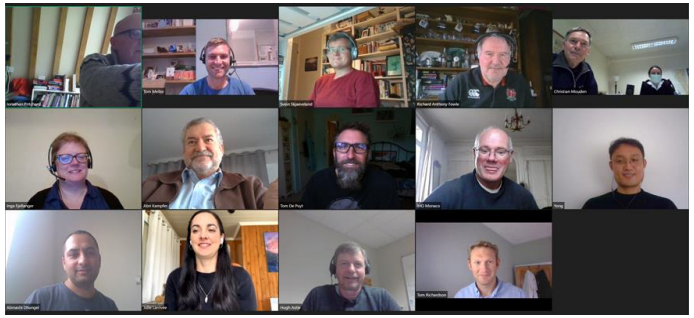
S-57 to S-101
Conversion Sub-group
Update

ENC Conversion (sub-working group)

ENC Conversion WG

- Formed following ENCWG online meeting
- Participation from member states RENCs and industry
- First meeting Oct 7th 2020 (8 meetings so far)
- Focused on delivering useful guidance and practical advice for data producers faced with:
  - Initial migration of data to S-101
  - Ongoing production of S-101 and S-57 data.



Outputs:

1. Help Member States prepare existing S-57 ENCs for conversion to S-101.
   - Identify possible conversion issues
   - Improve consistency of existing S-57 ENCs so that a large percentage of data can be converted automatically.
   - Produce a first version of this guidance within 6 months.
2. Help Member States prepare their global data for conversion to S-101 in conjunction with their own plans and rollout of S-101 during the transition period. This second item will be treated with a lower level of priority.

What are we doing? And why are we doing it?

- How possible is “automated” conversion of S-57 ENC data
- Looking at how, in theory, data that produces current S-57 ENCs can be converted to data that produces S-101 ENCs.
  - For some, these are cell files (.000)
  - For others, it may be database content

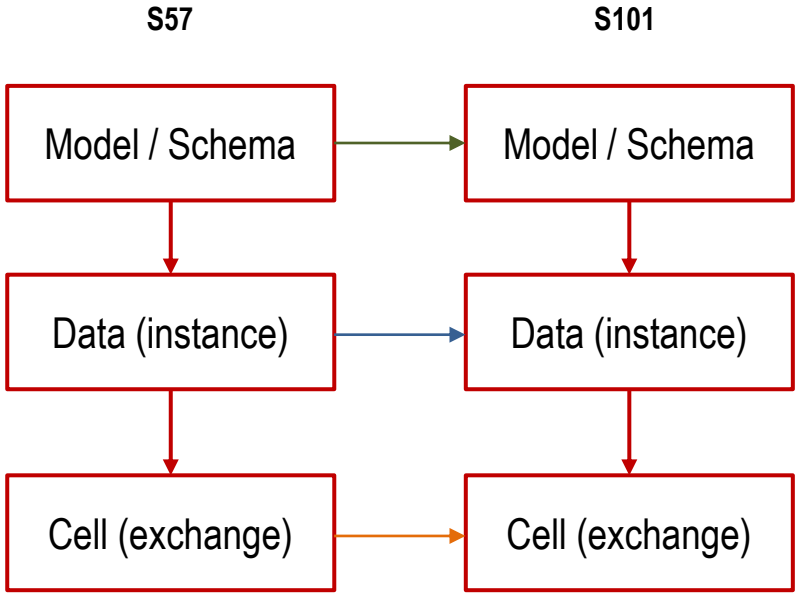
- When writing the document the wording has been carefully considered to inform data producers and industry partners (converter manufacturers and production system producers).

- We haven’t addressed dual fuel, nor ongoing production and maintenance of ENC data. This will need to follow on afterwards.
- However, the guidance to be issued in the output document will establish how to produce S-101 ENC cells which conform to the latest iteration of the S-101 DCEG and product specification.

Conversion (of what?)

- We often talk about data “conversion”
- Converting “cells” is one activity
- Assessing and adapting databases is another one

Schema	a description of the structure of a thing
Instance	the thing itself



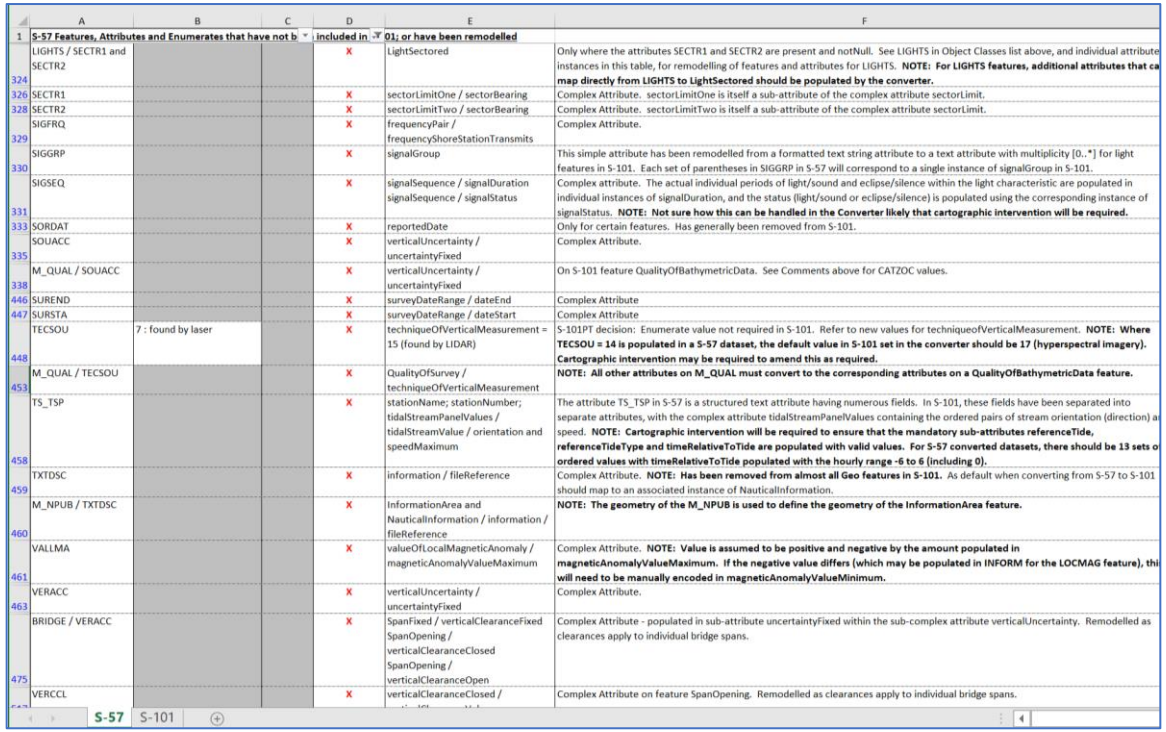
UOC/DCEG + Local Guidance

Production System (database “instance”)

Outputs, Cells and updates (for data exchange)

Re-modelling spreadsheet

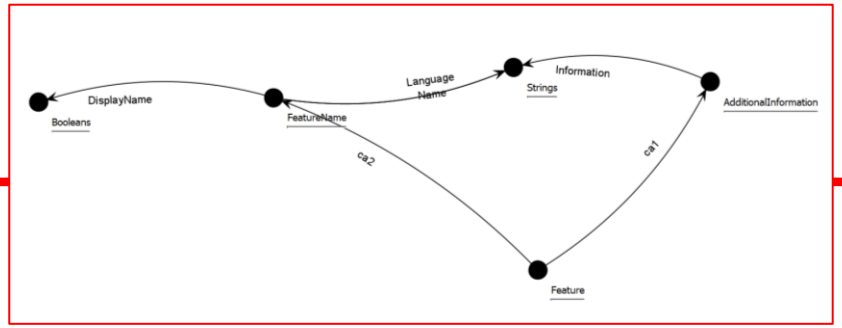
- Numerous updates
- Issues identified and noted to Github
- Used as source for draft of conversion document
  - Input from producers,
  - issues raised and discussed.
  - Instances flagged
  - Central source of discussion



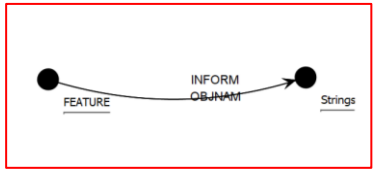
	A	B	C	D	E	F
1	S-57 Features, Attributes and Enumerates that have not b			included in	01; or have been remodelled	
324	LIGHTS / SECTR1 and SECTR2			X	LightSectored	Only where the attributes SECTR1 and SECTR2 are present and notNull. See LIGHTS in Object Classes list above, and individual attribute instances in this table, for remodelling of features and attributes for LIGHTS. **NOTE: For LIGHTS features, additional attributes that ca map directly from LIGHTS to LightSectored should be populated by the converter.**
326	SECTR1			X	sectorLimitOne / sectorBearing	Complex Attribute. sectorLimitOne is itself a sub-attribute of the complex attribute sectorLimit.
328	SECTR2			X	sectorLimitTwo / sectorBearing	Complex Attribute. sectorLimitTwo is itself a sub-attribute of the complex attribute sectorLimit.
329	SIGFRQ			X	frequencyPair / frequencyShoreStationTransmits	Complex Attribute.
330	SIGGRP			X	signalGroup	This simple attribute has been remodelled from a formatted text string attribute to a text attribute with multiplicity [0..*] for light features in S-101. Each set of parentheses in SIGGRP in S-57 will correspond to a single instance of signalGroup in S-101.
331	SIGSEQ			X	signalSequence / signalDuration signalSequence / signalStatus	Complex attribute. The actual individual periods of light/sound and eclipse/silence within the light characteristic are populated in individual instances of signalDuration, and the status (light/sound or eclipse/silence) is populated using the corresponding instance of signalStatus. **NOTE: Not sure how this can be handled in the Converter likely that cartographic intervention will be required.**
333	SORDAT			X	reportedDate	Only for certain features. Has generally been removed from S-101.
335	SOUACC			X	verticalUncertainty / uncertaintyFixed	Complex Attribute.
338	M_QUAL / SOUACC			X	verticalUncertainty / uncertaintyFixed	On S-101 feature QualityOfBathymetricData. See Comments above for CATZOC values.
446	SUREND			X	surveyDateRange / dateEnd	Complex Attribute
447	SURSTA			X	surveyDateRange / dateStart	Complex Attribute
448	TECSOU	7 : found by laser		X	techniqueOfVerticalMeasurement = 15 (found by LIDAR)	S-101PT decision: Enumerate value not required in S-101. Refer to new values for techniqueofVerticalMeasurement. **NOTE: Where TECSOU = 14 is populated in a S-57 dataset, the default value in S-101 set in the converter should be 17 (hyperspectral imagery). Cartographic intervention may be required to amend this as required.**
453	M_QUAL / TECSOU			X	QualityOfSurvey / techniqueOfVerticalMeasurement	**NOTE: All other attributes on M_QUAL must convert to the corresponding attributes on a QualityOfBathymetricData feature.**
458	TS_TSP			X	stationName; stationNumber; tidalStreamPanelValues / tidalStreamValue / orientation and speedMaximum	The attribute TS_TSP in S-57 is a structured text attribute having numerous fields. In S-101, these fields have been separated into separate attributes, with the complex attribute tidalStreamPanelValues containing the ordered pairs of stream orientation (direction) a speed. **NOTE: Cartographic intervention will be required to ensure that the mandatory sub-attributes referenceTide, referenceTideType and timeRelativeToTide are populated with valid values. For S-57 converted datasets, there should be 13 sets o ordered values with timeRelativeToTide populated with the hourly range -6 to 6 (including 0).**
459	TXTDSC			X	information / fileReference	Complex Attribute. **NOTE: Has been removed from almost all Geo features in S-101.** As default when converting from S-57 to S-101 should map to an associated instance of NauticalInformation.
460	M_NPUB / TXTDSC			X	InformationArea and NauticalInformation / information / fileReference	**NOTE: The geometry of the M_NPUB is used to define the geometry of the InformationArea feature.**
461	VALLMA			X	valueOfLocalMagneticAnomaly / magneticAnomalyValueMaximum	Complex Attribute. **NOTE: Value is assumed to be positive and negative by the amount populated in magneticAnomalyValueMaximum. If the negative value differs (which may be populated in INFORM for the LOCMAG feature), thi will need to be manually encoded in magneticAnomalyValueMinimum.**
463	VERACC			X	verticalUncertainty / uncertaintyFixed	Complex Attribute.
475	BRIDGE / VERACC			X	SpanFixed / verticalClearanceFixed SpanOpening / verticalClearanceClosed SpanOpening / verticalClearanceOpen	Complex Attribute - populated in sub-attribute uncertaintyFixed within the sub-complex attribute verticalUncertainty. Remodelled as clearances apply to individual bridge spans.
	VERCCL			X	verticalClearanceClosed /	Complex Attribute on feature SpanOpening. Remodelled as clearances apply to individual bridge spans.

S-57 S-101

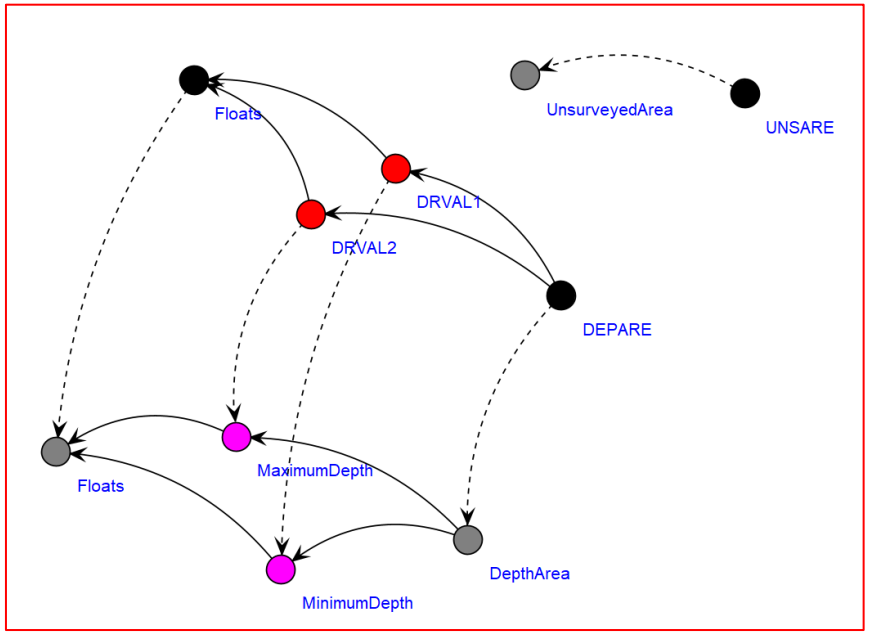
Types of Conversion



- **Simple dictionary conversion**
  - Where feature and attribute bindings don't change and are just re-labelled
  - Mapping from feature->feature and attribute->attribute
  - 80% of content (?) of current ENCs



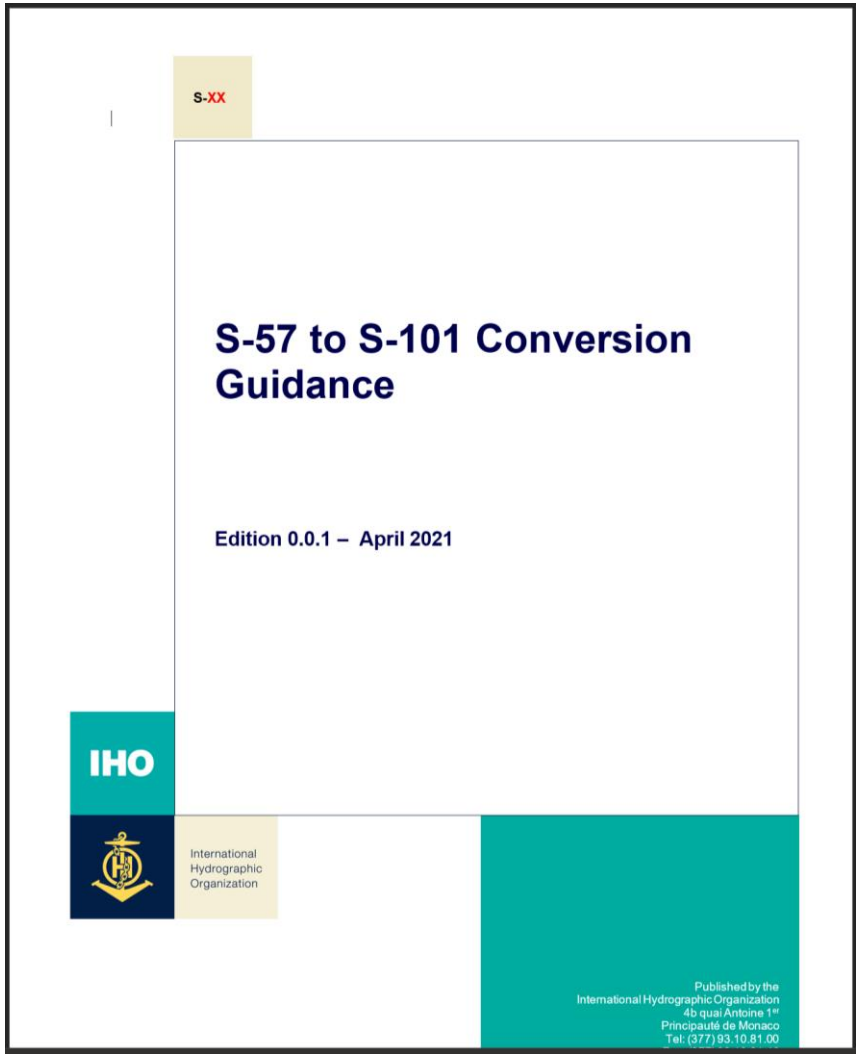
- **"Edge Cases"**
  - Changes to enumerations / meanings
  - Dropped features
  - Relationships between features
  - Skin of the Earth.



- **Special considerations**
  - Data Producers need to assess and (possibly) edit existing data prior to conversion.
  - Dropped Geometry primitives
  - INFORM could be used to define new features attributes (if suitable for inclusion in existing S-57)

Conversion Guidance Document

- Version 1.0.0 in preparation
- Follows UOC structure in grouping features
- Also contains Annexes for identifying data model differences between S-57 and S-101.
- Each UOC feature is dealt with enumerating S-57 content and how it <u>should</u> convert to S-101 cells.
- Non-mandatory! But shows how to achieve standards conformant data.



Conversion document selected extracts I

automated conversion process has been completed, this guidance is also included in this document.

It is important to note the following:

- **The guidance included in this document is intended to optimise S-57 ENC data for initial conversion to S-101.**
- **Where possible, every effort must be made such that the performance of officially published S-57 ENCs in ECDIS is not compromised. For example, this document includes guidance on the population of the S-57 INFORM attribute to facilitate automated conversion. Such ~~corresponding~~ attribute population may adversely affect ~~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.**

- The purpose of the document is to offer guidance to "optimise S-57 ECN data for initial conversion to S-101"
- The intended audience
  - Data Producers wishing to prepare their data for S-101 production
  - Manufacturers of converters
- Use of Language
  - Must, Should and May
  - "Will"

Layout / Structure

- Structure and initial compilation from IHO Secretariat
- Arranged to reflect UOC contents
- Features/Geometry
- Mapping : S-57 object to S-101 feature and attributes
- Noted:
  - Restrictions on attribute enumerations
  - Deleted attributes
  - Edge case notes
  - Producer actions

11.4 Dumping grounds

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

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

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

restriction (RESTRN)

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

11.3 Military practice areas; submarine transit lanes; minefields

11.3.1 Military practice areas

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

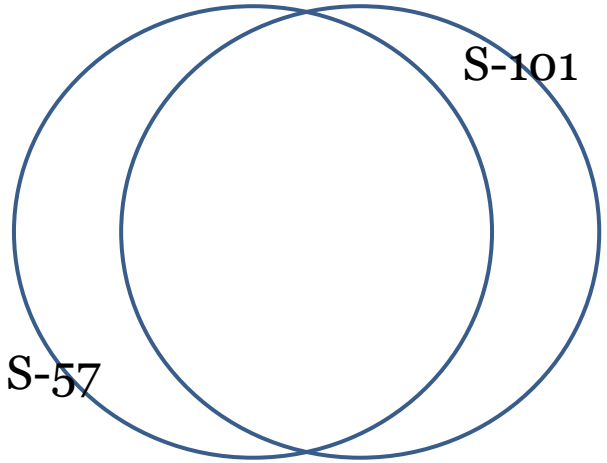
S101 Geo feature: **Military Practice Area** (P,S) (S-101 DCEG Clause 16.7)

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

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

Conversion document selected extracts II

- Cartographic Framework
  - Units
  - Datums
  - CSCL and Coverage
- INFORM->NauticalInformation
- Identifiers
- Metadata
  - UADT
  - ISDT
  - EDTN/UPDN

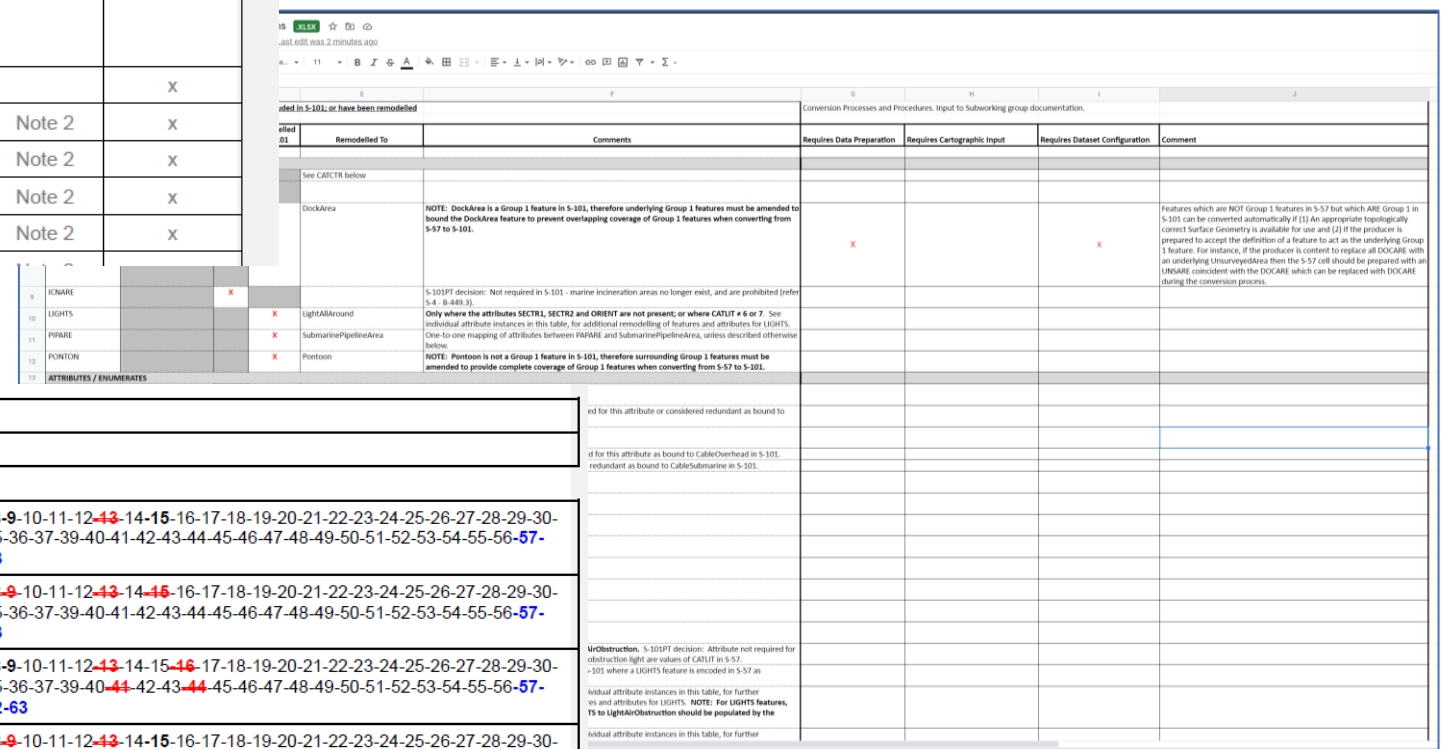


Are we dealing with “everything?”

- e.g M_HOPA, CTRPNT
- New features?

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

1	2	3	4	5	6	7	8
S-57 Object Class	**Clause**	**Examination Required**	**Attribution**	**Enumerates**	**New Geo Primitive(s)**	**New Attributes**	**New Enumerates**
ACHARE	9.2.1	x	x				x
ACHBRT	9.2.2						
ADMARE	**11.2.1** 11.16 12.13 13.1.2	x	x				
AIRARE	4.8.12	x		x			x
BCNCAR	12.3.1	x		x		Note 2	x
BCNISD	12.3.1	x		x		Note 2	x
BCNLAT	12.3.1	x		x		Note 2	x
BCNSAW	12.3.1	x		x		Note 2	x



CATSLO		1-2-3-4-5-6-7
	SLOTOP	1-2-~~3-4-5~~-6-~~7~~

CATSPM		1-2-3-4-5-6-7-8-**9**-10-11-12-~~13~~-14-**15**-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-**57**-**58**-**60**-**61**-**62**-**63**
	BCNSPP	1-2-3-4-5-6-7-8-~~9~~-10-11-12-~~13~~-14-~~15~~-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-**57**-**58**-**60**-**61**-**62**-**63**
	BOYSPP	1-2-3-4-5-6-7-8-**9**-10-11-12-~~13~~-14-15-~~16~~-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40-~~41~~-42-43-~~44~~-45-46-47-48-49-50-51-52-53-54-55-56-**57**-**58**-**59**-**60**-**61**-**62**-**63**
	DAYMAR	1-2-3-4-5-6-7-8-~~9~~-10-11-12-~~13~~-14-**15**-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-**57**-**58**-**60**-**61**-**62**-**63**

CATTSS		1-2 [Converts to new Boolean attribute **IMO adopted** for new feature **Traffic Separation Scheme** – see clause 10.2.1]

Producer Impacts

- The goal is to assist producers in preparing their data for initial conversion
- Not to show how to construct systems for ongoing (co)-production
- The information content is likely to be the same, just expressed in different ways
- Producers will have much information “locked up” in INFORM values – these values may be inconsistently encoded and may not match between producers (e.g. Fiber / Fibre)
- Document uses INFORM in some cases to define new features/attribute values, mainly where UOC guidance already exists. Some converters may enhance this

- Most producers will need to do a general assessment against the mappings defined in the document and define possibilities with their own INFORM values and/or internal database fields.
- Producer’s own encoding guidance will also need to be factored in

DISMAR

- INFORM is expected to contain data for new attribute ‚measured distance value‘ -> no changes needed

OBSTRN + WRECKS

- Problem: How to indicate ‚shoaled‘ (which is the most frequent entry in our data set)? -> This cannot be encoded using EXPSOU.

CBLSUB

- INFORM mainly contains information on the type of current for power lines (CATCBL = 1). -> According to DCEG, local magnetic anomalies should be added for direct current cables because they may cause magnetic compass deflections.

RDOSTA

- Redundant information to CATROS -> no problems

ADMARE

- Nautical Information Type will be neccesary. Automatic transfer from INFORM to new information type attribute (information -> text)?

Some current topics… (Work in Progress)

- Github
  - Use of Language
  - Change of Datum values
  - M_HOPA
  - M_CSCL
  - Bridges
  - INFORM
  - InTheWater
  - Association Features
  - Group 1 changes
- Converter Document
  - Purpose
  - Deleted features (M_HOPA, CTRPNT)
  - Changes of attribute (simple and complex (VDAT))
  - ISDT/UADT EDTN/UPDN
  - FOIDs
  - Coverage

IHO

International Hydrographic Organization

WHERE DO WE GO?

1. Continue rewiewing the document and compile first complete version ready for review by group and stakeholders

2. Compile list of any outstanding issues and difficulties which need to be flagged to either S-101 PT or ENCWG

3. Try to answer the BIG Questions…. Can it be automated? How manual is it likely to be? What needs to be thought about for production implementation?

4. Questions?