Global Map
Version 1.3 Specifications

Revised at 14th ISCGM meeting
Cambridge
14 July 2007

For more information on the Global Mapping project,
please visit the Global Map site.

ISCGM Home Page
http://www.iscgm.org/

Geoscience Australia made significant contribution
to drafting the original specifications

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1. Background

1.1 The need for a Global Map

It is only in the last few decades that people began to really become more aware of the environment around them. Satellite imagery and geo-spatial data analysis have helped monitor and understand the environment in which we live, in ways that were not possible before.

Since the 1972 United Nations Human Environment Conference, people around the world have realised that solving global environmental problems needs to be done at a global scale, that is, cooperatively. For that reason, international organisations and institutions around the globe provide and share global map information about the state of the globe and its changes. The “Earth Summit” – the United Nations Conference on Environment and Development (UNCED) – in Rio in June 1992 also addressed the issue of information access. Eight chapters of the *Agenda 21* plan dealt with the need to provide geographic information. In particular, Chapter 40 aimed at decreasing the gap in availability, quality, standardisation and accessibility of data between nations.

This was reinforced by the Special Session of the United Nations General Assembly on the Implementation of Agenda 21 held in June 1997. The report of this session includes mention of the need for global mapping, stressing the importance of public access to information and international cooperation in making it available.

It is therefore essential that we have access to the most accurate and up-to-date maps of important environmental features, if we are to properly understand our global environment. At present, available maps of the entire globe originate from various sources and therefore their accuracy is inconsistent, mainly because of irregularities in source material, lack of up-to-date data, gaps in the data, etc. Insufficient circulation of existing map information and a concern for national security has also reduced the availability of maps at a global scale.

1.2 Purpose and intended use of the Global Map

The concept of Global Mapping, and the establishment of an international body for Global Mapping, was first proposed by the Ministry of Construction of Japan (MOC) in 1992; and in 1994 the Geographical Survey Institute of Japan (GSI) proposed the first draft Map Specifications. The project currently involves the participation of many interested nations.

The main objective of this global project is to bring all nations and concerned organisations together to develop and provide easy and open access to global digital geographic information at a scale of 1:1 million. This would be used to facilitate the implementation of global agreements and conventions for environmental protection, for monitoring of major environmental phenomena and to encourage economic growth within the context of sustainable development. As part of this objective, a Global Map product will be developed to this specification.

The Global Map will also contribute to the development of a Global Spatial Data Infrastructure.

1.3 Ongoing support and future directions

At the First International Workshop on Global Mapping in Japan, it was agreed that the development of a Global Mapping product should be achieved by the year 2000. This specification is for this product.

However, Global Mapping will not just end in the year 2000. There will be plans for continued development following this date, such as revision and upgrading. Once the initial global mapping product is complete, this specification will be modified to achieve improvement in future Global Map products.

Section 9 gives contact details for the global mapping project.

1.4 Relationship to other international efforts, specifications and standards.

These specifications have been written to comply with international standardisation agreements and will be in the most part consistent with the International Organization for Standardization (ISO) TC211 recommendations for geographic data standards.

2. Data Sources

Significant data already exists on a global scale. To make the initial project efficient and achievable, this specification is built around the use of these data. The project will aim to improve the reliability and accuracy of these data sets. The upgrading of this data may involve editing the existing data or replacing parts of it with data from other sources. The data from other sources will meet the structure and other requirements of this specification. Data from other sources may exceed the minimum requirements set out in this specification, for example, in topological structure.

The base data sets are:

Global 30 Arc Second Elevation Data Set (GTOPO30) (US Geol. Survey, EROS Data Centre)

Elevation (DEM)

Global Land Cover Characteristics Database (US Geol. Survey, U. of Nebraska-Lincoln, EC Joint Research Centre).

Land Cover
Land Use
Vegetation

VMAP Level 0 (NGA)

Drainage System (rivers, streams, lakes)
Transportation (roads, railways, airports)
Political Boundaries (including coastlines)
Populated Places

3. Data Model

3.1 Product extents

The Global Map product will encompass the entire globe, at a scale of 1:1 million. All the data sets will be consistent with this scale and these specifications. Tiling of the data sets will be required as a way to manage the data more efficiently and quickly.

(See section 5 – Tiling)

3.2 Representation of features and layers

Spatial features are organised into thematic layers (coverages), with each layer containing logically related geographic information. These layers will either be in raster or vector form.

3.2.1 Vector layers

The layers in vector representation will include all those layers other than elevation, vegetation, land cover and land use. The features of the vector data model will be comprised of three spatial objects: points, edges and faces. (Formal ISO/TC211 terminology for these can be found in Appendix A.) Text features may also be included, however, these features are optional.

Vector layers and the associated feature types are shown in the following table.

Layer	Feature class	Feature name	Feature type	Inclusion
Transportation	Airport	Airport/Airfield	point	optional
	Rail yard	Railroad Yard/ Marshalling Yard	point	optional
	Railroad	Railroad	edge	mandatory
	Road	Road	edge	mandatory
	Trails and Tracks Line	Trail (Vehicle tracks)	edge	mandatory
	Structures	Bridge/Overpass/ Viaduct	edge	optional
		Ferry route	edge	optional
		Tunnel	edge	optional
	Transportation Text	Text	text	optional
Boundaries	Political Boundary	Administrative area	point	mandatory
	Coast Line	Coastline/ Shoreline	edge	mandatory
	Political Boundary Line	Administrative Boundary	edge	mandatory
	Ocean/Sea	Water (except inland)	face	optional
	Political Boundary	Administrative area	face	mandatory
	Political Entity Text	Text	text	optional
Drainage (Hydrography)	Miscellaneous	Dam/Weir	point	optional
		Island	point	optional
		Spring/Water-Hole	point	optional
	Aqueduct/Canal /Flume/ Penstock	Inland Water	edge	optional
	Miscellaneous	Dam/Weir	edge	optional
	Water Course	River/Stream	edge	mandatory
	Inland Water	Inland Water	face	mandatory
	Water Text	Text	text	optional
Population	Built-up Area	Built-up Area	point	optional

Layer	Feature class	Feature name	Feature type	Inclusion
Centres	Miscellaneous Population	Settlement	point	optional
	Built-up Area	Built-up Area	face	optional
	Population Text	Text	text	optional

Note: Mandatory layers will only be populated where the features are present and are significant at the scale of the data.

International boundaries for the Global Map will be as defined by nations supplying data. Where the nation one side of a border supplies no data the Vmap level 0 border will be used for that nation. Where adjoining nations supply different representations of the border both will be included in the product. All data will be identified as to its origin (see Appendix D).

3.2.2 Raster layers

Raster grid cells will be arrayed on a horizontal coordinate system in degrees of latitude and longitude referenced to ITRF94 and GRS80. See section 6.2 – Raster data structure.

Small islands less than approximately 1 square kilometre may not be represented.

The following groups of features are stored as raster layers:

ELEVATION: The vertical distance between the surface of the earth and the standard sea level that the nation has defined. Vertical units represent elevation in meters above Mean Sea Level (MSL).

VEGETATION: Percent tree cover data by an integer value from 0 to 100 will be used as vegetation layer.

LAND COVER: Newly defined GLCNMO global legend (APPENDIX D Table 2) will be used for land cover layer.

LAND USE: Codes developed for the Global Map will be adopted.

3.3 Attributes

An attribute is a particular property of a feature.

The non-locational information about a feature instance will be stored as attributes. Attributes are classified into two groups: mandatory attributes and optional attributes. Names should be stored in roman characters without diacritical marks. Attributes other than names will be stored in English characters.

3.4 Data Dictionary

The data dictionary is included as Appendix D. The table lists vector and raster feature types and their attributes.

Vector features will be selected on the basis of their suitability for 1:1 million scale mapping and the feature definitions. As a result some feature types will only occur in

the less densely settled areas where they are relatively more important than in the more densely settled areas. For example, Trails will be shown where there is not a well developed road network.

4. Spatial and attribute accuracy

4.1 Reference coordinate system

The ITRF94 coordinate system will be adopted as the reference coordinate system. GRS80 ellipsoid will be adopted to represent the position of spatial objects in longitude and latitude. As the difference between these coordinates and WGS84 coordinates is negligible at the scale of this product, data in WGS84 will be taken to be in ITRF94.

4.1.1 Precision

A pair of longitude and latitude values describes the position of spatial objects. The data shall be stored in decimal degrees to a minimum of three decimal points as geographic coordinates with southern and western hemispheres having a negative sign for latitude and longitude, respectively.

Resolution of vertical values is 1 metre.

4.1.2 Accuracy

The positional accuracy of spatial data is the degree to which planimetric coordinates and elevations of features agree with their real world values. The planimetric accuracy will be composed of errors from three sources:

- The positional accuracy of the source material
- Errors due to conversion processes.
- Errors due to the manipulation processes.

Absolute horizontal and vertical accuracy will vary by location according to the source data. Absolute accuracy is defined as the difference between the stored coordinates and the true coordinates for a specific point.

For horizontal accuracy, 90% of points will be within ±2km of their actual location. In the case of data obtained from satellite images, the maximum error is less than or equal to 0.5km.

Vertical accuracy is notionally ±150 metres for 90% of points. This figure may need to be reviewed once the data are available, as sources to this accuracy may not be available in areas of high relief.

5. Tiling

Tiling will be required in order to manage the large amounts of data. All thematic coverages in the global map product share the same tiling structure and coordinate system. There is no overlap or gap between tiles. In addition to the tiling structured data production, one global file and five continental files (Eurasia, North America, South America, Africa and Oceania) will be produced for land cover layer and vegetation layer.

If an area within a tile is revised with new or corrected data, only that tile will be updated for the particular feature.

The tiling schema is that used for Vmap0. Tiles will have the dimensions in the following table:

Latitude	Tile Size (Degrees Latitude by Degrees Longitude)	Origin (Latitude north and south, Longitude)
0°– 40°	5° x 5°	0°, 0°
40°– 50°	5° x 6°	40°, 0°
50°– 60°	5° x 8°	50°, 0°
60°– 65°	5° x 10°	60°, 0°
65°– 70°	5° x 12°	65°, 0°
70°– 75°	5° x 15°	70°, 0°
75°– 80°	5° x 20°	75°, 0°
80°– 90°	5° x 90°	80°, 0°

The tiling schemes used for some of the source material will differ in their spatial extent. Data from different sources will be re-tiled to meet this schema.

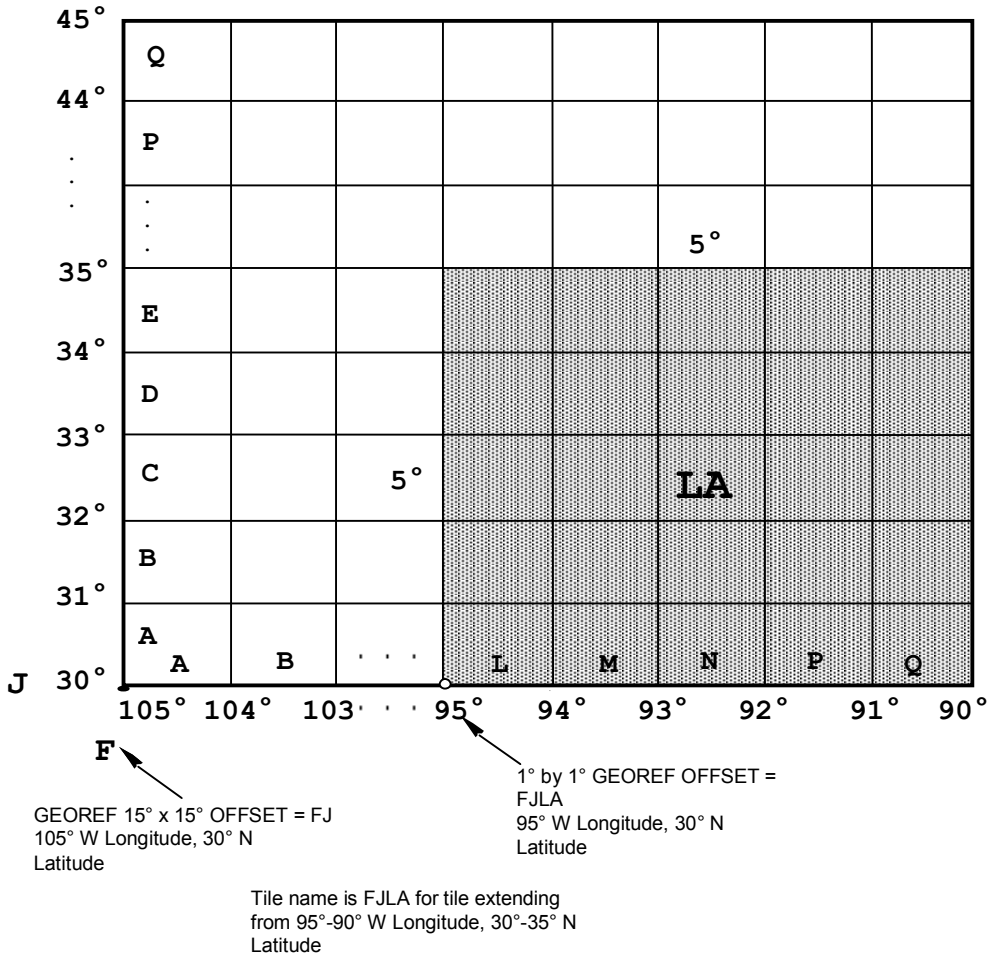
5.1 Tile identification

Tiles will be identified using the GEOREF naming system.

The GEOREF system uses two pairs of letters. The first pair of letters represents the coarsest, 15° by 15° standard GEOREF division, and represents the first coordinate pair identifying the tile name. The first letter represents the first tile partition of the southwest coordinate in the x direction (longitude). There are a maximum of 24 letters from A to Z (omitting I and O), for the 15° bands of GEOREF longitude zones. Longitude zones are lettered from the zone with 180° west as its western edge. The second letter represents the second partition of the southwest coordinate in the y direction (latitude). There are a maximum of 12 subdirectories lettered from A to M (omitting I), for the 15° GEOREF latitude zones. Latitude zones are lettered from the zone with 90° south as its southern extent.

The second pair of letters represents the 1° by 1° standard GEOREF divisions, and represents the second coordinate pair of the tile name. The first letter represents the x coordinate (longitude) of the southwest corner of tile. There are a maximum of 15 letters from A to Q (omitting I and O), for the 1° bands of GEOREF longitude zones. The second letter represents the y coordinate (latitude) of the southwest corner of the tile. There are a maximum of 15 letters from A to Q (omitting I and O) for the 1° bands of GEOREF latitude zones. These letters partition each 15° by 15° GEOREF cell into a total of 225 1° by 1° cells. The following diagram illustrates this arrangement:

Vmap Level 0 Tiling Scheme Based On Georef:
Example Of Naming Conventions For 5° By 5° Tile



Thus the GEOREF system identifies a grid of 1° x 1° grid. Tiles take the reference for their south west corner. So the shaded area in the above diagram represents a tile with the reference FJLA.

Where data collection procedures require individual source sheets, digital files or other media to be combined, features crossing source boundaries shall be continuous. Exceptions to this rule occur when more current source data are used and the feature position or presence has changed. In these cases, a discontinuity along a source boundary shall occur and be documented in the Metadata.

6. Structure and features

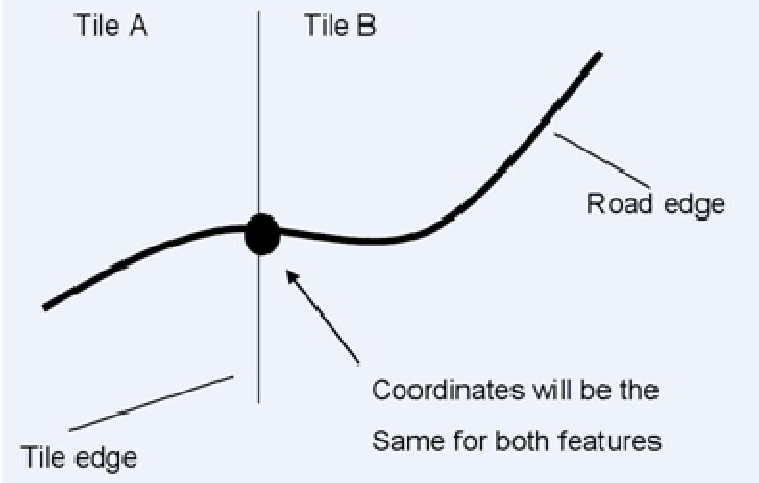
6.1 Vector Data Structure

6.1.1 Topology

Vector data in the Global Map will be partially topologically structured. Features stored as edges and faces will be individually structured. Edges making up a network such as roads will have nodes at intersections. Topological relationships between layers will not be enforced. In particular point features will not necessarily be topologically related to networks. So, for example, point

railway features may not necessarily fall on the railway line when viewed at large scale and particularly if the data has been projected.

Topology will be retained across the tile boundaries. Real world phenomena that cross the tile edge will have exactly the same coordinates on the nodes on the tile edge on each tile. This will enable the database to function as a seamless unit for analysis purposes. For example, in the diagram below, the road edge in both tiles will be matched at the edge of both tiles.



6.1.2 Data quality

- Logical consistency will be kept. For example, there will not be different elevation values in the same still water body.
- Features will not be duplicated or omitted where they meet the selection criteria.
- Metadata will document the data's quality (see section 7 Metadata).

6.2 Raster data structure

Cell size for raster data will be 30" by 30". With the origin being the NW corner of the tile.

At the Equator, a degree of longitude is about 111 kilometres, getting progressively finer longitudinally towards the poles. Thus, there will be slightly better than 1-km griding at the Equator.

6.2.1 Determination of cell's attributes

A cell's attribute value represents a characteristic that is dominant near the centre position of the cell.

6.2.2 Header file

A header file will accompany each raster file. Items to be included in the header file are as follows. One of the figures in parentheses is chosen if there are any. Data will meet the default values where specified in parentheses and italicised.

BYTEORDER byte order in which image pixel values are stored. Big endian *(M)*.

LAYOUT organisation of the bands in the file *(BIL = band interleaved by line) (note: all files are single band images)*
NROWS Number of rows (cells) in longitude direction of the image
NCOLS Number of columns (cells) in latitude direction of the image
NBANDS Number of spectral bands in the image *(1)*
NBITS Number of bits per cell *(8 for land cover, land use and vegetation layers and 16 for elevation)*
BANDROWBYTES Number of bytes of data per row
TOTALROWBYTES Total number of bytes of data per row
BANDGAPBYTES The number of bytes between bands in a BSQ format image *(0)*
NODATA Value used for masking purposes *(*9998 for elevation, 255 for vegetation, land cover, and land use*)*
ULXMAP Longitude of the centre of the upper-left pixel
ULYMAP Latitude of the centre of the upper-left pixel
XDIM Width of a cell in longitude direction
YDIM Width of a cell in latitude direction

A sample raster header file is at Appendix F.

6.2.3 Attributes description

The attribute for a raster file is the value of each of the cells, as referred to in the data dictionary.

7. Metadata

Metadata is data about the contents, quality, condition and other characteristics of the data. It also describes the lineage, process and accuracy of the data set. Metadata for the vector layers will be supported by and related to the quality layer.

7.1 Metadata file

A metadata file accompanies each layer within each library. This file will be an ASCII file. This file will be named after the relevant theme and have the extension '.met'.

7.2 Contents

The contents of metadata follow the ISO standard of metadata (ISO 15046) at conformance level 1 (See Appendix C for explanations of the metadata items). Metadata will be described in English. Metadata will be supplied separately for each layer in the data set.

The following will be included:

The number of asterisks before each item shows item's sublevels.

	For vector layers	For Raster layers
Cataloguing metadata information		
* Title	X	X
* Edition	X	X
* Issue identification	X	X
Initiative identification information		
*Initiative identification name	X	X
*Reference date	X	X
Responsible party information		
*Responsible party organisation name	X	X

	For vector layers	For Raster layers
*Responsible party role code	X	X
* Postal address	X	X
* City	X	X
* Administrative area	X	X
* Postal code	X	X
* Country	X	X
*On-line resource linkage	X	X
Dataset extent		
*Geographic extent coordinates		
** West bounding coordinate	X	X
** East bounding coordinate	X	X
** North bounding coordinate	X	X
** South bounding coordinate	X	X
* Temporal extent date/time	X	X
*Resolution level code	X	X
*Language of dataset code	X	X
*Dataset character code set	X	X
*Abstract	X	X
*Purpose	X	X
Category		
*Theme code	X	X
*Access constrains	X	X
*Use constrains	X	X
*Spatial representation type code	X	X
*Spatial reference system type code	X	X
*Distribution identifier	X	X
*Distribution format name	X	X
*Distribution media	X	X
*Level of conformance of metadata	X	X
*Language of metadata code	X	X
*Metadata date	X	X

Metadata at conformance level 2 may also be included for each tile (see ISO 15046-15). Inclusion of this metadata will be optional.

8. Output formats

Vector data will be distributed in VPF format and other formats to be determined when the product is completed. Raster data will be distributed as Band Interleaved (BIL) files with a separate header file.

8.1 Area of file coverage

The area covered by each file is described in section 5 tiling. Each layer of a tile will be stored in a separate file.

8.2 File names

8.2.1 Vector Representation

The theme and tile for vector files are identified by the directory structure (see section 8.4). File names for vector data are as shown below.

File name	Face	Edge	Point	Node	Text
Primitive Table	fac	edg	end	cnd	txt
Spatial Index	fsi	esi	nsi	csi	tsi
Ring file	rng				
Bounding Rectangle Table	fbr	ebr			
Variable-length Index		edx			txx

Vector files will be arranged into databases in the root directory for the database there will be a library attribute table (lat) and a data base header table (dht). In addition the library for the database will contain a library header table (lht), a geographic reference table (grt) and a coverage attribute table (cat). This directory will have an untiled library reference coverage (libref) and a tile reference coverage (tileref) as subdirectories. Each thematic directory will contain a metadata file named with the theme name with an extension '.met' (see section 7)

8.2.2 Raster Representation

Raster data have a file name of the form xxvvvv.zzz where xx identifies the theme, vvvv identifies the tile using the GEOREF system described in section 5.1 and zzz is the extension identifying the data (.bil) or the header (.hdr).

Theme identifiers are:

Identifier	Theme
el	elevation
ve	vegetation
lc	land cover
lu	land use

So elagaa.bil will be the file name for the elevation data for the tile whose origin is latitude 0°, longitude -180°. Metadata files will be named after the theme identifier with the extension '.met', for example 'el.met'

8.3 File format

8.3.1 Vector representation

The Vector Product Format (VPF) will be adopted. This format provides a standard format for transferring digital vector cartographic data.

8.3.2 Raster representation

Will be in a simple binary raster format without embedded header – BIL (Band Interleaved by Line) format. This type of data stores pixel information band by band for each line, or row, of the image. For example, given a one-band image such as the ones for Global Map, data is written for row 1, data is written for row 2, and so on, until the total number of rows in the image is reached. Vegetation,

Land Cover and Land Use layers will be 8-bit unsigned data and the elevation data will be 16-bit signed.

A header file will accompany each raster file.

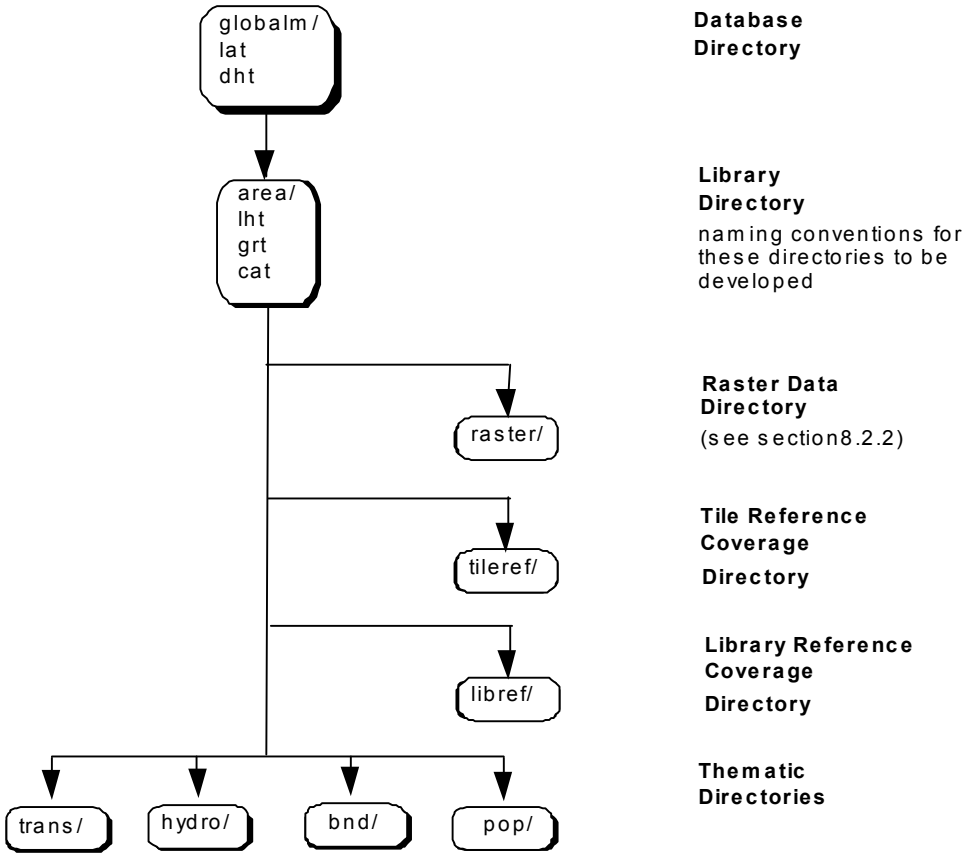
The data are stored in row major order (all the data for row 1, followed by all the data for row 2. etc.).

The elevation data are in Motorola (big-endian) byte order, that is, the most significant byte is stored first.

8.4 Directory structure

The directory structure will be that adopted for VMAP0 with modifications to account for the inclusion of the raster data layers.

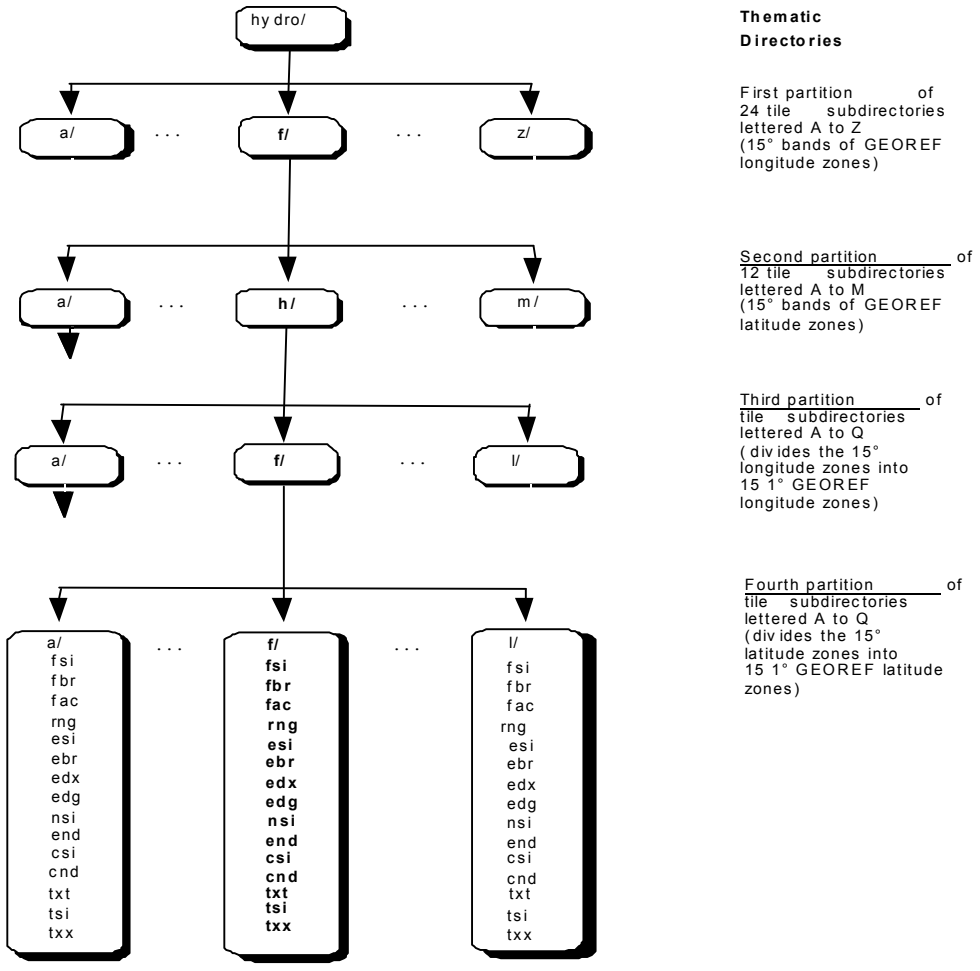
The structure will consist of a database directory with one or more libraries. Each library will contain a regional or a national data set. Beneath the library directories are a directory for the raster layers, a tile reference coverage directory and one or more thematic directories. The following diagram illustrates this arrangement.



The thematic directories will be:

Theme	Directory
Transport	/trans
Drainage	/hydro
Boundaries	/bnd
Population centres	/pop

Under the thematic directories are four levels of sub directories. Each level matches a letter in the GEOREF tile identifier (see section 5.1 Tile identification). The following diagram illustrates this with the path to the hdro files for tile fhff:



The spatial extent of the libraries will be determined as part of the distribution process.

9. Suggestions for change

Suggestions for changes or corrections to these Specifications should be referred to the Global Map Secretariat (sec@iscgm.org) or:

Secretariat of ISCGM
Geographical Survey Institute
Kitasato 1, Tsukuba, Ibaraki, 305-0811 JAPAN

10. References

Global Map Technical Specifications (Draft), Secretariat of ISCGM, Global Mapping Forum ’97, Gifu, Japan.

Directorate of Geomatics, Department of National Defence, Canada, June 1997, *The Digital Geographic Information Exchange Standard (DIGEST)* URL: http://www.digest.org (custodian NGA).

NGA (former NIMA), 1995, *VMAP0 Military Specifications*, URL: http://earth-info.nga.mil/publications/specs/ (MIL-STD-2407 and its Change Notice 1)

U.S. Geological Survey (USGS), University of Nebraska-Lincoln (UNL), and European Commission's Joint Research Centre (JRC), 1996, *Global Land Cover Characterization Data Set,* product documentation, URL: http://edcsns17.cr.usgs.gov/glcc/

U.S. Geological Survey's EROS Data Center (EDC), 1996, *Global 30 Arc Second Elevation Data Set*, product documentation, URL: http://www1.gsi.go.jp/geowww/globalmap-gsi/gtopo30/gtopo30.html

APPENDIX A Glossary of terms

Terminology definitions according to ISO/TC211 (may or may not be included in the specifications):

Accuracy

Closeness of observations to true values or values accepted to be true.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft]

Altitude

Height above a reference surface.
EXAMPLE — height above mean sea level
NOTE — Altitude is negative only when position is below the reference surface.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft]

Area

A generic term for a bounded, continuous, two-dimensional object that may or may not include its boundary.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Attribute

A property which describes a geometrical, topological, thematic, or other characteristic of an entity.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Attribute value

Value assigned to a feature attribute.

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Boundary

Closed non-self-intersecting curve or set of curves that bounds a surface.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Code

Representation of a label according to a specified scheme.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Connected node

Node related to one or more edges.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Coordinates

Pairs of numbers expressing horizontal distances along orthogonal axes; alternatively, triplets of numbers measuring horizontal and vertical distances.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 3 N 223
Document status: Working draft]

Curve

Bounded connected 1-dimensional geometric primitive.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Data

Reinterpretable representation of information in a formalised manner suitable for communication, interpretation, or processing

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Data element

Unit of data that, in a certain context, is considered indivisible.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Data quality element

Component of the quality of a dataset documenting quantitative information
NOTE — The applicability of a data quality element to a dataset depends on both the dataset's content and its product specification; all data quality elements are not applicable to all datasets.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: current working definition
Document status: Working Draft]

Dataset

Identifiable collection of related 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.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Data structure

A computer interpretable format used for storing, accessing, transferring, and archiving data.

[ISO/TC 211 N280, Geospatial services - Encoding; WG4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 016
Document status: Working Draft]

Data transfer

To move data from one point to another over a medium
NOTE — Transfer or information implies transfer of data.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Edge

1-dimensional topologic primitive.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Elevation

Height of a ground point above a reference surface.
EXAMPLE — height of a ground point above mean sea level
NOTE — Elevation is negative only when position is below the reference surface.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft]

Entity

1. Representation of a collection of data elements in a conceptual schema.
2. Class of objects with common properties [ISO 10303:11]

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2
Date of source document: 1997-01-15
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 026
Document status: Working Draft]

Entity attribute

Description of an element of an entity.

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2
Date of source document: 1997-01-15
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 026
Document status: Working Draft]

Event

Something (eg. a change in the state of a geographic feature) which occurs at an instant in time.

[ISO/TC 211, Geographic Information - Geomatics - Temporal subschema; WG2
Date of source document: 1996 April
Term status: New proposal
Document status: 1st draft]

Face

2-dimensional topologic primitive.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Feature

Representation of a real world phenomenon.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: current working definition
Document status: Working Draft]

Feature attribute

An essential trait, quality, or characteristic of a specific geographic feature.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 027
Document status: Working draft]

Feature catalogue

Definition and description of the feature types, feature type functions, feature attribute types, and feature relationship types occurring in one or more sets of geographic data.

[ISO/TC 211/WG 3 N 031, Geographic Information - Feature Cataloguing; WG 3
Date of source document: 1996-12-08
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 022
Document status: Working Draft]

Feature element

Part of a geographic feature that can be identified and treated separately.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Geographic data

Data with implicit or explicit reference to a location relative to the Earth.

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Geographic feature

Representation of a real world phenomenon associated with a location relative to the Earth.

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Grid

A set of points arrayed in a pattern that forms a regular, or nearly regular, tessellation of a surface.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 3 N 223
Document status: Working draft]

Grid cell

A two-dimensional object that represents the smallest non-divisible data element of a grid.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Grid coordinate system

System of point positioning on a plane, arising from a system mathematical projection of points on a specific geodetic datum to that plane.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft

Intermediate node

Connected node coincident with an edge without terminating it.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Isolated node

Node not related to any edge.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Level

Collection of data physically located within a dataset which share one or more common feature types or feature attribute types.
NOTE — Level may be extended upward to include the entire dataset or the dataset series to which a dataset belongs.
NOTE — If considered independently then compared, the individual data components of a level would most likely have similar or identical data quality results.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 045
Document status: Working Draft]

Line

A generic term for a one-dimensional object.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Metadata

Data describing and documenting data [ISO 15404-15]

NOTE — Metadata for geographic data typically provides information about its identification, extent, quality, spatial and temporal schema, spatial reference, metadata and distribution.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: term taken from ISO/TC 211/WG 3, Metadata
Document status: Working Draft]

Metadata element

Unit of metadata for which the definition, identification, representation, and permissible values are specified by means of a set of attributes [ISO 15046-15]

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: term taken from ISO/TC 211/WG 3, Metadata
Document status: Working Draft]

Metadata entity type

Collection of similar metadata elements [ISO 15046-15].
NOTE — A metadata entity type may include other metadata entity types.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: term taken from ISO/TC 211/WG 3, Metadata
Document status: Working Draft]

Model

A representation, generally in miniature which serves as a copy of something

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Node

0-dimensional topologic primitive

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Percent tree cover

A percentage of the area covered by a vertical projection of the canopy of the tree within a unit mapping area or a pixel

Point

0-dimensional geometric primitive

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Primitive

Smallest spatial component of which all features and composed.
EXAMPLE — There are 3 geometric primitives (nodes, edges, and faces) and one cartographic primitive (text).

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Product

A completely specified data set comprised of a set of profiles; specifically including, the schema, metadata, quality information, reference system, structure primitives, and encoding.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 5 N 077
Document status: Working draft]

Product specification

Description of the abstract universe and a specification for mapping the abstract universe to a dataset.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: current working definition
Document status: Working Draft]

Quality

1. The totality of characteristics of a product that bear on its ability to satisfy stated and implied needs.
2. An essential or distinguishing characteristic necessary for cartographic data to be fit for use.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: definitions taken from ISO/TC 211/WG 3 N 013 and ISO/TC 211/WG 3 N 223
Document status: Working draft]

Raster

One or more overlapping layers for the same grid or digital image.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 3 N 223
Document status: Working draft]

Raster data

Data represented in a regular spatial array.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Raster map

Map data based on a raster data model.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Resolution

The minimum difference between two independently measured or computed values, which can be distinguished by the measurement or analytical method being considered or used.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft]

Ring

Ordered set of connected edges forming a 1-dimensional closed non-self-intersecting element that bounds a face.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Scene

Geometric primitive which is a limited part of a specific grid.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 044
Document status: Working Draft]

Schema

The description, or global model, of the natural structure of data [ISO/IEC Standard 11179].

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 027
Document status: Working draft]

Section

Subset of metadata that defines a collection of related metadata.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Spatial attribute

Feature attribute that is a spatial characteristic of a geographic feature.
NOTE — Spatial attributes of a geographic feature are characteristics such as its position, size, and shape.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 044
Document status: Working Draft]

Spatial coordinate system

A system of providing basic numeric primitives for describing width, length, and height; the basic dimensions of space.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 027
Document status: Working draft]

Spatial object

A collection of spatial primitives that represents the spatial characteristics of a geographic feature.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 2 N 297
Document status: Working draft]

Spatial reference

Label or geocode which identifies an occurrence of a spatial unit.

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2
Date of source document: 1997-01-15
Term status: term taken from ISO/TC 211/WG 3 N 016
Document status: Working Draft]

Spatial unit

1. Class of features that represents the indirect spatial position of another features
2. Sub-division of an area according to value of a particular property

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2
Date of source document: 1997-01-15
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 026
Document status: Working Draft]

Surface

A generic term for a bounded, continuous, two-and-a-half-dimensional representation of a terrain-surface using connected areas.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Table

An ordinary arrangement of data, especially one in which the data is arranged in columns and row in a rectangular form.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Terminating node

Connected node terminating an edge.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Topology

Refers to properties of geometric forms that remain invariant when the forms are deformed or transformed by bending, stretching, or shrinking.
NOTE — Among the topological properties of concern in geographic information are connectivity, order, and neighbourhood.

[ISO/TC 211, Geographic Information - Geomatics - Temporal subschema; WG2
Date of source document: 1996 April

Term status: New proposal
Document status: 1st draft]

Vector data

Data represented by geometric primitives.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Vector map

Map data based on a graph theory data model.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

APPENDIX B Acronyms and Abbreviations

ASCII	American Standard Code for Information Interchange
AUSLIG	Australian Surveying and Land Information Group
AVHRR	Advanced Very High Resolution Radiometer
BIL	Byte Interleaved by Line
CD-ROM	Compact Disc - Read Only Memory
DCW	Digital Chart of the World
DEM	Digital Elevation Model
DTED	Digital Terrain Elevation Data
EC	European Commission
EROS	Earth Resources Observation Systems
GLOBE	Global Land One-kilometre Base Elevation
GRS80	Geodetic Reference System 1980
GSI	Geographical Survey Institute of Japan
IMW	International Map of the World
ISCGM	International Steering Committee for Global Mapping
ISO	International Organization for Standardization
ITRF94	International Terrestrial Reference Frame 1994
MOC	Ministry of Construction of Japan
MSL	Mean Sea Level
NGA	National Geospatial-Intelligence Agency (former NIMA (National Imagery and Mapping Agency))
NOAA	National Oceanographic and Atmospheric Administration
ONC	Operational Navigation Charts
PC	Personal Computer
UNCED	United Nations Conference on Environment and Development
USGS	United States Geological Survey
VAX	Virtual Address eXtension
VMAP0	Vector Smart Map Level 0
VPF	Vector Product Format
WG	Working Group
WGS84	World Geodetic System 84

APPENDIX C Metadata at conformance level 1

Table 1 Definition of Metadata elements at conformance level 1 (following International Organization for Standardization –15046-15 standard)

Name	Definition	Maximum occurrence	Data type	Domain
Cataloguing metadata information	Information to uniquely identify an entire dataset and/or dataset series	1	Metadata section	
Title	Name by which the dataset is known	1	string	free text
Edition	Version of the titled dataset	1	string	free text
Issue identification	Information identifying the issue of the series publication of which the dataset is a part	1	string	free text
Initiative identification information	Initiative under which a dataset is compiled or produced—used as a means of identification	N	Metadata entity	
Initiative identification name	Name of initiative used for identification	1	string	free text
Reference date	Date and time when the dataset was published or otherwise made available for release.	1	date	(See ISO 15046-8)
Responsible party information	Responsible party information for an individual or organisation that is knowledgeable about the dataset	N	Metadata entity	
Responsible party organisation name	Name of the organisation associated with the dataset	1	string	free text
Responsible party role code	Function performed by the responsible party	1	integer	1-originator 2-publisher 3-custodian 4-principal investigator 5-content provider 6-processor 7-distributor 8-point of contact 9-metadata provider
Postal address	Address line for the address	1	string	free text
City	City of the address	N	string	free text

Administrative area	State, province, or county of the address	1	string	free text
Postal code	ZIP or other postal code of the address	1	string	free text
Country	Country of the address	1	string	free text
Online resource linkage	Uniform Resource Locator (URL) to access the resource	N	string	free text
Dataset extent	Horizontal and vertical extent covered by the dataset	N	Metadata entity	
Geographic extent coordinates	Geographic areal domain of the dataset	1	Metadata entity	
West bounding coordinate	Western-most coordinate of the limit of coverage expressed in longitude	1	real	-180.0 <= West Bounding Coordinate < 180.0
East bounding coordinate	Eastern-most coordinate of the limit of coverage expressed in latitude	1	real	-180.0 <= East Bounding Coordinate < =180.0
North bounding coordinate	Northern-most coordinate of the limit of coverage expressed in latitude	1	real	-90.0 <= North Bounding Coordinate <= 90.0; North Bounding Coordinate >= South Bounding Coordinate
South bounding coordinate	Southern-most coordinate of the limit of coverage expressed in latitude	1	real	-90.0 <= South Bounding Coordinate <= 90.0; South Bounding Coordinate <= North Bounding Coordinate
Temporal extent date/time	Date and time of the dataset. Expressed by ISO 8601:1988	1	date	(See ISO 15046-8)
Resolution level code	Factor which provides an understanding of the density of spatial data	N	integer	See below1
Language of dataset code	Language(s) used within the dataset	N	string	(See ISO 639)
Dataset character code set	Character code set used by dataset	1	string	free text

[1] Resolution level code domain

0-1:500K-smaller	3-1:15K-1:39K	6-1:500-larger	9-2-5 meters	12-20-29 meters	15-100-999 meters
1-1:200K-1:499K	4-1:5K-1:14999	7-<1 meter	10-6-9 meters	13-30-49 meters	16-1 -9 kilometres
2-1:40K-1:199K	5-1:25K-1:4999	8-1-2 meters	11-10-19 meters	14-50-99 meters	17-=10 kilometres

Abstract	Brief narrative summary of the dataset	1	string	free text
Purpose	Summary of the intentions with which the dataset was developed	1	string	free text
Category	Words or phrases summarising a subject of the dataset	1	Metadata entity	
Theme code	High-level non-overlapping geospatial data thematic classification to assist in the grouping and search of available geospatial data sets	N	integer	See below2
Access constraints	Access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the dataset.	1	string	"none" free text
Use constraints	Constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on using the dataset	1	string	free text–Examples: "none", "copyright", "license", "non-commercial"
Spatial representation type code	Method used to represent geographic information in the data set.	N	integer	1- text 2- vector 3- raster 4- image
Spatial reference system type code	Reference system used to spatially locate information in the dataset.	2	integer	1- geographic identifiers 2- coordinates
Distribution identifier	Identifier by which the distributor knows the dataset	N	string	free text
Distribution format name	Name of the data transfer format, such as DXF and ARC/INFO	N	string	free text
Distribution media	Name of the media on which the dataset can be received	N	string	free text–see Examples below3

[2] Theme code domain

1- cadastral	5- geodetic control	9- soils	13- hydrologic	17- oceanographic	21- industry and energy
2- cultural and demographic	6- transportation and communications	10- political boundaries	14- environmental monitoring	18- modelling and simulation	22- buildings and structures
3- topography	7- radiance/imagery	11- vegetation	15- wetlands	19- facilities	
4- atmosphere	8- biosphere	12- cryosphere	16- land use	20- geologic	

[3] Distribution media domain examples:
"CD-ROM", "3.5 inch floppy disk", "5.25 inch floppy disk", "9-track tape", "4 mm cartridge tape", "8 mm cartridge tape", ".25 inch cartridge tape", "electronic network", "satellite", " telephone link", "brochure"

Level of conformance of metadata	Conformance level of metadata	1	integer	1- Level 1 2- Level 2 3- Level 1 w/ extension
Language of metadata code	Language used within metadata	1	string	(See ISO 639)
Metadata date	Date that the metadata were created or last updated	1	date	(See ISO 15046-8)

Table 2 Sample Metadata for Global Map dataset at conformance level 1

Cataloguing metadata information:
- **Title>** Global Map-Transport layer
- **Edition>** 1
- **Issue identification>**1.0

Initiative identification information:
- **Initiative identification name>**Global Map
- **Reference date>**200504

Responsible party information:
- **Responsible party organisation name>**Secretariat of ISCGM
- **Responsible party role code>**2
- **Postal address>**Geographical Survey Institute, Kitasato 1
- **City>**Tsukuba
- **Administrative area>**Ibaraki
- **Postal code>**305-0811
- **Country>**JAPAN
- **On-line resource linkage>**http://www.iscgm.org/
- **Responsible party organisation name>**Geoscience Australia
- **Responsible party role code>**5
- **Postal address>**GPO Box 378
- **City>**Canberra
- **Administrative area>**ACT
- **Postal code>**2601
- **Country>**AUSTRALIA
- **On-line resource linkage>**http:// www.ga.gov.au/

Dataset extent:
- **Geographic extent coordinates:**
  - **West bounding coordinate>** -180.0
  - **East bounding coordinate>** 180.0
  - **North bounding coordinate>** 90.0
  - **South bounding coordinate>** -90.0
- **Temporal extent date/time>**200001
- **Resolution level code>**0
- **Language of dataset code>**en

Dataset character code set> *(to be determined)*
Abstract>The Global Map-Transport layer is a component of the Global Map a 1:1,000,000 scale framework dataset of the world. It consists of vector and raster layers of transport, administrative boundaries, drainage, elevation, vegetation, land use and land cover data. The data were prepared from information provided by national mapping and other organisations worldwide.
Purpose>The Global Map is a basic framework database designed to support Geographic Information Systems applications, especially for examination of global environmental issues.

Category:
Theme code>6
Access constraints>none/minimal charge for distribution
Use constraints>Contact publisher constraints on commercial use may occur in some areas
Spatial representation type code>2
Spatial reference system type code>2
Distribution identifier>*(to be determined)*
Distribution format name>Vector Product Format
Distribution media>CD-ROM
Level of conformance of metadata>1
Language of metadata code>en
Metadata date>20050417

APPENDIX D Global Map Data Dictionary

Table 1 Vector data

Optional, layers, features and attributes are shown in **red bold type**. For features with optional attributes, all fields and attributes will be included. Even where the value is unknown or not applicable the appropriate listed value/code is required to be entered.

The attribute named ‘soc’ will identify the source country for the data. Values will be the country code of the country supplying the data (see Appendix E). The additional value 'vma' will indicate data that has been taken unchanged from the Vmap level 0 product.

Definitions in this dictionary are taken from DIGEST Edition 2.0 02 June 1997.

Field size of * is a variable length field and may be of any length.

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
Transportation	**Airport**	**Airport/ Airfield**	A defined area used for landing, take-off and movement of aircraft including associated buildings and facilities	point	FACC feature code	f_code	Character text string	5	GB005	
					ICAO Designator	iko	Character text string	4	Null **Actual value**	if not applicable **eg FAJS**
					Name	nam	Character text string	*	UNK **Actual value**	Unknown **eg JOHANNESBURG INTERNATIONAL**
					Usage	use	Number (short integer)	1	0 **8** **22** **49**	Unknown **Military/Defence** **Joint Military/Defence/ Civilian** **Civilian/Public**
					Airfield/Aerodrome Elevation	zv3	Number (short integer)	1	**999** 29999 **-500 to 9999**	**Other** Unknown **Elevation in metres**
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0
	Rail yard	**Railroad Yard/ Marshalling Yard**	A system of tracks within defined limits, and associated features, provided for loading/unloading and assembling trains. (Includes Railway stations)	point	FACC feature code	f_code	Character text string	5	AN060	
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
	Railroad	Railroad	A rail or set of parallel rails on which a train or tram runs.	edge	FACC feature code	f_code	Character text string	5	AN010	
					Existence Category	exs	Number (short integer)	1	2	Doubtful
									5	Under Construction
									28	Operational
									55	Unexamined/Unsurveyed
									59	Not Useable
					Feature Configuration	fco	Number (short integer)		0	Unknown
									2	**Multiple**
									3	**Single**
					Source Country or VMA	soc	Character text string	3	Country code	See Appendix E for country codes list (eg USA)
									vma	Vmap level 0
	Road	Road	An open way maintained for vehicular use.	edge	FACC feature code	f_code	Character text string	5	AP030	
					Accuracy Category	acc	Number (short integer)	1	1	Accurate
									2	Approximate
					Existence Category	exs	Number (short integer)	1	2	Doubtful
									5	Under Construction
									28	Operational
									55	Unexamined/Unsurveyed
					Surface	rst	Number (short integer)	1	0	Unknown
									1	**Paved**
									2	**Not paved**
					Median Category	med	Number (short integer)	1	0	Unknown
									1	**With median**
									2	**Without median**
					Route Intended Use	rtt	Number (short integer)	1	0	Unknown
									14	**Primary route**
									15	**Secondary route**
									16	**Limited access route (freeway)**
									999	**Other**
					Seasonal availability	rsu	Number (short integer)	1	0	Unknown
									1	**All year**
									2	**Seasonal**
					Source Country or VMA	soc	Character text string	3	Country code	See Appendix E for country codes list (eg USA)
									vma	Vmap lebel 0

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
	Trails and Tracks Line	Trail	A path worn by the passage of people or animals.	edge	FACC feature code Existence Category Source Country or VMA	f_code exs soc	Character text string Number (short integer) Character text string	5 1 3	AP050 2 5 28 Country code vma	 Doubtful Under Construction Operational See Appendix E for country codes list (eg USA) Vmap lebel 0
	Structures	**Bridge**	A man-made structure spanning and providing passage over a body of water, depression, or other obstacles.	edge	FACC feature code Transportation use Category Source Country or VMA	f_code tuc soc	Character text string Number (short integer) Character text string	5 1 3	AQ040 3 4 Country code vma	 Railroad Road See Appendix E for country codes list (eg USA) Vmap lebel 0
		Ferry route	A ferry route in a body of inland water connecting a road or railroad.	edge	FACC feature code Transportation use Category Source Country or VMA	f_code tuc soc	Character text string Number (short integer) Character text string	5 1 3	AQ070 3 4 Country code vma	 Railroad Road See Appendix E for country codes list (eg USA) Vmap lebel 0
		Tunnel	An underground or underwater passage, open at one or both ends, and usually containing a road or railroad.	edge	FACC feature code Transportation use Category Source Country or VMA	f_code tuc soc	Character text string Number (short integer) Character text string	5 1 3	AQ130 3 4 Country code vma	 Railroad Road See Appendix E for country codes list (eg USA) Vmap lebel 0
	Transportation text	**Text**	Feature names positioned to allow production of a cartographic product.	text	FACC feature code Text Source Country or VMA	f_code text soc	Character text string Character text string Character text string	5 * 3	ZD045 Country code vma	 Feature name See Appendix E for country codes list (eg USA) Vmap lebel 0

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
Boundaries	Political Boundary	Administrative area	An area controlled by administrative authority.	point	FACC feature code	f_code	Character text string	5	FA001	
					State/province/ prefecture name	nam	Character text string	*	Null **Actual value**	If not applicable **eg VIRGINIA**
					Country code	coc	Character text string	3	Country code	See Appendix E for country codes list (eg USA)
					Local admistrative area name	laa	Character text string	*	Null **Actual value**	If not applicable **eg FAIRFAX**
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0
	Coast Line	Coastline/ Shoreline	The line where a land mass is in contact with a body of water.	edge	FACC feature code	f_code	Character text string	5	BA010	
					Accuracy Category	acc	Number (short integer)	1	0 1 2 3	Unknown Accurate Approximate Tentative
					Existence Category	Exs	Number (short integer)	1	0 1 3 44 46 55 60	Unknown Definite Tentative Approximate/About Man-made Unexamined/Unsurveyed Indefinite (Shoreline)
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0
	Political Boundary Line	Administrative Boundary	A line of demarcation between controlled areas.	edge	FACC feature code	f_code	Character text string	5	FA000	
					Accuracy Category	acc	Number (short integer)	1	1 2	Accurate Approximate
					Usage	use	Number (short integer)		23 26 30	International Primary ie state Secondary ie local
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
	Ocean/Sea	Water (except inland)	An area of water which normally has tidal fluctuations.	face	FACC feature code Source Country or VMA	f_code soc	Character text string Character text string	5 3	BA040 Country code vma	 See Appendix E for country codes list (eg USA) Vmap lebel 0
	Political Boundary Area	Administrative area	An area controlled by administrative authority.	face	FACC feature code Name (state/province/ prefecture) Country code **Local admistrative area** Source Country or VMA	f_code nam coc laa soc	Character text string Character text string Character text string Character text string Character text string	5 * 3 * 3	FA001 Null **Actual value** See Appendix E for county codes list Null **Actual value** Country code vma	 If not applicable **eg VIRGINIA** eg USA If not applicable **eg FAIRFAX** See Appendix E for country codes list (eg USA) Vmap lebel 0
	Political entity text	**Text**	Feature names positioned to allow production of a cartographic product.	text	FACC feature code Text Source Country or VMA	f_code text soc	Character text string Character text string Character text string	5 * 3	ZD045 Country code vma	 Feature name See Appendix E for country codes list (eg USA) Vmap lebel 0
Drainage	**Miscellaneous**	**Dam/Weir**	A permanent barrier across a watercourse used to impound water or to control its flow.	point, edge	FACC feature code Source Country or VMA	f_code soc	Character text string Character text string	5 3	BI020 Country code vma	 See Appendix E for country codes list (eg USA) Vmap lebel 0
		Island	A land mass smaller than a continent and surrounded by water.	point	FACC feature code Source Country or VMA	f_code soc	Character text string Character text string	5 3	BA030 Country code vma	 See Appendix E for country codes list (eg USA) Vmap lebel 0
		Spring/Water Hole	A natural outflow of water from below the ground surface.	point	FACC feature code Source Country or VMA	f_code soc	Character text string Character text string	5 3	BH170 Country code vma	 See Appendix E for country codes list (eg USA) Vmap lebel 0

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
	Aqueduct/Canal/ Flume/ Penstock	**Inland Water**	A pipe or artificial channel designed to transport water from a remote source, usually by gravity. A man-made or improved natural waterway used for transportation. An open, inclined channel which carries water for use in such operations as mining or logging. A pipeline or channel generally used by hydroelectric plants or water mills to transport water by gravity or under pressure.	edge	FACC feature code	f_code	Character text string	5	BH000	
					Existence Category	exs	Number (short integer)	1	0 **1** **5** **6**	Unknown **Definite** **Under Construction** **Abandoned/Disused**
					Location Category	loc	Number (short integer)	1	0 **4** **8** **25**	Unknown **Below Surface/Submerged Underground** **On Ground Surface** **Suspended or Elevated Above Ground or Water Surface.**
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0
	Water Course	River/Stream	A natural flowing watercourse.	edge	FACC feature code	f_code	Character text string	5	BH140	
					Hydrological Category	hyc	Number (short integer)	1	0 6 8	Unknown Non-Perennial/ Intermittent/ Fluctuating Perennial/Permanent
					Name	nam	Character text string	*	UNK **Actual value**	unknown **NILE**
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0
	Inland Water	Inland Water	Any known inland waterway body, such as: lake/pond, reservoir, river/stream, etc. requiring separation into individual features due to status/type grouping that is currently indeterminable.	face	FACC feature code	f_code	Character text string	5	BH000	
					Hydrological Category	hyc	Number (short integer)	1	0 6 8	Unknown Non-Perennial/ Intermittent/ Fluctuating Perennial/Permanent
					Name	nam	Character text string	*	UNK **Actual value**	unknown **LAKE TANGANYIKA**
					Source Country or VMA	soc	Character text string	3	Country code vma	See Appendix E for country codes list (eg USA) Vmap lebel 0

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
	Water text	**Text**	Feature names positioned to allow production of a cartographic product.	text	FACC feature code Text Source Country or VMA	f_code text soc	Character text string Character text string Character text string	5 * 3	AD045 Country code vma	 Feature name See Appendix E for country codes list (eg USA) Vmap lebel 0
Population Centres	**Built-up Area**	**Built-up Area**	An area containing a concentration of buildings and other structures.	point	FACC feature code Name Source Country or VMA	f_code nam soc	Character text string Character text string Character text string	5 * 3	AL020 UNK **Actual value** Country code vma	 unknown **EMBARCACION** See Appendix E for country codes list (eg USA) Vmap lebel 0
	Miscellaneous Population	**Settlement**	A concentration of small dwellings.	point	FACC feature code Name Source Country or VMA	f_code nam soc	Character text string Character text string Character text string	5 * 3	AL105 UNK **Actual value** Country code vma	 unknown **HALL** See Appendix E for country codes list (eg USA) Vmap lebel 0
	Built-up Area	**Built-up Area**	An area containing a concentration of buildings and other structures.	face	FACC feature code Name Source Country or VMA	f_code nam soc	Character text string Character text string Character text string	5 * 3	AL020 UNK Actual value Country code vma	 unknown NAIROBI See Appendix E for country codes list (eg USA) Vmap lebel 0
	Population text	**Text**	Feature names positioned to allow production of a cartographic product.	text	FACC feature code Text Source Country or VMA	f_code text soc	Character text string Character text string Character text string	5 * 3	ZD045 Country code vma	 Feature name See Appendix E for country codes list (eg USA) Vmap lebel 0

Table 2 Raster data (Draft)

Layer	Definition	Feature Class	Value	Value Meaning
Elevation	Elevation above mean sea level.	cell	-407 to 8752	**Elevation in metres**
			-9999	areas masked as sea
Vegetation	Percent tree cover	cell	0 to 100	**Percent**
			254	areas masked as water bodies
			255	areas of no data
Land Cover	GLCNMO land cover classification	cell	1	Broadleaf Evergreen Forest LCC Code: 21496-121340 // 10001-1 LCC Formula: A3A20B2XXD1E1-A21 // A1-A7A9 The main layer consists of broadleaved evergreen closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a smaller range. // Tree crops cover a defined area. The leaf type and leaf phenology can be further specified optionally.
			2	Broadleaf Deciduous Forest LCC Code: 21497-121340 // 10001-1891 LCC Formula: A3A20B2XXD1E2-A21 // A1-A7A10 The main layer consists of broadleaved deciduous closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a smaller range. // Tree crops cover a defined area. The leaf type and leaf phenology can be further specified optionally.
			3	Needleleaf Evergreen Forest LCC Code: 21499-121340 // 10001-5671 LCC Formula: A3A20B2XXD2E1-A21 // A1-A8A9 The main layer consists of needleleaved evergreen closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a smaller range. // Tree crops cover a defined area. The leaf type and leaf phenology can be further specified optionally.
			4	Needleleaf Deciduous Forest LCC Code: 21500-121340 // 10001-7561 LCC Formula: A3A20B2XXD2E2-A21 // A1-A8A10 The main layer consists of needleleaved deciduous closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a

				smaller range. // Tree crops cover a defined area. The leaf type and leaf phenology can be further specified optionally.
			5	Mixed Forest LCC Code: A3A20B2XXD1E1-A21 // A3A20B2XXD1E2-A21 // A3A20B2XXD2E1-A21 // A3A20B2XXD2E2-A21 // A1 LCC Formula: 21496-121340 // 21497-121340 // 21499-121340 // 21500-121340 // 10001 The main layer consists of broadleaved evergreen closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a smaller range. // The main layer consists of broadleaved deciduous closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a smaller range. // The main layer consists of needleleaved evergreen closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a smaller range. // The main layer consists of needleleaved deciduous closed to open trees. The crown cover is between 100 and 40%. The height is in the range of >30 - 3m but may be further defined into a smaller range. // Tree crops cover a defined area. The leaf type and leaf phenology can be further specified optionally.
			6	Tree Open LCC Code: 20013-3012 LCC Formula: A3A11-A13 The main layer consists of open trees. The crown cover is between 40% and (20-10)%. The openness of the vegetation may be further specified.
			7	Shrub LCC Code: 20017 // 20021 LCC Formula: A4A10 // A4A11 The main layer consists of closed shrubland. The crown cover is more than (70-60)%. // The main layer consists of open shrubland. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified.
			8	Herbaceous, single layer LCC Code: 20409 // 20454 LCC Formula: A2A10B4XXXXXXF1 // A2A11B4XXXXXXF1 The main layer consists of closed herbaceous vegetation. The crown cover is more than (70-60)%. The height is in the range of 3 - 0.03m but may be further defined into a smaller range. The vegetation consists of one single layer. // The main layer consists of open herbaceous vegetation. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of 3 - 0.03m but may be further defined into a smaller range. The vegetation consists of one single layer.
			9	Herbaceous with Sparse Tree / Shrub LCC Code: 20412 // 20457 LCC Formula: A2A10B4XXXXXXF2F5F10G2F2F6F10G3 // A2A11B4XXXXXXF2F5F10G2F2F6F10G3 The main layer consists of closed herbaceous vegetation. The crown cover is more than (70-60)%. The height is in the range of 3 - 0.03m but may be further defined into a smaller range. The second layer consists of sparse trees. The third layer consists of sparse shrubs. // The main layer consists of open herbaceous vegetation. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of 3 - 0.03m but may be further defined into a smaller range. The second layer consists of sparse trees. The third layer consists of sparse shrubs.

			10	Sparse Vegetation LCC Code: 20058 // 20049 LCC Formula: A2A14 // A1A14 The main layer consists of sparse herbaceous vegetation. The crown cover is between (20-10) and 1%. The sparseness of the vegetation may be further specified. // The main layer consists of sparse woody vegetation. The crown cover is between (20-10) and 1%. The sparseness of the vegetation may be further specified.
			11	Cropland LCC Code: 10025 LCC Formula: A3 A defined area is covered by herbaceous crops. This cover excludes paddy field.
			12	Paddy field LCC Code: 3001 // 3013 LCC Formula: A1 // A2 A defined area is covered with graminoid crops. // A defined area is covered with non-graminoid crops. The main cover type is rice paddy.
			13	Cropland / Natural Vegetation Mosaic LCC Code: 0003 // 0006 // 0004 LCC Formula: A11 // A23 // A12 Primarily vegetated areas containing more than four percent vegetation during at least two months a year. The environment is influenced by the edaphic substratum. The vegetative cover is characterised by the removal of the (semi)natural vegetation and replacement with a vegetative cover resulting from human activities. This cover is artificial and requires maintenance. It is grown with the intention to be managed and/or (partly) harvested at the end of the growing season. Before or after harvest there may be a period without vegetative cover. // Primarily vegetated areas containing more than four percent vegetation during at least two months a year. The environment is significantly influenced by the presence of water over extensive periods of time, i.e. water is present for more than three months a year and when water is present less than three months a year, it is present 75 percent of the flooding time. The vegetative cover is characterised by the removal of the (semi)natural vegetation and replacement with a vegetative cover resulting from human activities. This cover is artificial and requires maintenance. It is grown with the intention to be managed and/or (partly) harvested at the end of the growing season. Before or after harvest there may be a period without vegetative cover. // Primarily vegetated areas containing more than four percent vegetation during at least two months a year. The environment is influenced by the edaphic substratum. The vegetative cover is characterised by the presence of (semi)natural vegetation which species composition, its environmental and ecological processes are indistinguishable from, or in a process of achieving, its undisturbed state. The vegetative cover is not artificial and does not need to be managed nor maintained.
			14	Mangrove LCC Code: 41519-R3 LCC Formula : A1A20-R3 The main layer consists of closed to open woody vegetation. The crown cover is between 100 and 15% (a further sub range can be defined – Closed to Open 100-40%). The openness of the vegetation may be further specified. [Note: water quality is saline.] Depending on the level of Total Dissolve Solids (TDS) expressed in parts per million (ppm), three

				classes are distinguished: fresh, brackish and saline water (Cowardin et al., 1979). 1) Fresh Water: Less than 1000 ppm TDS. 2) Brackish Water: Between 1000 and 10000 ppm TDS. 3) Saline Water: More than 10000 ppm TDS.
			15	Wetland LCC code: 41519-R1 // 41519-R2 // 42155 LCC formula: A1A20-R1 // A1A20-R2 // A2A20 The main layer consists of closed to open woody vegetation. The crown cover is between 100 and 15% (a further sub range can be defined – Closed to Open 100-40%). The openness of the vegetation may be further specified. [Note: water quality is fresh.] // The main layer consists of closed to open woody vegetation. The crown cover is between 100 and 15% (a further sub range can be defined – Closed to Open 100-40%). The openness of the vegetation may be further specified. [Note: water quality is brackish.] // The main layer consists of closed to open herbaceous vegetation. The crown cover is between 100 and 15% (a further sub range can be defined – Closed to Open 100-40%). The openness of the vegetation may be further specified. Depending on the level of Total Dissolve Solids (TDS) expressed in parts per million (ppm), three classes are distinguished: fresh, brackish and saline water (Cowardin et al., 1979). 1) Fresh Water: Less than 1000 ppm TDS. 2) Brackish Water: Between 1000 and 10000 ppm TDS. 3) Saline Water: More than 10000 ppm TDS.
			16	Bare area, consolidated (gravel, rock) LCC code: 6001 LCC formula: A1 The land cover consists of consolidated material(s).
			17	Bare area, unconsolidated (sand) LCC code: 6004 LCC formula: A2 The land cover consists of unconsolidated material(s).
			18	Urban LCC code: 0010 LCC formula: B15 Primarily non-vegetated areas containing less than four percent vegetation during at least 10 months a year. The environment is influenced by the edaphic substratum. The cover is artificial and a result of human activities.
			19	Snow / Ice LCC code: 8005 // 8008 LCC formula: A2 // A3 The land cover consists of perennial snow. // The land cover consists of perennial ice. A further specification can be made in moving or stationary ice. Perennial: The snow/ice covers the surface for more than 9 months each year in all years.
			20	Water Bodies LCC code: 7001 // 8001 LCC formula: A1 // A1 The land cover consists of artificial water bodies. A further specification can be made in flowing or standing water. // The land cover consists of natural water bodies. A further specification can be made in flowing or standing water.

			255	no data
Land Use	Global Map land use classification	cell	10	Forest: *Area dominated by trees higher than shrubs with a canopy cover greater than or equal to 10 percent.*
			20	Mixture: *Area where more than two classes are mixed including Non-vegetated area, Agricultural area, Grassland/Shrub and Wetland. This class is not applied where one class dominates.*
			30	Grassland/shrub: *Area covered by trees with canopy cover less than l0percent.*
			40	Agricultural area: *Area where agricultural activities are implemented constantly.*
			50	Wetland: *Area where underground water level is near the ground surface, or area with humid soil.*
			60	Barren area: *Non-vegetated area where no artificial structures exist.*
			70	Built-up area: *Area where artificial structures occupy significant surfaces.*
			80	Drainage/water: *Area inside coastline forming water surface.*
			90	Ocean: *Area outside coastline forming water surface.*
			255	no data

"GLCNMO land cover classification" in the above table is used for global or continental land cover products. LCC code and LCC formula in the Value Meaning column is the land cover definition by Land Cover Classification System version 2 (LCCS2) developed by FAO (http://www.glcn-lccs.org/). "//" in LCC code and LCC formula means "or".

On the other hand, national land cover products use different land cover legend which is defined by 'Type 2 country (page 84 of the Report of 12th ISCGM, at Cairo 2005)' based on LCCS2.

Table 3 Comparative listing between GLCNMO legend (draft) and Global Map initial land cover legend

GLCNMO legend (draft)	Global Map initial land cover legend (Same as IGBP-DIScover legend)
1. Broadleaf Evergreen Forest	2. Evergreen Broadleaf Forests
2. Broadleaf Deciduous Forest	4. Deciduous Broadleaf Forests
3. Needleleaf Evergeen Forest	1. Evergreen Needleleaf Forests
4. Needleleaf Deciduous Forest	3. Deciduous Needleleaf Forests
5. Mixed Forest	5. Mixed Forests
6. Tree Open	8. Woody Savannas
7. Shrub	6. Closed Shrublands 7. Open Shrublands
8. Herbaceous, single layer	10. Grasslands
9. Herbaceous with Sparse and Tree/Shrub	9. Savanna
10. Sparse Vegetation	16. Barren
11. Cropland	12. Croplands
12. Paddy field	
13. Cropland/Natural Vegetation Mosaic	14. Cropland/Natural Vegetation Mosaics
14. Mangrove	11. Permanent Wetlands
15. Wetland	
16. Bare area, consolidated (gravel, rock)	16. Barren
17. Bare area, unconsolidated (sand)	
18. Urban	13. Urban and Built-up
19. Snow/Ice	15. Snow and Ice
20. Water Bodies	17. Water Bodies

Table 4 Comparative listing between GLCNMO legend (draft) and GLC2000 legend

GLCNMO legend (draft)	GLC2000 global legend
1. Broadleaf evergreen Forest	1. Tree Cover, broadleaved, evergreen
2. Broadleaf Deciduous Forest	2. Tree Cover, broadleaved, deciduous, closed
3. Needleleaf Evergeen Forest	4. Tree Cover, needle-leaved, evergreen
4. Needleleaf Deciduous Forest	5. Tree Cover, needle-leaved, deciduous
5. Mixed Forest	6. Tree Cover, mixed leaf type
6. Tree Open	3. Tree Cover, broadleaved, deciduous, open
7. Shrub	11. Shrub Cover, closed-open, evergreen
	12. Shrub Cover, closed-open, deciduous
8. Herbaceous, single layer	13. Herbaceous Cover, closed-open
9. Herbaceous with Sparse and Tree/Shrub	
10. Sparse Vegetation	14. Sparse Herbaceous or sparse Shrub Cover
11. Cropland	16. Cultivated and managed areas
12. Paddy field	
13. Cropland/Natural Vegetation Mosaic	17. Mosaic: Cropland / Tree Cover / Other natural vegetation
	18. Mosaic: Cropland / Shrub or Grass Covered
14. Mangrove	8. Tree Cover, regularly flooded, saline water
15. Wetland	7. Tree cover, regularly flooded, fresh water
	15. Regularly flooded Shrub and/or Herbaceous Cover
16. Bare area, consolidated (gravel, rock)	19. Bare Areas
17. Bare area, unconsolidated (sand)	
18. Urban	22. Artificial surfaces and associated areas
19. Snow/Ice	21. Snow and Ice
(N/A)	9. Mosaic: Tree Cover / Other natural vegetation
	10. Tree Cover, burnt
20. Water Bodies	20. Water Bodies

Table 5 Raster data (Global Map Version 1.2.1 Specifications)

Layer	Definition	Feature Class	Attributes Description	Value Meaning	
Elevation	Elevation above mean sea level.	cell	**Elevation in metres**	-407 to 8752 (-9999 for areas masked as sea)	
Vegetation	Global Map Vegetation Classification (Modified Walter)	cell		Tropical rainforest: *Evergreen forest which has high rainfall and high humidity throughout the year. This class has an upper canopy formed by trees from 30 to 40m tall and may have occasional emerging trees taller than the upper canopy.*	10
				Hydrotropic forest: *Deciduous broad-leaved trees which are defoliated in dry season and foliate in rainy season.*	20
				Grassland in tropical or sub-tropical zone: *Grassland which has a long dry season and is heavily dried. Trees are only sparsely distributed. Plant density depends on dryness.*	30
				Semi desert in tropical or sub-tropical zone: *Plants are sparsely distributed in the area which has a little rainfall and is heavily dried*	40
				Desert in tropical or sub-tropical zone: *Plants are very sparsely distributed in the area which has a little rainfall and is extremely dried.*	50
				Evergreen thick-leaved forest: *Forest which has high rainfall in the rainy season and is relatively dried in summer. Trees which have evergreen thick and hard leaves dominate this forest.*	60
				Evergreen broad-leaved forest: *Forest in the warm temperate zone which has high rainfall in summer, or is humid throughout the year. Broad-leaved trees which have a little larger leaves than evergreen thich-leaved trees are the main component of this forest.*	70
				Deciduous broad-leaved forest: *Forest which mainly consists of trees defoliated in winter. This forest appears in the area which has sufficient rainfall in cool temperate zone.*	80
				Grassland in temperate zone: *Grassland in drier climates in temperate zone. No trees grow.*	90
				Semi-desert in temperate zone: *Heavily dried area in the temperate zone. Grasses, such as mugwort and pigweed cover this area.*	100
				Desert in temperate zone: *Extremely dried area in temperate zone. Grasses, such as mugwort and pigweed cover this area.*	110
				Northern coniferous forest: *Coniferous trees in semi-frigid zone which has very cold and long winter. Trees in this forest are usually evergreen*	120
				Tundra: *Plant colony consists of shrub, grass with broad leaves, moss and lichen. Trees cannot become tall due to severe cold.*	130
				Water body: *Water surfaces, such as rivers and lakes.*	140
				Ice and snow: *Area which is covered with snow and ice throughout the year.*	150
				Wetland: Vegetated area with waterlogged soils or surface water for significant periods of the year.	210
				Mixed forest: Forest containing a mixture of types. Usually deciduous and coniferous.	220

				Mixed land: Area containing a mosaic of other types.	230
				Non natural: Cultivated, urban or otherwise modified vegetation.	240
				Unclassified: Areas not included in other classifications. For example, baren land.	250
Land Cover	International Geosphere Biosphere Programme Land Cover Classification (DISCOVer data set)	cell		Evergreen Needleleaf Forest: Lands dominated by trees with a percent canopy cover >60% and height exceeding 2 meters. Almost all trees remain green all year. Canopy is never without green foliage.	1
				Evergreen Broadleaf Forest: Lands dominated by trees with a percent canopy cover > 60% and height exceeding 2 meters. Almost all trees remain green all year. Canopy is never without green foliage.	2
				Deciduous Needleleaf Forest: Lands dominated by trees with a percent canopy cover > 60% and height exceeding 2 meters. Consists of seasonal needleleaf tree communities with an annual cycle of leaf-on and leaf-off periods.	3
				Deciduous Broadleaf Forest: Lands dominated by trees with a percent canopy cover > 60% and height exceeding 2 meters. Consists of seasonal broadleaf tree communities with an annual cycle of leaf-on and leaf-off periods.	4
				Mixed Forest: Lands dominated by trees with a percent canopy cover > 60% and height exceeding 2 meters. Consists of tree communities with interspersed mixtures or mosaics of the other four forest cover types. None of the forest types exceeds 60% of the landscape.	5
				Closed Shrublands: Lands with woody vegetation less than 2 meters tall and with shrub canopy cover > 60%. The shrub foliage can be either evergreen or deciduous.	6
				Open Shrublands: Lands with woody vegetation less than 2 meters tall and with shrub canopy cover between 10-60%. The shrub foliage can be either evergreen or deciduous.	7
				Woody Savannas: Lands with herbaceous and other understory systems, and with forest canopy cover between 3-=60%. The forest cover height exceeds 2 meters.	8
				Savannas: Lands with herbaceous and other understory systems, and with forest canopy cover between 10-30%. The forest cover height exceeds 2 meters.	9
				Grasslands: Lands with herbaceous types of cover. Tree and shrub cover is less than 10%.	10
				Permanent Wetlands: Lands with a permanent mixture of water and herbaceous or woody vegetation that cover extensive areas. The vegetation can be present in either salt, brackish, or fresh water.	11
				Croplands: Lands covered with temporary crops followed by harvest and a bare soil period (e.g., single and multiple cropping systems). Note that perennial woody crops will be classified as the appropriate forest or shrub land cover type.	12
				Urban and Built-Up: Land covered by buildings and other man-made structures.	13
				Cropland/Natural Vegetation Mosaic: Lands with a mosaic of croplands, forests, shrublands, and grasslands in which no one component comprises more than 60% of the landscape.	14
				Snow and Ice: Lands under snow and/or ice cover throughout the year.	15
				Barren or Sparsely Vegetated: Lands with exposed soil, sand, rocks, or snow and never has more than 10% vegetated cover during any time of the year.	16

				Water Bodies: Oceans, seas, lakes, reservoirs, and rivers. Can be either fresh or salt water bodies.	17
Land Use	Global Map Land use classification	cell		Forest: *Area dominated by trees higher than shrubs with a canopy cover greater than or equal to 10 percent.*	10
				Mixture: *Area where more than two classes are mixed including Non-vegetated area, Agricultural area, Grassland/Shrub and Wetland. This class is not applied where one class dominates.*	20
				Grassland/shrub: *Area covered by trees with canopy cover less than l0percent.*	30
				Agricultural area: *Area where agricultural activities are implemented constantly*.	40
				Wetland: *Area where underground water level is near the ground surface, or area with humid soil.*	50
				Barren area: *Non-vegetated area where no artificial structures exist.*	60
				Built-up area: *Area where artificial structures occupy significant surfaces.*	70
				Drainage/water: *Area inside coastline forming water surface.*	80
				Ocean: *Area outside coastline forming water surface.*	90

APPENDIX E Three-character ISO 3166 Nation Code

Country	3 character code
Afghanistan	AFG
Albania	ALB
Algeria	DZA
American Samoa	ASM
Andorra	AND
Angola	AGO
Anguilla	AIA
Antarctica	ATA
Antigua and Barbuda	ATG
Argentina	ARG
Armenia	ARM
Aruba	ABW
Australia	AUS
Austria	AUT
Azerbaijan	AZE
Bahamas	BHS
Bahrain	BHR
Bangladesh	BGD
Barbados	BRB
Belarus	BLR
Belgium	BEL
Belize	BLZ
Benin	BEN
Bermuda	BMU
Bhutan	BTN
Bolivia	BOL
Bosnia and Herzegowina	BIH
Botswana	BWA
Bouvet Island	BVT
Brazil	BRA
British Indian Ocean Territory	IOT
Brunei Darussalam	BRN
Bulgaria	BGR
Burkina faso	BFA
Burundi	BDI
Cambodia	KHM

Country	3 character code
Cameroon	CMR
Canada	CAN
Cape Verde	CPV
Cayman Islands	CYM
Central African Republic	CAF
Chad	TCD
Chile	CHL
China	CHN
Christmas Island	CXR
Cocos (Keeling) Islands	CCK
Colombia	COL
Comoros	COM
Congo	COG
Congo, the Democratic Republic of the	COD
Cook Islands	COK
Costa Rica	CRI
Cote d'Ivoire	CIV
Croatia (local name: Hrvatska)	HRV
Cuba	CUB
Cyprus	CYP
Czech Republic	CZE
Denmark	DNK
Djibouti	DJI
Dominica	DMA
Dominican Republic	DOM
East Timor	TMP
Ecuador	ECU
Egypt	EGY
El salvador	SLV
Equatorial Guinea	GNQ
Eritrea	ERI
Estonia	EST
Ethiopia	ETH
Falkland Islands (Malvinas)	FLK
Faroe Islands	FRO
Fiji	FJI
Finland	FIN

Country	3 character code
France	FRA
France, metropolitan	FXX
French Guiana	GUF
French Polynesia	PYF
French Southern Territories	ATF
Gabon	GAB
Gambia	GMB
Georgia	GEO
Germany	DEU
Ghana	GHA
Gibraltar	GIB
Greece	GRC
Greenland	GRL
Grenada	GRD
Guadeloupe	GLP
Guam	GUM
Guatemala	GTM
Guinea	GIN
Guinea-Bissau	GNB
Guyana	GUY
Haiti	HTI
Heard and Mc Donald Islands	HMD
Holy See (Vatican City State)	VAT
Honduras	HND
Hong Kong	HKG
Hungary	HUN
Iceland	ISL
India	IND
Indonesia	IDN
Iran (Islamic Republic of)	IRN
Iraq	IRQ
Ireland	IRL
Israel	ISR
Italy	ITA
Jamaica	JAM
Japan	JPN
Jordan	JOR

Country	3 character code
Kazakhstan	KAZ
Kenya	KEN
Kiribati	KIR
Korea, Democratic People's Republic of	PRK
Korea, Republic of"	KOR
Kuwait	KWT
Kyrgyzstan	KGZ
Lao People's Democratic Republic	LAO
Latvia	LVA
Lebanon	LBN
Lesotho	LSO
Liberia	LBR
Libyan Arab Jamahiriya	LBY
Liechtenstein	LIE
Lithuania	LTU
Luxembourg	LUX
Macau	MAC
Macedonia, the former Yugoslav Republic of	MKD
Madagascar	MDG
Malawi	MWI
Malaysia	MYS
Maldives	MDV
Mali	MLI
Malta	MLT
Marshall Islands	MHL
Martinique	MTQ
Mauritania	MRT
Mauritius	MUS
Mayotte	MYT
Mexico	MEX
Micronesia, Federated States of	FSM
Moldova, Republic of	MDA
Monaco	MCO
Mongolia	MNG
Montserrat	MSR
Morocco	MAR
Mozambique	MOZ

Country	3 character code
Myanmar	MMR
Namibia	NAM
Nauru	NRU
Nepal	NPL
Netherlands	NLD
Netherlands Antilles	ANT
New Caledonia	NCL
New Zealand	NZL
Nicaragua	NIC
Niger	NER
Nigeria	NGA
Niue	NIU
Norfolk Island	NFK
Northern Mariana Islands	MNP
Norway	NOR
Oman	OMN
Pakistan	PAK
Palau	PLW
Panama	PAN
Papua New Guinea	PNG
Paraguay	PRY
Peru	PER
Philippines	PHL
Pitcairn	PCN
Poland	POL
Portugal	PRT
Puerto Rico	PRI
Qatar	QAT
Reunion	REU
Romania	ROM
Russian Federation	RUS
Rwanda	RWA
Saint Kitts and Nevis	KNA
Saint Lucia	LCA
Saint Vincent and the Grenadines	VCT
Samoa	WSM
San Marino	SMR

Country	3 character code
Sao tome and Principe	STP
Saudi Arabia	SAU
Senegal	SEN
Seychelles	SYC
Sierra Leone	SLE
Singapore	SGP
Slovakia (Slovak Republic)	SVK
Slovenia	SVN
Solomon islands	SLB
Somalia	SOM
South Africa	ZAF
South Georgia and the South Sandwich Islands	SGS
Spain	ESP
Sri Lanka	LKA
St. Helena	SHN
St. Pierre and Miquelon	SPM
Sudan	SDN
Suriname	SUR
Svalbard and Jan Mayen Islands	SJM
Swaziland	SWZ
Sweden	SWE
Switzerland	CHE
Syrian Arab Republic	SYR
Taiwan, province of China	TWN
Tajikistan	TJK
Tanzania, United Republic of	TZA
Thailand	THA
Togo	TGO
Tokelau	TKL
Tonga	TON
Trinidad and Tobago	TTO
Tunisia	TUN
Turkey	TUR
Turkmenistan	TKM
Turks and Caicos Islands	TCA
Tuvalu	TUV
Uganda	UGA

Country	3 character code
Ukraine	UKR
United Arab Emirates	ARE
United Kingdom	GBR
United States	USA
United States minor outlying islands	UMI
Uruguay	URY
Uzbekistan	UZB
Vanuatu	VUT
Venezuela	VEN
Viet Nam	VNM
Virgin Islands (British)	VGB
Virgin Islands (U.S.)	VIR
Wallis and Futuna Islands	WLF
Western Sahara	ESH
Yemen	YEM
Yugoslavia	YUG
Zambia	ZMB
Zimbabwe	ZWE

APPENDIX F Sample header file for Raster representation

BYTEORDER	M
LAYOUT	BIL
NROWS	600
NCOLS	600
NBANDS	1
NBITS	8
BANDROWBYTES	600
TOTALROWBYTES	600
BANDGAPBYTES	0
NODATA	
ULXMAP	100.00416666666667
ULYMAP	9.99583333333333
XDIM	0.00833333333333
YDIM	0.00833333333333