DGIWG – 252-1

Defence Topographic Map for 1:50,000 Scale (DTM50) Data Product Specification (DPS)

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Abstract:	This product specification describes the content and arrangement of a Defence Topographic Map for 1:50,000 Scale (DTM50).
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Document history

Version	Date	Comments	Authors
1.1	1 March 2023	First version of the DTM50 to be ratified. V1.1 is used, instead of v1.0 in order to indicate the content alignment between MTM v1.1 and this DTM50 v1.1	Chad Wettlaufer (CAN)

Foreword

The purpose of this document is to describe the content and arrangement of a Defence Topographic Map for 1:50,000 Scale (DTM50). A DTM50 is a hardcopy map characterized by a high level of planimetric detail and quantitative representation of relief using elevation contour lines. The various features shown on the map are represented by standard symbols. These symbols are explained in the margin of the map along with other information about the map and its content. Topographic map content includes symbolization of transportation and cultural features, vertical obstructions, hydrography, hypsography, vegetation, boundaries, geographic place-names, along with a Military Grid Reference System (MGRS) grid.

The Data Product Specification for Topographic Maps consists of three parts:

- **DGIWG-252-1_DTM50_DPS** - This Defence Topographic Map Data Product Specification (DTM DPS), which defines the requirements for a hardcopy topographic map product at 1:50,000 scale.
- **DGIWG-252-2_DTM50_DPS_PC** - The Defence Topographic Map Data Product Specification Portrayal Catalogue (DTM DPS PC), which defines requirements for the portrayal of feature data on hardcopy topographic maps.
- **DGIWG-252-3_DTM50_DPS_AC** - The Defence Topographic Map Data Product Specification Annotation Catalogue (DTM DPS AC), which defines requirements for the portrayal of non-feature (marginalia) data on hardcopy topographic maps.

Note: *All three of the above documents are required to produce a topographic map product. These external resources can be found at: https://dgiwg.org/documents/dgiwg-standards.*

The format of these documents is based on the DGIWG profile of International Organization for Standardization (ISO) 19131, Geographic information - Data product specifications (2007+A1:2011). This DGIWG profile extends the ISO standard to provide a definition of the format, content and structure of a specification for geospatial data products meeting military requirements. This specification also considers a hardcopy map or chart to be a data product.

This DPS is part of the Defence Geospatial Information Framework (DGIF) Edition 2.0 and utilizes the artefacts and specifications defined there within. Specifically, DGIM baseline 2016-2. That does not preclude this specification from being used in a national context but may need to be adjusted to national specifications.

This DPS identified as Edition 1.1 despite there being no Edition 1.0. This is being done to establish the clear content and structural relationship between this edition of the DTM50 DPS and Editions 1.1 of both the MGCP Topographic Map (MTM) DPS and Topographic Map (TM) DPS produced by NGA.

Comments, questions, or suggestions to improve this document should be addressed to the Defence Geospatial Information Working Group secretariat@dgiwg.org

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List of Figures and Tables

1   Overview

1:50,000 scale topographic maps are used by land and air/rotary forces in support of ground operations, for the planning and execution of tactical operations, land navigation, and fire support missions, as well as to provide basic terrain analysis information to assist in the Intelligence reparation of the battle space through a standardized graphical representation. This product specification describes the content and arrangement of a Defence Topographic Map for 1:50,000 Scale (DTM50).

1.1   DPS Title

Defence Topographic Map for 1:50,000 Scale (DTM50) Data Product Specification (DPS).

1.2   DPS Version

Version 1.1

1.3   DPS Reference Date

01 March 2023

1.4   DPS language

English according to Shorter Oxford English Dictionary (5th edition)

1.5   DPS Classification

NON-CLASSIFIED

1.6   DPS Contact

Comments, questions, or suggestions to improve this document should be addressed to the Defence Geospatial Information Working Group secretariat@dgiwg.org

1.7   DPS URL

This product specification is available at: https://dgiwg.org/documents/dgiwg-standards.

1.8   DPS Identifier

DGIWG-252-1_DTM50_DPS

1.9   DPS Maintenance

There is no regular maintenance/update schedule for this product specification. It will be updated by DGIWG as requirements dictate.

1.10 DPS Keywords

topographic, hardcopy, map

1.11 DPS topic categories

010: Imagery/Base Maps/Earth Cover.

1.12 DPS distribution format

This document is distributed in Portable Document Format (PDF).

1.13 Terms and definitions

1.13.1   Data product

Dataset or dataset series that conforms to a data product specification

1.13.2   Data product specification

A geospatial data product specification is a precise technical description which characterizes a geospatial data product. It includes general information for data identification as well as information on data content and structure, reference systems, data quality aspects, data capture, maintenance, delivery and metadata. The DTM50 DPS is produced in compliance with DGIWG 101 - Profile of ISO 19131 Geographic information - Data product specification

1.13.3   Dataset

Identifiable collection of data

NOTE: A dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset may be as small as a single feature or feature attribute contained within a larger dataset. A hardcopy map or chart may be considered a dataset.

1.13.4   Dataset series

Collection of datasets sharing the same product specification

1.14 Abbreviations

AC   Annotation Catalogue

AGeoP   Allied Geographic Publication

AS   Application Schema

CE   Circular Error

DGIF   Defence Geospatial Information Framework

DGIM   Defence Geospatial Information Model

DMF   DGIWG Metadata Foundation

DPS   Data Product Specification

DTM50 Defence Topographic Map for 1:50,000 Scale

FC   Feature Catalogue

LE   Linear Error

MDG   MGCP Derived Graphic

MGCP   Multinational Geospatial Co-production Program

MGRS   Military Grid Reference System

MTM   MGCP Topographic Map

NATO   North Atlantic Treaty Organization

NSN   NATO Stock Number

PC   Portrayal Catalogue

PDF   Portable Document Format

RN   Reference Number

UPS   Universal Polar Stereographic

UTM   Universal Transverse Mercator

1.15 Informal description of the data product

1.15.1   Title

Defence Topographic Map for 1:50,000 Scale

1.15.2   Acronym

DTM50

1.15.3   Abstract

The product of this DPS is a Defence Topographic Map for 1:50,000 Scale (DTM50) which is a hardcopy map characterized by a high level of planimetric detail and quantitative representation of relief using elevation contour lines. The various features shown on the map are represented by standard symbols. These symbols are explained in the margin of the map along with other information about the map and its content.

1.15.4   Content

Topographic map content includes symbolization of transportation and cultural features, vertical obstructions, hydrography, hypsography, vegetation, boundaries, geographic place-names, along with a Military Grid Reference System (MGRS) grid. Examples of marginalia annotation include: a map legend to illustrate and define symbols used on the map, a glossary of geographic terms, adjoining sheet diagram, boundaries diagram, bar scales, notes on geographic reference system, datum, elevation contour interval, and sheet identification.

All units of measurement (elevations, heights, lengths, widths) are in meters unless otherwise noted.

1.15.5   Spatial extent

1:50,000 scale map sheets normally cover 15 arcminutes in the north-south dimension, and 15 arcminutes in the east-west dimension at the equator. The number of arcminutes covered by a map sheet in the east-west dimension increases with distance from the equator, as meridians converge (See Table 1).

1.15.6   Specific purpose

Although primarily a "paper" product, a DTM50 may also be converted to digital "copies" of paper maps, such as Portable Document Format (PDF), or GeoTIFF (TIF). Producing digital copies of Defence Topographic Maps is outside the scope of this DPS.

2   Scopes

The scope of this DPS is to define the product requirements for Defence Topographic Maps at 1:50,000 Scale. The DTM50 has unique scopes for the following topics of information.

2.1   Scope Identification – Scale

This section has been intentionally left blank.

2.2   Scope Identification – Coloured Light Readability

2.2.1   Scope Level

Dataset (map sheet)

2.2.2   Level Names

Red-Light Readable, Red-Light & Blue/Green-Light Readable

2.2.3   Level Description

Defence Topographic Maps shall be produced to be readable under red-light conditions. Under unique circumstances, a map may need to be both red-light & blue/green-light readable. Annex C - "Colour" of the Defence Topographic Map for 1:50,000 Scale Portrayal Catalogue (DTM50 PC) defines the colour tokens for both red-light readable and, red & blue/green-light readable maps.

2.2.4   Coverage

Not Applicable.

2.2.5   Extent

Red-Light Readable and, Red & Blue/Green-Light readable apply to the entire map sheet, including margin information.

2.3   Scope Identification – Languages

2.3.1   Scope Level

Dataset (map sheet)

2.3.2   Level Names

Single Language, Multi-Lingual

2.3.3   Level Description

Defence Topographic Maps for 1:50,000 Scale can be produced in one language, or in multiple languages. See section 3.10 for multi-lingual map requirements.

2.3.4   Coverage

Not Applicable

2.3.5   Extent

The language or languages applied to the map are applicable to the entire map sheet, including margin information.

2.4   Scope Identification – Expurgation

2.4.1   Scope Level

Dataset (map sheet)

2.4.2   Level Name

Expurgated area

2.4.3   Level Description

In certain cases (based on supplementary project instructions), the topographic detail on one side of an international boundary on a map may be omitted (expurgated) if the map sheet is primarily intended to support operations on the other side of the boundary. See DTM50 PC section 2.5.5 for additional information.

2.4.4   Coverage

Not Applicable

2.4.5   Extent

The extent of the expurgated area normally extends from the boundary (or the river bank if the countries are separated by a water body). In the expurgated area, no topographic detail shall be shown except for Administrative Boundary, Land Water Boundary and Tidal Water. Grid and graticule information is shown for the entire map sheet.

3   Data product identification

3.1   Title: Product Name_series_sheet_edition identification numbers

Each DTM50 shall be identified primarily by a unique combination of the product name, series identification number, map sheet identification number, and edition number.

Series, sheet, and edition numbers shall be constructed according to the definitions and principles in sections 3.14.1.2, 3.14.2.3.1, and 3.14.3.

3.2   Alternate title (1): Sheet name

Each DTM50 shall also be identified by a sheet name.

Sheet names shall be constructed according to the definitions and principles in section 3.14.2.4.

3.3   Alternate title (2): NATO Stock Number (NSN)

Each DTM50 shall also be identified by a NATO Stock Number (NSN).

The NSN shall be constructed according to the definitions and principles in section 3.14.4.

3.4   Alternate title (3): Reference Number (RN)

Each DTM50 shall also be identified by a Reference Number (RN). The RN shall be constructed according to the definitions and principles in section 3.14.5.

An additional identification number may also be required by the producing nation/agency.

3.5   Abstract

1:50,000 scale topographic maps are important hardcopy maps for use in tactical military operations. They portray transportation and cultural features, vertical obstructions, hydrography, hypsography, vegetation, boundaries, geographic place-names, along with a Military Grid Reference System (MGRS) grid. Annotation in the margin of the map provides basic metadata about the information shown on the map, as well as additional non-feature related information, such as an adjoining sheets diagram, map legend, glossary, etc.

3.6   Purpose

Topographic maps are used by land and air/rotary forces in support of ground operations, for the planning and execution of tactical operations, land navigation, and fire support missions, as well as to provide basic terrain analysis information to assist in the Intelligence preparation of the battle space through a standardized graphical representation.

3.7   Topic category

010 – Imagery/Base Maps/Earth Cover.

3.8   Spatial resolution

1:50,000

3.9   Geographic extent

The geographic extent of a DTM50 map sheet shall correspond to a specification of sheet lines. This DPS prescribes no positional limitations for a DTM50 map sheet in terms of geographic location (i.e. this DPS is valid worldwide).

Sheet lines shall follow an established format as described in section 3.14.2.

3.10 Language

A maximum of three languages shall be employed on any single instance of a DTM50 data product (map sheet). One of the languages shall always be English. The selection of the languages other than English shall be governed by national policy, the provisions of map standardization agreements, and map

agreements applying to specific projects, and shall be specified in supplemental instructions for the project.

3.11 Security Constraints

3.11.1   Classification

The level of classification is determined in accordance with the provisions and regulations of the producer. The appropriate classification shall be indicated in the security classification guidance for the project, operation, or exercise.

The security classification of the products generated by the use of this specification should be the lowest category practicable – normally UNCLASSIFIED with some form of restricted dissemination.

3.11.2   Classification Policy

Each map bearing a security classification marking shall also identify the organization/agency responsible for the classification and shall also contain contact information to obtain downgrading or declassification instructions. The appropriate note or statement shall be determined in accordance with the provisions of the producing nation. The specific note shall be indicated in pertinent security classification policy for the project, operation, or exercise.

3.11.3   Handling Description

Certain maps, classified or unclassified, require notes which restrict their distribution based on releasability instructions. When required, the appropriate note shall be specified in the security classification guidance pertaining to the project, operation, or exercise.

3.11.3.1 Restricted dissemination / LIMITED DISTRIBUTION note

A Restricted Dissemination or LIMITED DISTRIBUTION note is normally required on unclassified maps. The exact wording of this note is subject to change. Refer to national guidance and/or supplementary project instructions for the text of this note.

3.11.3.2

This section has been intentionally left blank.

3.12 Point of contact

The point of contact for Defence Topographic Map data products are defined by each nation and shall be contained in a "users note". See DTM50 AC section 3.1.7.2 for more details.

Since the point of contact information contained in the users note changes frequently, the Point of Contact for this data product specification (see section 1.6) should be contacted to obtain the latest information.

3.13 Identification scope

Dataset (map sheet)

3.14 Supplemental information

3.14.1   Map series

A series consists of a group of maps which are common to one another in that they:

- Cover a particular geographic area;
- Are on the same sheet line system;
- Are of the same scale or within the same scale group; or
- Are prepared under the same cartographic specifications.

Series are planned to cover all or part of a Continental, Regional, Sub-regional, or National area.

Topographic maps are grouped into a map series to facilitate preparation, identification, indexing, storage, and distribution. The map series used for topographic maps are defined in the NATO Index of Regional Areas, Annex C to NATO AGeoP-9 "NATO Specifications for Identification of Hard Copy Land Maps, Aeronautical Charts and Image Plans".

Each map series shall be identified by a series name and a series number.

3.14.1.1 Series name

The name assigned to a series should normally be the geographic name of the area covered by the series. Rigid rules cannot be established for the assignment of all series names. With exceptions permissible for necessary deviations, the following guidance applies:

- When more than one series, at the same scale, are designed to cover a country or region, each series shall be identified by the Country or Regional name, qualified by a geographic term. Example: Southern Honshu; Central Philippines; Western Russia; Northern Europe.
- When the series covers a large well-known area, it shall be given the name most commonly used to designate that area; usually this is a country name. In such cases, the name shall be spelled in accordance with the naming policy of the producing nation.
- When the series covers a small and not widely-known area, it shall be identified by the accepted local name.

3.14.1.2 Series number

The series number shall provide a unique identification for the map series. The series number indicates the geographic area, scale, and series designation of the series.

3.14.1.2.1   Series number format

The series number shall consist of four or five elements and shall be expressed by a capital letter followed by three or four numerals. Examples:

SERIES U711 – Afghanistan, 1:50,000 Scale

SERIES U711G – Afghanistan, 1:50,000 Scale

SERIES L7014 - Vietnam, 1:50,000 Scale

3.14.1.2.1.1 First element (geographic area)

The first element (capital letter) shall identify the regional area within which the series falls. These geographic areas are defined in NATO Index of Regional Areas, Annex C to NATO AGeoP-9, which presents a systematic breakdown of the world into Continental, Regional, and Sub-regional areas.

3.14.1.2.1.2 Second element (scale group)

The second element (first numeral) shall identify the scale range or group within which the series falls.

The 1:50,000 Scale Topographic Map falls within scale range number 7, larger than 1:70,000 through 1:35,000. For information on other scale ranges, see NATO Index of Regional Areas, Annex C to NATO AGeoP-9.

3.14.1.2.1.3 Third element (sub-regional area)

The third element (second numeral) shall identify the sub-regional area within which the series falls, following the geographic sub-regions defined in NATO Index of Regional Areas, Annex C to NATO AGeoP-9.

When a series extends beyond a sub-regional area, the third element shall be a "0" (zero). An exception to the rule is in regional areas L, N, Q, and U where the zero is used to designate a sub-regional area.

3.14.1.2.1.4 Fourth element (series designation)

The fourth element (third and fourth numerals) shall be used to distinguish between series whose scales and geographic coverages (and accordingly the first three elements of the series number) are the same. The initial series of such a group shall be given the numeral "1" with subsequent series incremented consecutively as: 2, 3, 4...9, 10, 11, etc. The number shall not be used a second time.

3.14.1.2.1.5 Fifth element (special series distinction)

A fifth element (capital letter) may be added to distinguish a regular series over a given area from special series. A special series may be required for several reasons including unique source data, expurgation, or other circumstances. Examples:

"G" in U711G denotes an MGCP Derived Graphic (MDG) or MGCP Topographic Map (MTM) series for Afghanistan, 1:50,000 scale

"M" in U711M denotes a miscellaneous or mission specific map, 1:50,000 scale

"Z" in U6711Z denotes an expurgated series for Afghanistan, 1:50,000 scale

3.14.2   Map sheets

Sheet lines are the means by which a geographic area is divided to establish the limits of individual sheets. Sheet lines shall generally be formed by parallels of latitude and meridians of longitude. The sheet lines of individual maps are also referred to as neatlines.

3.14.2.1 Establishment of standard sheet lines

The 1:50,000 scale sheet lines shall be based on an established 1:100,000 scale format, which was designed to incorporate pertinent worldwide map series. A quartered 1:100,000 scale map forms four (4) 1:50,000 scale maps (e.g.: the 1:100,000 scale map sheet 4141 of Series L673 quarters into the 1: 50,000 scale sheets 4141-1, 4141-2, 4141-3, and 4141-4 of Series L772).

The establishment of sheet lines is based on the following principles:

- Sheet lines shall be developed on a series or project basis;
- Sheet lines shall be designed to provide map coverage of an area with the minimum number of sheets without unduly impairing the continuity of adjoining sheets; and
- Sheet lines shall be so positioned that they coincide with the grid, ellipsoid, and datum junctions wherever possible. Sheet lines may vary within a map series. The following table lists the standard 1:50,000 scale sheet line sizes and the latitudes at which they occur:

Latitude	Sheet Sizes 1:50,000 N-S E-W
0° to 36°	15' x 15'
36° to 44°	15' x 18'
44° to 50°	15' x 20'
50° to 61°	15' x 22'30"
61° to 67°	15' x 30'
67° to 72°	15' x 36'
72° and above	As specified in instructions for the assignment.

Table 1. Standard 1:50,000 scale sheet line sizes and applicable latitudes.

3.14.2.2 Departures from standard sheet lines

Certain departures from the standard sheet lines may be required to avoid unnecessary sheets, thereby reducing the number of map sheets in a project. However, these departures shall be kept at a minimum and shall be based on careful consideration of their impact on the overall requirement of continuity of standard sheet lines. Departures from standard sheet lines occur most often in coastal areas, long narrow islands, and large islands with varying widths.

Base considerations when addressing possible departures from standard sheet lines should include the following principles and options:

- Adherence to normal preferred maximum work limits (see section 7.2.3);
- Extent of land topography and the need to show landmark coastal hydrographic features;
- The placement of margin data in open water areas;
- Existence of grid, ellipsoid, and datum junctions; and
- Adjustment of sheet lines to avoid decimal parts of second-of-arc.

3.14.2.2.1   Examples of non-standard sheets

The following are examples of departures from standard sheet lines. NOTE: the dashed lines in the figures represent where the standard sheet lines would exist if not adjusted.

3.14.2.2.1.1 Border break extensions

A border break extension ("bump out") permits an adjustment to a sheet neatline to accommodate islands of an adjoining area or small points of land (see Figure 1 and Figure 2). When there is a choice of sheets which may contain a border break extension, the sheet which requires the least rearrangement of margin data shall be selected. The neatline is extended around the protruding land mass and incorporates all applicable features within.
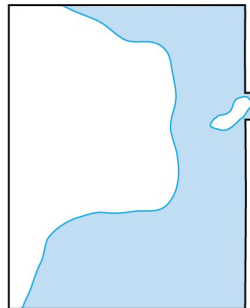
Figure 1. Border break for island.
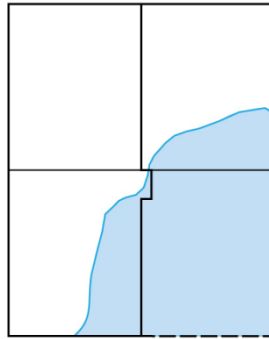
Figure 2. Border break for coastal land.

3.14.2.2.1.2 Extensions

An extension (Figure 3) is the enlargement of a sheet by moving one or more sheet lines to include adjoining land areas.
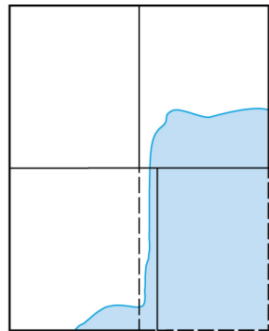
Figure 3. Sheet line extension.

3.14.2.2.1.3 Shifts

A shift is a change in continuity of sheet lines to accommodate a landmass (Figure 4). Sheets that are shifted usually retain the defined sheet dimensions for the area. A shift may involve more than one sheet. Overlapping sheets are permitted only if the overlapped area does not contain land, as shown in the example on the right.
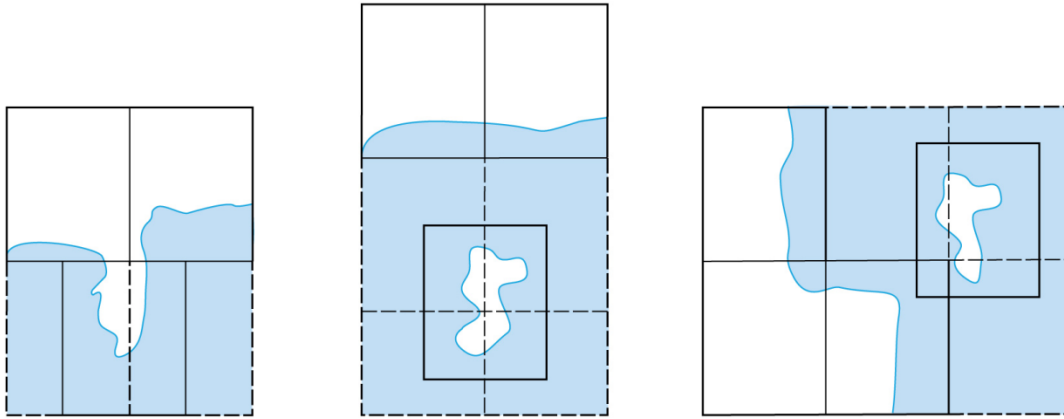
Figure 4. Various sheet line shifts.

3.14.2.2.1.4 Reproportionment

Reproportionment (Figure 5) permits the adjustment of the latitudinal and longitudinal limits of the defined sheet lines.
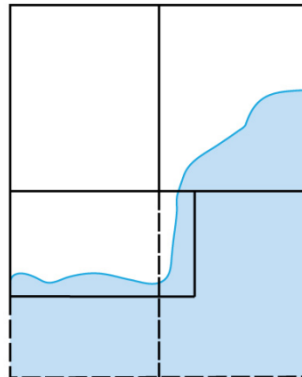
Figure 5. Reproportionment.

3.14.2.2.1.5 Insets

An inset (Figure 6) is a shift of a portion of a sheet covering an island(s) to relocate it within the open water area of another sheet. The inset is relocated on the nearest sheet and preferably along the same line of latitude or longitude.
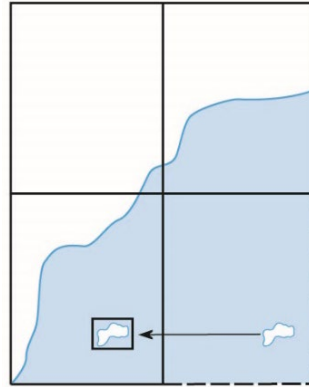
Figure 6. Insets.

3.14.2.2.2   Map sheets and series boundaries

When considered in the context of a map series, the designation of sheet lines, as well as the inclusion of map sheets in a series, may be affected.

3.14.2.2.2.1 Peripheral sheets and extensions

Peripheral sheets of a standard map series may have extended or broken projections to include small land areas. In special situations, standard sheet lines may be shifted to reduce the number of sheets needed to map the area.

A mapping project may include one or more sheets which fall within an adjacent Region or Sub-region which is unmapped at the scale of the project. If a series at the same scale is not planned for the adjacent Region or Sub-region, the sheets in question may be assigned to the series covering the area of the project.

Where a series exists for a specific area, a single map, or a small number of maps of different scales, but within the same scale group and within the same area, may be incorporated as part of the existing series instead of establishing a separate series for the odd sheets.

3.14.2.2.2.2 Assignment of peripheral map sheets to series

When determining the limits of a series, the area covered by the peripheral sheets is considered. Example: a series covering France will include some peripheral sheets which contain portions of Spain. If the portion of France, on a peripheral sheet, is greater than that of Spain, the sheet shall be included in the France series. If the portion of Spain is greater, the sheet shall be assigned to the Spain series. This rule may be subject to modifications induced by special mapping requirements, bilateral mapping arrangements, etc.

3.14.2.3 Numbering of map sheets

3.14.2.3.1   Sheet numbering basis

The basis for DTM50 sheet numbering shall be a 1:100,000 scale sheet layout with each sheet systematically identified by a four digit number (see Figure 7).

The four digit sheet number shall be comprised of two significant pairs of digits. The first two digits shall identify the column of 1:100,000 scale sheets, and the second two digits, the row of 1:100,000 scale sheets. The westernmost column of sheets should usually be assigned the number 10 (first two digits), and the southernmost row of sheets the number 10 (second two digits). Therefore, the southwest sheet of the sheet number layout is identified as "Sheet 1010," and is referred to as the sheet of origin. The respective two digit numbers shall increase progressively from the sheet of origin.

In large areas where the number of columns or rows of sheets exceed 99, the first column or row, depending on the extent of the area to be covered, should be given a lower number as 09, 08, 07, etc., to avoid running out of two digit numbers.

The numbering system shall not be limited to a single map series. It may also include adjacent map series of the same format and scale.
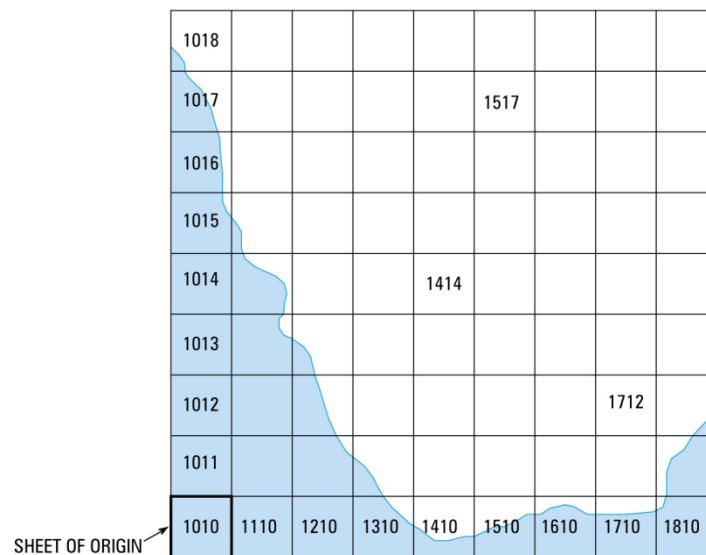
Figure 7. Basic development of the sheet number for 1:100,000 scale maps.

Finally, each 1:100,000 scale map sheet shall be quartered (see Figure 8). The four quarters shall retain the number of the 1:100,000 scale map, and shall be supplemented by the numbers 1, 2, 3, and 4, numbered clockwise beginning with the northeast quarter of the 1:100,000 scale map.
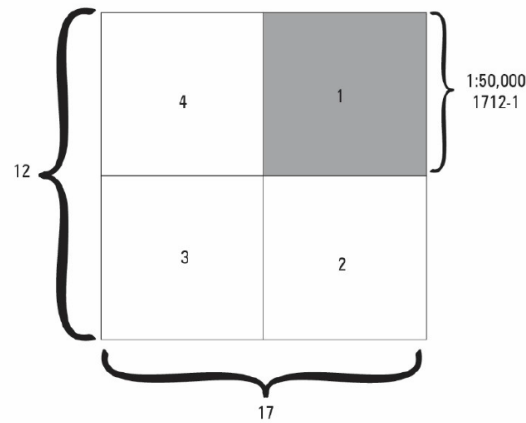
Figure 8. System for numbering 1:50,000 scale maps.

3.14.2.3.2   Sheet numbering with changes from standard sheet lines

3.14.2.3.2.1 Sheet numbers and sheet line breaks/insets

A sheet number shall not be affected by an extension of or a break in a sheet line which is made to include adjacent land areas, or by the inclusion of an inset.

3.14.2.3.2.2 Sheet numbers and sheet line shifts

For a sheet that is shifted from a standard sheet system, the sheet number assigned shall be that which, in the standard system, relates to the greater part of the sheet.

3.14.2.3.2.3 Special sheet numbering systems

A series composed of a small group of sheets which cannot be logically tied to an established numbering system shall follow a special sheet numbering system. Sheets within the series are assigned Arabic numerals beginning with "1" (Figure 9). The area covered by the series is laid out with the numbers reading from left to right in rows which are arranged from top to bottom. The word "SHEET" precedes the numbers. Example:

Figure 9. Sheet numbering for series containing a few maps.

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3.14.2.4 Naming of map sheets

3.14.2.4.1   Normal sheet naming practices

A map should normally be named after its most outstanding cultural or natural feature. Names of cultural features are preferred over natural features; however, if a natural feature is better known than any cultural feature appearing on the map, the name of the natural feature should be chosen.

The names of rivers, valleys, mountain ranges and other features extending over several sheets should be avoided when selecting a sheet name. In addition, area, locality and tribal names should not be used as a sheet name. Names of destroyed populated places or features should not be used as a sheet name when a natural feature is more prominent.

When the feature is divided by the neatline(s) separating two or more sheets and is the best known feature on each of the sheets, the feature name is followed by the geographic term (in parenthesis) describing the portion of the feature for which the sheet is being named. Examples:

"STUTTGART (NORTH)" and "STUTTGART (SOUTH)"

"KABOL (NORTHWEST)", "KABOL (NORTHEAST)", "KABOL (SOUTHWEST)" and "KABOL (SOUTHEAST)"

3.14.2.4.1.1 Spelling of sheet name

The sheet name shall be spelled to correspond exactly to the name of the outstanding feature as it is shown in the map interior. Diacritics, hyphens, and apostrophes shall only be shown if they appear with the name in the interior of the map.

3.14.2.4.2   Alternate sheet naming practices

When a sheet does not contain a named cultural or natural feature, the name of any adjacent sheet (typically 8 sheets) may be used in conjunction with the appropriate directional term. The adjacent sheet that has the most prominent name shall be selected. For example: "EAST OF TARA" shall be used for the sheet immediately to the east of the sheet with the sheet name "TARA"; "NORTHWEST OF SPRINGFIELD" shall be used for the sheet immediately to northwest of the sheet with the sheet name "SPRINGFIELD".

In cases where the 8 adjacent sheets are also devoid of any named feature that could be used as a sheet name option, the sheet number of the map being produced may be used as the sheet name (for example: "1417_2").

3.14.2.4.3   Sheet names for copied maps

When a map is copied from or based on a foreign map, and uses the same sheet lines, the name of the original map should usually be retained.

3.14.2.4.4   Uniqueness of sheet names

Sheet names shall not be duplicated within a map series. Individual maps should be given distinct sheet names wherever possible.

3.14.2.4.5   Coordination of sheet names between scales

Sheet names of 1:50,000 and 1:100,000 scale maps shall be coordinated whenever possible. The sheet name for a 1:100,000 map should be the sheet name of one of the 1:50,000 maps covering the same geographic area. The most prominent feature used for the sheet names of the 1:50,000 maps should be selected as the sheet name for the 1:100,000 map. Conversely, the sheet name of the 1:100,000 map should be used as the sheet name for the applicable 1:50,000 map. For example, 1:100,000 map named "SPRINGFIELD" has associated   1:50,000 named "SPRINGFIELD (NORTHWEST)", "SPRINGFIELD (NORTHEAST)", "SPRINGFIELD (SOUTHWEST)" and "SPRINGFIELD (SOUTHEAST)".

3.14.3 Edition numbering

The edition number shall identify the publication sequence of an individual map. Edition numbers shall run consecutively. A map bearing a higher edition number in the same series is assumed to contain more recent information than the same map bearing a lower edition number.

3.14.3.1 Standard edition designation

The standard edition designation shall consist of the word "Edition", a [space], a cardinal number, a dash, and the coded initial of the mapping agency responsible for the edition. Examples:

EDITION 1-NGA

EDITION 2-MCE

EDITION 3-GSGS

On maps produced by subsidiaries and affiliates of national mapping agencies, the coded initials of the preparing unit may be included as suffixed parenthetical code. Example:

EDITION 2-NGA (USAEUR)

The organization responsible for new military mapping in a given area shall also be responsible for coordinating the edition number. This does not prohibit another agency or its affiliate from producing a new edition. It is mandatory, however, for the producer to coordinate the edition number with the responsible organization. "Edition 1" is always applied to maps in a given series which are produced for the first time.

3.14.3.2 Advancement of edition number

The edition number shall be advanced in the following instances:

- Any map on which an alteration or revision is made to the factual data shown on the map, or any alteration that affects the operational soundness of the map. Examples would be the addition of a new grid or the revision of boundary information.
- A newly constructed map which is to replace an existing map.
- A map converted from a non-standard military scale within the same scale range. Example: a 1:50,000 scale map which replaces a 1:63,360 scale map and retains the same series number.

The advancement of an edition number constitutes authority to destroy stock and reproduction materials of the preceding edition.

3.14.3.2.1 Facsimile reprints

The edition number shall not be advanced for facsimile reprints on which no changes are made to map content or margin data.

The only authorized modifications to the facsimile reprints are:

- the addition of the NATO Stock Number (NSN), Reference Number (RN), and bar code to introduce map products of national mapping agencies into the NATO distribution system;
- the addition, deletion, or change of the coded initials or agency seal of the printing element or the printing date;
- the update of any security note (i.e. Limited Distribution); or
- the update of the users note.

3.14.3.3 Edition numbering for provisional, emergency, special, and temporary printings

The word "edition" shall be used only in conjunction with the edition number. The words "provisional," "emergency," "special," "temporary," etc., shall not be used as prefixes to the word "edition." Such prefixes may be used in conjunction with the word "printing," in which case an edition number is not shown.

3.14.4   NATO Stock Number

The NATO Stock Number (NSN) consists of a 13 digit number and is used to uniquely identify the map in the NATO distribution system.

The NSN shall be displayed on the map in human-readable and bar-code forms. See DTM50 AC section 3.1.5 & 3.1.5.1 for details.

3.14.5   Reference Number

The Reference Number (RN) shall consist of an alphanumeric designation not to exceed 15 characters. The RN shall be constructed as follows:

- The first five units shall be reserved for the series number. The letter "X" is shown as the fifth unit when the series number consists of four units.
- The 6th through 15th units shall be reserved for the sheet number. The dash in 1:50,000 scale sheet numbers is not included in the reference number.

When displayed on the map, the RN shall be prefixed by "REF. NO." See the DTM50 AC section 3.1.5.2 for details.

Examples of Reference Numbers used with topographic maps are shown as follows:

- For Series P773, Sheet Number 4779-3:

    REF. NO. P773X47793

- For Series L7018, Sheet Number 4624-1:

    REF. NO. L701846241

- For Series U711G, Sheet Number 2275-3:

    REF. NO. U711G22753

3.14.5.1 Modification of reference numbers for classified maps

When a modification of reference numbers is required for classified maps, guidance shall be included in the pertinent classification guide.

3.14.6 Expurgated Sheets

On map sheets containing expurgated areas (areas where map information is not shown) the fifth element of the series number is shown with a "Z" to distinguish it from a map sheet of the same area which is not expurgated. The sheet name shall also be changed to reflect the most outstanding feature within the non-expurgated area of the sheet. See DTM50 PC section 2.5.5 for additional information on the treatment of sheets containing expurgated areas.

4   Data content and structure

Defence Topographic Maps are feature-based hardcopy map products, based on the graphic symbolization of geospatial features contained within the map sheet limits.

4.1   Feature-based data

The Defence Topographic Map for 1:50,000 Scale (DTM50) utilizes a subset of the Defence Geospatial Information Model (DGIM) consisting of those features required for portrayal.

4.2   Feature-based application schema

The Defence Topographic Map for 1:50,000 Scale Application Schema (DTM50 AS) is a GML 3.2.1 format application schema that will define the model structure and content required to produce a DTM50.

4.3   Feature catalogue

The Defence Topographic Map for 1:50,000 Scale (DTM50) Feature Catalogue (FC) describes a subset, known as 'Product Objects', of the Defence Geospatial Information Model (DGIM) consisting of those features required for portrayal. The FC is available in HTML format.

5   Reference systems

5.1   Spatial reference system

World Geodetic System 1984 (WGS 84)

5.1.1   Ellipsoid

The ellipsoid shall be World Geodetic System 1984 (WGS 84).

5.1.2   Horizontal datum

The horizontal datum shall be World Geodetic System 1984 (WGS 84).

5.1.3   Vertical datum

The vertical datum shall be Mean Sea Level (MSL) as determined by the appropriate Earth Gravity Model (EGM) WGS84.

The EGM clarifier may be added to the Vertical Datum note in the margin if it is known. For example:

"VERTICAL DATUM...............MEAN SEA LEVEL (EGM96)"

5.1.4   Projection

The projection shall be the Transverse Mercator between 84 degrees north latitude and 80 degrees south latitude. The Polar Stereographic projection shall be used for maps north of 84 degrees north latitude and south of 80 degrees south latitude. Any requirement for any projection other than those mentioned here should be specified in supplementary instructions provided as part of the project assignment.

The use of geographic coordinates as a system of reference is based on the expression of position by latitude and longitude in degrees, minutes and decimal minutes. The projection shall be represented by limiting sheet lines (neatlines) and a series of evenly-spaced projection intersections in the map interior. These intersections shall be at 5 minutes of arc intervals. The sheet lines of standard maps shall show the meridians (lines of longitude) as straight lines, and parallels (lines of latitude) which effect curvature

through the connection of straight line segments between successive intermediate projection intersections. The intersections of the parallels and meridians of the projection shall be plotted within 0.15 mm of the computed position.

5.1.5   Grid

The Universal Transverse Mercator (UTM) or Universal Polar Stereographic (UPS) grid shall be shown. The Military Grid Reference System (MGRS) shall be used to express positions in terms of UTM and UPS grid coordinates. Between 84 degrees north latitude and 80 degrees south latitude, the standard grid shall be the UTM grid. The UPS grid shall be used for maps north of 84 degrees north latitude and south of 80 degrees south latitude.

The grid interval shall be 1,000 meters in both northing and easting. The grid shall be constructed on a given sheet so that the distances between adjacent grid lines shall not vary more than 0.15 mm from the computed grid interval; and the overall distances between the first full grid lines, complementing those of adjoining sheets, shall not vary more than 0.15 mm from their computer measurements.

5.1.6   Resources

Explanatory data and specifications can be found in: NATO STANAG 2211 – "Geodetic Datums, Projections, Grids and Grid References". This document pertains to:

- Descriptive data and parameters for worldwide application of datums, ellipsoids, projections, and grids;
- Explanations on the use of the Military Grid Reference System (MGRS) and Geographic Coordinate Reference Systems;
- Definitions, specifications, and illustrations of treatments of grid(s) and graticule(s) for the primary map, inset maps and map margin of 1:100,000 scale maps and larger;
- Treatment of grid zone junctions;
- Treatment of applicable declination diagrams
- Figures (diagrams) with definitive illustrations delimiting worldwide coverage of geodetic datums, ellipsoids, grids and grid reference systems; and
- Appropriate sheet margin guidance for all subject related requirements.

5.2 Temporal reference system

Temporal reference systems are not applicable to Topographic Maps.

6   Data quality

6.1 Accuracy

6.1.1   Horizontal accuracy

Horizontal accuracy shall be within 1.0 mm at hardcopy scale (50 meters at 1:50,000 scale) circular error (CE) at the 90% confidence level.

- *Circular error is an accuracy figure representing the stated percentage of probability that any point expressed as a function of two linear components (e.g., horizontal position) will be within the given figure.*

6.1.2   Vertical accuracy

Vertical accuracy shall be one elevation contour interval linear error (LE) at 90% confidence level.

- *Linear error is a one dimensional error (such as an error in elevation) defined by the normal distribution function.*

6.1.3   Displaced features

The accuracies stated above shall be for well-defined points such as drainage confluences, major transportation crossing points, survey points, or the equivalent. Feature symbols which are displaced shall be excluded from the accuracy requirement stated above.

6.2   Quality scope

The data quality measures defined above are applicable to the entire map sheet.

7   Data product delivery

7.1   Delivery medium information

Maps described by this DPS shall be delivered as paper map sheets.

These maps may also be converted to digital representations of paper maps, in formats such as Portable Document Format (PDF), GeospatialPDF, or GeoTIFF. How digital representations of topographic maps are produced is outside of the scope of this DPS.

7.2   Delivery format information

7.2.1   Format name

Hardcopy map

7.2.2   Language

The languages of the delivery format shall be the languages for the Defence Topographic Map data product as a whole. See Section 3.10 for a discussion of the languages of delivery for topographic map sheets.

7.2.3   Work limits

Work limits define the area available for a map to be plotted or printed on a roll or sheet of paper. Dimensions are expressed in linear units of measure.

The normal preferred work limits shall be 540 mm east-west and 730 mm north-south.

If necessary, these limits may be increased up to a maximum of 870 mm east-west and 980 mm north-south, in order to accommodate:

- wider sheet areas located at latitudes between 14˚N and 14˚S;
- extended marginalia (i.e. bi/tri-lingual translations); or
- departures from standard sheet lines (see 3.14.2.2).

Any variance beyond these maximum work limits shall be specified in supplemental project instructions.

7.2.4   Paper size and dimensions

Paper/trim size pertains to the overall dimensions on which a map may be plotted and/or cut after printing. Dimensions are expressed in linear units of measure.

The paper/trim size shall be a total of 30 mm greater in east-west direction than the work limits, and 20 mm in south-north.

The normal preferred paper/trim size shall be 570 mm east-west and 750 mm north-south.

If necessary, the maximum paper/trim size may be increased to 900 mm east-west and 1,000 mm north-south[1].

Figure 10 illustrates sheet lines, preferred work limits, and preferred paper/trim size pictorially (see also DTM50 AC, Annex B - Style Sheets).

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[1] This depends on the format of the printing machine. Most of the middle-format printing machines have the format class 3b, that means max paper size 1000 x 700 mm.
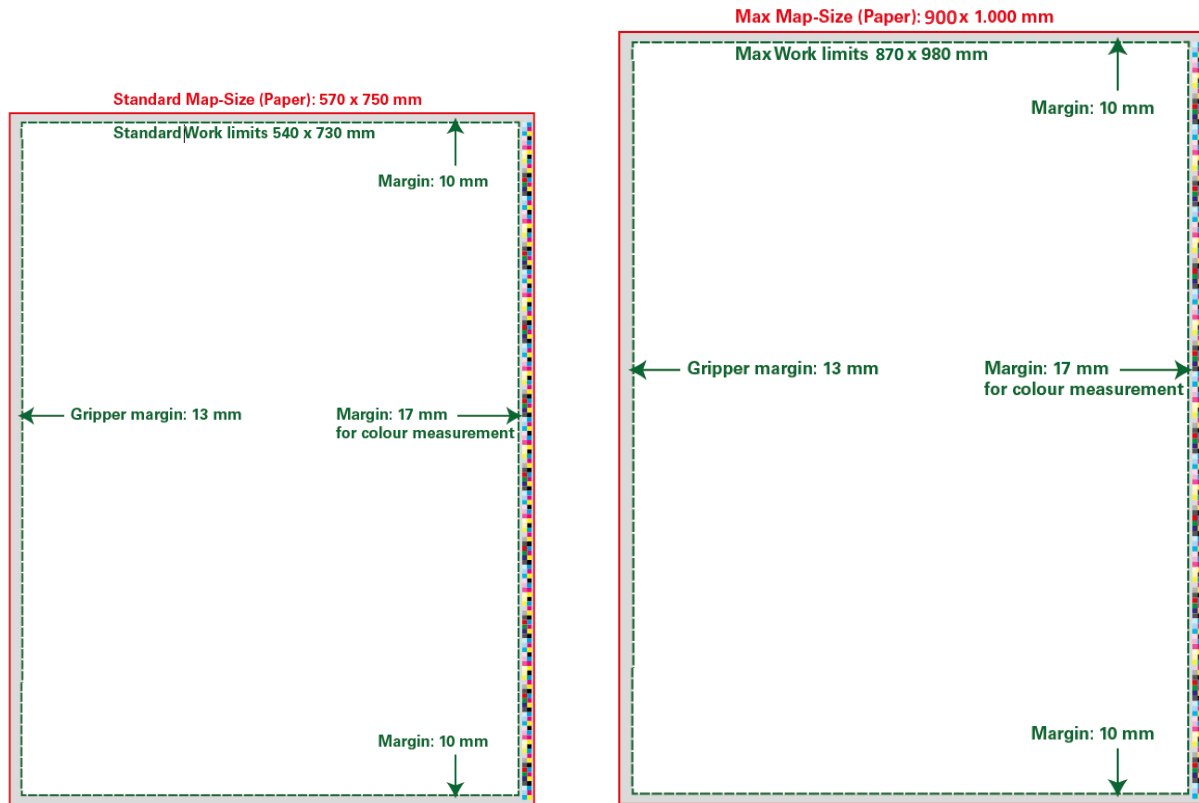
Figure 10. Sheet lines, work limits and paper/trim size.

8   Metadata

8.1   Overview/Guidance

Metadata for DGIWG is defined in the DGIWG Metadata Foundation (DMF). The DMF defines both mandatory and optional metadata elements for a resource or data product.

In addition to the metadata elements included in the DMF, additional metadata elements have been identified that are applicable to, or are required for, the production of a DTM50 map sheet.

This section lists the DMF and non-DMF metadata elements applicable to a DTM50 product. Many of these elements are described more fully elsewhere in this document; this section is meant to be a complete listing for reference purposes.

8.1.1   Metadata and the Map Display/Annotation Catalogue

Annotations on a DTM50 map sheet (map display) are the primary vehicle for conveying metadata values for that map sheet or the product as a whole. Both Annotation Symbols and Annotation Rules

may be parameterized, using the values of metadata elements as input. See the DTM50 AC for more details.

8.2   DMF Metadata Applicable to the DTM50

Table 2 describes those Defence Topographic Map metadata elements that correspond to mandatory or optional DMF metadata elements. In many cases, more than one DTM50 metadata element may correspond to a DMF equivalent.

The structure of the table is as follows:

- Name: The name of the metadata element.
- DMF Element Correspondence: The DMF metadata element to which this corresponds.
- DMF Mandatory/Optional/Conditional: M (for mandatory), O (for optional), or C (for Conditional). Describes whether population of this element is mandatory to be DMF compliant.
- DTM50 Multiplicity: The number of values this element may represent for DTM50.
- Description: Description of how the element is populated from the map sheet.
- Notes / Value example: General notes or specific examples of how the element is to be populated.
- Ref.: The section of the DTM50 DPS (or associated Catalogues) that describes this metadata element and its use in more detail.

Name	DMF Element Correspondence	DMF Mandatory (M), Optional (O), or Conditional (C)	DTM50 Multiplicity	Description	Notes / Value example	Ref.
Sheet Scale	Resource Spatial Resolution Equivalent Scale {RSSRES.equivalentScale}	O	1	The scale (representative fraction) of the map sheet. (1:50,000).	50000	DPS 3.8
Sheet Name	Resource Alternate Title {RSALT}	O	1	The unique name of the map sheet.	E.g. "STUTTGART (NORTH)"	DPS 3.2
Sheet Number	Resource Sheet Name {RSSHNA}	O	1	The 5 digit systematically assigned sheet number	E.g. "1483-2"	DPS 3.14.2.3
Sheet Production Date	Resource Reference Date {RSDATE.date (with RSDATE.type = '"creation")}	M	1	The production date of the file used to make the map sheet. This information is derived from the "Prepared and published" note	YYYY-MM	AC 3.1.7.1

				on the map surround.		
Copyright Note	Resource Legal Constraint Statement {RSLCST.statement}	O	1	The copyright note of the map sheet including the text and date.	E.g. "©2023. His Majesty the King in Right of Canada."	AC 3.1.7.4
Abstract	Resource Abstract {RSABSTR}	M	1	An abstract describing the product.	Defence Topographic Map for 1:50,000 Scale (DTM50) is a hardcopy map characterized by a high level of planimetric detail and quantitative representation of relief using elevation contour lines. The various features shown on the map are represented by standard symbols. These symbols are explained in the margin of the map along with other information about the map and its content.	DPS 3.5
Display Language	Resource Default Locale (Language and Encoding) {RSDLOC.language="*primary language on map*"} {RSDLOC.encoding="utf8"}	M	1	The language(s) of presentation of the map sheet.	Select appropriate entry from LanguageCodelist. One entry must be 'eng'.	DPS 3.10
	Resource Other Locale (Language and Encoding) {RSTLOC.language="*secondary language on map*"} {RSTLOC.encoding="utf8"}	O	0..2			
Topic Category	Resource Topic Category {RSTOPIC}	M	1	The fixed value of "Imagery/Base Maps/Earth Cover"	imageryBaseMapsEarthCover	DPS 3.7

Sheet Extent	Resource Extent (Bounding Box or Bounding Polygon) {RSEXT.boundingBox} OR {RSEXT.boundingPolygon}	M	1..*	The geographic extent of the map sheet.	Multiple instances could be created if the map has one or more insets. Ex. RSEXT[1].bounding Box & {RSEXT[2].bounding Box	DPS 3.9
Data Content – Countries Depicted	Resource Extent Geographic Identifier Code {RSEXT.geogId.code}	O	1..*	The countries shown on the map sheet.		AC 3.1.4
Data Content – Maximum Elevation	Resource Extent (Maximum Z Value) {RSEXT.verticalExtent.max z=*max elevation value*} RSEXT.verticalExtent.verti calCRS= » http://www.opengis.net/ def/crs/EPSG/0/5100" }	O	1	The maximum elevation value over the geographic extent of the map sheet referenced to MSL.		AC 3.3.6.3. 3
Data Content – Minimum Elevation	Resource Extent (Minimum Z Value) {RSEXT.verticalExtent.min z=*min elevation value*} RSEXT.verticalExtent.verti calCRS= » http://www.opengis.net/ def/crs/EPSG/0/5100" }	O	1	The minimum elevation value over the geographic extent of the map sheet referenced to MSL.		AC 3.3.6.3. 3
JOG-A Sheet Number	Resource Extent Geographic Identifier Code {RSEXT.geogId.code=*JOG-A sheet number*}	O	1	The Joint Operation Graphic-Air (JOG-A) sheet number to which the area of the map sheet corresponds.	E.g. "NH41-12"	AC 3.3.6.1. 9
100,000m Grid Square Identifier	Resource Extent Geographic Identifier Code {RSEXT.geogId.code=*100, 000m grid square identifier(s)*}	O	1..4	The 100,000m grid square identifier(s) overlapping this map extent.	If multiple 100,000m squares overlap the map sheet, identifiers will be comma separated. E.g. WG, WF, XG, XF	AC 3.3.1.4
Classification (Code)	Resource Security Constraint Classification Level {RSSCST.level}	O	1	The security classification of the map sheet.	Select appropriate entry from Classification Level Codelist	AC 3.2.1
Classification System	Resource Security Constraint Classification System {RSSCST.system}	C (required if a Classification Code is provided)	1	The classification system used to derive the security classification of the map sheet.	The String value is expected to be a 3-character country code from STANAG 1059 when available.	DPS 3.11.2

Sheet Title	Resource Title {RSTITLE}	M	1	The unique title of a map sheet. Combines the product name, map series, sheet number, and edition.	E.g. Defence Topographic Map_U713_1410-2_Edition 6-NGA	DPS 3.1
Edition Number	Resource Edition {RSED}	O	1	The edition number of the map sheet including producing agency abbreviation.	E.g. "6-NGA"	DPS 3.14.3
Reference Number (RN)	Resource Identifier {RSID.code} {RSID.namespace = "ReferenceNumber"}	O	1	The unique Reference Number (RN) of the map sheet.	E.g. "U713X14102"	DPS 3.4
NATO Stock Number (NSN)	Resource Identifier {RSID.code} {RSID.namespace = "NATOStockNumber"}	O	1	The unique NATO Stock Number (NSN) of the map sheet.	E.g. "1234567890987"	DPS 3.3
Series Number and Name	Name of Resource Series {RSSERI}	O	1	The number and name identifying the map series.	E.g. "U723 - Pakistan" or "Y771 - Madagascar"	DPS 3.14.1
Map Producing Agency	Resource Responsible Party {RSRPTY.role="originator"} {RSRPTY.party.orgName}	O	1	The agency responsible for producing the map sheet.	E.g. "Mapping and Charting Establishment"	AC 3.1.7.1
Map Point of Contact	Resource Responsible Party {RSRPTY.role="pointOfContact"} {RSRPTY.party.orgName} {RSRPTY.party.name} {RSRPTY.party.address} {RSRPTY.party.postalCode} {RSRPTY.party.administrativeArea} {RSRPTY.party.city} {RSRPTY.party.country} {RSRPTY.party.phone} {RSRPTY.party.email}	O	1	The point of contact information for the map sheet.	E.g. "Users should refer corrections, additions and comments for improving this product to: <insert contact information here>."	AC 3.1.7.2
Data Content Lineage	Resource Lineage {RSLING}	M	1	The lineage of the data content represented on the map sheet.	E.g. "MAP INFORMATION AS OF 2011-2013"	AC 3.4.2

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Data Producing Agency	Resource Responsible Party {RSRPTY.role=" principalInvestigator"} {RSRPTY.party.orgName}	O	0..1	The agency responsible for producing the data used in the map sheet.		AC 3.1.7.1
Ellipsoid/ Horizontal Datum/Proje ction	Resource Reference System {RSRSYS[1].code}	O	1	Ellipsoid, Horizontal Datum and Projection represented as an EPSG code. Note: the EPSG code is influenced by the UTM zone number.	E.g. "http://www.openg is.net/def/crs/EPSG /0/32637"	DPS 5.1
Vertical Datum	Resource Reference System {RSRSYS[2].code}	O	1	The vertical datum represented as an EPSG code.	E.g. "http://www.openg is.net/def/crs/EPSG /0/5775"	DPS 5.1.3
Grid System	Resource Reference System {RSRSYS[3].code}	O	1	The grid system used for map sheets.	"Universal Transverse Mercator (UTM)" or "Universal Polar Stereographic (UPS)"	DPS 5.1.5
Declassificati on Information	Resource Security Constraint Security Note {RSSCST.note}	O	1	Declassification information for a classified map sheet.		DPS 3.11.2
Special Handling Information	Resource Security Constraint Handling Description {RSSCST.handling}	O	0..1	Any security caveats or special handling instructions related to the map sheet.		DPS 3.11.3
Product Specification Name and Publication Date	Resource Regulated Quality Report Conformance Result Specification {RSRQR.identifier.code=" urn:dgiwg:meta:qualityM easure:ProdSpecComp"} {RSRQR.cnfResult.specific ation.title} {RSRQR.cnfResult.specific ation.referenceDate.date } {RSRQR.cnfResult.specific ation.referenceDate.type ="publication"} {RSRQR.cnfResult.explana tion="See the referenced specification"} {RSRQR.cnfResult.confor mance="true"}	O	1	The name and publication date of the product specification	Defence Topographic Map for 1:50,000 Scale (DTM50) YYYY-MM-DD (*publication date of the DPS*)	DPS 1.15.1 DPS 1.3
Viewing Conditions - Red and Red & Blue/Green-	Resource Use Limitation {RSUSE}	O	0..1	Whether or not the map sheet is blue/green-light readable in addition to red-	E.g. "Red-Light Readable" or "Red * Blue/Green-Light Readable"	AC 3.8

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Light Readability				light readable.	
Limited Distribution Note Text	Resource Security Constraint Limitation {RSSCST.limitation}	O	0..1	The text of the Limited Distribution Note	AC 3.2.1.2

Table 2. DMF metadata applicable to a DTM50.

8.3   DMF Mandatory Metadata Not Annotated on a DTM50 Map Sheet

Table 3 describes mandatory DMF metadata elements that are not depicted on the surround of a DTM50 map sheet, but would be required to generate DMF compliant metadata:

DMF name	DMF definition	Note
MDSID	Metadata Set Identifier	Mandatory in DMF when used in a catalogue. In this case, it should be the value which enables the user to access a metadata set by its identifier. It is usually generated automatically by the catalogue system.
MDDLOC	Metadata Default Locale	Defaulted to language='eng' and characterSet="utf8"
MDRPTY	Metadata Responsible Party	Set to the body creating the metadata
MDDATE	Metadata Date Stamp	Date of creation of the metadata
MDSTD	Metadata Standard	MDSTD.title='urn:dgiwg:metadata:dmf:2.0:profile:core' and MDSTD.version='2.0'
RSTYPE	Resource Type Code	Fixed to 'dataset'
RSPREF	Resource Representation Form	Fixed to 'analogue'
RSDFMT	Resource Distribution Format	Fixed to name='paper' and version='unknown'
RSUD	Resource Unit of Distribution	Fixed to 'Map sheet'
RSOFDM	Resource Offline Distribution Medium	Fixed to Medium.name="hardcopy'

Table 3. Mandatory DMF metadata elements not on a DTM50 map sheet.

8.4   Additional Metadata for Defence Topographic Maps

The tables in this section list additional categorized metadata elements that have been identified as important for constructing a DTM50 but do not have corresponding DMF metadata elements, and thus may appear in the criteria of Annotation Rules or as parameters for Annotations.

8.4.1   Additional Presentation Information

Table 4 describes additional metadata elements needed to drive textual annotations on the DTM50 sheet.

Name	Multiplicity	Description how/what data appears on map sheet	Data Type	Reference
Terms and	0..*	The terms and definitions to be	String	AC 3.6

Definitions		displayed in the glossary.		
Miscellaneous Note Text	0..*	The text of the miscellaneous notes to appear on the map.	String	AC 3.7
Users Note Text	1	The text of the Users Note as required by supplementary instructions.	String	AC 3.1.7.2

Table 4. Additional metadata related to presentation.

8.4.2

This section has been intentionally left blank

8.4.3   Data Content-Derived Information

Table 5 describes metadata elements representing information derived from the data content portrayed on the Defence Topographic Map.

Name	Multiplicity	Description how/what data appears on map sheet	Data Type	Reference
Data Content - Intermediate Elevation Contour Interval	1	The primary (intermediate) elevation contour interval represented by the elevation contour data for the map sheet.	Integer	PC 2.4.2.2
Data Content – Supplementary Elevation Contour Interval	0..*	The supplementary elevation contour interval(s) represented by the elevation contour data for the map sheet.	Integer	PC 2.4.2.2

Table 5. Additional metadata related to data content.

8.4.4   Additional Spatial Reference Information

8.4.4.1 Sheet-Level Spatial Reference Information

Table 6 describes additional spatial reference-related metadata elements applicable to a Defence Topographic Map sheet as a whole.

Name	Multiplicity	Description how/what data appears on map sheet	Data Type	Reference
Latitude Second Equivalence	1	The equivalent distance in meters for one second of latitude, given the extent/geodetic information of the map sheet.	Double	AC 3.3.1.6
Longitude Second Equivalence	1	The equivalent distance in meters for one second of longitude, given the extent/geodetic information of the map sheet.	Double	AC 3.3.1.6
Sheet Line System	1	The sheet line system used to define the borders of the map sheet.	String	DPS 3.14.2
Epoch Date	1	The standard epoch year (divisible by five, such as 2010, 2015, etc.) of latest isogonic data.	Date	AC 3.3.1.3

Table 6. Additional sheet-level spatial reference metadata.

8.4.4.2   Map-Specific Spatial Reference Information

Table 7 describes spatial reference metadata elements that are specific to one or more of the maps within the map display (see section 12.5).

In addition to the primary map, one or more insets may be present on a DTM50 sheet, depending on the geographic extent of the sheet (see section 3.14.2.2.1.5 for further discussion of insets). Both the primary map and the insets require specific values for their construction and for the parameterization of the Annotations that accompany them. Accordingly, each map (primary and each inset) will have its own set of values for the following metadata elements. (The DTM50 AC specifies which set of values should be used for a given map-specific annotation.)

Name	Multiplicity	Description how/what data appears on map sheet	Data Type	Reference
Map Major Grid Zone	1..*	The major grid zone(s) to be shown on the map.	CharacterString	DPS 5.1.5
Map Major Grid Zone Designation	1..*	The full designation, including latitude band, of the major grid zone(s) to be shown on the map.	CharacterString	DPS 5.1.5
Map Major Grid Convergence Info	1..*	The convergence info for the major grid(s) on the map.	CharacterString	AC 3.3.1.3
Map Major Grid Magnetic Angle Info	1..*	The magnetic angle(s) for the major grid(s) on the map.	CharacterString	AC 3.3.1.3
Map Minor Grid Zone	0..*	The minor grid zone(s) to be shown on the map.	CharacterString	DPS 5.1.5
Map Minor Grid Zone Designation	0..*	The full designation, including latitude band, of the minor grid zone(s) to be shown on the map.	CharacterString	DPS 5.1.5
Map Minor Grid Convergence Info	0..*	The convergence info for the minor grid(s) on the map.	CharacterString	AC 3.3.1.3
Map Minor Grid Magnetic Angle Info	0..*	The magnetic angle(s) for the minor grid(s) on the map.	CharacterString	AC 3.3.1.3

Table 7. Additional map-level spatial reference metadata.

9   Data capture

9.1   Data capture statement

Geospatial information portrayed on Defence Topographic Maps at 1:50,000 Scale shall be derived from the best and/or most suitable sources available (e.g. MGCP).

Although there is no specific extraction guide to define how data for DTM50 should be captured, it is expected that any vector data used to create a DTM50 map sheet should already be compliant, or should be conditioned to, what is cartographically acceptable for 1:50,000 hardcopy map portrayal.

10   Data maintenance

Defence Topographic Maps do not have an established maintenance/update cycle. The date of currency is indicated in the margin (see DTM50 AC 3.4.2 for details).

11   Portrayal

The portrayal of geospatial features and annotations shall be defined in the DTM50 PC and DTM50 AC. The DGIWG profile of ISO 19131, Geographic information - Data product specifications document allows for multiple portrayal and annotation catalogues to exist, the use of which will result in different portrayals, depending on delivery format and/or user needs.

11.1 Portrayal catalogue

The DTM50 PC presents symbol descriptions, symbol rules, labelling rules, generalization rules, finishing rules and additional informative guidance associated with feature portrayal on hardcopy topographic maps. Feature categories portrayed on a DTM50 include topographic, aeronautical, boundary, elevation, and maritime.

The DTM50 PC (DGIWG-252-2_DTM50_DPS_PC) is available at:

https://dgiwg.org/documents/dgiwg-standards

11.2 Annotation catalogue

The DTM50 AC presents rules for including, composing, and placing annotations (marginalia) in the map display on hardcopy topographic maps. The DTM50 AC incorporates information currently found in text and map style sheets.

The DTM50 AC (DGIWG-252-3_DTM50_DPS_AC) is available at:

https://dgiwg.org/documents/dgiwg-standards

12   Additional information

12.1 DPS Organization

This DPS is organized in accordance with the DGIWG profile of ISO 19131, Geographic information - Data product specifications document. Several of the sections in this DPS refer to external resources to document product requirements, including:

- Defence Topographic Map for 1:50,000 Scale Portrayal Catalogue (DTM50 PC)
- Defence Topographic Map for 1:50,000 Scale Annotation Catalogue (DTM50 AC)

These external resources are available at: https://dgiwg.org/documents/dgiwg-standards.

12.2

This section has been intentionally left blank

12.3 Standardization agreements

This specification implements the NATO Standardization Agreements (STANAGs) listed below. When amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with Defence Geospatial Information Working Group secretariat@dgiwg.org.

12.3.1   NATO Standardization Agreements (STANAGs)

- STANAG 2211 - "GEODETIC DATUMS, PROJECTIONS, GRIDS AND GRID REFERENCES"
- STANAG 2215 – "EVALUATION OF LAND MAPS, AERONAUTICAL CHARTS AND DIGITAL TOPOGRAPHIC DATA"
- STANAG 3675 - "SYMBOLS ON LAND MAPS, AERONAUTICAL AND SPECIAL NAVAL CHARTS"
- STANAG 3676 - "MARGINAL INFORMATION ON HARD COPY LAND MAPS, AERONAUTICAL CHARTS AND IMAGE MAPS"
- *STANAG 3677 – "STANDARD SCALES FOR LAND MAPS AND AERONUTICAL CHARTS"
- *STANAG 7136 - "NATO SPECIFICATIONS FOR IDENTIFICATION OF HARDCOPY LAND MAPS, AERONAUTICAL CHARTS AND IMAGE PLANS"
- *STANAG 3666 - "MAXIMUM SIZE FOR MAPS, AERONAUTICAL CHARTS AND OTHER GEOSPATIAL PRODUCTS (EXCLUDING NAUTICAL CHARTS)"
- STANAG 3689 – "PLACE NAME SPELLING ON MAPS AND CHARTS"

*These STANAGs are cancelled but the STANAG content remains relevant for this specification in the absence of replacement standards.

12.4 Cartographic process

The following sections describe a cartographic process for creating a hardcopy map display that accurately and effectively portrays feature data and associated metadata (as annotation). Information on the cartographic process is provided in this DPS to provide a general understanding of the process and to illustrate the terminology used in this DPS. The international standard for portrayal of geospatial information is ISO 19117, Geographic information portrayal. That standard indicates that typically there are two types of information included in a geospatial dataset: geographic information (the data) and metadata. Metadata is depicted by annotations.

12.5 Map Display

The highest level concept present in a topographic map is the map display (Figure 11). The current section describes the anatomy of a map display, as well as the maps within.

A Map consists of:

- Feature Portrayal (geographic information / feature data)
- Annotation (metadata)

A Map Display consists of 1 or more maps:

- Primary Map (~ map sheet)
- Inset Map(s)
- Margin mini-maps (Annotations)

Each Map in the Map Display has:

- Map Interior (inside neatline)
- Map Margin (outside neatline)

The Map Interior (Figure 12) contains:

- Geographic Information (Feature data)
- Annotation (Interior Annotation within the neatline) – see blue outlines:
  - o Georeferencing annotations (e.g. grids, graticules)
  - o Geo-oriented annotations (e.g. grid labels)

The Map Margin contains:

- Annotation (Interior Annotations related to the neatline)
  - o Geo-oriented annotations (e.g. grid and graticule ticks and labels)
- Annotation (other)
  - o Geographic annotations (e.g., "mini-maps", boundaries diagram, adjoining sheets diagram)
  - o Geo-oriented annotations (e.g., declination diagram, scale bar, slope guide)
  - o Non-geographic orientations (e.g. symbol legend, copyright notice)

Map Display Design (Style Sheet):

- Specifies content and placement of maps, including the arrangement of interior and other annotations
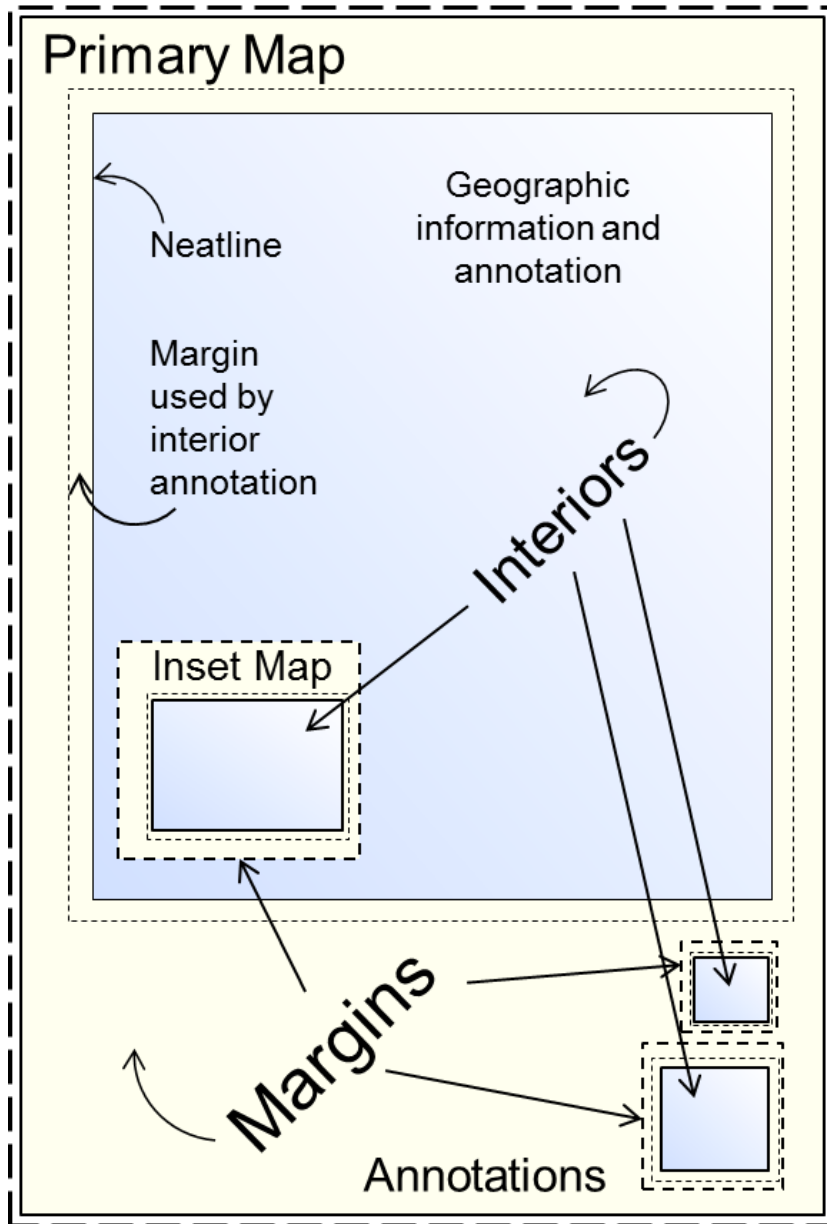- May employ "open space" over map interiors for arrangement of inset maps, etc.

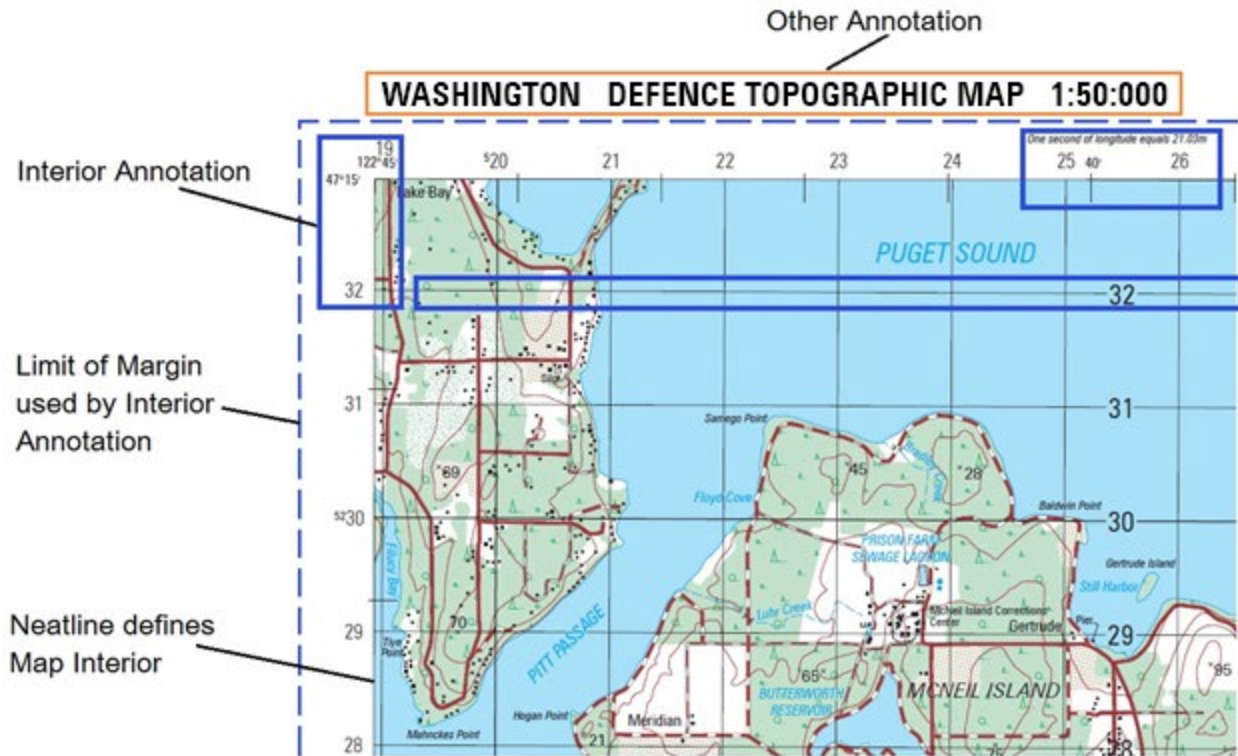Figure 11. Anatomy of a Map Display.

Figure 12. Interior Annotation and Other Annotation.

12.6 Geographic Portrayal Process

Whether automated, hand-crafted, or a combination thereof, the process of portraying geospatial information (i.e., attributed geospatial features) can be depicted as shown in Figure 13.
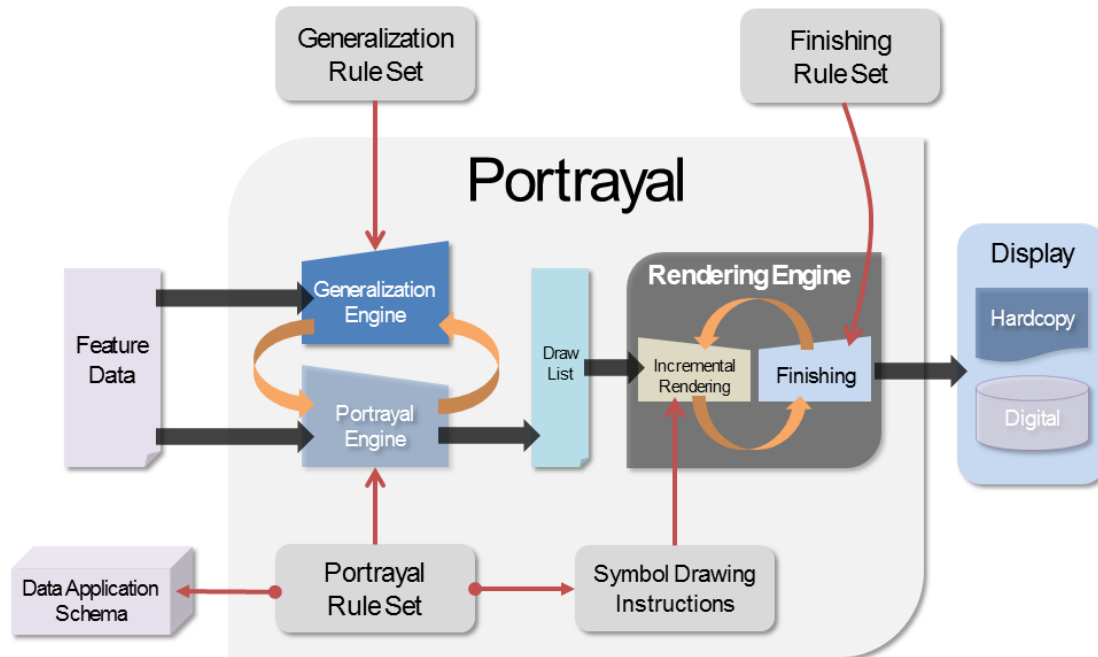
Figure 13. Geographic Portrayal Process as conceptualized in ISO/FDIS 19117.

Figure 13 can be summarized as follows. Feature data that is managed according to a well-defined schema (encoding model) feeds a portrayal process whose first step is to apply generalization rules that guide any changes in the aggregation or delineation of a feature.

Generalization may result in assigning different display geometry to the feature as it is represented on the portrayal draw list. The portrayal engine coordinates with the generalization engine to determine which portrayal function (portrayal rule) applies to the feature – resulting in the assignment of a symbol code and progressing to the portrayal draw list along with labelling instructions.

The rendering engine takes features from the draw list and applies the associated symbol definitions along with geographic display geometries. To this point, each feature, now represented as a symbol, has been manipulated as an individual entity – with no consideration for other features/symbols on the draw list. The function of the finishing process is to consider sets of features/symbols that must be made to co-exist in the display space and make adjustments that yield the desired cartographic result. Finishing rules provide a structured way for specifying finishing adjustments. Some symbols must be geospatially displaced to ensure readability when otherwise multiple symbols would "overprint" one another. Finishing rules will indicate which type of feature stays geospatially accurate and which type of feature gets displaced. Some rules apply to labelling.

It is the geographic portrayal finishing process that most heavily involves the skill and experience of a cartographer. Automated methods can achieve various levels of success for the generalization and displacement of features, but for the most demanding projects there is no better solution than the cartographer's judgment and experience.

The end result of the geographic portrayal process is the map interior (minus annotation) for a map display – hardcopy or digital.

12.7 Overall Cartographic Process

The overall cartographic process addresses both geographic feature portrayal and annotation to create a complete map display. Figure 14 builds on the geographic feature portrayal process to illustrate this point.

All the rules and symbol definitions important to geographic feature portrayal are managed in a portrayal catalogue. Also in the portrayal catalogue is a representation for portrayal context – the conditions not associated with features and their attributes for invoking a particular rule, e.g., whether the map is red-light readable.
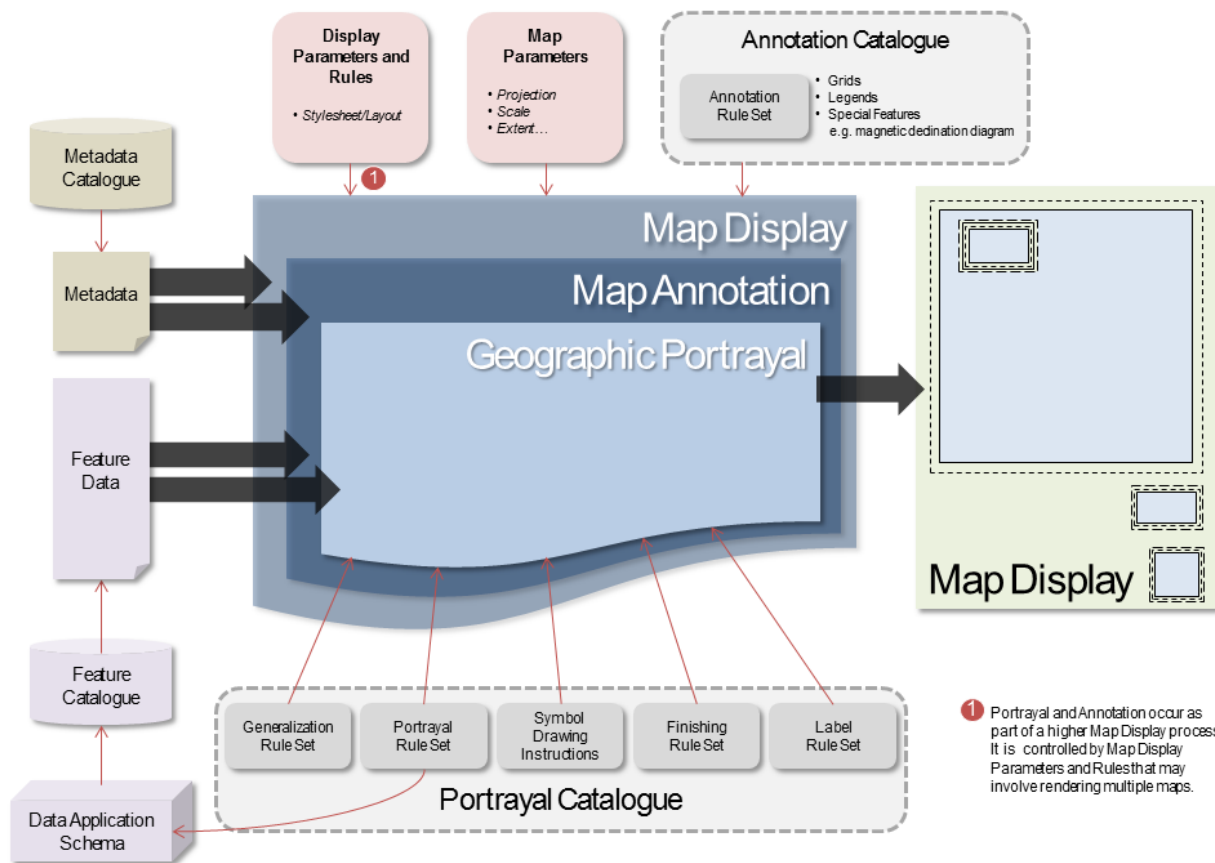

Figure 14. The cartographic process for a complete map display.

Working clockwise from the portrayal catalogue, the figure acknowledges a feature catalogue for maintaining the semantics for encoding features and attributes (on which the application depends). As well as feature data, metadata is a crucial aspect of any geospatial dataset and map display. For example,

portrayal context consists of metadata (though that subtlety is not depicted). Just as there is a feature catalogue, there is a metadata catalogue that defines the structure for metadata. This structure informs the definition and content of display parameters and rules, which is how metadata drives the layout and content of the map display, to include map parameters and annotation. Very similar to the portrayal catalogue there is an annotation catalogue. The annotation catalogue manages rules for presenting metadata in the map display.

The greater map display process encompasses the geographic portrayal process and the annotation process, all of which feed on feature data and metadata as depicted. Certain annotations are georeferenced (e.g., graticule and grids), while certain others are geo-oriented (e.g., declination diagram, road objective). For this reason the map annotation process includes the geographic portrayal process in order to help place such annotations in the map display and even facilitate finishing, e.g., grid ladder labelling, insets and annotation over "open water" of the primary map's interior.

The end result of the cartographic process is a map display. A hardcopy topographic map represents an extensive application of the cartographic process.

Annex A - Feature Catalogue

The DTM50 Feature Catalogue presents all the DGIF features and associated attributes and values described by the DTM50 DPS PC. This annex is presented in html format and can be found in attached to this PDF.