S-57 to S-101 Conversion Guidance

Edition 0.0.1 – January 2021

IHO

International
Hydrographic
Organization

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Document Control

Version	Version Type	Date	Approved By	Signed Off By	Role

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1   Introduction

1.1   General

The following clauses specify the conventions that are recommended for preparing 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*.

> **Commented [TS1]:** FR: Or 1.0.1? (may be we could publish the draft versions of this document until 2.0.0 so that Hos can prepare conversion in advance).

This document describes how to adapt S-57 ENC data so as to optimise the automation of S-57 ENC data to S-101 data. However, 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 for one" comparison between S-57 encoding and the corresponding S-101 encoding in many cases. This results in an inability for full automatic conversion of an operational S-57 ENC dataset to a fully operational and compliant S-101 dataset, resulting in a requirement for the Data Producer to apply manual changes to the converted dataset in some circumstances. Where manual intervention is required by the Data Producer after the automatic conversion process has been completed, this guidance is also included in this document.

> **Commented [TS2]:** JP: I think this is fair comment. I'm not sure if we know yet whether conversion can be 100% automatic or not yet – subject of much debate. Also, I think the co-production situation isn't clear yet in industry (but this should become clearer over time and I don't think it will be a one-size fits all)…..

It is important to note the following:

- **The guidance included in this document is intended to optimise S-57 ENC <u>data</u> for 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 INFORM attribute to facilitate corresponding attribute population may adversely compromise 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.**

> **Commented [TS3]:** JP: I think we should clarify if we're trying to advise on initial conversion to S-101 or conversion/equivalence on an ongoing basis – I think the two are different, and the group was focused by Tom (M and R) on the "initial" conversion. I think we should definitely advise on ongoing maintenance but I think it would be good to highlight where this is the case?.....

1.2   Presentation of the document

The following conventions are used:

- Presentation conventions:

Object class:	**WRECKS**
Geometric primitive:	(P,A)*
Attribute:	EXPSOU
Mandatory attribute:	<u>WATLEV</u>
Prohibited attribute:	~~VERDAT~~
Attribute value:	*-2.4*

- Attributes_A: For each object class, the whole list of subset A is given, with the specific applicable attribute values, where required, for the feature object. Reference should be made to S-57 Appendix B1; ENC Product Specification, section 3.5.2, for conditional mandatory attributes.
- Attributes_B, attributes_C: Except for attributes INFORM, NINFOM, and more rarely SORDAT, the attributes from subsets B and C are not mentioned in the following lists; however, this does not mean that their use is prohibited.

For definitions of attribute subsets A, B and C, see S-57 Appendix A, Chapter 1, section 1.1.

* For geometric primitives: P = point; L = line; A = area; N = none.

> **Commented [TS4]:** To be amended once a standard format has been approved.

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

> **Commented [TS5R4]:** JP: Can we capture and highlight "differences", primitives and bindings? And bring them out for producers to consider in their own data.

1.3   Use of language

Within this document:
>   "Must" indicates a mandatory requirement.
>   "Should" indicates an optional requirement, that is the recommended process to be followed,
>   but is not mandatory.
>   "May" means "allowed to" or "could possibly", and is not mandatory.

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 Use of the Object Catalogue for ENC. 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 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 all other S-57 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.

Commented [TS6]: FR: The document being a guidance, I think the maintenance will be reduced to New Editions (and may be revisions). Needs to be decided (and clauses 1.4.2 and 1.4.3, etc. changed accordingly.

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 reflected in the "Datum Name" [DTNM] subfield of the "Geodetic Datum" [GDAT] field for the S-101 dataset. As for S-57, the horizontal datum for S-101 ENCs must be WGS 84.

S-57 Meta object: Horizontal datum (**M_HOPA**)   (A)

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

2.1.2   Vertical datum

The default vertical datum for the entire data set encoded in the "Vertical Datum" [VDAT] subfield of the "Data Set Parameter" [DSPM] field is reflected in the "Datum Name" [DTNM] subfield of the "Vertical Datum" [VDAT] field for the S-101 dataset.

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

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

table 2.1

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

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

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

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

Commented [TS7]: TBC
FR: Or [CRNM] and [CRSI] subfields of the [CRSH] field?

Commented [TS8]: TBC
FR: Or [DTNM] and [DTIDI] subfields of the [VDAT] field?

Commented [TS9]: Not sure if this is the case in regard to this paragraph?

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

BRIDGE   BUISGL   CBLOHD   CONVYR   CRANES   GATCON   LIGHTS

PIPOHD   TUNNEL

2.1.3   Sounding datum

The default sounding datum for the entire data set encoded in the "Sounding Datum" [SDAT] subfield of the "Data Set Parameter" [DSPM] field is directly translated to the "Datum Name" [DTNM] subfield of the "Vertical Datum" [VDAT] field for the S-101 dataset.

Commented [TS10]: TBC

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

Commented [TS11]: Not sure if this is the case in regard to this paragraph?

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

table 2.2

All other values in the S-57 VERDAT attribute are prohibited for sounding datum in S-101.

S-57 Meta object: Sounding datum (**M_SDAT**)   (A)

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

Conversion of these features is automated only if the value populated for VERDAT is in accordance with table 2.1 above. If a value other than those listed in table 2.2 is populated, Data Producers should consider replacing this value with a permitted value before conversion to S-101.

2.1.4   Units

Not applicable.

2.1.5   Dates

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

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 populated automatically against the S-101 attribute **status** on conversion.

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

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

2.1.6   Times

Not applicable.

2.1.7   Cells

As for S-57, the coordinate multiplication factor for latitude and longitude coordinates in S-101 is *10000000* (10^7). The value in the Coordinate Multiplication Factor [COMF] subfield of the Data Set Parameter [DSPM] field in S-57 is reflected 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 (overlaps and gaps in data coverage) remain unchanged for S-101.

2.1.8.1   Feature Object Identifiers

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

2.1.8.2   180° Meridian of Longitude

The rule prohibiting datasets from crossing the 180° meridian remain 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 is 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) are reset in the corresponding S-101 file name and Dataset Discovery Metadata fields to reflect the release of a new S-101 dataset.

Commented [TS12]: FR: If we have no counter-example, may be could we delete this sentence (and similar ones throughout the document).
ED: This statement will only be included if there are exceptions to this general rule.

Commented [TS13]: JP: Is it worth adding information on New Editions/Updates and how they might relate to the S-57 versions of the cell. I don't believe they need to be coincident but it might be easier for producers to coordinate…

Commented [TS14]: JP: Might need some further explanation. Discussios with a few folks highlight the need to differentiate between "coverage" and "scheming". I believe (from the DF point of view) "coverage" will be identical (i.e producers need to support both S-57 and S-101 during the transition period but "scheming" can, potentially be different. This is more in the WEND camp but we should cwertainly describe it. The technical details of how CSCALE/Usage bands etc etc interact with the data loading strategy would be great to capture here as it affects what values are set for dataset metadata….

Commented [TS15]: FR: Are we sure? This is not a good news in regard with DF production and maintenance of 2 products from a single data base.

Commented [TS16]: Need to confirm that this will be the case.

Commented [TS17R16]: JP: Not sure I understand this completely. Are we saying you can't use the same foid in two different datasets (i.e. cells) or coverage features in the same dataset? I don't believe FOID has changed. MRN will probably be defined across all features as an attribute which will diminish the use of foid as a unique identifier in the dataset. From a users' perspective I'm not sure whether it makes a difference though?

Commented [TS18]: FR: This would be a nightmare!

2.2.3   Quality, reliability and accuracy of bathymetric data

2.2.3.1   Quality of bathymetric data

<u>S-57 Meta object:</u>   Quality of data (**M_QUAL**)   (A)

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

The differences in the data modelling between the S-57 **M_QUAL** Meta object and the S-101 **Quality of Bathymetric Data** Meta feature constitute one of the most significant changes from S-57 to S-101. In the S-101 data model, the defining S-57 CATZOC attribute has been effectively "deconstructed" into its component parts of position and depth accuracies; and seafloor coverage (including feature detection). 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.

<u>Category of Zone of Confidence in Data:</u>   During the automated conversion process, the value populated in the S-57 attribute CATZOC will be used to populate the S-101 mandatory attributes **data assessment**, **features detected** (complex attribute), **full seafloor coverage achieved**, **horizontal position uncertainty** (complex attribute) and **vertical uncertainty** (complex attribute). 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 in the "dual-fuel" ECDIS environment, the S-101 attribute **category of zone of confidence in data** is included as identical to the S-57 CATZOC attribute, from which ECDIS portrayal will be derived.

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

<u>Data Assessment:</u> 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).

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

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

<u>Survey Data Range:</u> In S-57, the attribute SUREND is not mandatory for M_QUAL. In S-101, the complex attribute **survey date range**, sub-attribute **date end**, is mandatory for **Quality of Bathymetric Data**. In order to optimise the S-57 to S-101 conversion process, Data Producers should ensure that the attribute SUREND is populated on all **M_QUAL** objects for their S-57 datasets as required (for

example, where the seabed is likely to change over time). If this is not done, **survey date range**, sub-attribute **date end** will be populated as empty (null) during the automated conversion process.

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

Overlapping **Quality of Bathymetric Data** features: S-101 allows for overlapping **Quality of Bathymetric Data** features in order to define the quality of bathymetric data at varying depths in the water column. There is no corresponding encoding for this information in S-57 – while not a requirement, for full capability S-101 data, Data Producers will be required to evaluate their data holdings and encode this information manually, if considered necessary.

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

2.2.3.2   Survey reliability

S-57 Meta object: Survey reliability (**M_SREL**)   (L,A)

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

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

> *3* - inadequately surveyed
> *4* - approximate
> *6* - unreliable

Data Producers are advised to revisit their S-57 data holdings prior to conversion and amend any populated values for QUAPOS to one of the above values. 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.

The S-101 the attribute **full seafloor coverage achieved** in combination with the complex attribute **features detected** introduces an option to include additional quality information about a survey. There is no corresponding encoding for this information in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.

The S-101 the optional attributes **measurement distance maximum** and **measurement distance minimum** introduce an option to include details of the maximum and minimum distance between soundings along the sounding lines in a survey. There is no corresponding encoding for this information in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.

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

Commented [TS19]: FR: Suggest removing as there is no need in terms of "conversion proper".
ED: While this is not a requirement in initial conversion of S-57 to S-101, the ability for an indication of the quality of the bathymetry shown for depths deeper than the swept depth in S-57 does not exist. I think it is therefore useful to include this information so that HOs are provided with some information to provide this information should they wish to.

Commented [TS20]: FR: This should be done through mappings.
ED: perhaps as an option (yes/no) during the conversion process?

carries QUASOU = *5*, it will be converted to the S-101 feature **Depth – No Bottom Found**. For any other S-57 objects carrying QUASOU = *5*, the attribute will not be converted across to S-101.

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

2.2.3.4   Sounding accuracy

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

2.2.3.5   Technique of sounding measurement

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

DRGARE   DWRTCL   DWRTPT

These restrictions are listed against the relevant Object class clauses in this document. All other instances of encoding of TECSOU will be populated automatically against the corresponding **technique of sounding measurement** values on conversion, except for the following:

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

2.2.4   Accuracy of non-bathymetric data

2.2.4.1   Quality of positions

<u>S-57 Meta object:</u>   Accuracy of data (**M_ACCY**)   (A)

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

Values populated for the S-57 mandatory attribute POSACC will be converted across to the S-101 complex attribute **horizontal position uncertainty**, sub-attribute **uncertainty fixed**.

The following S-101 attributes/complex attributes are allowable for the S-101 Meta feature **Quality of Non-Bathymetric Data**, however there is no equivalent allowable attribute for the S-57 Meta object **M_ACCY**:

> **category of temporal variation**
> **horizontal distance uncertainty**
> **orientation uncertainty**
> **survey date range**
> **vertical uncertainty**

For full capability S-101 data, Data Producers will be required to populate these attributes manually, if considered necessary.

2.2.4.2   Horizontal accuracy

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

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

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

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

2.2.4.3   Vertical accuracy

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

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

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 across to the S-101 attribute **survey authority** for the **Quality of Survey** Meta feature.

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

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

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.

Commented [TS21]: This section will require a thorough review, and possibly further discussion as to the whole concept of "compilation scale" is intended to work in S-101.

Commented [TS22R21]: JP: True. Needs to be watched carefully.

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

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

<u>S-57 Meta object:</u>	Coverage (**M_COVR**)	(A)
<u>S-57 Meta object:</u>	Compilation scale of data (**M_CSCL**)	(A)
<u>S101 Meta feature:</u>	**Data Coverage**	(S) (S-101 DCEG Clause 3.4)

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

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

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

table 2.3

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

Commented [TS23]: To be confirmed.

Commented [TS24R23]: JP: Agree – does this contradict the para att the top of the page?

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

Where an S-57 dataset contains one or more **M_CSCL** Meta objects, the **Data Coverage** Meta feature(s) created from **M_COVR** are effectively "cookie-cut" to create separate discrete **Data Coverage** Meta feature(s), having **maximum display scale** populated in accordance with the value populated for the attribute CSCALE for the **M_CSCL**.

Commented [TS25]: JP: Effectively each M_COVR will need a hole where M_CSCL exists and will split the coverage into a number of spatially disjoint areas…. This will need to be managed by the converter (and could be an onerous task – one thing to watch could be when features span M_CSCL, particularly group 1)….

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.

2.2.7   Use of the attribute SCAMIN

<u>S-57 Attribute:</u>   Scale minimum (SCAMIN)

<u>S101 Attribute</u>:   **scale minimum**   (S-101 DCEG Clause 2.5.9)

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

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

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

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

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

For an optimum outcome during the automated conversion process and to ensure consistent data display in a "dual fuel" ECDIS environment, Data Producers are advised to examine their S-57 ENC

Commented [TS26]: To be confirmed.

Commented [TS27R26]: JP: Could this be done using a default rule which is then moderated manually… This is dependent on how the whole loading strategy conversation is resolved.?

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 highest value in table 2.4 for **scale minimum**.

Commented [TS28]: To be confirmed.

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 information type **Nautical Information**. **Nautical Information** is associated to the feature instance for which the information applies using the association **Additional Information**.

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

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

- In some cases, information encoded using INFORM/NINFOM in S-57 has been implemented in S-101 as an enhancement to the data model such as a new dedicated feature, attribute or enumerate value. Within this document, this is indicated against the relevant Object class along with any additional guidance to assist in the automated conversion process. This guidance may include instruction as to a standard text string to be populated in INFORM that can be recognised by the S-57 to S-101 converter so as to convert to a new S-101 feature/attribute/enumerate. This will require Data Producers to check their S-57 ENC portfolio prior to conversion and apply these changes as required. In such cases a **Nautical Information** feature will not be created;
- In relation to the above, Data Producers must note that additional encoded instances of INFORM in an ENC dataset may result in excessive screen clutter (display of "information" symbols) in certain ECDIS display settings. Data Producers should evaluate the impact for the mariner of guidance within this document to populate INFORM additional to existing instances in their S-57 ENC portfolio and consider options to mitigate this impact. This may include population of INFORM (or database specific variant attribute) in the S-57 source database and filtering out these instances on creation of the S-57 product dataset; and

Commented [TS29]: JP: We should note this is production system dependent (As is many other aspects of the conversion guidance)… I agree with the comment though. INFORM can be stripped out post-extraction too (only those matching particular patterns) and we should aim to not "pollute" the S-57 ENC with too many new INFORM attributes.

- Information encoded in NINFOM, when converted to S-101, requires an entry in the **information** complex attribute instance, sub-attribute **language** to indicate the language of the text string. There is no corresponding attribute in S-57 to provide this information. Data Producers will be required to manually populate this attribute during the conversion process (see S-101 DCEG clause 2.4.6).

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

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

Commented [TS30]: JP: Although this could be a one-off conversion parameter across a number of datasets rather than requiring individual attribution.

2.4 Colours and colour patterns

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

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

Coastline	[**COALNE**]	(S-101 DCEG clause 5.3)
Light Air Obstruction	[**LIGHTS**]	(S-101 DCEG clause 19.5)
Light All Around	[**LIGHTS**]	(S-101 DCEG clause 19.2)
Light Fog Detector	[**LIGHTS**]	(S-101 DCEG clause 19.4)
Light Sectored	[**LIGHTS**]	(S-101 DCEG clause 19.3)
Sloping Ground	[**SLOGRD**]	(S-101 DCEG clause 5.14)
Slope Topline	[**SLOTOP**]	(S-101 DCEG clause 5.15)

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

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

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

2.5   Reference to other publications

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

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

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

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

Commented [TS31]: To be discussed. Is this an appropriate attribute for this information? Could not find another appropriate attribute in S-101.

Commented [TS32R31]: JP: I think this is appropriate. In some cases though, particularly where M_NPUB is coincident with the M_COVR maybe just an association to NauticalInformation is appropriate. I can't really see what the advantage of using "information area" is as most of the actual information is in the information type…. One to discuss I guess, I know this has been a long standing item though….

2.6   Updating

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

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

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

2.6.1   Issuing Updates in advance

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

2.6.1.1   Advance notification of changes to traffic separation schemes

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

2.6.2   Guidelines for encoding Temporary and Preliminary ENC Updates

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

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

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

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

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.

Commented [TS33]: JP: Might need revising re: M_CSCALE->DataCoverage as this will leave holes in DAtaCoverage? The assumption, I think is that the sum total of all DataCoverage features contains no holes at a dataset level.

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.

3   Time Varying Objects

3.1   Magnetic data

3.1.1   Magnetic variation

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

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

All instances of encoding of the S-57 Feature object **MAGVAR** and its binding attributes will be populated automatically against the S-101 feature **Magnetic Variation** during the automated conversion process. However the following exceptions apply:
- The S-57 attributes DATEND and DATSTA for **MAGVAR** will not be converted. It is considered that these attributes are not relevant for **Magnetic Variation** in S-101.

3.1.2   Abnormal magnetic variation

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

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

All instances of encoding of the S-57 Feature object **LOCMAG** and its binding attributes will be populated automatically against the S-101 feature **Local Magnetic Anomaly** during the automated conversion process. However the following exceptions apply:
- The S-57 mandatory attribute VALLMA has been remodelled in S-101 as the mandatory complex attribute **value of local magnetic anomaly**, having sub-attributes **magnetic anomaly value maximum** (mandatory) and **magnetic anomaly value minimum**, where:
  - **magnetic anomaly value maximum** is intended to indicate the positive anomaly value where **magnetic anomaly value minimum** is also populated; or both the positive and negative values where **magnetic anomaly value maximum** only is populated; and
  - **magnetic anomaly value minimum** is intended to indicate the negative anomaly value, but only where the positive and negative values are not equal.

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

> **Commented [TS34]:** Not sure if this process can be improved by utilizing INFORM? Perhaps something as simple as a prompt during the conversion process?

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 ENC and consider inclusion of this information in datasets conforming to product Specification S-104 – *Water Level Information for Surface Navigation* (in development 2021).

3.3   Tidal stream data

3.3.1   Tidal stream (flood/ebb)

<u>S-57 Geo object:</u>   Tidal stream-flood/ebb (**TS_FEB**)   (P,A)

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

All instances of encoding of the S-57 Feature object **TS_FEB** and its binding attributes will be populated automatically against the S-101 feature **Tidal Stream – Flood/Ebb** during the automated conversion process. However the following exceptions apply:
- The S-57 attributes PEREND and PERSTA for **TS_FEB** will not be converted. It is considered that these attributes are not relevant for **Tidal Stream – Flood/Ebb** in S-101.

3.3.2   Tidal stream time series

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

3.3.3   Prediction by harmonic methods

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

3.3.4   Prediction by non-harmonic methods

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

3.3.5   Tidal stream panels

<u>S-57 Geo object:</u>   Tidal steam panel data (**TS_PAD**)   (P,A)

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

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

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

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

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

3.4   Current data

<u>S-57 Geo object:</u>   Current (**CURRENT**)   (P)

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

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

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

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)

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

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

condition   (CONDTN)

status   (STATUS)

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

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 populated automatically against the S-101 attribute **elevation** on conversion.

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

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 the navigational ENC. In general, therefore, encoded **CTRPNT** will not convert across to S-101. However, in certain circumstances where a control point may be visible from seaward and therefore used as a navigational fixing mark, this information may be encoded in S-101 using a **Landmark** feature. During the automated conversion process, the following **CTRPNT**/CATCTR encoding instances will be converted to the corresponding **Landmark**/**category of landmark** instances.
>   CATCTR = *1* (triangulation mark) -> **category of landmark** = *22* (triangulation mark)
>   CATCTR = *5* (boundary mark)   -> **category of landmark** = *23* (boundary mark)

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

4.4   Distance marks

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

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

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

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

Commented [TS35]: To be discussed. Is there a way that INFORM can be structured to parse different parts of the text to different S-101 attributes (including population of enumerate values)?

4.5 Coastline

4.5.1 Natural coastline

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

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

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

category of coastline (CATCOA)

colour (COLOUR)

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

- The attribute **nature of surface** has been included as an allowable attribute for **Coastline** in S-101. During the automated conversion process, the following **COALNE**/CATCOA encoding instances will be converted to the corresponding **Coastline**/**nature of surface** instances.
    - CATCOA = *3* (sandy shore) -> **nature of surface** = *4* (sand)
    - CATCTR = *4* (stony shore) -> **nature of surface** = *5* (stone)
    - CATCTR = *5* (shingly shore) -> **nature of surface** = *7* (pebbles)
    - CATCTR = *9* (coral reef) -> **nature of surface** = *14* (coral)
    - CATCTR = *11* (shelly shore) -> **nature of surface** = *17* (shells)

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

4.5.2 Artificial coastline

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

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

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

condition (CONDTN)

status (STATUS)

See S-101 DCEG clause 8.6 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 **SLCONS** and amend appropriately.

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

4.6   Harbour installations

4.6.1   Harbour facilities

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

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

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

condition   (CONDTN)

nature of construction   (NATCON)

status   (STATUS)

See S-101 DCEG clause 22.7 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 **HRBFAC** and amend appropriately.

The S-101 the attributes **product** and **restriction** introduce options to encode additional information related to **Harbour Facility**. There is no corresponding encoding for this information on **HRBFAC** in S-57 – for full capability S-101 data, Data Producers will be required to populate these attributes manually, if considered necessary.

4.6.2   Berths

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

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

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

quality of vertical measurement   (QUASOU)

status   (STATUS)

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

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

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

The S-101 the attributes **horizontal clearance length** and **horizontal clearance length** introduce options to encode additional information related to **Berth**. There is no corresponding encoding for this information on **BERTHS** in S-57 – for full capability S-101 data, Data Producers will be required to populate these attributes manually, if considered necessary.

4.6.3   Harbour offices

See clause 4.8.15.

4.6.4   Checkpoints

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

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

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

status   (STATUS)

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

4.6.5   Small craft facilities

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

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

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

status   (STATUS)

See S-101 DCEG clause 22.8 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 STATUS on **SMCFAC** and amend appropriately.

4.6.6   Docks

4.6.6.1   Dry docks

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

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

All instances of encoding of the S-57 Feature object **DRYDOC** and its binding attributes will be populated automatically against the S-101 feature **Dry Dock** during the automated conversion process. However the following exceptions apply:
• The S-57 attribute HORACC for **DRYDOC** will not be converted. It is considered that this attribute is not relevant for **Dry Dock** in S-101.

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

condition   (CONDTN)

quality of vertical measurement   (QUASOU)

status   (STATUS)

See S-101 DCEG clause 8.15 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, QUASOU and STATUS on **DRYDOC** 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 **DRYDOC** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **DRYDOC** must be in the format *Maximum draught*

permitted = xx.x metres, where *xx.x* is the value of the maximum permitted vessel draught (decimal part not required if the value is whole metres).

Commented [TS37]: To be confirmed.

The S-101 the attribute **horizontal clearance length** introduces the option to encode additional information related to **Dry Dock**. There is no corresponding encoding for this information on **DRYDOC** in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.

4.6.6.2 Floating docks

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

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

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

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

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

Commented [TS38]: To be discussed.

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

condition (CONDTN)

status (STATUS)

See S-101 DCEG clause 8.16 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 **FLODOC** and amend appropriately.

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

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

Commented [TS39]: To be confirmed.

The S-101 the attribute **horizontal clearance length** introduces the option to encode additional information related to **Floating Dock**. There is no corresponding encoding for this information on **FLODOC** in S-57 – for full capability S-101 data, Data Producers will be required to populate this attribute manually, if considered necessary.

4.6.6.3 Tidal and non-tidal basins

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

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

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

- The S-57 attributes DATEND, DATSTA and SCAMIN for **DOCARE** will not be converted. In S-101, the **Dock Area** feature has been included as a Skin of the Earth feature (see S-101 Main document

clause 4.3.2.1.1), and as such cannot be removed from the data based on date or viewing scale dependency. Date dependency for **Dock Area** in S-101 is indicated by associating an instance of the information type **Nautical Information**, complex attribute **information**.

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

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

condition   (CONDTN)

status   (STATUS)

See S-101 DCEG clause 8.18 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 **DOCARE** and amend appropriately.

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

The S-101 the attribute **horizontal clearance length** and **horizontal clearance width** introduce options to encode additional information related to **Dock Area**. There is no corresponding encoding for this information on **DOCARE** in S-57 – for full capability S-101 data, Data Producers will be required to populate these attributes manually, if considered necessary.

4.6.6.4 Gates

<u>S-57 Geo object:</u>   Gate (**GATCON**)   (P,L,A)

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

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

condition   (CONDTN)

nature of construction   (NATCON)

quality of vertical measurement   (QUASOU)

status   (STATUS)

vertical datum   (VERDAT)

See S-101 DCEG clause 8.10 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, QUASOU, STATUS and VERDAT on **GATCON** and amend appropriately.

4.6.6.5 Locks

<u>S-57 Geo object:</u>   Lock basin (**LOKBSN**)   (A)

<u>S101 Geo feature:</u>   **Lock Basin**   (S)   (S-101 DCEG Clause 8.20)

Commented [TS40]: Can this be done by the conversion tool?

Commented [TS41]: To be discussed.

Commented [TS42]: To be confirmed.

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

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

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

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

status   (STATUS)

See S-101 DCEG clause 8.20 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 **LOKBSN** and amend appropriately.

4.6.6.6   Gridirons

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

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

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

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

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

nature of construction   (NATCON)

status   (STATUS)

water level effect   (WATLEV)

See S-101 DCEG clause 8.19 for the listing of allowable values. Values populated in S-57 for 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, 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)

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

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

condition   (CONDTN)

nature of construction   (NATCON)

quality of vertical measurement   (QUASOU)

Commented [TS43]: Can this be done by the conversion tool?

Commented [TS44]: To be discussed.

status   (STATUS)

water level effect   (WATLEV)

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

4.6.7.2   Piles

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

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

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

condition   (CONDTN)

status   (STATUS)

See S-101 DCEG clause 8.4 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for CONDTN and STATUS on **PILPNT** and amend appropriately.

4.6.7.3   Pontoons

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

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

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

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

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

> **Commented [TS45]:** To be discussed.

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

condition   (CONDTN)

status   (STATUS)

See S-101 DCEG clause 8.17 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 **PONTON** and amend appropriately.

4.6.8   Hulks

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

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

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

condition   (CONDTN)

See S-101 DCEG clause 8.3 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 CONDTN on **HULKES** and amend appropriately.

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)

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

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

condition   (CONDTN)

status   (STATUS)

vertical datum   (STATUS)

See S-101 DCEG clause 8.12 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 CONDTN, STATUS and VERDAT on **CRANES** and amend appropriately.

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

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. 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)

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

All instances of encoding of the S-57 Feature object **LNDRGN** and its binding attributes will be populated automatically against the S-101 feature **Land Region** during the automated conversion process. However the following exceptions apply:
- The S-57 attribute NATQUA for **LNDRGN** will not be converted. It is considered that this attribute is not relevant for **Land Region** in S-101.

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

water level effect (WATLEV)

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

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

> **Commented [TS46]:** To be confirmed.

4.7.2 Height contours, spot heights

<u>S-57 Geo object:</u> Land elevation (**LNDELV**) (P,L)

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

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

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

<u>S-57 Geo object:</u> Sloping ground (**SLOGRD**) (P,A)

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

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

colour (COLOUR)

nature of surface (NATSUR)

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

4.7.5 Cliffs

<u>S-57 Geo object:</u> Slope topline (**SLOTOP**) (L)

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

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

category of slope (CATSLO)

colour (COLOUR)

nature of surface (NATSUR)

See S-101 DCEG clause 5.15 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are

advised to check any populated values for CATSLO, COLOUR and NATSUR on **SLOTOP** and amend appropriately.

4.7.6   Rivers

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

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

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

status   (STATUS)

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

4.7.7   Rapids, waterfalls

4.7.7.1   Rapids

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

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

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

4.7.7.2   Waterfalls

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

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

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

4.7.8   Lakes

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

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

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

The S-101 the 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.