted allowable enumerate values for **Light Fog Detector** in S-101:

colour (COLOUR)
light characteristic (LITCHR)

See S-101 DCEG clause 19.4 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 COLOUR and LITCHR on **LIGHTS** and amend appropriately.

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

- The S-101 attribute **vertical length** has been introduced to encode the height of a light above the sea surface for **Light Fog Detector** attached to floating structures. 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** should be in a standardised format, such as *Height of light xx metres*, where *xx* is the height of the light.

S-57 Geo Object: Light (**LIGHTS**) (P)

S-101 Geo Feature: **Light Air Obstruction** (P) (S-101 DCEG Clause 19.5)

All instances of encoding of the S-57 Object class **LIGHTS** having attribute CATLIT containing value *6* (air obstruction light) and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Light Air Obstruction** during the automated conversion process. However, Data Producers are advised that the following enumeration type attributes have restricted allowable

enumerate values for **Light Air Obstruction** in S-101:

colour	(COLOUR)
light characteristic	(LITCHR)

See S-101 DCEG clause 19.5 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 COLOUR and LITCHR on **LIGHTS** and amend appropriately.

12.8.2 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.

12.8.3 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.

12.8.4 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.

12.8.5 Times of exhibition and exhibition conditions

12.8.5.1 Night lights

The guidance for the encoding of night lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.1.

12.8.5.2 Unwatched lights

The guidance for the encoding of unwatched lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.2.

12.8.5.3 Occasional lights

The guidance for the encoding of occasional lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.3.

12.8.5.4 Daytime lights

The guidance for the encoding of daytime lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.4.

12.8.5.5 Fog lights

The guidance for the encoding of fog lights remains unchanged in S-101. See S-101 DCEG clause 19.1.4.5.

12.8.5.6 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** should be in a standardised format, such as *Radio activated light* or *Call activated light*. See S-101 DCEG clause 19.1.4.6.

12.8.6 Sector lights and lights not visible all round

12.8.6.1 Sector lights

S-57 Geo Object:	Light (**LIGHTS**)	(P)	
S-101 Geo Feature:	**Light Sectored**	(P)	(S-101 DCEG Clause 19.3)

All instances of encoding of the S-57 Object class **LIGHTS** having:

- attributes SECTR1 and SECTR2 present; and/or
- attribute CATLIT = *1* (directional function) or *16* (moiré effect)

and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Light Sectored** during the automated conversion process. However, the following exceptions apply:

- **LIGHTS** having attribute LITVIS = *7* (obscured) will not be converted.

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

colour	(COLOUR)
light characteristic	(LITCHR)
light visibility	(LITVIS)
marks navigational – system of	(MARSYS)

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 COLOUR, LITCHR and MARSYS 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 visible sectors of a sectored light are encoded within a single **Light Sectored** feature using the complex attribute **sector characteristics** and its 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; or, if grouped to define sets of light sectors used for different range systems using the Collection object **C_AGGR**, as multiple **Light Sectored** features in accordance with the collections. Data Producers are advised to check their converted S-101 data and ensure that converted sector lights have been structured and attributed as intended; this includes situations where, for example, discrete sets of light sectors sharing the same light structure are part of different range systems, in which case two or more **Light Sectored** features may be required.
- 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.

12.8.6.2 Lights obscured by obstructions

Light sectors encoded as **LIGHTS** features having attribute LITVIS = *7* (obscured) will not be converted. See also clause 12.8.6.1.

The guidance for the encoding of faint light sectors resulting from being obscured by obstructions remains unchanged in S-101. See S-101 DCEG clause 19.3.1.1.

12.8.6.3 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.

12.8.6.4 Leading lights

The guidance for the encoding of leading lights remains unchanged in S-101. See S-101 DCEG clause 19.1.5.

12.8.6.5 Directional lights

The guidance for the encoding of leading lights remains unchanged in S-101. See S-101 DCEG clause 19.3.1.2.

12.8.6.6 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.

12.8.7 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.

12.8.8 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. This attribute is populated automatically during the conversion process based on the underlying Skin of the Earth feature. 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.

12.9 Radio stations

S-57 Geo Object: Radio station (**RDOSTA**) (P)

S-101 Geo Feature: **Radio Station** (P) (S-101 DCEG Clause 21.4)

All instances of encoding of the S-57 Object class **RDOSTA** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 enumeration 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 dataset conversion must be noted:

- The S-57 attribute COMCHA will convert to an instance(s) of the S-101 attribute **communication channel** on the **Radio Station**. However, where multiple Features in a S-57 dataset have the same value populated for COMCHA, this may be encoded in S-101 using the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the relevant S-101 Geo Features using the association **Additional Information**. Data Producers may evaluate the converted S-101 dataset and replace **communication channel** on **Radio Station** with **communication channel** on an associated **Contact Details** in the interests of data economy/consistency.
- The format for the S-101 attribute **communication channel** is different from the format used for the S-57 attribute COMCHA (see S-101 DCEG clause 27.77). By definition, COMCHA is used to provide VHF communication channels. Therefore, during the automated conversion process, if no characters (A-Z) are included for a communication channel, the channel will convert to the corresponding S-101 format for a VHF communication channel; for example, *[07]* will convert to *[VHF0007]*. However, if characters (A-Z) are included in an encoded value for COMCHA, these letters will be included in the converted value of **communication channel**; for example, *[WX1]* will convert to *[WX0001]*. Data Producers may be required to revisit converted instances of **communication channel** and adjust to comply with the new format convention as required.

12.9.1 Marine and aero-marine radiobeacons

Not applicable.

12.9.2 Aeronautical radiobeacons

Not applicable.

12.9.3 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.

12.9.4 Coast radio stations providing QTG service

Not applicable.

12.10 Radar beacons

S-57 Geo Object: Radar transponder beacon (**RTPBCN**) (P)

S-101 Geo Feature: **Radar Transponder Beacon** (P) (S-101 DCEG Clause 21.5)

All instances of encoding of the S-57 Object class **RTPBCN** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Radar Transponder Beacon** during the automated conversion process.

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

- For S-101 Edition 2.0.0, the attribute **signal group**, which is intended to have multiplicity [0..*] with each group included in the rhythm of the light to be encoded as separate instances of **signal group**, has been erroneously been assigned as multiplicity [0..1] for **Radar Transponder Beacon**. As a result of this error in S-101 Edition 2.0.0, values for SIGGRP on **RTPBCN** must be converted to **signal group** on a “one to one” basis, and the guidance for the population of multiple values of **signal group** as included in S-101 DCEG clause 27.162 should be ignored.

12.11 Radar surveillance systems

12.11.1 Radar ranges

S-57 Geo Object: Radar range (**RADRNG**) (A)

S-101 Geo Feature: **Radar Range** (S) (S-101 DCEG Clause 15.30)

All instances of encoding of the S-57 Object class **RADRNG** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Radar Range** during the automated conversion process.

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

- The S-57 attribute COMCHA will convert to an instance(s) of the S-101 attribute **communication channel** on the **Radar Range**. However, where multiple Features in a S-57 dataset have the same value populated for COMCHA, this may be encoded in S-101 using the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the relevant S-101 Geo Features using the association **Additional Information**. Data Producers may evaluate the converted S-101 dataset and replace **communication channel** on **Radar Range** with **communication channel** on an associated **Contact Details** in the interests of data economy/consistency.
- The format for the S-101 attribute **communication channel** is different from the format used for the S-57 attribute COMCHA (see S-101 DCEG clause 27.77). By definition, COMCHA is used to provide VHF communication channels. Therefore, during the automated conversion process, if no characters (A-Z) are included for a communication channel, the channel will convert to the corresponding S-101 format for a VHF communication channel; for example, *[07]* will convert to *[VHF0007]*. However, if characters (A-Z) are included in an encoded value for COMCHA, these letters will be included in the converted value of **communication channel**; for example, *[WX1]* will convert to *[WX0001]*. Data Producers may be required to revisit converted instances of **communication channel** and adjust to comply with the new format convention as required.

12.11.2 Radar reference lines

S-57 Geo Object: Radar line (**RADLNE**) (L)

S-101 Geo Feature: **Radar Line** (C) (S-101 DCEG Clause 15.29)

All instances of encoding of the S-57 Object class **RADLNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Radar Line** during the automated conversion process.

12.11.3 Radar station

S-57 Geo Object: Radar station (**RADSTA**) (P)

S-101 Geo Feature: **Radar Station** (P) (S-101 DCEG Clause 15.31)

All instances of encoding of the S-57 Object class **RADSTA** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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.

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

- The S-57 attribute COMCHA will convert to an instance(s) of the S-101 attribute **communication channel** on the **Radar Station**. However, where multiple Features in a S-57 dataset have the same value populated for COMCHA, this may be encoded in S-101 using the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the relevant S-101 Geo Features using the association **Additional Information**. Data Producers may evaluate the converted S-101 dataset and replace **communication channel** on **Radar Station** with **communication channel** on an associated **Contact Details** in the interests of data economy/consistency.
- The format for the S-101 attribute **communication channel** is different from the format used for the S-57 attribute COMCHA (see S-101 DCEG clause 27.77). By definition, COMCHA is used to provide VHF communication channels. Therefore, during the automated conversion process, if no characters (A-Z) are included for a communication channel, the channel will convert to the corresponding S-101 format for a VHF communication channel; for example, *[07]* will convert to *[VHF0007]*. However, if characters (A-Z) are included in an encoded value for COMCHA, these letters will be included in the converted value of **communication channel**; for example, *[WX1]* will convert to *[WX0001]*. Data Producers may be required to revisit converted instances of **communication channel** and adjust to comply with the new format convention as required.

12.12 Radar conspicuous objects

In S-57 the attribute CONRAD is an enumeration type attribute having the value *3* (radar conspicuous (has radar reflector)) in addition to values *1* (radar conspicuous) and *2* (not radar conspicuous), while in S-101 the attribute **radar conspicuous** is a Boolean type attribute (see S-101 DCEG clause 27.146). During the automated conversion process, all encoded instances of CONRAD will be converted to **radar conspicuous** as follows:

CONRAD = *1* -> **radar conspicuous** = *True*

CONRAD = *2* -> **radar conspicuous** = *False*

CONRAD = *3* -> **radar conspicuous** = *True*

S-57 Geo Object: Radar reflector (**RADRFL**) (P)

S-101 Geo Feature: **Radar Reflector** (P) (S-101 DCEG Clause 20.18)

All instances of encoding of the S-57 Object class **RADRFL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Radar Reflector** during the automated conversion process.

12.13 Radio reporting (calling-in) points

S-57 Geo Object: Radio calling-in point (**RDOCAL**) (P,L)

S-101 Geo Feature: **Radio Calling-In Point** (P,C) (S-101 DCEG Clause 15.27)

All instances of encoding of the S-57 Object class **RDOCAL** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Radio Calling-In Point** during the automated conversion process.

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.
- The S-57 attribute COMCHA will convert to an instance(s) of the S-101 attribute **communication channel** on the **Radio Calling-In Point**. However, where multiple Features in a S-57 dataset have the same value populated for COMCHA, this may be encoded in S-101 using the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the relevant S-101 Geo Features using the association **Additional Information**. Data Producers may evaluate the converted S-101 dataset and replace **communication channel** on **Radio Calling-In Point** with **communication channel** on an associated **Contact Details** in the interests of data economy/consistency.
- The format for the S-101 attribute **communication channel** is different from the format used for the S-57 attribute COMCHA (see S-101 DCEG clause 27.77). By definition, COMCHA is used to provide VHF communication channels. Therefore, during the automated conversion process, if no characters (A-Z) are included for a communication channel, the channel will convert to the corresponding S-101 format for a VHF communication channel; for example, *[07]* will convert to *[VHF0007]*. However, if characters (A-Z) are included in an encoded value for COMCHA, these letters will be included in the converted value of **communication channel**; for example, *[WX1]* will convert to *[WX0001]*. Data Producers may be required to revisit converted instances of **communication channel** and adjust to comply with the new format convention as required.

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

S-101 Geo Feature: **Vessel Traffic Service Area** (S) (S-101 DCEG Clause 22.2)

The S-101 Feature type **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** should be in a standardised format, such as *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 values populated for the complex attribute **information**.

12.14 Automatic Identification Systems (AIS)

12.14.1 AIS equipped aids to navigation

S-101 Geo Feature: **Physical AIS Aid to Navigation** (P) (S-101 DCEG Clause 21.2)

The S-101 Feature type **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 the location of 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 should be in a standardised format, such as *Automatic Identification System (AIS) aid to navigation*.

Data Producers will be required to evaluate each instance of the Feature type **Physical AIS Aid to Navigation** created during the automated conversion process and populate allowable attributes as required.

12.14.1.1 Virtual AIS aids to navigation

S-57 Geo Object: New object (**NEWOBJ**) (P)

S-101 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 Object class **NEWOBJ** will be converted to an instance of the S-101 Feature type **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 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 type **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.

13 Marine services and signal stations

13.1 Pilot stations

13.1.1 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.

13.1.2 Pilot boarding places

S-57 Geo Object: Pilot boarding place (**PILBOP**) (P,A)

S-101 Geo Feature: **Pilot Boarding Place** (P,S) (S-101 DCEG Clause 22.1)

All instances of encoding of the S-57 Object class **PILBOP** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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 type **Pilotage District** below.

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

status (STATUS)

See S-101 DCEG clause 22.1 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 **PILBOP** and amend appropriately.

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

- The S-57 attribute COMCHA will convert to an instance(s) of the S-101 attribute **communication channel** on the **Pilot Boarding Place**. However, where multiple Features in a S-57 dataset have the same value populated for COMCHA, this may be encoded in S-101 using the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the relevant S-101 Geo Features using the association **Additional Information**. Data Producers may evaluate the converted S-101 dataset and replace **communication channel** on **Pilot Boarding Place** with **communication channel** on an associated **Contact Details** in the interests of data economy/consistency.
- The format for the S-101 attribute **communication channel** is different from the format used for the S-57 attribute COMCHA (see S-101 DCEG clause 27.77). By definition, COMCHA is used to provide VHF communication channels. Therefore, during the automated conversion process, if no characters (A-Z) are included for a communication channel, the channel will convert to the corresponding S-101 format for a VHF communication channel; for example, *[07]* will convert to *[VHF0007]*. However, if characters (A-Z) are included in an encoded value for COMCHA, these letters will be included in the converted value of **communication channel**; for example, *[WX1]* will convert to *[WX0001]*. Data Producers may be required to revisit converted instances of **communication channel** and adjust to comply with the new format convention as required.

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

S-101 Geo Feature: **Pilotage District** (S) (S-101 DCEG Clause 16.26)

S-101 Association: **Pilotage District Association** (N) (S-101 DCEG Clause 25.11)

The S-101 Feature type **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** should be in a standardised format, such as *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 values populated for the complex attribute **information**.

13.2 Coastguard stations

S-57 Geo Object:	Coastguard station (**CGUSTA**)	(P)	
S-101 Geo Feature:	**Coast Guard Station**	(P,S)	(S-101 DCEG Clause 22.3)

All instances of encoding of the S-57 Object class **CGUSTA** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **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** should be in a standardised format, such as *Maritime Rescue and Coordination Centre*.

13.3 Rescue stations

S-57 Geo Object:	Rescue station (**RSCSTA**)	(P)	
S-101 Geo Feature:	**Rescue Station**	(P,S)	(S-101 DCEG Clause 22.6)

All instances of encoding of the S-57 Object class **RSCSTA** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Rescue Station** during the automated conversion process.

13.4 Signal stations

S-57 Geo Object:	Signal station, traffic (**SISTAT**)	(P)	
S-101 Geo Feature:	**Signal Station Traffic**	(P,S)	(S-101 DCEG Clause 22.5)
S-57 Geo Object:	Signal station, warning (**SISTAW**)	(P)	
S-101 Geo Feature:	**Signal Station Warning**	(P,S)	(S-101 DCEG Clause 22.4)

All instances of encoding of the S-57 Object classes **SISTAT** and **SISTAW** and their binding attributes will be converted automatically to an instance of the S-101 Feature types **Signal Station Traffic** and **Signal Station Warning**, respectively, during the automated conversion process.

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

- The S-57 attribute COMCHA will convert to an instance(s) of the S-101 attribute **communication channel** on the **Signal Station Warning**. However, where multiple Features in a S-57 dataset have the same value populated for COMCHA, this may be encoded in S-101 using the S-101 Information type **Contact Details** (see S-101 DCEG clause 24.1), attribute **communication channel**, associated to the relevant S-101 Geo Features using the association **Additional Information**. Data Producers may evaluate the converted S-101 dataset and replace **communication channel** on **Signal Station Warning** with **communication channel** on an associated **Contact Details** in the interests of data economy/consistency.
- The format for the S-101 attribute **communication channel** is different from the format used for the S-57 attribute COMCHA (see S-101 DCEG clause 27.77). By definition, COMCHA is used to provide VHF communication channels. Therefore, during the automated conversion process, if no characters (A-Z) are included for a communication channel, the channel will convert to the corresponding S-101 format for a VHF communication channel; for example, *[07]* will convert to *[VHF0007]*. However, if characters (A-Z) are included in an encoded value for COMCHA, these letters will be included in the converted value of **communication channel**; for example, *[WX1]* will convert to *[WX0001]*. Data Producers may be required to revisit converted instances of **communication channel** and adjust to comply with the new format convention as required.

14 Geographic names

S-101 Geo Feature:	**Island Group**	(S,N)	(S-101 DCEG Clause 5.5)
S-101 Association:	**Island Aggregation**	(N)	(S-101 DCEG Clause 25.9)
S-101 Association:	**Text Association**	(N)	(S-101 DCEG Clause 25.17)

Instances of the S-57 attributes OBJNAM and NOBJNM will be converted into an instance of the S-101 complex attribute **feature name**, having the following sub-attributes:

- **language** (mandatory);
- **name** (mandatory); and
- **name usage** (conditionally mandatory).

See S-101 DCEG clause 2.5.8.

During the automated conversion process, instances of OBJNAM and NOBJNM will be converted to an instance of **feature name** as follows:

- OBJNAM:
  - **language** = empty (null) or *eng* *
  - **name** = text string as included in OBJNAM
  - **name usage** = *1* (default name)

- NOBJNM:
  - **language** = empty (null) *
  - **name** = text string as included in NOBJNM
  - **name usage** = *2* (alternate name)

* The converter may be customised so as to populate an assigned value for **language** with the relevant three-letter language code in accordance with ISO 639-2/T.

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

- The S-101 Feature type **Island Group** has been introduced in S-101 to provide a dedicated method for the encoding of named groups of islands and archipelagos (see S-101 DCEG clause 5.5). This information may be encoded in S-57 using an instance of the S-57 Object class **LNDRGN** covering or centred in the group of islands. For guidance on ENC conversion from **LNDRGN** to **Island Group**, see clause 4.7.1.

15 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 8.23.1 (not mandatory but recommended)
Measured distances	**C_AGGR**	**Range System Aggregation**	S-101 DCEG clause 15.4.2 (mandatory)
Traffic Separation Schemes systems	**C_AGGR**	**Traffic Separation Scheme Aggregation**	S-101 DCEG clause 15.3 (mandatory)
Navigation lines and tracks	**C_AGGR**	**Range System Aggregation**	S-101 DCEG clause 15.1.1 (not mandatory but recommended)
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 (not mandatory)
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 (mandatory)
Radar beacon	**C_AGGR**	**Range System Aggregation**	S-101 DCEG clause 21.5.1 (not mandatory but recommended)

Table 15-1

It is recommended that Data Producers, as a minimum, include the appropriate S-57 Collection Objects within their data holdings indicated for the corresponding S-101 associations in Table 15-1 above as mandatory.

16 New Object

See clause 12.14.1.1.

17 Masking

The guidance for masking remains unchanged in S-101. See S-101 DCEG clause 2.5.10.

Appendix A: S-57 to S-101 conversion quick references

A-1 Summary of possible manual intervention required by the Data Producer

Table A-1 below provides a summary of the pre- or post-conversion manual intervention that may be required by the Data Producer when converting S-57 ENCs so as to provide an "equivalent" S-101 ENC. For a more comprehensive description of the intent for the requirement to perform this manual intervention, see clause 1.1. For optional S-101 encoding that may be applied post-conversion to extend the dataset to be a "full capability" S-101 dataset, see Tables A-2 and A-3.

The level of manual intervention required is dependent on the extent that conversion tools may be customised so as to adapt to the specific data encoding policies and practices of the Data Producer. The summary information contained in Table A-1 is intended to cater for conversion tools having a minimal customization capability.

More concise guidance within this document can be found in the clause numbers listed in the 2nd column. Where there are multiple clause numbers listed against an S-57 Object class, the clause number listed in **bold** is the principle reference. Where the 3rd column indicates that one or more binding attributes for an S-57 Object class has a restricted allowable list of enumerate values in S-101, refer to Table A-2 for the allowable list of S-101 values.

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
All	-	Separate discrete information populated in INFORM using a standard separator such as semicolon ";".	
All	**2.1.5**	Consider removal of date-expired S-57 Objects.	
All	**2.2.3.5**	Reconcile conversion of TECSOU value *14* (computer generated).	**Technique of vertical measurement** = *17* (hyperspectral imagery)
All	**2.3** **4.8.20**	Reconcile new file naming convention for support files for attributes **information**/**file reference** and **pictorial representation**.	
All	**2.3**	Reconcile encoding of national language in S-101 using attribute **information**/**language**.	
All	**14**	Reconcile encoding of national language in S-101 using attribute **feature name**/**language**.	
ACHARE	**9.2.1**	Standardised text string for INFORM (for reported anchorage).	**Anchorage Area**; **Mooring Area**
ACHBRT	**9.2.2**	None.	**Anchorage Area**; **Mooring Area**
ADMARE	**11.2.1** 11.16 12.13 13.1.2	Standardised text strings for INFORM (for marine pollution regulations area, vessel traffic service area and pilotage district). Replacement of "very narrow area" features to represent "linear" feature with new allowable curve geometric primitive in S-101. Reconcile encoding of **CTNARE** for areas in dispute.	**Administration Area**; **Marine Pollution Regulations Area**; **Pilotage District**; **Vessel Traffic Service Area**
AIRARE	**4.8.12**	Restricted allowable S-101 enumerate values for STATUS.	**Airport/Airfield**
ARCSLN	**10.5.1**	None.	**Archipelagic Sea Lane Area**
ASLXIS	**10.5.2**	None.	**Archipelagic Sea Lane Axis**
BCNCAR	**12.3.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Cardinal Beacon**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
BCNISD	**12.3.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Isolated Danger Beacon**
BCNLAT	**12.3.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Lateral Beacon**
BCNSAW	**12.3.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Safe Water Beacon**
BCNSPP	**12.3.1**	Restricted allowable S-101 enumerate values for CATSPM, MARSYS, NATCON.	**Special Purpose/General Beacon**
BERTHS	**4.6.2**	Standardised text strings for INFORM (for maximum permitted draught and dangerous or hazardous cargo). Restricted allowable S-101 enumerate values for QUASOU, STATUS.	**Berth**
BOYCAR	**12.4.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Cardinal Buoy**
BOYINB	**12.4.1**	Attributes MARSYS and VERLEN will not be converted. Restricted allowable S-101 enumerate values for NATCON. **TOPMAR** associated to **BOYINB** will not be converted.	**Installation Buoy**
BOYISD	**12.4.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Isolated Danger Buoy**
BOYLAT	**12.4.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Lateral Buoy**
BOYSAW	**12.4.1**	Restricted allowable S-101 enumerate values for MARSYS, NATCON.	**Safe Water Buoy**
BOYSPP	**12.4.1**	Restricted allowable S-101 enumerate values for CATSPM, MARSYS, NATCON. Attributes PEREND and PERSTA will not be converted (when converting to **Emergency Wreck Marking Buoy**). Restricted allowable S-101 enumerate values for BOYSHP, MARSYS, NATCON (when converting to **Emergency Wreck Marking Buoy**).	**Special Purpose/General Buoy**, **Emergency Wreck Marking Buoy**
BRIDGE	2.1.2 2.2.4.2 2.2.4.3 **4.8.10**	Each span of a bridge encoded as a separate **BRIDGE** feature (recommended). Confirm converted S-101 encoding, including bridge and span type; categorization of bridge as opening or closing; population of complex attribute **information**; and clearance types and values. Restricted allowable S-101 enumerate values for NATCON. Standardised text string for INFORM (for Baltic Sea chart datum 2000).	**Bridge**, **Span Fixed**, **Span Opening** **Landmark** (**BRIDGE** of geometric primitive point)
BUAARE	**4.8.14**	None.	**Built-Up Area**
BUISGL	**4.8.15**	Restricted allowable S-101 enumerate values for NATCON, STATUS. Standardised text string for INFORM (for multiplicity of features and boathouse or boatshed). Remove S-57 ECDIS Base display structure for buildings located in the water in converted S-101 dataset. Optional amendment of converted **Building** feature to **Structure Over Navigable Water** (see S-101 DCEG clause 8.7).	**Building**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
CANALS	**4.8.1** 5.4.8 5.8.1	Ensure that the underlying S-101 Skin of the Earth feature is **Land Area**.	**Canal**
CAUSWY	**4.8.9**	None.	**Causeway**
CBLARE	**11.5.3**	Restricted allowable S-101 enumerate values for RESTRN.	**Cable Area**
CBLOHD	2.1.2 **11.5.2**	Standardised text string for INFORM (for multiplicity of features and Baltic Sea chart datum 2000).	**Cable Overhead**
CBLSUB	**11.5.1**	Attributes DRVAL1 and DRVAL2 will not be converted.	**Cable Submarine**
CGUSTA	**13.2**	Standardised text string for INFORM (for Marine Rescue and Coordination Centre (MRCC)).	**Coast Guard Station**
CHKPNT	**4.6.4**	Restricted allowable S-101 enumerate values for STATUS.	**Checkpoint**
COALNE	2.4 **4.5.1** 4.7.11	Restricted allowable S-101 enumerate values for COLOUR.	**Coastline**
CONVYR	2.1.2 **4.8.11**	Restricted allowable S-101 enumerate values for PRODCT, STATUS. Standardised text string for INFORM (for multiplicity of features).	**Conveyor**
CONZNE	**11.2.5**	Attribute STATUS will not be converted. Replacement of “very narrow area” features to represent “linear” feature with new allowable curve geometric primitive in S-101. Reconcile encoding of **CTNARE** for areas in dispute.	**Contiguous Zone**
COSARE	**11.2.7**	Replacement of “very narrow area” features to represent “linear” feature with new allowable curve geometric primitive in S-101.	**Continental Shelf Area**
CRANES	2.1.2 **4.6.9.3**	Remove S-57 ECDIS Base display structure for buildings located in the water in converted S-101 dataset.	**Crane**
CTNARE	6.5 **6.6** 4.6.6.2 4.6.7.3 4.6.8 11.2.1 11.2.4 11.2.5 11.2.8 11.13.5	Standardised text string for INFORM (for discoloured water and collision regulations limits). Replacement of “very narrow area” features to represent “linear” feature with new allowable curve geometric primitive in S-101 (for **Collision Regulations Limit**). Reconcile encoding of **CTNARE** for areas in dispute and areas of continual change in bathymetry. Reconcile **CTNARE** encoded to indicate periodicity of S-57 Skin of the Earth Objects for which the corresponding S-101 Features are not part of the Skin of the Earth.	**Administration Area**, **Contiguous Zone**, **Caution Area**, **Collision Regulations Limit**, **Discoloured Water**, **Exclusive Economic Zone**, **Territorial Sea Area**
CTRPNT	**4.3**	Restricted allowable S-101 enumerate values for CATCTR. Mandatory attribute **visual prominence** on the converted **Landmark** feature will be populated with value *2* (not visually conspicuous).	**Landmark**
CTSARE	**11.13.4**	None.	**Cargo Transhipment Area**
CURENT	**3.4**	None.	**Current – Non-Gravitational**
CUSZNE	**11.2.2**	None.	**Custom Zone**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
C_AGGR	4.8.10 9.2.5 10.1.2 10.1.3 10.2.1 10.2.2 10.2.3 10.2.6 10.4 10.5.3 **15**	**C_AGGR** encoded to aggregate **ADMARE** (for Vessel Traffic Service) with associated **RDOCAL** will not be converted. For bridges over navigable water in S-57, encode each span as a separate **BRIDGE** feature and aggregate using **C_AGGR** (see clause 4.8.10). Remove **feature name** from most representative feature if OBJNAM has been populated on most representative Object; or delete converted **Sea Area/Named Water Area** if **SEAARE** has been encoded to include the name in S-57. For converted named **Fairway System**, populate attributes **fixed date range**, **maximum permitted draught** and **periodic date range** manually, if considered necessary. For converted named **Archipelagic Sea Lane**, **Deep Water Route**, **Fairway System**, **Mooring Trot**, **Traffic Separation Scheme**, **Two-Way Route** geometric primitive should be of type surface. Reconcile conversion of CATTSS for **Traffic Separation Scheme**. For converted named **Range System**, geometric primitive should be of type curve or surface.	**Archipelagic Sea Lane**, **ASL Aggregation**, **Bridge**, **Bridge Aggregation**, **Deep Water Route**, **Deep Water Route Aggregation**, **Fairway Aggregation**, **Fairway System**, **Mooring Trot**, **Mooring Trot Aggregation**, **Range System**, **Range System Aggregation**, **Traffic Separation Scheme**, **Traffic Separation Scheme Aggregation**, **Two-Way Route**, **Two-Way Route Aggregation**
C_ASSO	10.1.2 **15**	**C_ASSO** will not be converted. Data Producers will be required to manually create the relevant named associations if considered necessary.	**-**
DAMCON	**4.8.5** 4.8.15	Restricted allowable S-101 enumerate values for NATCON. For **DAMCON** of geometric primitive point, mandatory attribute **visual prominence** on the converted **Landmark** feature will be populated with value *2* (not visually conspicuous) if not populated on **DAMCON**.	**Dam** **Landmark** (**DAMCON** of geometric primitive point)
DAYMAR	**12.3.3**	Restricted allowable S-101 enumerate values for CATSPM, NATCON. Check contents of converted attributes **information**/**text** and **shape information** for appropriateness and/or duplication.	**Daymark**
DEPARE	**5.4.1**	Attribute QUASOU will not be converted.	**Depth Area**
DEPCNT	**5.2**	None.	**Depth Contour**, **Spatial Quality**
DISMAR	**4.4**	Standardised text string for INFORM (for measured distance value and unit of measure). Check that there is an appropriate structure feature associated with the converted S-57 **DISMAR** Object if attribute CATDIS = *2*, *3*, or *4*.	**Distance Mark**
DOCARE	**4.6.6.3**	Standardised text string for INFORM (for maximum permitted draught).	**Dock Area**
DMPGRD	**11.4**	Restricted allowable S-101 enumerate values for RESTRN.	**Dumping Ground**
DRGARE	**5.5**	Restricted allowable S-101 enumerate values for RESTRN. Delete any converted **SEAARE** or **SOUNDG** features used to encode depth of dredging information in S-57. Check that the date encoded in SORDAT on **DRGARE** is the date of dredging; remove if not.	**Dredged Area**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
DRYDOC	2.2.4.2 **4.6.6.1**	Attribute HORACC will not be converted. Standardised text string for INFORM (for maximum permitted draught).	**Dry Dock**
DYKCON	**4.8.7**	Restricted allowable S-101 enumerate values for NATCON.	**Dyke**
DWRTCL	2.2.3.5 **10.2.2.2**	Restricted allowable S-101 enumerate values for TECSOU.	**Deep Water Route Centreline**
DWRTPT	2.2.3.5 10.1.1 **10.2.2.1**	Restricted allowable S-101 enumerate values for TECSOU.	**Deep Water Route Part**
EXEZNE	**11.2.8**	Replacement of “very narrow area” features to represent “linear” feature with new allowable curve geometric primitive in S-101. Reconcile encoding of **CTNARE** for areas in dispute.	**Exclusive Economic Zone**
FAIRWY	10.1.1 **10.4**	Restricted allowable S-101 enumerate values for QUASOU.	**Fairway**
FERYRT	**10.3**	None.	**Ferry Route**
FLODOC	2.2.4.2 **4.6.6.2**	Attribute HORACC will not be converted. Restricted allowable S-101 enumerate values for CONDTN. Ensure appropriate Skin of the Earth coverage. Reconcile date dependent attributes being allowed for **Floating Dock** in S-101 with encoding of **CTNARE** to indicate date dependency in S-57. Standardised text string for INFORM (for maximum permitted draught).	**Floating Dock**
FNCLNE	**4.8.16**	Restricted allowable S-101 enumerate values for NATCON.	**Fence/Wall**
FOGSIG	**12.5**	Standardised text string for INFORM (for radio activated and call activated fog signals).	**Fog Signal**
FORSTC	**4.8.17**	Restricted allowable S-101 enumerate values for CONDTN. Remove S-57 ECDIS Base display structure for structures located in the water in converted S-101 dataset.	**Fortified Structure**
FRPARE	**11.2.3**	None.	**Free Port Area**
FSHFAC	**11.9.1**	Restricted allowable S-101 enumerate values for STATUS.	**Fishing Facility**
FSHGRD	**11.9.4**	None.	**Fishing Ground**
FSHZNE	**11.2.6**	Reconcile encoding of INFORM for extent of seaward limit (6M or 12M).	**Fishery Zone**
GATCON	2.1.2 **4.6.6.4**	Restricted allowable S-101 enumerate values for NATCON.	**Gate**
GRIDRN	2.2.4.2 **4.6.6.6** 6.2.2	**GRIDRN** of geometric primitive point will not be converted. Restricted allowable S-101 enumerate values for NATCON, STATUS, WATLEV.	**Gridiron**
HRBARE	**9.1.1**	Restricted allowable S-101 enumerate values for STATUS.	**Harbour Area (Administrative)**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
HRBFAC	**4.6.1**	Point not an allowable geometric primitive for **Structure Over Navigable Water** in S-101. Restricted allowable S-101 enumerate values for NATCON (**Harbour Facility**); and CATHAF, CONDTN, NATCON and STATUS (**Structure Over Navigable Water**). Standardised text string for INFORM (for conversion to **Structure Over Navigable Water**; and horizontal and vertical clearances).	**Harbour Facility**, **Structure Over Navigable Water**
HULKES	2.2.4.2 **4.6.8**	Ensure appropriate Skin of the Earth coverage. Reconcile date dependent attributes being allowed for **Hulk** in S-101 with encoding of **CTNARE** to indicate date dependency in S-57.	**Hulk**
ICEARE	**11.13.1**	Restricted allowable S-101 enumerate values for STATUS.	**Ice Area**
ICNARE	**11.13.3**	Will not convert to S-101.	
ISTZNE	**10.2.1.7**	If required, check conversion of CATTSS to **Traffic Separation Scheme** (see clause 10.2.1).	**Inshore Traffic Zone**
LAKARE	**4.7.8** 5.8.1	Ensure that the underlying S-101 Skin of the Earth feature is **Land Area**.	**Lake**
LNDARE	**4.1** 4.7.6 4.7.8 4.8.1 5.8.1	Restricted allowable S-101 enumerate values for STATUS.	**Land Area**
LNDELV	**4.7.2**	None.	**Land Elevation**
LNDMRK	4.3 **4.8.15** 11.7.2 11.7.4	**LNDMRK** of geometric primitive point encoded to represent rapids or a road should not be converted. Restricted allowable S-101 enumerate values for NATCON, STATUS. Standardised text string for INFORM (for multiplicity of features). Standardised text string for INFORM for **LNDMRK** encoded to represent S-57 Object/geometric primitive combinations that do not display in ECDIS (for sloping ground, waterfalls, vegetation, dams, helipads, pipes). Remove S-57 ECDIS Base display structure for structures located in the water in converted S-101 dataset.	**Landmark**, **Wind Turbine**, **Helipad Rapids**, **Sloping Ground**, **Vegetation**, **Waterfall**
LNDRGN	**4.7.1** 14	Attribute NATQUA will not be converted. Restricted allowable S-101 enumerate values for WATLEV. Standardised text string for INFORM (for radio activated and island group).	**Land Region**, **Island Group**
LIGHTS	2.1.2 2.4 **12.8.1** 12.8.5.6 **12.8.6.1**	Restricted allowable S-101 enumerate values for COLOUR, LITCHR, LITVIS, MARSYS. **LIGHTS** having LITVIS = 7 (obscured) will not be converted. Standardised text string for INFORM (for radio activated and call activated lights; and vertical length). Reconcile discrete sector lights sharing the same spatial instance but having different purposes (for example, part of different range systems).	**Light Air Obstruction**, **Light All Around**, **Light Fog Detector**, **Light Sectored**
LITFLT	2.2.4.2 **12.4.2**	Restricted allowable S-101 enumerate values for NATCON.	**Light Float**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
LITVES	2.2.4.2 **12.4.2**	Restricted allowable S-101 enumerate values for NATCON. **TOPMAR** associated to **LITVES** will not be converted.	**Light Vessel**
LOCMAG	**3.1.2**	Reconcile enhanced encoding of the value of the local magnetic anomaly using the S-101 complex attribute **value of local magnetic anomaly**.	**Local Magnetic Anomaly**
LOKBSN	**4.6.6.5**	None.	**Lock Basin**
LOGPON	**11.13.2**	Restricted allowable S-101 enumerate values for STATUS.	**Log Pond**
MAGVAR	**3.1.1**	Attributes DATEND and DATSTA will not be converted.	**Magnetic Variation**
MARCUL	**11.9.2**	Restricted allowable S-101 enumerate values for EXPSOU.	**Marine Farm/Culture**
MIPARE	**11.3.1**	None.	**Military Practice Area**
MORFAC	**4.6.7.1** 9.2.4	Evaluate conversion of CATMOR = *6* (chain/wire/cable) if the cable is not a junction cable as a component of a mooring trot. Evaluate conversion of CATMOR = *7* (mooring buoy) if BOYSHP is not populated and the buoy shape is not spherical. Check for illogical S-57 geometric primitives and/or feature/attribute combinations based on attribute CATMOR. Restricted allowable S-101 enumerate values for STATUS on **Bollard** and **Pile**. Restricted allowable S-101 enumerate values for CONDTN, STATUS on **Cable Submarine**. Restricted allowable S-101 enumerate values for NATCON, STATUS on **Dolphin** and **Shoreline Construction**. Restricted allowable S-101 enumerate values for BOYSHP, NATCON on **Mooring Buoy**.	**Bollard**, **Cable Submarine**, **Dolphin**, **Mooring Buoy**, **Pile**, **Shoreline Construction**
M_ACCY	2.2.4.1	None.	**Quality of Non-Bathymetric Data**
M_COVR	**2.2.6** 2.8.1	Check values for S-101 attributes **maximum display scale**, **optimum display scale** and **minimum display scale** if the S-57 dataset has no encoded **M_CSCL** Objects. Check values for optional S-101 attribute **drawing index**, if populated.	**Data Coverage**
M_CSCL	**2.2.6**	Check for complete, non-overlapping **Data Coverage** Feature(s) covering the entire dataset area covered by data. Check values for S-101 attributes **maximum display scale**, **optimum display scale** and **minimum display scale**. Check values for optional S-101 attribute **drawing index**, if populated.	**Data Coverage**
M_HOPA	**2.1.1**	Will not convert to S-101.	
M_NPUB	**2.5**	None.	**Information Area**
M_NSYS	**12.2**	Restricted allowable S-101 enumerate values for MARSYS.	**Navigational System of Marks**, **Local Direction of Buoyage**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
M_QUAL	2.1.3 **2.2.3.1** 2.2.3.5	Evaluate converted values for attributes **data assessment**, **features detected** and **full seafloor coverage achieved** on **Quality of Bathymetric Data** for suitability. Evaluate converted values for attributes **horizontal position uncertainty** and **vertical uncertainty** on associated **Spatial Quality** for suitability and possible alternate encoding on the associated **Quality of Bathymetric Data** itself. Attribute TECSOU will not be converted.	**Quality of Bathymetric Data**, **Spatial Quality**
M_SDAT	**2.1.3**	Ensure allowable values are populated for SDAT and VERDAT. Ensure complete, non-overlapping coverage of **Sounding Datum** for areas of bathymetry. Standardised text string for INFORM (for Baltic Sea chart datum 2000).	**Sounding Datum**
M_SREL	**2.2.3.2** 2.2.5.1	Attribute TECSOU will not be converted. Restricted allowable S-101 enumerate values for QUAPOS.	**Quality of Survey**
M_VDAT	**2.1.2**	Ensure allowable values are populated for VDAT and VERDAT. Ensure complete, non-overlapping coverage of **Vertical Datum** for the entire area of data coverage. Standardised text string for INFORM (for Baltic Sea chart datum 2000).	**Vertical Datum**
NAVLNE	**10.1.1**	Standardised text string for INFORM (for measured distance).	**Navigation Line**
NEWOBJ	**12.14.1.1**	Evaluate converted **Virtual AIS Aid to Navigation** feature for suitability. Attribute INFORM will not be converted. Restricted allowable S-101 enumerate values for STATUS.	**Virtual AIS Aid to Navigation**
OBSTRN	**6.2.2** 11.7.4	Attributes NATCON and NATQUA will not be converted for **Obstruction**. Attributes CONDTN, EXPSOU, NATCON, NATQUA, NATSUR, PRODCT, VERLEN and WATLEV will not be converted for **Foul Ground**. Attributes CATOBS, EXPSOU, NATQUA, NATSUR, PRODCT, QUASOU, SOUACC, TECSOU and VALSOU will not be converted for **Dam**. **OBSTRN** of geometric primitive point encoded to represent gridiron or a road should not be converted. Standardised text string for INFORM (for wave energy device, underwater turbine and active submarine volcano). Assess appropriateness of populated value of “system” attribute **default clearance depth** for **Obstruction**.	**Obstruction**, **Foul Ground**, **Dam**, **Spatial Quality**
OFSPLF	**11.7.2**	Attribute NATCON will not be converted. Restricted allowable S-101 enumerate values for STATUS. Reconcile encoding of **LNDMRK** to include a flare stack.	**Offshore Platform**
OSPARE	**11.7.4**	Restricted allowable S-101 enumerate values for CONDTN. Standardised text string for INFORM (for wind farm and current farm).	**Offshore Production Area**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
OILBAR	**4.8.19**	None.	**Oil Barrier**
PILBOP	**13.1.2**	Attributes NPLDST and PILDST will not be converted. Restricted allowable S-101 enumerate values for STATUS. Reconcile conversion of attribute COMCHA.	**Pilot Boarding Place**
PILPNT	**4.6.7.2**	**TOPMAR** associated to **PILPNT** will be converted to **Daymark**.	**Pile**
PIPARE	**11.6.4**	Restricted allowable S-101 enumerate values for PRODCT.	**Submarine Pipeline Area**
PIPOHD	2.1.2 **11.6.3**	Standardised text string for INFORM (for multiplicity of features).	**Pipeline Overhead**
PIPSOL	4.8.15 6.2.2 **11.6.1**	Point not an allowable geometric primitive for **Pipeline Submarine/On Land** in S-101. Reconcile attribution for **PIPSOL** of geometric primitive point converted to **Landmark** or **Obstruction**. Restricted allowable S-101 enumerate values for PRODCT. Standardised text string for INFORM (for multiplicity of features). Reconcile encoding bubble curtain in S-57 using value CATPIP = *5* (bubbler system).	**Pipeline Submarine/On Land** **Landmark**, **Obstruction** (**PIPSOL** of geometric primitive point)
PONTON	**4.6.7.3**	Attribute NATCON will not be converted. Ensure appropriate Skin of the Earth coverage. Reconcile date dependent attributes being allowed for **Pontoon** in S-101 with encoding of **CTNARE** to indicate date dependency in S-57.	**Pontoon**
PRCARE	**10.2.1.8**	None.	**Precautionary Area**
PRDARE	**4.8.13**	Restricted allowable S-101 enumerate values for STATUS.	**Production/Storage Area**
PYLONS	**4.8.18**	Restricted allowable S-101 enumerate values for NATCON. Standardised text string for INFORM (for multiplicity of features).	**Pylon/Bridge Support**
RADLNE	**12.11.2**	None.	**Radar Line**
RADRNG	**12.11.1**	Reconcile conversion of attribute COMCHA.	**Radar Range**
RADRFL	**12.12**	None.	**Radar Reflector**
RADSTA	**12.11.3**	Attributes DATEND and DATSTA will not be converted. Reconcile conversion of attribute COMCHA.	**Radar Station**
RAILWY	**4.8.2**	Restricted allowable S-101 enumerate values for CONDTN.	**Railway**
RAPIDS	**4.7.7.1** 4.8.15	**RAPIDS** of geometric primitive point will not be converted.	**Rapids**
RCRTCL	2.2.3.5 **10.2.4**	Restricted allowable S-101 enumerate values for TECSOU.	**Recommended Route Centreline**
RCTLPT	**10.2.5**	None.	**Recommended Traffic Lane Part**
RDOCAL	**12.13**	Reconcile conversion of attribute COMCHA. Reconcile converted collocated **Radio Calling-In Point** having non-reciprocal directions of traffic flow.	**Radio Calling-In Point**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
RDOSTA	**12.9**	Attribute ORIENT will not be converted. Restricted allowable S-101 enumerate values for CATROS. Reconcile conversion of attribute COMCHA.	**Radio Station**
RECTRC	2.2.3.5 **10.1.1**	Restricted allowable S-101 enumerate values for QUASOU, TECSOU. Standardised text string for INFORM (for maximum permitted draught). **RECTRC** of geometric primitive area will not be converted.	**Recommended Track**
RESARE	9.1.2 **11.1**	Standardised text string for INFORM (for speed limit). Reconcile converted complex attribute **vessel speed limit**.	**Restricted Area**
RETRFL	**12.7**	None.	**Retroreflector**
RIVERS	**4.7.6** 4.7.8 5.8.1	Restricted allowable S-101 enumerate values for STATUS. Ensure that the underlying S-101 Skin of the Earth feature is **Land Area**. Reconcile lakes encoded as **RIVERS** in converted data.	**River**
ROADWY	**4.8.8** 4.8.15 6.2.2	**ROADWY** of geometric primitive point will not be converted. Restricted allowable S-101 enumerate values for CONDTN, NATCON, STATUS.	**Road**
RSCSTA	**13.3**	None.	**Rescue Station**
RTPBCN	**12.10**	None.	**Radar Transponder Beacon**
RUNWAY	**4.8.12** 4.8.15	Reconcile attribution for **RUNWAY** of geometric primitive point converted to **Helipad**. Restricted allowable S-101 enumerate values for NATCON.	**Runway**, **Helipad**
SBDARE	2.4 **7.1**	Attribute COLOUR will not be converted. Check complex attribute **surface characteristics** instances for conversion of NATSUR and NATQUA.	**Seabed Area**
SEAARE	5.5 **8** 10.2.3 10.2.6 10.4 10.5.3	Reconcile converted **SEAARE** used to encode depth of dredging information for **DRGARE**. Standardised text string for INFORM (for Traffic Separation Scheme or Archipelagic Sea Lane). Reconcile converted **SEAARE** used to encode the name of a two-way route or fairway.	**Sea Area/Named Water Area**
SILTNK	**4.8.15**	Restricted allowable S-101 enumerate values for NATCON, STATUS. Standardised text string for INFORM (for multiplicity of features). Remove S-57 ECDIS Base display structure for silos/tanks located in the water in converted S-101 dataset.	**Silo/Tank**
SISTAT	**13.4**	Reconcile conversion of attribute COMCHA.	**Signal Station Traffic**
SISTAW	**13.4**	Reconcile conversion of attribute COMCHA.	**Signal Station Warning**
SLCONS	**4.5.2**	Restricted allowable S-101 enumerate values for STATUS. Reconcile conversion of CATSLC = *6* (wharf (quay)) to **category of shoreline construction** = *6* (wharf) or *22* (quay).	**Shoreline Construction**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
SLOGRD	2.4 **4.7.4** 4.8.15	Restricted allowable S-101 enumerate values for COLOUR, NATSUR.	**Sloping Ground**
SLOTOP	2.4 **4.7.5**	Restricted allowable S-101 enumerate values for COLOUR, NATSUR.	**Slope Topline**
SMCFAC	**4.6.5**	Reconcile value populated for **buoy shape** on converted **Mooring Buoy**.	**Small Craft Facility**, **Mooring Buoy**
SOUNDG	2.2.3.3 2.2.3.5 **5.3** 5.5	Attribute EXPSOU will not be converted for **Sounding**. Attributes EXPSOU, NOBJNM, OBJNAM, SOUACC and STATUS will not be converted for **Depth – No Bottom Found**. Confirm that value converted to **reported date** is a reported date. Restricted allowable S-101 enumerate values for QUASOU, TECSOU.	**Sounding**, **Depth – No Bottom Found**, **Spatial Quality**
SNDWAV	**7.2.1**	None.	**Sandwave**
SPLARE	**11.12**	None.	**Seaplane Landing Area**
SPRING	**7.2.3**	None.	**Spring**
STSLNE	**11.2.4**	None.	**Straight Territorial Sea Baseline**
SUBTLN	**11.3.2**	None.	**Submarine Transit Lane**
SWPARE	2.2.3.4 2.2.3.5 **5.6**	Attributes QUASOU, SOUACC and TECSOU will not be converted. Confirm that value converted to **swept date** is the swept date.	**Swept Area**
TESARE	**11.2.4**	Restricted allowable S-101 enumerate values for RESTRN. Replacement of “very narrow area” features to represent “linear” feature with new allowable curve geometric primitive in S-101. Reconcile encoding of **CTNARE** for areas in dispute.	**Territorial Sea Area**
TIDEWY	**7.2.4**	None.	**Tideway**
TOPMAR	4.6.7.1 4.6.7.2 12.3.1 12.4.1 12.4.2 **12.6**	Attributes DATEND, DATSTA, PEREND, PERSTA and STATUS will not be converted. **TOPMAR** associated to **BOYINB** and **MORFAC** will not be converted. **TOPMAR** associated to **LITVES**, **MORFAC** or **PILPNT** will be converted to **Daymark**. Check contents of converted attributes **information**/**text** and **shape information** for appropriateness and/or duplication.	Complex attribute **topmark** **Daymark**
TSELNE	**10.2.1.3**	Reconcile conversion of CATTSS.	**Separation Zone or Line**
TSEZNE	**10.2.1.4**	Reconcile conversion of CATTSS.	**Separation Zone or Line**
TSSBND	**10.2.1.2**	Reconcile conversion of CATTSS.	**Traffic Separation Scheme Boundary**
TSSCRS	**10.2.1.5**	Reconcile conversion of CATTSS.	**Traffic Separation Scheme Crossing**
TSSLPT	**10.2.1.1**	Reconcile conversion of CATTSS.	**Traffic Separation Scheme Lane Part**
TSSRON	**10.2.1.6**	Reconcile conversion of CATTSS.	**Traffic Separation Scheme Roundabout**

S-57 Object class	Clause	Possible Pre- or Post-Conversion Work Required:	Converts to:
TUNNEL	2.1.2 **4.8.3**	**TUNNEL** of geometric primitive point will not be converted. Restricted allowable S-101 enumerate values for CONDTN. STATUS.	**Tunnel**
TWRTPT	2.2.3.5 10.1.1 **10.2.6**	Restricted allowable S-101 enumerate values for TECSOU.	**Two-Way Route Part**
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**	Attributes PEREND and PERSTA will not be converted.	**Tidal Stream – Flood/Ebb**
TS_PAD	**3.3.5**	Reconcile converted TS_TSP to revised S-101 model.	**Tidal Stream Panel Data**
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	4.7.6 4.7.8 4.8.1 **5.8.1**	Reconcile **UNSARE** covering **RIVERS**, **CANALS** and **LAKARE**.	**Unsurveyed Area**, **Land Area**
UWTROC	**6.1.2**	Attribute NATQUA will not be converted. Confirm that value converted to **reported date** is a reported date. Restricted allowable S-101 enumerate values for EXPSOU, NATSUR, STATUS. Assess appropriateness of populated value of “system” attribute **default clearance depth**.	**Underwater/Awash Rock**, **Spatial Quality**
VEGATN	**4.7.11** 4.8.15	Reconcile conversion of **VEGATN** to **Obstruction**. Reconcile requirement for mandatory encoding of **vertical uncertainty**/**uncertainty fixed** and **display uncertainties** for all **VEGATN** of geometric primitive point converted to **Obstruction**. Restricted allowable S-101 enumerate values for CATVEG.	**Vegetation**, **Obstruction**
WATFAL	**4.7.7.2** 4.8.15	None.	**Waterfall**
WATTUR	**6.4**	None.	**Water Turbulence**
WEDKLP	**7.2.2**	None.	**Weed/Kelp**, **Seagrass**
WRECKS	**6.2.1**	Confirm that value converted to **reported date** is a reported date. Assess appropriateness of populated value of “system” attribute **default clearance depth**.	**Wreck**

Table A-1

A-2 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 enumeration 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 direct 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 combined full list of allowable values in S-57 (as included in S-57 Appendix A, Chapter 2, as amended) and 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
BOYSHP		1-2-3-4-5-6-7-8 [Values 7 and 8 do not convert for new Feature type **Emergency Wreck Marking Buoy**. See clause 12.4.1.1]
	MORFAC	1-2-3-4-5-6-~~7-8~~ [No equivalent feature in S-101. See clause 4.6.7.1]
CATAIR		1-2-3-4-5-6-8-**9**
CATACH		1-2-3-4-5-6-7-8-9-10-**14-15** [Value 4 converts to value 7 for new attribute **category of cargo**. Value 8 converts to new Feature type **Mooring Area**. See clause 9.2.1]

Attribute	Object	Allowable Attribute Values
CATBRG		1-2-3-4-5-6-7-8-9-10-11-12 [No equivalent attribute in S-101. All values convert to combinations of the enumeration type attributes **bridge construction**, **bridge function**, **category of opening bridge** and the Boolean type attribute **opening bridge**. See clause 4.8.10]
CATCBL		1-3-4-5-6-**7-9-10** [Values 4 and 5 convert to new value 10]
	CBLARE	1-4-5-**7-10** [Values 4 and 5 convert to new value 10]
	CBLOHD	1-3-4-5-**10** [Values 4 and 5 convert to new value 10]
	CBLSUB	1-4-5-6-**7-9-10** [Values 4 and 5 convert to new value 10]
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**
CATDIS		1-2-3-4 [Converts to new Boolean attribute **distance mark visible**. Value 1 converts to *False* and values 2-4 convert to *True* – see clause 4.4]
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-**22-23-24-25-26-27** [Value 19 converts to new Feature type **Wind Turbine** – see clause 4.8.15]
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 type **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]

Attribute	Object	Allowable Attribute Values
CATMOR		1-2-3-4-5-6-7 [No equivalent attribute in S-101. Values 1 and 2 convert to new Feature type **Dolphin**. Value 3 converts to new Feature type **Bollard**. Value 4 converts to new value 23 for attribute **category of shoreline construction**. Value 5 converts to new value 8 for attribute **category of pile**. Value 6 converts to new value 9 for attribute **category of cable**. Value 7 converts to new Feature type **Mooring Buoy**. See clause 4.6.7.1]
CATOBS		1-2-3-4-5-6-7-8-9-10-**12-13-14-15-16-17-18-19-20-21-22-23** [Value 7 converts to new Feature type **Foul Ground** – see clause 6.2.2]
CATOFP		1-2-3-4-5-6-7-8-9-10-**11**
CATPLE		1-3-4-**5-6-7-8**
CATPIP		2-3-4-5-6-**7**
CATPRA		1-2-3-4-5-6-7-8-9-10-**11-12**
	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-**11-12**
CATPYL		1-2-3-4-5-**6**
CATROS		~~1-2-3-4~~-5-~~6-7-8-9~~-10-11-~~12-13~~-14-**19-20**
CATRUN		1-2 [No equivalent attribute in S-101. Value 1 converts to Feature type **Runway**; value 2 converts to new Feature type **Helipad**. See clause 4.8.12]
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-**20-22-23**
CATSLO		1-2-3-4-5-6-7
	SLOTOP	1-2-~~3-4-5~~-6-~~7~~
CATSCF		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 [Value 29 converts to new Feature type **Mooring Buoy** – see clause 4.6.5]

Attribute	Object	Allowable Attribute Values
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** [Value 9 converts to value 10]
	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 type **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 [Values 7 and 21 convert to new value 23 for attribute **category of obstruction** – see clause 4.7.11]

CATWED		1-2-3-4 [Value 3 converts to new Feature type **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
	~~**MORFAC**~~	1-2-3-4-5-6-7-8-9-10-11-12-13 [No equivalent feature in S-101. See clause 4.6.7.1]
	~~**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**]
	~~**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
	~~**MORFAC**~~	1-2-3-4-5-6 [No equivalent feature in S-101. See clause 4.6.7.1]
	~~**NEWOBJ**~~	~~1-2-3-4-5-6~~ [**colour pattern** is not a valid attribute for **Virtual AIS Aid to Navigation**]

CONDTN		1-2-3-4-5
	FLODOC	1-2-~~3~~-5
	FORSTC	1-2-~~5~~
	~~**MORFAC**~~	1-2-5 [No equivalent feature in S-101. See clause 4.6.7.1]
	~~**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

Attribute	Object	Allowable Attribute Values
CONRAD		1-2-3 [Converts to new Boolean attribute **radar conspicuous** (value *3* converts to **radar conspicuous** = *True*)]

CONVIS		1-2-3
	~~MORFAC~~	1-2-3 [No equivalent feature in S-101. See clause 4.6.7.1]

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~~
	BCNISD	1-2-6-7-8-~~9~~
	BCNLAT	1-2-6-7-8-~~9~~
	BCNSAW	1-2-6-7-8-~~9~~
	BCNSPP	1-2-6-7-8-~~9~~
	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

Attribute	Object	Allowable Attribute Values
	BOYSPP	6-7-8-~~9~~-11
	DAMCON	1-2-3-~~4-5~~-6-7-~~9~~
	DAYMAR	1-2-4-6-7-8-~~9~~-11
	DYKCON	1-2-3-4-5-6-7-~~9~~
	FNCLNE	1-2-3-6-7-~~9~~-11
	FORSTC	1-2-3-6-7-~~9~~
	GATCON	1-2-6-7-~~9~~
	GRIDRN	1-2-6-7-~~9~~-11
	HRBFAC	1-2-3-6-7-~~9~~
	LNDMRK	1-2-3-6-7-8-~~9~~-11-12
	LITFLT	6-7-~~9~~-11
	LITVES	6-7-~~9~~
	~~**MORFAC**~~	~~1-2-6-7-9~~ [No equivalent feature in S-101. See clause 4.6.7.1]
	~~**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~~
	RUNWAY	1-2-4-5-6-7-~~9~~
	SILTNK	1-2-6-7-8-~~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**

Attribute	Object	Allowable Attribute Values
	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 type **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**
	~~**MOREAC**~~	~~2-3-4-6-7~~ [No equivalent feature in S-101. See clause 4.6.7.1]
	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**
	M_SREL	1-2-3-4-5-6-7-8-9-10-11

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-**39-42**
	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~~ [No equivalent feature in S-101]
	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-**39-42**
	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

Attribute	Object	Allowable Attribute Values
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 [No equivalent feature in S-101. See clause 4.6.7.1]
	NEWOBJ	1-2-3-4-5-6-7-8-9-11-12-13-14-15-16-17-18 [Converts to **status** on new Feature type **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
	RESARE	1-2-3-4-5-6-7-9-18-28
	RIVERS	1-2-5-8-14

Attribute	Object	Allowable Attribute Values
	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-**15-16-17-18** [Value 6 converts to new value 18; value 7 converts to new value 15 and value 14 converts to new value 17]
	DWRTCL	1-~~2~~-3-**5**-6-7-8-9-~~11~~-13-**15-16-17-18**
	DWRTPT	1-~~2~~-3-**5**-6-7-8-9-~~11~~-13-**15-16-17-18**
	DRGARE	1-2-3-6-7-8-9-~~11~~-13-**15-16-17-18**
	OBSTRN	1-2-3-4-5-6-7-8-9-10-11-12-13-**15-16-17-18**
	RCRTCL	1-~~2~~-3-6-7-8-9-~~11~~-13-**15-16-17-18**
	RECTRC	1-2-3-6-7-8-9-~~11~~-13-**15-16-17-18**
	SOUNDG	1-2-3-~~4-5~~-6-7-8-9-~~10-11-12~~-13-14-**15-16-17-18**
	~~**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-**15-16-17-18**
	UWTROC	1-2-3-4-5-6-7-8-9-10-11-12-13-**15-16-17-18**
	WRECKS	1-2-3-4-5-6-7-8-9-10-11-12-13-**15-16-17-18**
	~~**M_QUAL**~~	~~1-2-3-4-5-6-7-8-9-10-11-12-13~~ [**technique of vertical measurement** is not a valid attribute for **Quality of Bathymetric Data**. May be converted to **technique of vertical measurement** on a **Quality of Survey** feature]
~~T_ACWL~~		[No equivalent attribute in S-101]

~~T_MTOD~~		[No equivalent attribute in S-101]

Attribute	Object	Allowable Attribute Values
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/daymark 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-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**44** [Converts to **vertical datum** on new Feature types **Span Fixed** or **Span Opening**]
	CBLOHD	3-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**44**
	CONVYR	3-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**44**
	CRANES	3-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**44**
	GATCON	3-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**44**
	LIGHTS	3-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**44** [Converts to **vertical datum** on Feature types **Light All Around**, **Light Sectored**, **Light Fog Detector** or **Light Air Obstruction**]
	PIPOHD	3-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**44**
	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**
	M_VDAT	3-**13**-16-17-18-19-20-21-24-25-26-28-29-30-**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~~ [No equivalent feature in S-101. See clause 4.6.7.1]
	~~**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 [Values 3, 5, 6, 7, 8, 9 and 11 convert to value 4]
	M_SREL	~~**1 2 3**~~-4-~~**5 6 7 8 9 10 11**~~

Table A-2

A-3 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 type	S-57 Object	Remarks
All Meta and Geo Features	All Meta and Geo	New S-101 attribute **interoperability identifier**. See S-101 DCEG clause 27.114.
All Features having complex attribute **feature name**	All Objects having attribute OJBNAM, NOBJNM	Capability to encode multiple instances of a single language version of a name; and multiple languages. See S-101 DCEG clause 2.5.8.
All Features having complex attribute **information**	All Objects having attributes INFORM, NINFOM, TXTDSC, NTXTDS	Capability to encode multiple language instances of a text string or referenced external file. See DCEG clause 2.4.6.
Light Features	Light Features	New “system” attribute **flare bearing** added. See S-101 DCEG clauses 2.4.5.1 and 30.2.
Administration Area	**ADMARE**	New allowable geometric primitive Curve. See clause 11.2.1 and S-101 DCEG clauses 16.2 and 16.9.
Anchor Berth	**ACHBRT**	New S-101 attribute **category of cargo**. See S-101 DCEG clause 16.5.
Anchorage Area	**ACHARE**	New S-101 attributes **category of cargo** and **vessel speed limit**. See S-101 DCEG clause 16.3.
Archipelagic Sea Lane	**C_AGGR**	New S-101 Feature type. See clause 10.5.3 and S-101 DCEG clause 15.26.
Berth	**BERTHS**	New S-101 attributes **category of cargo**, **horizontal clearance length**, **horizontal clearance width** and **maximum permitted draught**. See clause 4.6.2 and S-101 DCEG clause 8.14.
Bollard	**MORFAC**	New S-101 Feature type. See clause 4.6.7.1 and S-101 DCEG clause 8.16.
Bridge	**BRIDGE**	Attributes **height** and **status** added. New enumerate values introduced for new S-101 attributes **bridge construction** and **bridge function**. See S-101 DCEG clause 6.6. See also new S-101 features **Span Fixed** and **Span Opening** (clause 4.8.10 and S-101 DCEG clauses 6.7 and 6.8).
Building	**BUISGL**	New S-101 complex attribute **multiplicity of features**. See S-101 DCEG clauses 2.1.1 and 6.2.
Cable Overhead	**CBLOHD**	New S-101 complex attribute **multiplicity of features**. See S-101 DCEG clauses 2.1.1 and 6.10.
Canal	**CANALS**	Attribute **horizontal width** (HORWID) added. See S-101 DCEG clause 8.9.
Cargo Transhipment Area	**CTSARE**	Attribute **restriction** (RESTRN) added; new S-101 attribute **vessel speed limit**. See S-101 DCEG clause 16.10.
Caution Area	**CTNARE**	Attributes **condition** (CONDTN), **status** (STATUS) and **pictorial representation** (PICREP) added. See S-101 DCEG clause 16.11.
Coast Guard Station	**CGUSTA**	New allowable geometric primitive Surface. Attribute **communication channel** (COMCHA) added. See S-101 DCEG clause 22.3.

S-101 Feature type	S-57 Object	Remarks
Coastline	**COALNE**	Attribute **nature of surface** (NATSUR) added. See clause 4.5.1 and S-101 DCEG clause 5.3.
Collision Regulations Limit	**CTNARE**	New S-101 Feature type. See clause 11.13.5 and S-101 DCEG clause 16.27.
Contact Details		New S-101 Information Feature type. See S-101 DCEG clause 24.1.
Contiguous Zone	**CONZNE**	New allowable geometric primitive Curve. See clause 11.2.5 and S-101 DCEG clauses 16.2 and 16.13.
Continental Shelf Area	**COSARE**	New allowable geometric primitive Curve. See clause 11.2.7 and S-101 DCEG clauses 16.2 and 16.14.
Dam	**DAMCON**	Attributes **status** (STATUS) and **water level effect** (WATLEV) added. See S-101 DCEG clause 8.12.
Data Coverage	**M_COVR**	New S-101 attributes **maximum display scale**, **minimum display scale** and **drawing index**. See clause 2.2.6 and S-101 DCEG clause 3.5.
Daymark	**DAYMAR**	Attribute **radar conspicuous** (CONRAD) added. See S-101 DCEG clause 20.13.
Deep Water Route	**C_AGGR**	New S-101 Feature type. See clause 10.2.2 and S-101 DCEG clause 15.15.
Deep Water Route Centreline	**DWRTCL**	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 attributes **IMO adopted** and **vessel speed limit**. See clause 10.2.2.1 and S-101 DCEG clause 15.14.
Depth – No Bottom Found	**SOUNDG**	New S-101 Feature type. See clause 5.3 and S-101 DCEG clause 11.8.
Discoloured Water	**CTNARE**	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 8.20.
Dolphin	**MORFAC**	New S-101 Feature type. See clause 4.6.7.1 and S-101 DCEG clause 8.15.
Dredged Area	**DRGARE**	New S-101 attributes **maximum permitted draught** and **vessel speed limit**. See S-101 DCEG clause 11.4.
Dry Dock	**DRYDOC**	New S-101 attributes **elevation**, **horizontal clearance length**, **horizontal clearance width** and **maximum permitted draught**. See clause 4.6.6.1 and S-101 DCEG clause 8.17.
Dumping Ground	**DMPGRD**	New S-101 attributes **date disused** and **vessel speed limit**. See S-101 DCEG clause 16.7.
Dyke	**DYKCON**	Attribute **visual prominence** (CONVIS) added. See S-101 DCEG clause 8.5.
Exclusive Economic Zone	**EXEZNE**	New allowable geometric primitive Curve. See clause 11.2.8 and S-101 DCEG clauses 16.2 and 16.16.
Fairway	**FAIRWY**	New S-101 attributes **maximum permitted draught** and **vessel speed limit**. See S-101 DCEG clause 15.7.
Fairway System	**C_AGGR**	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; new S-101 attribute **vessel speed limit**. See S-101 DCEG clause 16.18.
Floating Dock	**FLODOC**	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 8.18.
Fortified Structure	**FORSTC**	Attribute **status** (STATUS) added. See S-101 DCEG clause 7.5.

S-101 Feature type	S-57 Object	Remarks
Foul Ground	**OBSTRN**	New S-101 Feature type. See clause 6.2.2 and S-101 DCEG clause 13.7.
Harbour Facility	**HRBFAC**	Attributes **communication channel** (COMCHA), **product** (PRODCT), **restriction** (RESTRN) and **pictorial representation** (PICREP) added; new S-101 attribute **vessel speed limit**. See S-101 DCEG clause 22.7.
Helipad	**RUNWAY**	New S-101 Feature type. See clause 4.8.12 and S-101 DCEG clause 6.5.
Hulk	**HULKES**	Complex attributes **fixed date range** (DATEND/DATSTA) and **periodic date range** (PEREND/PERSTA) added. See S-101 DCEG clause 8.3.
Information Area		New S-101 Feature type. See clause 2.5 and S-101 DCEG clause 16.12.
Inshore Traffic Zone	**ISTZNE**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 15.16.
Island Group	**C_AGGR**	New S-101 Feature type. See clause 14 and S-101 DCEG clause 5.5.
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 complex attribute **multiplicity of features**. See S-101 DCEG clauses 2.1.1 and 7.2. See also new S-101 Feature type **Wind Turbine** (see clause 4.8.15 and DCEG clause 7.4).
Light Air Obstruction	**LIGHTS**	New S-101 attribute **flare bearing**. See S-101 DCEG clause 19.5.
Light All Around	**LIGHTS**	Attributes **signal generation** (SIGGEN) and **vertical length** (VERLEN) added; new S-101 attribute **flare bearing**. See clause 12.8.1 and S-101 DCEG clause 19.2.
Light Fog Detector	**LIGHTS**	Attribute **vertical length** (VERLEN) added; new S-101 attribute **flare bearing**. See clause 12.8.1 and S-101 DCEG clause 19.4.
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 **reference direction**. See S-101 DCEG clause 4.2.
Lock Basin	**LOKBSN**	New S-101 attribute **periodic date range**. See S-101 DCEG clause 8.22.
Log Pond	**LOGPON**	Complex attribute **periodic date range** (PEREND/PERSTA) added. See S-101 DCEG clause 16.21.
Marine Farm/Culture	**MARCUL**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 13.10.
Marine Pollution Regulations Area	**ADMARE**	New S-101 Feature type. See clause 11.16 and S-101 DCEG clause 16.28.
Military Practice Area	**MIPARE**	Attribute **nationality** (NATION) added; new S-101 attribute **vessel speed limit**. See S-101 DCEG clause 16.8.
Mooring Area	**ACHARE**	New S-101 Feature type. See clause 9.2.1 and S-101 DCEG clause 16.4.
Mooring Buoy	**MORFAC**	New S-101 Feature type. See clause 4.6.7.1 and S-101 DCEG clause 20.8.
Mooring Trot	**C_AGGR**	New S-101 Feature type. See clause 9.2.5 and S-101 DCEG clause 8.23.
Nautical Information	**M_NPUB**	New S-101 Information Feature type. See clause 2.3 and S-101 DCEG clause 24.4.
Non-Standard Working Day		New S-101 Information Feature type. See S-101 DCEG clause 24.3.
Obstruction	**OBSTRN**	New S-101 attribute **maximum permitted draught**. See clause 6.2.1 and S-101 DCEG clause 13.5.

S-101 Feature type	S-57 Object	Remarks
Offshore Production Area	**OSPARE**	Attribute **water level effect** (WATLEV) added; new S-101 attributes **category of offshore production area** and **vessel speed limit**. See S-101 DCEG clause 14.6.
Physical AIS Aid to Navigation		New S-101 Feature type. See clause 12.14.1 and S-101 DCEG clause 21.2.
Pile	**PILPNT**	New allowable geometric primitives Curve and Surface. Attributes **status** (STATUS) and **pictorial representation** (PICREP) 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 22.1.
Pilotage District	**ADMARE**	New S-101 Feature type. See clause 13.1.2 and S-101 DCEG clause 16.26.
Pipeline Overhead	**PIPOHD**	New S-101 complex attribute **multiplicity of features**. See S-101 DCEG clauses 2.1.1 and 6.11.
Pipeline Submarine/On Land	**PIPSOL**	Attributes **restriction** (RESTRN) and **pictorial representation** (PICREP) added. New S-101 complex attribute **multiplicity of features**. See S-101 DCEG clauses 2.1.1 and 14.4.
Pontoon	**PONTON**	Attribute **pictorial representation** (PICREP) added.
Precautionary Area	**PRCARE**	Attributes **feature name** (NOBJNM, OBJNAM) and **IMO adopted** (CATTSS) added; new S-101 attribute **vessel speed limit**. See S-101 DCEG clause 15.17.
Pylon/Bridge Support	**PYLONS**	Attribute **status** (STATUS) added; new S-101 complex attribute **multiplicity of features**. See S-101 DCEG clauses 2.1.1 and 6.12.
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 clauses 3.8 and 24.5.
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 3.4.
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 3.11.
Radar Reflector	**RADRFL**	Complex attributes **fixed date range** (DATEND/DATSTA) and **periodic date range** (PEREND/PERSTA) added. See S-101 DCEG clause 20.18.
Radar Station	**RADSTA**	Attribute **call sign** (CALSGN) added. See S-101 DCEG clause 15.31.
Radio Calling-In Point	**RDOCAL**	Attribute **communication channel** (COMCHA) added. See S-101 DCEG clause 15.27.
Radio Station	**RDOSTA**	New S-101 attribute **frequency shore station receives**. See clause 12.9 and S-101 DCEG clause 21.4.
Range System	**C_AGGR**	New S-101 Feature type. See clause 10.1.2 and S-101 DCEG clause 15.6.
Rescue Station	**RSCSTA**	New allowable geometric primitive Surface. Attribute **communication channel** (COMCHA) added. See S-101 DCEG clause 22.6.
Restricted Area	**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.

S-101 Feature type	S-57 Object	Remarks
Seagrass	**WEDKLP**	New S-101 Feature type. See clause 7.2.2 and S-101 DCEG clause 12.3.
Seaplane Landing Area	**SPLARE**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 16.6.
Service Hours		New S-101 Information Feature type. See S-101 DCEG clause 24.2.
Signal Station Traffic	**SISTAT**	New allowable geometric primitive Surface.
Signal Station Warning	**SISTAW**	New allowable geometric primitive Surface.
Silo/Tank	**SILTNK**	New S-101 complex attribute **multiplicity of features**. See S-101 DCEG clauses 2.1.1 and 7.3.
Sounding	**SOUNDG**	See new S-101 Feature type **Depth – No Bottom Found** (see clause 5.3 and S-101 DCEG clause 11.8).
Span Fixed	**BRIDGE**	New S-101 Feature type. See clause 4.8.10; and S-101 DCEG clauses 6.6 and 6.7.
Span Opening	**BRIDGE**	New S-101 Feature type. See clause 4.8.10; and S-101 DCEG clauses 6.6 and 6.8.
Spatial Quality		New S-101 Information Feature type. See S-101 DCEG clause 24.5.
Structure Over Navigable Water	**BUISGL**, **HRBFAC**	New S-101 Feature type. See clauses 4.6.1 and 4.8.15; and S-101 DCEG clause 8.7.
Submarine Cable Area	**CBLARE**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 14.3.
Submarine Pipeline Area	**PIPARE**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 14.5.
Submarine Transit Lane	**SUBTLN**	Attribute **nationality** (NATION) added; new S-101 attribute **vessel speed limit**. See S-101 DCEG clause 16.25.
Territorial Sea Area	**TESARE**	New allowable geometric primitive Curve; new S-101 attribute **vessel speed limit**. See clause 11.2.4 and S-101 DCEG clauses 16.2 and 16.24.
Text Placement		New S-101 Cartographic Feature type. See S-101 DCEG clause 23.1.
Tidal Stream Panel Data	**TS_PAD**	New attribution and multiplicity to allow multiple instances of tidal stream information for various tide types to be encoded. See S-101 DCEG clause 10.5.
Traffic Separation Scheme	**C_AGGR**	New S-101 Feature type. See clause 10.2.3 and S-101 DCEG clause 15.23.
Traffic Separation Scheme Crossing	**TSSCRS**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 15.21.
Traffic Separation Scheme Lane Part	**TSSLPT**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 15.18.
Traffic Separation Scheme Roundabout	**TSSRON**	New S-101 attribute **vessel speed limit**. See S-101 DCEG clause 15.22.
Tunnel	**TUNNEL**	Attribute **vertical datum** (VERDAT) added. See S-101 DCEG clause 6.16.
Two-Way Route	**C_AGGR**	New S-101 Feature type. See clause 10.2.6 and S-101 DCEG clause 15.11.
Update Information		New S-101 Meta Feature. See S-101 DCEG clause 3.12.
Vessel Traffic Service Area	**ADMARE**	New S-101 Feature type. See clause 12.13 and S-101 DCEG clause 22.2.

S-101 Feature type	S-57 Object	Remarks
Virtual AIS Aid to Navigation	**NEWOBJ**	New S-101 Feature type. See clause 12.14.1.1 and S-101 DCEG clause 21.3.

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