



## DGIWG 130 SD1

### Web Symbology User Guide

<b>Document type:</b>	User Guide
<b>Document date:</b>	24 July 2020
<b>Edition number:</b>	1.0
<b>Responsible Party:</b>	Defence Geospatial Information Working Group (DGIWG)
<b>Audience:</b>	This document is approved for public release and is available on the DGIWG website, <a href="https://www.dgiwg.org/">https://www.dgiwg.org/</a> .
<b>Abstract:</b>	This user guide provides guidance for use of DGIWG 130, Web Symbology, which is available on the DGIWG website, <a href="https://www.dgiwg.org/">https://www.dgiwg.org/</a> .
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## Introduction

DGIWG 130, Web Symbology, contains a set of symbols that were developed for portrayal feature data as web services across a full range of zoom levels. The symbols set may be used as a complete set or used as subsets. This project was initiated based on a requirement for portrayal suitable for web applications. Data Product Specifications provide detailed guidance for building single scale products for print products. As part of the development of this spreadsheet, DGIWG participants developed prototypes and worked to develop symbols, colours and patterns that will render well within the scale bands. A new colour specification was also developed by National Geospatial-Intelligence Agency to provide hex colour values suitable for rendering within a web service.

## 1 Scope

This portrayal spreadsheet was developed to support systems offering web-based portrayal capabilities to apply criteria-based filters and point, line and polygon symbology. The DGIWG Portrayal Technical Panel, in cooperation with the DGIWG Vector Data Panel, also develops and manages hard-copy portrayal specifications. Therefore, many of the hard-copy portrayal concepts were similarly applied to the development of the web symbology. The symbols represented in this spreadsheet are well suited to both commercial and open source systems.

## 2 Application

Web applications provide the capability to zoom in and out on a map and see appropriate levels of detail from urban to global scale. This spreadsheet identifies appropriate symbols, features and geometries from urban up to global scales. The symbology covers most features found on standard map products such as Topographic Map (TM), MGCP Topographic Map (MTM), Joint Operations Graphic (JOG) and Tactical Pilotage Chart (TPC). The symbols within the spreadsheet are a pictorial representation that can be used as a reference for styling web services. A symbol design library is also in development in order to provide comprehensive machine-readable style instructions for each symbol. This will include scalable vector graphics (SVG) samples, as well as definitions for pattern fills, colour values, line weights and opacity.

This spreadsheet is intended to function as a visual library of symbols to facilitate the development of web services with a standard look and feel. Each required feature geometry has one associated symbol for a given scale range. This allows for the application of the entire library of symbols if required. Many features are represented by the same symbology, so an implementer should select the feature that best represents the attributes found within their dataset. Symbols are identified by a unique identifier specific to its visual representation, so the same symbol identifier may be used on many features. To leverage web portrayal capabilities, an implementer must determine what vector data is available and what scale ranges the data is appropriate for viewing at. For example, data that was collected for global hardcopy product may not have sufficient content or spatial accuracy for display at an urban scale. Unlike raster data, which degrades when a user zooms in beyond its intended scale, vector data will provide the same visual clarity at all zoom levels so it is important that the scale ranges reflect the spatial accuracy of the data.

### 3 Structure and Definitions

The spreadsheet is divided into three sections: a conceptual group, feature information, and symbology.

Note: Labeling instructions have not been collected as part of this project. Label Object identifiers (LO\_ID) identify the rules for a label in the Product Object model.

#### 3.1 Conceptual Group

The Conceptual Group has headings highlighted in yellow which provide the thematic group, sub-group categories and the geometries that are used to represent them.

Local Sort	No	Group	Sub-Group	Geometry
33	0182	Boundaries	Boundary lines	A
34	2533	Cultural	Disposal Waste Management Facilities	A
35	2534	Cultural	Disposal Waste Management Facilities	P
36	0248	Cultural	Communication Facilities	P
37	0249	Cultural	Communication Facilities	P

Figure 1 Conceptual Group

#### Column Descriptions:

**Local Sort** - administrative field to assist with management of the spreadsheet.

**No** - administrative field to assist with management of the spreadsheet.

**Group** - describes general categories.

**Sub-Group** - further breaks the categories down into smaller subsets.

#### 3.2 Feature Information

The feature information section, including columns with headings highlighted in blue, provides a detailed breakdown of features based on a combination of attributes that reflect a range of features from a very general feature to very specific features. This is further defined by their type, status, or other characteristics. Each described feature is assigned one unique identifier represented by the Product Object code. These identifiers are used to associate symbols and rules from different products or symbols sets. The DGIWG Vector Data Panel manages the product objects and their associated characteristics. These descriptions were

derived from the Defence Geospatial Information Model (DGIM) but are intended also map to features and characteristics from other feature data models.

AlphaCode	Product Object ID	Product Object Criteria	DGIM FeatureType	Geometry
SecondOrderAdministrativeDivisionA	PO_0182	Administrative Division / second order	Administrative Division	A
AerationBasinA	PO_2533	Aeration Basin / default	Aeration Basin	A
AerationBasinP	PO_2534	Aeration Basin / default	Aeration Basin	P
AerialNonObstructionP	PO_0248	Aerial / non-obstruction	Aerial	P
AerialObstructionP	PO_0249	Aerial / obstruction	Aerial	P

**Figure 2 Feature Information**

#### Column Descriptions:

**Alphacode** - a camel case description for the PO with the last letter indicating the geometry of the feature.

**Product Object ID** - the Product Object (PO) is a unique identifier representing the real world object (feature) to be portrayed.

**Product Object Criteria** - a full name description based on the characteristics of the PO, each characteristic is separated by a slash (/). These criteria include attributes which further describe the feature for building expressions to filter data for portrayal.

**DGIM feature type** - the entity that contain the feature in the DGIM.

**Geometry** - describes the geometry of the PO as a Point (P) Line (L) or Area (A).

### 3.3 Symbology

The symbology section, including columns with headings highlighted in orange, is comprised of six sub-sections representing five scale bands and one for default or alternative symbology (Figure 3). These sub-sections are further divided to describe and depict appropriate symbology for each scale band (Figure 4). The Web Symbology five scale bands for products alignment with the Web Map Tile Service (WMTS) zoom levels and general maps scales is depicted in Figure 5.

Default or Alternative Symbol		Urban L20-16 500-10,000			50k L15-13 10,000-100,000			250k L12-11 100,000-500,000			1M L10-08 500,000-2,500,000			Global L07-00 >2,500,000		
Default or Alternative Symbol		L20-16 (Urban)			L15-13 (50K)			L12-11 (250K)			L10-08 (1M)			L07-00 (>1M)		
SO_ID	Graphic Preview	SO_ID	Graphic Preview	Standard Inclusion	SO_ID	Graphic Preview	Standard Inclusion	SO_ID	Graphic Preview	Standard Inclusion	SO_ID	Graphic Preview	Standard Inclusion	SO_ID	Graphic Preview	Standard Inclusion
SO_0184		SO_0184		YES	SO_0184		YES	SO_0184		YES	SO_0184		YES	SO_0184		YES
SO_0446		SO_0446		YES	SO_0446		YES	SO_0446		YES	DO NOT PORTRAY	DO NOT PORTRAY	NO	DO NOT PORTRAY	DO NOT PORTRAY	NO
SO_0016		SO_0016		YES	SO_0016		YES	SO_0016		YES	DO NOT PORTRAY	DO NOT PORTRAY	NO	DO NOT PORTRAY	DO NOT PORTRAY	NO
SO_0415		SO_0415		YES	SO_0415		YES	DO NOT PORTRAY	DO NOT PORTRAY	NO	DO NOT PORTRAY	DO NOT PORTRAY	NO	DO NOT PORTRAY	DO NOT PORTRAY	NO
SO_0006		SO_0006		YES	SO_0006		YES	SO_0006		YES	SO_0006		YES	SO_0006		YES

Figure 3 Symbology Section for Scale Bands and Default or Alternative Symbology

Default or Alternative Symbol		Default	L20-16 (Urban)		
SO_ID	Graphic Preview		SO_ID	Graphic Preview	Standard Inclusion
SO_0184			SO_0184		YES
SO_0446			SO_0446		YES
SO_0016			SO_0016		YES
SO_0415			SO_0415		YES
SO_0006			SO_0006		YES

Figure 4 Enlargement of Default or Alternative Symbol and Urban Scale Band sub-sections

**Column Descriptions:**

**SO\_ID** - a unique Symbol Object identifier for the graphical representation of the symbol. This identifier represents the symbol only and will remain the same regardless of the feature it is representing. The SO\_ID uses a SO\_#### structure but the column may also include the text "DO NOT PORTRAY" for features that will not be displayed.

**Graphic Preview** - a thumbnail image of the symbol for reference. These preview symbols are for visual reference, a separate library of SVG is being developed for direct use within applications.

**Standard Inclusion** - indicates whether a feature is included on the standard hard copy product associated with the scale range or zoom level band.

Common Scale	World Mercator Tile Matrix Set		Scale Band
	Zoom Level	Scale	
	0	559,082,264	General World Data Set
500,000,000			
	1	279,541,132	
250,000,000			
	2	139,770,566	
100,000,000			
	3	69,885,283	
50,000,000			
	4	34,942,642	
25,000,000			
	5	17,471,321	
10,000,000			
	6	8,735,660	
5,000,000			
	7	4,367,830	1:1M Data Set
2,500,000			
	8	2,183,915	
	9	1,091,958	
1,000,000			1:250K Data Set (or 1:100K or 1:50K Generalised Data)
	10	545,979	
500,000			
	11	272,989	1:50K or 1:25K Data Set
250,000			
	12	136,495	
100,000			
	13	68,247	1:10K or 1:5K Data Set
50,000			
	14	34,124	
25,000			
	15	17,062	
10,000			
	16	8,531	
5,000			
	17	4,265	
2,500			
	18	2,133	
1,000		1,066	
500	20	533	

**Figure 5 Scale Bands for Web Symbology Spreadsheet**

### Column Descriptions:

**Common Scale** - the general map scales that are used for production.

**Zoom Level** - hierarchical order of a tile matrix set that represents relative level of detail of the current view. Zoom levels are related to map scale and resolution - higher zoom levels are a greater scale and increased resolution. See OGC 17-083r2, OGC Two Dimensional Tile Matrix Set, 2019-10-06.

**Scale** - provides the specific scale associated with the zoom level. Tile matrix set scales are automatically generated based on initial size of largest tile (zoom level 0 is a global extent) using quad tree algorithms. Each subsequent zoom level has a scale denominator that is half of the previous zoom level. See OGC 17-083r2, OGC Two Dimensional Tile Matrix Set, 2019-10-06.

**Scale Band** - zoom levels are sectioned into 5 bands loosely grouped around data product specification product lines and the OCG Two Dimensional TileMatrixSet Specification for World Mercator WGS84 Quad TileMatrixSet (one of the mandated Coordinate Reference Systems in the DGIWG WMTS profile). The bands align to currently approved Data Product Specifications for topographic products. Note that additional zoom levels are possible but commonly available datasets will not support quality portrayal at those scales.

## 4 Implementation Guidance

This spreadsheet was initiated with a very comprehensive breakout of described features to reflect a variety of levels of detail. For web symbology, many features may be represented by the same symbology across all zoom levels so that the implementer takes this into consideration when defining their symbology.

This outline shows a general workflow for using the Web Symbology Spreadsheet:

- 1) Determine general categories of what will be on the map.
- 2) Determine the level of detail desired (categories and geometries).
- 3) Reference the Product Object Criteria to find descriptions that match the desired categories.
- 4) Look at the symbology. If the symbols are the same across all zoom levels/scale bands, consider using the most general category of Product Object Criteria that covers the feature represented in the data set.
- 5) Verify that available data supports the planned level of detail.
- 6) Relate the Product Object Criteria with the data schema for the data that will be portrayed and define an expression or filter expression for the feature. This may be built through a user interface or encoding in a style such as Style Layer Descriptor.
- 7) Define the scale ranges for the symbology and assign appropriate symbols dimensions such as line weight, point symbol and pattern sizes for each scale band. This may require a set of layers for each scale band or scale-dependent sizing in the GIS software.
- 8) To simplify the rendering process, a user may also choose to pre-process the data and assign a product object code to each feature. This simplifies the systems' query for selecting the feature that a symbol will be applied to. This pre-processing improves performance although requires that the pre-processing be recalculated when the data changes.

## 5 Future Work

This project builds a common visualization for web symbology. The next version of the spreadsheet will be migrated to a database linked to a symbol library as part of an effort to build a foundation for a portrayal registry.