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Série des 171

WITHDRAWAL

December 2016

Standards in series Geomatics

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CAN/CGSB-171.100-2009

North American Profile of ISO 19115:2003 – Geographic Information – Metadata (NAP – Metadata) (ICS 35.240.70)

CAN/CGSB-171.101-2010

Canadian Geographic Information Standard – Canadian Geographical Names, Level 1 (CGIS - CGN1) (ICS 35.240.70)

CAN/CGSB-171.102-2010

Canadian Geographic Information Standard – National Road Network 2.0 (CGIS – NRN2) (ICS 35.240.70)

CAN/CGSB-171.103-2010

Canadian Geographic Information Standard – Canadian Digital Elevation Data, Level 1 (CGIS – CDED1) (ICS 35.240.70)

CAN/CGSB-171.104-2010

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CAN/CGSB-171.100-2009

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CAN/CGSB-171.101-2010

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Norme canadienne de l'information géographique – Données numériques d'élévation du Canada, niveau 1 (NCIG - DNEC1) (ICS 35.240.70)

CAN/CGSB-171.104-2010

Norme canadienne de l'information géographique – Imagerie Landsat 7 orthorectifiée du Canada (NCIG – IOR) (ICS 35.240.70)



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Canadian Geographic Information Standard – Canadian Digital Elevation Data, Level 1 (CGIS – CDED1)

ICS 35.240.70



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Canadian Geographic Information Standard – Canadian Digital Elevation Data, Level 1 (CGIS – CDED1)

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Prepared by the

**Natural Resources Canada,
Canadian Council on Geomatics**



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Introduction

Canadian Geographic Information Standards

This document is part of a series of Canadian Geographic Information Standards (CGIS). These standards are localized national standards for particular types of geographic data, such as the product specifications for the GeoBase suite of publicly available data products, or specializations or profile of international standards in the Canadian or North American context.

The International Organization for Standardization Technical Committee TC/211 Geographic information - Geomatics has developed a suite of international standards for geographic information. These are primarily high level abstract standards that describe the fundamental information components for feature oriented vector based, or coverage (imagery and gridded) data, or geospatial services. The ISO standards tend to be too high a level to be directly implementable. It is necessary to be able to develop profiles to address specific national needs or implementations of the ISO standards such as the development of feature catalogues and product specifications in accordance with the ISO standards.

GeoBase

GeoBase is an initiative of the federal, provincial and territorial governments in Canada operating through the Canadian Council on Geomatics (CCOG) to ensure the provision of, and access to a common, up-to-date and maintained base of quality geospatial data for all of Canada. This allows Canadians to have access to the wealth of knowledge about the geography of Canada. This data is provided on line and free of charge under common terms and conditions by the participating members of the CCOG through Natural Resources Canada. The data is structured based on international standards to ensure maximum compatibility with users' systems.

The GeoBase suite of Product Specifications has been made into National Standards of Canada to stabilize the specifications and to make them permanently available. As national standards these specifications may also be referenced by other specifications and standards within and external to Canada thereby increasing the level of interoperability. Geospatial information is presented in GeoBase in separate layers, each one addressing a specific topic. There are initially four layers of geospatial information available through GeoBase which have been produced as National Standards.

These standards describe the information content of the GeoBase data layers. They do not mandate the encoding or representation of the data. GML is described as a neutral encoding. This permits multiple encodings that may be used in different media and services. A common metadata schema is used that is compatible with the CAN/CGSB-171.100-2009 (NAP-Metadata). The actual metadata elements were developed using the earlier US Federal Geospatial Data Committee (FGDC) metadata standard; however, this is directly convertible to the new North American standard. For those data layers that are geographically feature oriented a geospatial feature catalogue is included as an appendix to the standard.

Canadian Geographic Information Standard – Canadian Digital Elevation Data, Level 1 (CGIS – CDED1)

1 Scope

This National Standard of Canada describes a product specification in compliance to *ISO 19131:2007 – Geographic information – Data Product Specification* for the provision of elevation data and associated metadata to the public through the GeoBase initiative of the CCOG. This product specification describes the Canadian Digital Elevation Data which consists of an ordered array of ground and reflective surface elevations recorded in meters, at regularly spaced intervals.

Note: The Canadian Digital Elevation Data aligns with the USGS DEM product (USGS 1997) and is different from the Digital Terrain Elevation Data (DTED) product produced by the Department of National Defence of Canada.

2 Conformance

Any data set claiming conformance with this National Standard shall pass all the requirements described in the abstract test suites in Appendix A.

3 Normative references

The following documents contain provisions that, through reference in this text, constitute provisions of this National Standard of Canada. The referenced documents may be obtained from the sources noted below. The following referenced documents are indispensable for the application of this document.

A dated reference in this standard is to the issue specified. An undated reference in this standard is to the latest issue, unless otherwise specified by the authority applying this standard.

3.1 Canadian General Standards Board

CAN/CGSB-171.100:2009 – *North American Profile of ISO 19115:2003 – Geographic information – Metadata (NAP – Metadata)*¹

3.1.1 Source

The above may be obtained from the Canadian General Standards Board, Sales Centre, Gatineau, Canada K1A 1G6. Telephone 819-956-0425 or 1-800-665-2472. Fax 819-956-5644. E-mail ncr.cgsb-ongc@tpsgc-pwgsc.gc.ca. Web site www.ongc-cgsb.gc.ca

¹ This standard contains a cross reference from the US FGDC Metadata fields used in the data to the definitions in the NAP Metadata standard. All the definitions, codes and tables from CAN/CGSB 171.100-2009 are available at <http://www.geoconnections.org/nap/metadata/>

3.2 International Organization for Standardization

ISO 19115: 2003² *Geographic Information - Metadata*

3.2.1 Source

The above may be obtained from IHS Canada, 1 Antares Drive, Suite 200, Ottawa, Ontario K2E 8C4, telephone 613-237-4250 or 1-800-387-4408, fax 613-237-4251, e-mail gic@ihscanada.ca, Web site canada.ihs.com.

4 Terms and definitions

For the purposes of this National Standard of Canada, the following terms and definitions apply.

4.1

Canadian Geodetic Vertical Datum of 1928 (CGVD28)

Official height reference system in Canada.

Note: The reference frame for the CGVD28 is the mean sea level at six tide gauges during 1928. These tide gauges were located on both the Pacific and Atlantic Oceans as well as on the St-Lawrence River. The datum is propagated across Canada (mostly southern Canada) by a first-order levelling network and is accessible to users through some 80,000 federal benchmarks.

4.2

Cell

Rectangular unit of coverage for an elevation grid.

Note: Each CDED cell corresponds to half an NTS tile, which means there is always an eastern and western CDED cell to an NTS tile.

4.3

Contour line

An imaginary line on the ground connecting an infinite number of points of equal elevation.

Note: A contour line elevation as used in this standard may be recorded in meters or feet relative to mean sea level based on the North American Datum 1983 horizontal reference datum.

4.4

Digital Elevation Model (DEM)

A numerical representation of the Earth's surface based on a collection of ground or reflective surface elevations.

4.5

Edge matching

A process of matching elevation values along edges of the CDED.

4.6

Mean high water level (MHWL)

Ocean based vertical reference (sounding) datum based on the mean high water level.

Note: The Nova Scotia coastline, oceans, and estuaries are depicted at the MHWL which has varying elevations across the province. All MHWL elevation values are with reference to the Canadian Geodetic Vertical Datum 1928.

² The normative reference is to the base ISO 19115 metadata standard. Although ISO 19115-2 exists for Imagery, this part is not applicable here.

4.7**Mean sea level (MSL)**

Ocean based vertical reference (sounding) datum based on the average sea level for a particular geographical location, obtained from numerous observations, at regular intervals, over a long period of time.

4.8**Metadata**

Data about data. [ISO 19115]

Note: Metadata in this standard is information about the source data set used to produce CDED. The information is formally structured according to CAN/CGSB 171.100 NAP-Metadata standard which is a profile of the ISO 19115 metadata standard. The metadata fields used in this standard correspond to the U.S. Federal Geographic Data Committee metadata standard FGDC-STD-001-1998, which was a source standard for the ISO 19115 standard. That is, at the current time the older FGDC standard is used, but many of the fields are identical, and where there is a difference a transition to the ISO and CGSB standard can be done in the future.

4.9**North American Datum 1983 (NAD83)**

The horizontal control datum for the U.S., Canada, Mexico and Central America, based on the Geodetic Reference System 1980 (GRS80) geocentric reference ellipsoid.

4.10**National Topographic System (NTS)**

The National Topographic System provides general-purpose topographic map coverage of Canada. These maps depict in detail ground relief (landforms and terrain), drainage (lakes and rivers), forest cover, administrative areas, populated areas, transportation routes and facilities (including roads and railways), and other man-made features.

4.11**NTS Tile**

The organizational unit of the National Topographic System.

4.12**Orthometric height**

Height of a point related to the geoid, generally presented as an MSL elevation.

5 Acronyms and abbreviations

CDED	Canadian Digital Elevation Data
CGVD28	Canadian Geodetic Vertical Datum of 1928
CRSID	Coordinate Reference System Identifier
CTI	Centre for Topographic Information
DEM	Digital Elevation Model
EPSG	European Petroleum Survey Group
ESS	Earth Sciences Sector
FGDC	U.S. Federal Geographic Data Committee
GDB	Geospatial Data Base

ISO	International Organization for Standardization
MHWL	Mean High Water Level
MSL	Mean Sea Level
NAD83	North American Datum of 1983
NRCan	Natural Resources Canada
NTDB	National Topographic Data Base
NTS	National Topographic System
OGP	International Organization of Oil and Gas Producers
UML	Unified Modeling Language
USGS	United States Geological Survey

6 Overview

6.1 Title

Canadian Geographic Information Standard – Canadian Digital Elevation Data, Level 1 (CGIS – CDED1)

6.2 Reference date

Data product specifications creation date: 2010-11-10

6.3 Responsible party

GeoBase
Natural Resources Canada,
Earth Sciences Sector,
Centre for Topographic Information
2144 King Street West, Suite 010
Sherbrooke (Quebec), Canada
J1J 2E8

Telephone: 1-800-661-2638 (Canada and USA)

Fax: 819-564-5698

E-mail: supportgeobase@NRCan.gc.ca

URL: <http://www.geobase.ca/>

6.4 Language

This data product is available in:

eng - English

fra - French

6.5 Informal description of the data product

A CDED consists of an ordered array of ground or reflective surface elevations recorded in meters, at regularly spaced intervals. The source digital data for CDED is extracted from the hypsographic and hydrographic elements of the NTDB at scales of 1:50 000 and 1:250 000, the GDB, various scaled positional data acquired by the provinces and territories, or remotely sensed imagery.

The tile reference scheme for CDED models the NTS mapping series. The coverage for each CDED corresponds to half an NTS tile, which means there is always a western and eastern CDED cell to a whole NTS tile. Cell coverage varies according to three geographic areas.

The North American Datum 1983 (NAD83) is used as the reference system for planimetric coordinates. Elevations are orthometric and expressed in reference to Mean Sea Level, Canadian Geodetic Vertical Datum 1928(CGVD28).

The geographic extent of CDED includes the Canadian landmass and water bodies. The vertical domain of the data set identifies the lowest and highest vertical extent contained within the data. The vertical extent is expressed in meters and can vary from zero meters (MSL) to 5959 meters (Mount Logan) in Canada. An exception is that ground elevation data having negative values may be found in certain areas of Canada that naturally lie below Mean Sea Level. The temporal extent for the content of the data is from 1945.

CDED plays the same role as contours and relief shading on conventional paper maps. CDED serves as key primary data in a range of applications critical to achieving sustainable development. These applications include environmental and ecological impact assessments, water flow and water quality analysis, climate change studies, forest regeneration planning and wildlife habitats. In addition, CDED can be used in the generation of three-dimensional graphics displaying terrain slope, profiles and line of sight. Other applications include geoid calculations, terrain modeling, flood simulations and telecommunication studies.

7 Product specification scope

7.1 Scope general

This section describes the scope referred to by information provided in subsequent sections which describe the product.

7.2 Scope identification

Global

Note: "Global" means that this scope refers to all parts of this data product specifications.

7.3 Level

This scope refers to the following level according to the ISO 19115 and CAN/CGSB-171.100-2009 standards:

006 - series

7.4 Level name

CDED Level 1

7.5 Extent

This section describes the spatial and temporal extent of the scope.

7.5.1 Description

Canadian landmass.

7.5.2 Vertical extent

The vertical domain of the data set identifies the lowest and highest vertical extent contained within the data. The vertical extent is expressed in meters and can vary from zero meters (MSL) to 5 959 meters (Mount Logan) in Canada. Exceptions are: ground elevation data having negative values may be found in certain areas of Canada that naturally lie below mean sea level.

7.5.2.1 Minimum value

The lowest elevation contained in the series is zero meters (MSL). Exceptions are: ground elevation data having negative values may be found in certain areas of Canada that naturally lie below mean sea level.

7.5.2.2 Maximum value

The highest elevation contained in the series is 5 959 meters (Mount Logan).

7.5.2.3 Unit of measure

The unit of measure for storing vertical data is the meter (m). Coordinates are expressed as integers.

7.5.2.4 Vertical datum

Elevations are orthometric and expressed in reference to mean sea level (Canadian Geodetic Vertical Datum 1928 (CGVD28)).

Note: The Nova Scotia coastline, oceans, and estuaries are depicted at the mean high water level which has varying elevations across the province. Users must be careful when integrating and using this data in conjunction with other CDED data especially across the Maritimes.

7.5.3 Geographic extent

The geographic extent is described by the following geographic bounding box:

7.5.3.1 West bound longitude

150° West (or -150°)

7.5.3.2 East bound longitude

52° West (or -52°)

7.5.3.3 South bound latitude

41° North (or +41°)

7.5.3.4 North bound latitude

85° North (or +85°)

7.5.4 Temporal extent

The temporal extent for the content of the data is from 1945. See CDED dataset level metadata for temporal extent of the CDED dataset.

7.6 Coverage

Data covers the Canadian landmass. It is subdivided to align with the NTS map sheet coverage.

8 Data production identification

8.1 Title

Canadian Digital Elevation Data, Level 1

8.2 Alternate title

CDED1

8.3 Abstract

A CDED consists of an ordered array of ground or reflective surface elevations recorded in meters, at regularly spaced intervals. The source digital data for CDED is extracted from the hypsographic and hydrographic elements of the NTDB at scales of 1:50 000 and 1:250 000, the GDB, various scaled positional data acquired by the provinces and territories, or remotely sensed imagery.

Note: The CTI jointly produces CDED with federal, provincial and territorial government agencies, as well as, the private sector.

8.4 Purpose

The CDED provides ground or reflective surface elevations of the Canadian landmass. CDED play the same role as contours and relief shading on conventional paper maps. CDED serves as key primary data in a range of applications critical to achieving sustainable development. These applications include environmental and ecological impact assessments, water flow and water quality analysis, climate change studies, forest regeneration planning and wildlife habitats. In addition, CDED can be used in the generation of three-dimensional graphics displaying terrain slope, profiles and line of sight. Other applications include geoid calculations, terrain modeling, flood simulations and telecommunication studies.

8.5 Topic category

Main topics for the product, as defined by the ISO 19115 or CAN/CGSB-171.100:

006 - elevation

8.6 Spatial representation type

Type of spatial representation for the product, as defined by the ISO 19115 or CAN/CGSB-171.100-2009:

002 - grid

8.7 Spatial resolution

Spatial resolution for the CDED is described in terms of measurement or "post" spacing. This is not directly convertible to a conventional map scale representation since it is more related to the accuracy of the data. However for general comparison it can be expressed as an approximate equivalent to a contour map at a given scale. Some areas are covered with a spacing of 20 meters while others are covered with a spacing of 100 meters. Taken in this way, the scale denominator of the data is:

50 000 (20 meters)

250 000 (100 meters)

8.8 Geographic description

8.8.1 Code

Code of the geographical region covered by the product according to the ISO 3166-1 standard:

CA – Canada

8.8.2 Extent type code

Not applicable

8.8.3 Reference to specification scope

Global (see 7.2)

9 Data content and structure

9.1 Description

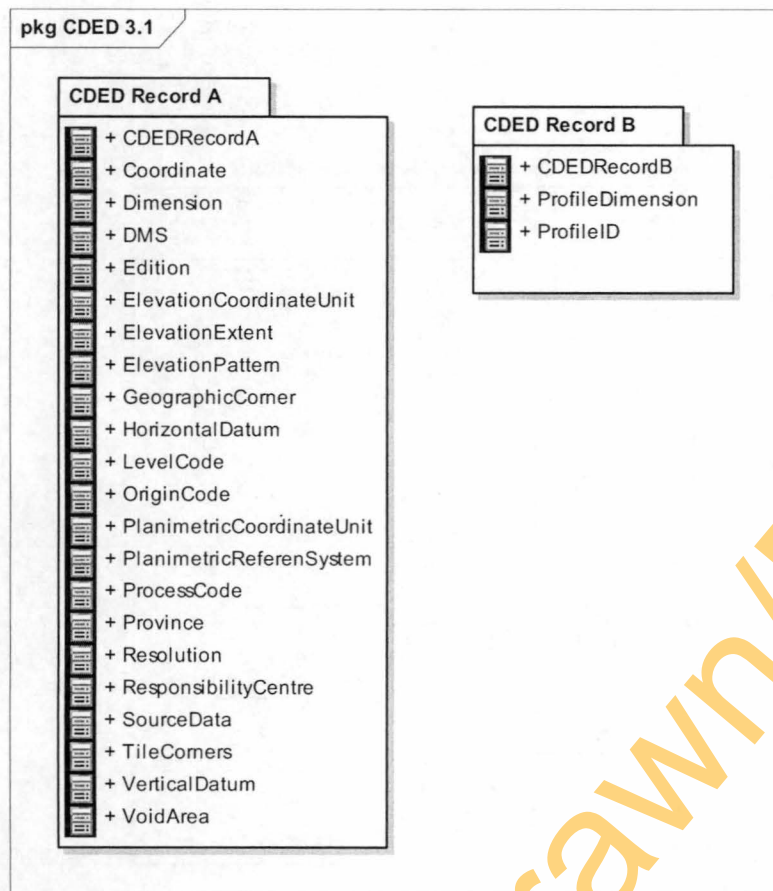
CDED is one of the datasets available through the GeoBase portal.

Each CDED file contains one Logical Record A. Logical Record A contains general information about the CDED such as: CDED Responsibility Centre, software used to create the CDED, origin code, geographic coordinates of the four corners of the CDED, minimum and maximum elevations for the CDED, CDED edition/version, CDED Product Specifications edition/version. See Appendix B for further information.

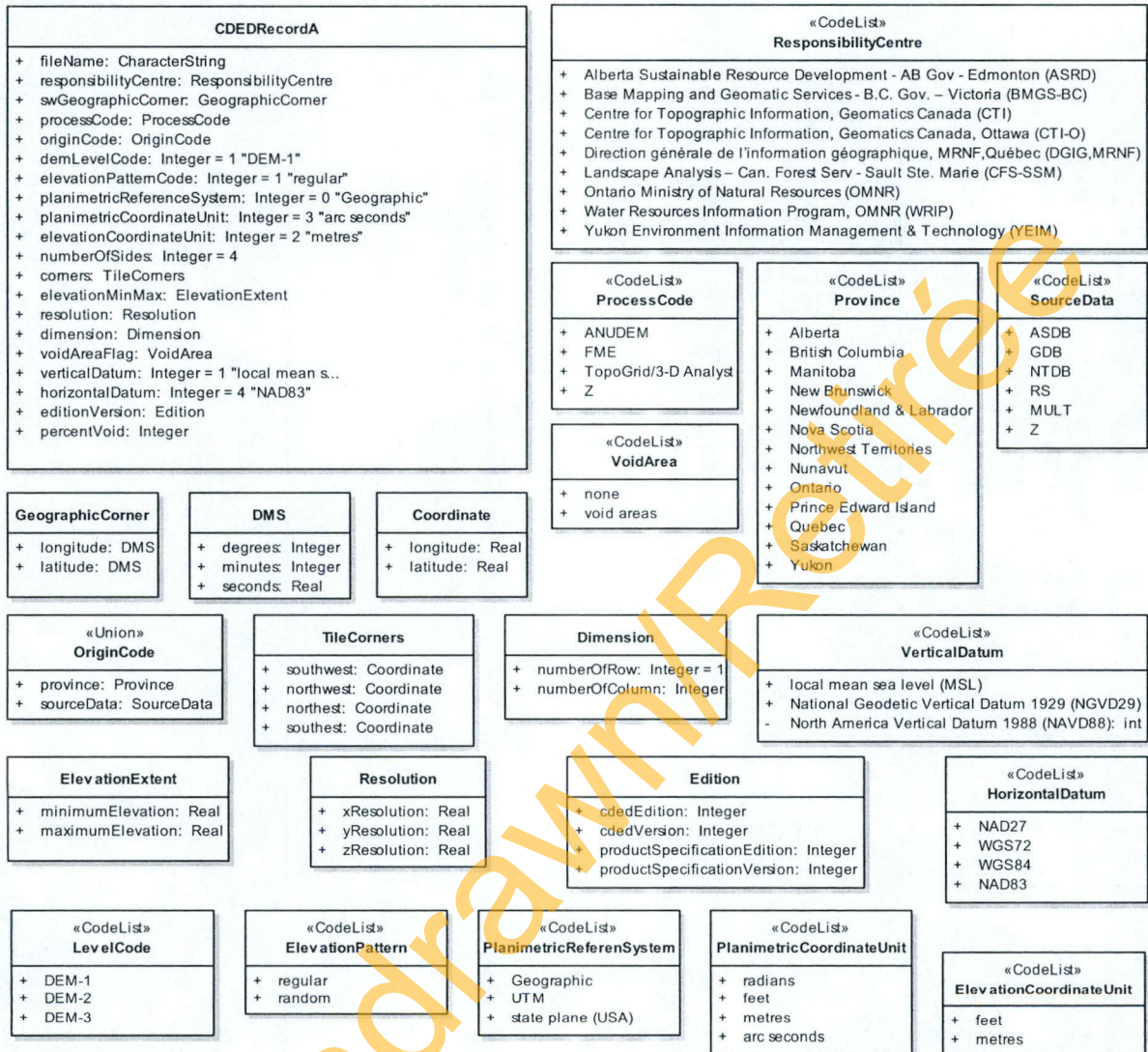
Logical Record B contains elevation data and associated header information. All Type B records of the CDED files are made up of data from one-dimensional bands called profiles. The number of profiles covering the CDED is the same as the number Logical Record B's in the CDED. See Appendix C for further information.

9.2 Data Model

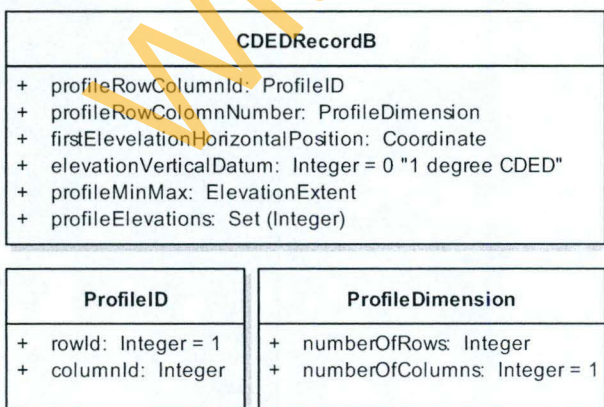
9.2.1 Application schema



class CDED Record A



class CDED Record B



9.2.2 Data Dictionary

The CDED Data Dictionary is located in Appendix D.

9.2.3 Reference to specification scope

Global (See 7.2)

10 Reference systems

10.1 Reference system general

CDED uses a geocentric 3-dimensional reference system (longitude, latitude and Z). Elevations are orthometric and expressed in reference to mean sea level CGVD28. Exception: The Nova Scotia coastline, oceans, and estuaries are depicted at the mean high water level which has varying elevations across the province. The unit of measure for storing vertical data is the meter (m). Coordinates are expressed as integers.

The NAD83 is used as the reference system for planimetric coordinates. Data is stored in geographic coordinates (longitude (λ) and latitude (ϕ)).

Note: The epoch of the CRS is 1986.

Note: The authority responsible for the horizontal CRS NAD83 and the Canadian Geodetic Vertical Datum of 1928 is the Geodetic Survey Division of Natural Resources Canada. The contact information is given below.

Geodetic Survey Division
Natural Resources Canada
615 Booth Street, Room 440
Ottawa, Ontario
Canada
K1A 0E9

Phone: 613-995-4410 (Monday - Friday, 07:00 - 16:00 EST)

Fax: 613-995-3215

Email: information@geod.nrcan.gc.ca

<http://www.geod.nrcan.gc.ca/>

Note: Local vertical datums are used in Nova Scotia.

Note: The register of geodetic codes and parameters maintained by the OGP makes authoritative reference to the source of the CRS it contains. The following sub-clauses define the authority for the management of the code space, not the CRS itself.

10.2 Horizontal reference system

10.2.1 Spatial reference system

10.2.1.1 Authority of code space

10.2.1.1.1 Title of code space register

Coordinate reference system registry:

EPSG Geodetic Parameter Registry

10.2.1.1.2 Date of reference to the code space register

Reference date:

2009-11-25

10.2.1.1.3 Date type code

Date type according to ISO 19115 and CAN/CGSB-171.100-2009:

002 – publication

10.2.1.1.4 Responsible party

OPG - International Organisation of Oil and Gas Producers

URL: <<http://www.epsg-registry.org/>> or < <http://www.ogp.org>>

10.2.1.2 Code

Coordinate reference system identifier (CRSID):

The CGIS - CDED makes use of the OGP/EPSG code 4269 which is equivalent to NAD83 from the Geodetic Survey of Canada for its horizontal reference system.

10.2.1.3 Code Space

EPSG – European Petroleum Survey Group

10.2.1.4 Version of code space register

7.4.5

10.2.2 Reference to product specification scope

Global (See 7.2)

10.3 Vertical reference system

10.3.1 Spatial reference system

10.3.1.1 Authority of code space

10.3.1.1.1 Title of code space register

Coordinate reference system registry:

EPSG Geodetic Parameter Registry

10.3.1.1.2 Date of reference to the code space register

Reference date:

2009-11-25

10.3.1.1.3 Date type code

Date type according to ISO 19115 and CAN/CGSB-171.100-2009:

002 – publication

10.3.1.1.4 Responsible party

OPG - International Organisation of Oil and Gas Producers

URL: <<http://www.epsg-registry.org/>> or <<http://www.epsg.org>>

10.3.1.2 Code

Coordinate reference system identifier (CRSID):

The CGIS - NRN makes use of the OGP/EPSG code - 5114 which is equivalent to CGVD28 from the Geodetic Survey of Canada.

10.3.1.3 Code space

EPSG – European Petroleum Survey Group

10.3.1.4 Version of code space register

7.4.5

10.3.2 Reference to product specification scope

Global (See 7.2)

11 Data quality**11.1 Completeness**

Not Applicable

11.2 Logical consistency**11.2.1 Conceptual consistency**

All information presented in the UML model, Section 9.2.1, is provided in the CDED file.

11.2.2 Domain consistency

All values are according to the information identified in the code lists presented in the UML model.

11.2.3 Format consistency

Format complies with the CDED format as presented in the Logical Record A - Appendix B, and Logical Record B - Appendix C.

11.2.4 Topological consistency

Not Applicable.

11.3 Positional accuracy

11.3.1 Absolute external positional accuracy

Not Applicable

11.3.2 Relative internal positional accuracy (VD, GD)

Not Applicable

11.3.3 Gridded data positional accuracy (GD)

The source digital data for CDED is extracted from the hypsographic and hydrographic elements of the NTDB at scales of 1:50 000 and 1:250 000, the GDB, various scaled positional data acquired by the provinces and territories, or remotely sensed imagery. Due to the multiple sources, a homogeneous accuracy statement of CDED is not available.

11.4 Temporal accuracy

Not Applicable

11.5 Thematic accuracy

Not Applicable

11.6 Reference to specification scope

Global (See 7.2)

12 Portrayal

This National Standard for Canadian Digital Elevation data only addresses the information content of the CDED Product Specification 3.1 [Appendix G-6] and multiple representations of the data are not permitted.

13 Data product delivery

This National Standard for Canadian Digital Elevation data only addresses the information content of the CDED Product Specification 3.1 [Appendix G-6] and multiple encodings and product delivery mechanisms for the data are not permitted.

13.1 Delivery format information

13.1.1 Format name

The digital data exchange format for CDED is a profile of the USGS Standards for Digital Elevation Models (USGS 1997). Note that CDED does not utilize Logical Record C defined in the USGS Standards for Digital Elevation Models.

13.1.2 Language

eng – English
fra – Français

13.1.3 Character set

US-ASCII

Note: This character set is the 7-bit character set also known as ANSI X3.4-1968 (ANSI INCITS 4-1986 [Appendix G-2]), and ISO 646 International Reference Version registration 2. The Canadian standard equivalents are CSA Z234.4 and TBITS 3. This character set is a direct subset of the ISO 8859-1 8 bit and ISO 10646 UTF8 multi-byte character sets.

13.2 Delivery medium information

13.2.1 Units of delivery

The tile reference scheme for CDED models the NTS mapping series. The coverage for each CDED corresponds to half an NTS tile, which means there is always a western and eastern CDED cell to a whole NTS tile.

13.2.2 Transfer size

9609 Kilobytes

13.2.3 Medium name

GeoBase portal http and ftp

13.2.4 Other delivery information

Data is written as ANSI Standard ASCII characters and is recorded in IBM Standard fixed-block format.

Logical record size is 1024 bytes. No more than one logical record type (A or B) can be recorded in any 1024 byte record. However, more than one 1024 byte record is usually required to store a single record type B. Logical records are padded with blanks if necessary to fill to the end of the logical record.

There is only one Logical Record A for each CDED file, and it appears as the first record in the data file. Logical Record A contains general information about the CDED such as: CDED Responsibility Centre, software used to create the CDED, origin code, geographic coordinates of the four corners of the CDED, minimum and maximum elevations for the CDED, CDED edition/version, CDED Product Specifications edition/version. Please see Appendix B for complete information about the content of Logical Record A.

Logical Record B contains elevation data and associated header information. All Logical Record B's of the CDED files are made up of data from one-dimensional bands called profiles. Therefore, the number of profiles covering the CDED area is the same as the number of Logical Record B's in the CDED.

The number of elevation points per profile and the number of profiles per cell are constant for all CDED files (1201 x 1201). Please see Appendix C for complete information about the content of Type B Logical Record.

The following conventions shall be observed for the population of data fields in the Logical Record A and B elements:

1. All fields that are left empty shall be blank, ASCII space (binary 0010 0000);
2. All character fields of no data value shall be blank, ASCII space (binary 0010 0000);
3. All integer or character flagged fields of no data value but which default to zero shall be ASCII zero (binary 0011 0000);
4. All integer fields of no data value but which default to zero shall be ASCII zero (binary 0011 0000);

5. All real (non-integer) numeric fields shall be populated. Default zero fill respects the convention as shown below in Table 1. Exception: Data element 31, vertical datum shift, is left empty.
6. All character fields shall be in upper case, except for 'File name' and 'CDED Responsibility Centre' in Data Element 1 which uses a combination of upper and lower case. See section 10.4 for CDED file naming convention.
7. All fields are right justified, except for the 'Origin Code', which is left justified.

Table 1 — The record delivered by the CGN Level 1 dataset

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	Byte position
			.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	D	+	0	0	Standard format specified is D24.15. Zero values listed are common machine dependant numeric default for real zeros.
		0	.	0																				
		0	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	D	+	0	0	
			.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					

14 Metadata

The National Standard makes use of the North American Profile for Geographic Information Metadata and is based on the US FGDC metadata.

CDED collection and dataset level metadata are available on the GeoBase portal. The CDED collection metadata record is presented in Appendix E.

The metadata of the CDED dataset complies with the FGDC CSDGM Metadata and the NAP – Metadata Standard and may be provided in both forms. The records are available in xml or html format. Metadata files are stored in the same zip file as the east and west cells of the CDED. Files can be downloaded from the Digital Elevation Data section, found under the Data section at www.GeoBase.ca

The following metadata is available for each CDED record.

1. Identification Information
2. Data Quality Information
3. Spatial Data Organization Information
4. Spatial Reference Information
5. Entity and Attribute Information
6. Distribution Information
7. Metadata Reference Information

A sample CDED dataset level metadata record is presented in Appendix F.

14.1 Reference to specification scope

14.1.1 Format name

Global (See 7.2)

Appendix A

(Normative)

Abstract test suite

A.1 Test Case – Evaluation of Collection and Dataset Metadata

- a) Test purpose: Verify that all required Metadata entities are available and comply with the U.S. Federal Geographic Data Committee Standard FGDC-STD-001-1998.
- b) Test method:
 - i. Dataset level: For the NTS tile of interest, download dataset level metadata from the GeoBase portal. Review metadata record to ensure that all required Metadata entities are available and comply with the U.S. Federal Geographic Data Committee Standard FGDC-STD-001-1998.
 - ii. Collection level: Download collection level metadata from the GeoBase portal. Review metadata record to ensure that all required Metadata entities are available and comply with the U.S. Federal Geographic Data Committee Standard FGDC-STD-001-1998.
- c) Reference: Federal Geographic Data Committee. FGDC-STD-001-1998. Content standard for digital geospatial metadata (revised June 1998). Federal Geographic Data
- d) Test type: Basic.

A.2 Test Case – Evaluation of Logical Record A and B

- a) Test purpose: For the NTS tile of interest, verify that all required elements for Logical Record A and B entities are available and valid according to the CDED Product Specifications.
- b) Test method: Compare each element of Logical record A and B to ensure that they are populated with the correct domain values listed in the CDED Product Specification.
- c) Reference: CDED Level 1, Product Specification, Edition 3.1, June 2009
- d) Test type: Basic.

A.3 Test Case – Validation of Contours

- a) Test purpose: To ensure that valid contours can be successfully created from the CDED.
- b) Test method: Generate contours from the CDED. The difference in elevation between two (2) contour lines shall be one contour interval. Examine the contours for:
 - i. spikes and/or anomalies,
 - ii. Lakes - Ensure that the elevation outside of the lake is equal to or higher than the lake perimeter elevation and that the elevation inside the lake is equal to or lower than the lake perimeter elevation. The difference in elevation between the highest and lowest points shall not exceed ½ contour interval.
 - iii. Drain lines- for drain lines; ensure that all the points lie in a drain and not on a slope or ridge. The elevation on one side of the drain line is equal to or higher than the watercourse.

- iv. Drainage Flow - Ensure that the change in elevation of consecutive elevation points in a drain line remains in the same direction. The elevation of a point shall be greater than the next point downstream and lower than the next point upstream.
- v. Continuity – Ensure that contours between neighbouring CDED are continuous, and no gaps or spikes exist.
- c) Reference: Generation of Digital Elevation Model for Canadian Digital Elevation Data (CDED) Production, October 22, 2004
- d) Test type: Basic.

A.4 Test Case – Inspection of Edge Matching

- a) Test purpose: To ensure that the elevation values along the edges of a CDED are identical to the corresponding elevation values of the adjacent CDED.
- b) Test method: An inspection procedure can calculate the difference in elevation between each common point and generate statistics about these differences.
- c) Reference: Generation of Digital Elevation Model for Canadian Digital Elevation Data (CDED) Production, October 22, 2004
- d) Test type: Basic.

A.5 Test Case –Evaluation of minimum and maximum elevation values

- a) Test purpose: Verify that for each elevation, the elevation value is greater than mean sea level and lower than the highest summit found in Canada (ex. 5959 m). Also verify that the elevation is greater than or equal to the minimum elevation value recorded in data element 12 of Logical Record A.
- b) Test method: Inspect each grid point, to ensure that the elevation:
 - i. falls in the bounding values [0, 5 959],
 - ii. is greater than or equal to the minimum elevation value recorded in data element 12.
- c) Reference: CDED Level 1, Product Specification, Edition 3.1, June 2009
- d) Test type: Basic.

A.6 Test Case –Compare CDED with alternative DEM

- a) Test purpose: To identify anomalies and bias errors in the CDED.
- b) Test method: Compare CDED with digital elevation models generated by Natural Resources Canada Height Reference System modernization
- c) Reference: http://www.geod.nrcan.gc.ca/hm/images_e.php - 3b
- d) Test type: Basic.

Appendix B

(Normative)

Logical Record A

DATA ELEMENT	Contents	Format Type	ASCII	DOMAIN OF VALUES/ EXPLANATION
1	<p>CDED Responsibility Centre (The name of the organization that produced the CDED).</p> <p>Free format text When there is only one CDED producer, the producer's full name is used in this 60 character field. When there is more than one producer the field is divided into 4 subfields and the acronyms of all CDED producers that produced a portion of the CDED are listed within the first 3 subfields which are 18 characters long. The fourth subfield is only 6 characters in length and is reserved for the acronym CTI-O when the CDED has been clipped or merged by CTI-O. All subfields are right justified.</p>	ALPHA	A60	<p>Alberta Sustainable Resource Development - AB Gov - Edmonton (ASRD)</p> <p>Base Mapping and Geomatic Services - B.C. Gov. - Victoria (BMGS-BC)</p> <p>Centre for Topographic Information, Geomatics Canada (CTI)</p> <p>Centre for Topographic Information, Geomatics Canada, Ottawa (CTI-O)</p> <p>Direction générale de l'information géographique, MRNF, Québec (DGIG, MRNF)</p> <p>Landscape Analysis - Can. Forest Serv - Sault Ste. Marie (CFS-SSM)</p> <p>Ontario Ministry of Natural Resources (OMNR)</p> <p>Water Resources Information Program, OMNR (WRIP)</p> <p>Yukon Environment Information Management & Technology (YEIM)</p>
1	Filler		9 bytes	Blank fill
1	SW geographic corner	INTEGER*2 REAL*8	2(I4,I2,F7.4)	<p>SW geographic coordinates of NTS tile:</p> <p>Longitude SDDMMSS.SSSS</p> <p>Latitude SDDMMSS.SSSS</p>
1	<p>Process code</p> <p>Indicates the software used to create the DEM</p>	ALPHA	A1	<p>8 ANUDEM™</p> <p>9 FME™ for LINUX, build 842</p> <p>A TopoGrid™/3-D Analyst</p> <p>Z See the CDED Process Description in the CDED metadata file, available on the GeoBase portal, for information on the process code.</p> <p>http://www.GeoBase.ca</p>
1	Filler		1 byte	Blank fill
1	Sectional indicator	ALPHA	A3	Not used in this case.

DATA ELEMENT	Contents	Format Type	ASCII	DOMAIN OF VALUES/ EXPLANATION
2	<p>Origin code</p> <p>This field lists the acronym of the province or territory where the source data originates,</p> <p>or,</p> <p>it lists the acronym of the source data used to produce the CDED.</p> <p>This field is left justified.</p>	ALPHA	A4	<p>Acronym of the province or territory where the source data originates:</p> <p>AB Alberta</p> <p>BC British Columbia</p> <p>MB Manitoba</p> <p>NB New Brunswick</p> <p>NL Newfoundland & Labrador</p> <p>NS Nova Scotia</p> <p>NT Northwest Territories</p> <p>NU Nunavut</p> <p>ON Ontario</p> <p>PE Prince Edward Island</p> <p>QC Quebec</p> <p>SK Saskatchewan</p> <p>YT Yukon</p> <p>Acronyms for source data used to produce CDED:</p> <p>ASDB Aerial Survey Data Base</p> <p>GDB Geospatial Data Base</p> <p>NTDB National Topographic Data Base</p> <p>RS Remote Sensing Data</p> <p>MULT Indicates more than one source of data.</p> <p>Z See CDED metadata record for source data origin.</p> <p>For MULT and Z see the CDED metadata record under Section 2, Data Quality Information, Lineage, Title, for details on the data sources.</p> <p>This field is left justified.</p>
3	DEM level code	INTEGER*2	I6	<p>1 DEM-1</p> <p>2 DEM-2</p> <p>3 DEM-3</p> <p>This field is set to "1" for 1:50 000 and 1:250 000 CDED</p>
4	Code defining the elevation pattern (regular or random).	INTEGER*2	I6	<p>1 regular</p> <p>2 random</p> <p>This field is set to "1"</p>
5	Code defining the planimetric reference system.	INTEGER*2	I6	<p>0 Geographic</p> <p>1 UTM</p> <p>2 state plane (USA)</p> <p>This field is set to "0"</p>

DATA ELEMENT	Contents	Format Type	ASCII	DOMAIN OF VALUES/ EXPLANATION
6	Code defining the zone in the planimetric reference system.	INTEGER*2	I6	This field is set to "0" for 1:50 000 and 1:250 000 CDED.
7	Map projection parameters	REAL*8	15D24.15	All 15 fields of this element are set to "0" and should be ignored when geographic.
8	Code defining the unit of measure for the planimetric coordinates throughout the file.	INTEGER*2	I6	0 radians 1 feet 2 meters 3 arc seconds This field is set to "3".
9	Code defining the unit of measure for the elevation coordinates throughout the file.	INTEGER*2	I6	1 feet 2 meters This field is set to "2".
10	Number (n) of sides in the polygon that defines the coverage of the CDED file.	INTEGER*2	I6	"n" is set to "4".
11	A 4,2 array containing the geographic coordinates of the four corners of the CDED.	REAL*8	4(2D24.15)	The coordinates of the NTS tile corners are ordered clockwise beginning with the southwest corner. The array is stored as pairs of longitude and latitude in arc seconds.
12	A two-element array containing minimum and maximum elevations for the CDED.	REAL*8	2D24.15	The values are in the unit of measure given by data element 9 (meters). This field does not consider -32767 (void area) as a value, except when the entire profile value is - 32767.
13	Counter clockwise angle (in radians) from the primary axis of the planimetric reference to the primary axis of the CDED local reference system.	REAL*8	D24.15	Set to "0", to align with the coordinate system specified in element 5. Expressed in radians.
14	Accuracy code for elevations	INTEGER*2	I6	Set to "0" as no Type C Record exists for this product.
15	A three-element array containing CDED spatial resolution (x, y, z). Units of measure for these resolution elements are consistent with those indicated by data elements 8 and 9 in this record.	REAL*4	3E12.6	These elements are set to the following depending on latitude: 1:50 000 CDED 0.75, 0.75, 1 (Area A) 1.5, 0.75, 1 (Area B) 3, 0.75, 1 (Area C) 1:250 000 CDED 3, 3, 1 (Area A) 6, 3, 1 (Area B) 12, 3, 1 (Area C) These units should not be confused with data accuracy.
16	A two-element array containing the number of rows and columns (m, n) of profiles in the CDED.	INTEGER*2	2I6	The row value m is set to "1". Thus, the n value describes the number of columns in the CDED file (1201).

DATA ELEMENT	Contents	Format Type	ASCII	DOMAIN OF VALUES/ EXPLANATION
17	Largest primary contour interval	INTEGER*2	I5	Present only if two or more primary intervals exist. This field is left empty.
18	Largest source contour interval unit	INTEGER*1	I1	Corresponds to the unit of the source data's largest primary contour interval 0 NA 1 feet 2 meters This field is left empty.
19	Smallest primary contour interval.	INTEGER*2	I5	Smallest or only primary contour interval. This field is left empty.
20	Smallest source contour interval unit	INTEGER*1	I1	Corresponds to the unit of the source data's smallest primary contour interval: 1 feet 2 meters This field is left empty.
21	Data source date	INTEGER*2	I4	YYMM: two-digit year and two-digit month. MM is "00" for source having year only. This field is left empty.
22	Data inspection/revision date	INTEGER*2	I4	YYMM: two-digit year and two-digit month. This field is left empty.
23	Inspection/revision flag	ALPHA*1	A1	"I" or "R". This field is left empty.
24	Data validation flag	INTEGER*1	I1	0 No validation performed. 1 RMSE computed from test points, no quantitative test, no interactive CDED editing or review. 2 Batch process water body edit and RMSE computed from test points. 3 Review and edit, including water edit; no RMSE computed from test points. 4 CDED reviewed and edited. Includes water body editing RMSE computed from test points. This field is left empty.
25	Suspect and void area flag	INTEGER*1	I2	0 none 1 suspect areas 2 void areas 3 suspect and void areas This field is set to "0" or "2".

DATA ELEMENT	Contents	Format Type	ASCII	DOMAIN OF VALUES/ EXPLANATION
26	Vertical datum	INTEGER*1	I2	1 local mean sea level (MSL) 2 National Geodetic Vertical Datum 1929 (NGVD29) 3 North American Vertical Datum 1988 (NAVD88) This field is set to "1".
27	Horizontal datum	INTEGER*1	I2	1 NAD27 2 WGS72 3 WGS84 4 NAD83 This field is set to "4".
28	CDED edition/version, Product Specifications edition/version	INTEGER*2	I4	1020 represents the CDED edition version, and the CDED Product Specifications edition version. Two first digits = CDED edition version (e.g. 10 means edition 1 version 0) Two last digits = Product Specifications edition version (e.g. 20 means edition 2 version 0 of the Product Specifications)
29	Percent void	INTEGER*2	I4	This field contains the percentage of nodes set to void (-32767) in the CDED. If there are no void values the percentage of voids should be reported as 0.
30	Edge-match flag	INTEGER*1	4I2	Edge-match status flag. Ordered west, north, east, and south. Explanation of codes: 1 Edge-matched 3 No match required 4 Edge not matched This field is left empty.
31	Vertical datum shift	REAL*8	F7.2	This field is left empty.

Appendix C

(Normative)

Logical Record B

DATA ELEMENT	Contents	Format Type	ASCII	DOMAIN OF VALUES/ EXPLANATION
1	A two-element array containing the row and column identification number of the CDED profile contained in this record.	INTEGER*2	2I6	The identification number ranges from 1 to m (rows) and from 1 to n (columns or profiles). Rows are normally set to "1". The column identification is the profile sequence number.
2	A two-element array containing the number of rows and columns (m, n) of elevations in the CDED profile.	INTEGER*2	2I6	This first element in the field corresponds to the number of rows or nodes in the profile (1201). The second element in this field is set to "1", specifying 1 column per profile.
3	A two-element array containing the horizontal coordinates of the first elevation in the profile.	REAL*8	2D24.15	Planimetric coordinates (longitude and latitude) in arc seconds according to element 8 in Type A Logical Record
4	Elevation of local vertical datum for the profile.	REAL*8	D24.15	The values are in the units of measure given by data element 9 in Logical Record Type A. Set to "0" for 1 degree CDED (reference is MSL).
5	A two-element array of minimum and maximum elevations for the profile.	REAL*8	2D24.15	The values are in the units of measure given by data element 9 in Type A Logical Record.
6	The array of m x n elevations for the profile. Elevations are expressed in units of resolution elements (meters).	INTEGER*2	mn (I6)	A value in this array would be multiplied by the spatial resolution value and added to the elevation of the local elevation datum for the profile to obtain the elevation for the point.

Appendix D

(Normative)

Data Dictionary

D.1 Data Dictionary General Information

Name	CDED Feature Catalogue
Scope	This is a Data Dictionary for CDED. CDED consists of an ordered array of ground or reflective surface elevations recorded in meters.
Field of application	CDED plays the same role as contours and relief shading on conventional paper maps. It serves as key primary data in a range of applications critical to achieving sustainable development. These applications include environmental and ecological impact assessments, water flow and water quality analysis, climate change studies, forest regeneration planning and wildlife habitats. In addition, CDED can be used in the generation of three-dimensional graphics displaying terrain slope, profiles and line of sight. Other applications include geoid calculations, terrain modelling, flood simulations and telecommunication studies.
Producer	Organization Name: Canadian Council on Geomatics
Version Number	1.0
Version Date	May 29, 2009
Functional Language	English

D.2 Feature Type CDEDRecordA

Type name	CDEDRecordA
Definition	Logical Record A contains general information about the CDED such as: CDED Responsibility Centre, software used to create the CDED, origin code, geographic coordinates of the four corners of the CDED, minimum and maximum elevations for the CDED, CDED edition/version, CDED Product Specifications edition/version.
isAbstract	false

D.3 Attributes CDEDRecordA

Name	fileName
Definition	File name for complete and interim CDED. Interim CDED straddle a provincial or territorial boundary. The file name contains the provincial or territorial acronym to indicate the province or territory that produced the CDED.
Cardinality	1..1
Value type	CharacterString

Name	responsibilityCentre		
Definition	The name of the organization that produced the CDED.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	Alberta Sustainable Resource Development - AB Gov - Edmonton		CDED produced by Alberta Sustainable Resource Development, Alberta provincial government.
	ASRD		Subfield. Alberta Sustainable Resource Development was one of the producers of the CDED.
	Base Mapping and Geomatic Services - B.C. Gov. - Victoria		CDED produced by Base Mapping and Geomatic Services - British Columbia provincial government.
	BMGS-BC		Subfield. British Columbia Base Mapping and Geomatic Services was one of the producers of the CDED.
	Centre for Topographic Information, Geomatics Canada		CDED produced by Centre for Topographic Information, Geomatics Canada
	CTI		Subfield. Centre for Topographic Information, Natural Resources Canada was one of the producers of the CDED.
	Centre for Topographic Information, Geomatics Canada, Ottawa		CDED produced by Centre for Topographic Information, Geomatics Canada, Ottawa
	CTI-O		Subfield. Centre for Topographic Information, Natural Resources Canada, Ottawa was one of the producers of the CDED.
	Direction générale de l'information géographique, MRNF, Québec		CDED produced by Direction générale de l'information géographique, MRNF, Québec, Québec provincial government
	DGIG, MRNF		Subfield. Direction générale de l'information géographique, MRNF, Québec was one of the producers of the CDED.
	Landscape Analysis - Can. Forest Serv - Sault Ste. Marie		CDED produced by Landscape Analysis - Canadian Forest Service - Sault Ste. Marie
	CFS-SSM		Subfield. Landscape Analysis - Canadian Forest Service - Sault Ste. Marie was one of the producers of the CDED.
	Ontario Ministry of Natural Resources		CDED produced by Ontario Ministry of Natural Resources, Ontario provincial government.
	OMNR		Subfield. Ontario Ministry of Natural Resources was one of the producers of the CDED.

	Water Resources Information Program, OMNR		CDED produced by Water Resources Information Program, Ontario provincial government.
	WRIP		Subfield. Water Resources Information Program, OMNR Ontario provincial government was one of the producers of the CDED.
	Yukon Environment Information Management & Technology		CDED produced by Yukon Environment Information Management & Technology, Yukon territorial government
	YEIM		Subfield. Yukon Environment Information Management & Technology was one of the producers of the CDED.
Value type	«CodeList» Responsibility Centre		

Name	swGeographicCorner
Definition	SW geographic coordinates of NTS tile
Cardinality	1..1
Value type	GeographicCorner

Name	processCode		
Definition	Indicates the software used to create the DEM.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	8		ANUDEM™
	9		FME™ for LINUX, build 842
	A		TopoGrid™/3-D Analyst
	Z		See the CDED Process Description in the CDED metadata file, available on the GeoBase portal, for information on the process code. http://www.GeoBase.ca
Value type	«CodeList» ProcessCode		

Name	originCode
Definition	Acronym of the province or territory where the source data originates or Acronym of the source data used to produce the CDED.
Cardinality	1..1
Value type	OriginCode

Name	demLevelCode		
Definition	CDED Level 1. The default is 1.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	1	DEM-1	CDED Level 1

Name	elevationPatternCode		
Definition	Code defining the elevation pattern. The default is 1.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	1		regular

Name	planimetricReferenceSystem		
Definition	Code defining the planimetric reference system. The default is 0.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	0		Geographic

Name	planimetricCoordinateUnit		
Definition	Code defining the unit of measure for the planimetric coordinates throughout the file. The default is 3.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	3		Arc seconds

Name	elevationCoordinateUnit		
Definition	Code defining the unit of measure for the elevation coordinates throughout the file. The default is 2.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	2		Meters

Name	numberOfSides		
Definition	Number of sides in the polygon that defines the coverage of a CDED file. The default value is 4.		
Cardinality	1..1		
Value type	Integer = 4		

Name	corners		
Definition	Geographic coordinates of the four corners of the CDED.		
Cardinality	1..1		
Value type	TileCorners		

Name	elevationMinMax
Definition	Minimum and maximum elevations for the CDED. elevationMinMax does not consider -32767(void) area as a value, except when the entire profile is - 32767.
Cardinality	1..1
Value type	ElevationExtent

Name	resolution
Definition	Post spacing within the CDED varies according to the geographic location (latitude) of the cell.
Cardinality	1..1
Value type	Resolution

Name	dimension
Definition	The number of rows and columns of profiles in the CDED.
Cardinality	1..1
Value type	Dimension

Name	voidAreaFlag		
Definition	Void areas (areas where there is no data) are represented by elevation values of -32767. However, CDED produced before April 2004 shows the void values as -32767 or zero. CDED may contain void areas when they include lands or waters outside Canada's borders.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	0		None
	2		Void areas
Value type	«CodeList» VoidArea		

Name	verticalDatum		
Definition	Vertical datum. The default is 1.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	1		Local mean sea level(MSL)

Name	horizontalDatum		
Definition	Horizontal datum. The default is 4.		
Cardinality	1..1		
Listed values	Code	Label	Definition
	4		NAD83

Name	editionVersion
Definition	CDED edition/version, Product Specifications edition/version.
Cardinality	1..1
Value type	Edition

Name	percentVoid
Definition	Contains the percentage of nodes set to void (-32767) in the CDED.
Cardinality	1..1
Value type	Integer

D.4 Feature Type CDEDRecordB

Type name	CDEDRecordB
Definition	Logical Record B contains elevation data and associated header information.
isAbstract	false

D.5 Attributes CDEDRecordB

Name	profileRowColumnId
Definition	Contains the row and column identification number of the CDED profile contained in Logical Record B.
Cardinality	1..1
Value type	ProfileID

Name	profileRowColumnNumber
Definition	A two-element array containing the number of rows and columns (m, n) of elevations in the CDED profile.
Cardinality	1..1
Value type	ProfileDimension

Name	firstElevationHorizontalPosition
Definition	The horizontal coordinates of the first elevation in the profile.
Cardinality	1..1
Value type	Coordinate

Name	elevationVerticalDatum
Definition	Elevation of local vertical datum for the profile.
Cardinality	1..1
Value type	Integer = 0 ("1 degree CDED")

Name	profileMinMax
Definition	Minimum and maximum elevations for the profile.
Cardinality	1..1
Value type	ElevationExtent

Name	profileElevations
Definition	Elevations for the profile.
Cardinality	1..1
Value type	Set(Integer)

D.6 Feature type ProfileID

Type name	ProfileID
Definition	Row and column identification number of the CDED profile.
isAbstract	false

D.7 Attribute ProfileID

Name	rowId
Definition	Row identification number of the CDED profile. Rows are normally set to "1".
Cardinality	1..1
Value type	Integer = 1 Note: Value always equals 1

Name	columnId
Definition	Column identification number of the CDED profile. The column identification is the profile sequence number.
Cardinality	1..1
Value type	Integer

D.8 Feature Type ProfileDimension

Type name	ProfileDimension
Definition	The number of rows and columns (m, n) of elevations in the CDED profile.
isAbstract	false

D.9 Attributes ProfileDimension

Name	numberOfRows
Definition	The number of rows or nodes in the profile.
Cardinality	1..1
Value type	Integer

Name	numberOfColumns
Definition	The number of column is set to 1 per profile.
Cardinality	1..1
Value type	Integer = 1 Note: Value always equals 1

D.10 Feature Type OriginCode

Type name	«Union» OriginCode
Definition	Acronym of the province or territory where the source data originates, or the acronym of the source data used to produce the CDED.
isAbstract	false

D.11 Attributes OriginCode

Name	province		
Definition	This field lists the acronym of the province or territory where the source data originates.		
Cardinality	0..1		
Listed values	Code	Label	Definition
	AB		Source data originated from Alberta provincial government.
	BC		Source data originated from British Columbia provincial government.
	MB		Source data originated from Manitoba provincial government.
	NB		Source data originated from New Brunswick provincial government.
	NL		Source data originated from Newfoundland and Labrador provincial government.
	NS		Source data originated from Nova Scotia provincial government.
	NT		Source data originated from Northwest Territories territorial government.
	NU		Source data originated from Nunavut territorial government.
	ON		Source data originated from Ontario provincial government.
	PE		Source data originated from Prince Edward Island provincial government.
	QC		Source data originated from Quebec provincial government.
	SK		Source data originated from Saskatchewan provincial government.
	YT		Source data originated from Yukon territorial government.
Value type	«CodeList» Province		

Name	sourceData		
Definition	This field lists the acronym of the source data used to produce the CDED.		
Cardinality	0..1		
Listed values	Code	Label	Definition
	ASDB		Aerial Survey Data Base was the source data used to produce CDED
	GDB		Geospatial Data Base was source data used to produce CDED.
	MULT		Indicates more than one source of data. See the CDED dataset level metadata record for details on the data sources.
	NTDB		National Topographic Data Base was the source data used to produce CDED.
	RS		Remotely sensed data was the source data used to produce CDED
	Z		From the GeoBase portal, see CDED dataset level metadata for details on the data sources.
Value type	«CodeList» SourceData		

D.12 Feature Type TileCorner

Type name	TileCorner
Definition	geographic coordinates of the four corners of the CDED
isAbstract	false

D.13 Attributes TileCorner

Name	northWest
Definition	Coordinate of the north-west corner of the tile.
Cardinality	1..1
Value type	Coordinate

Name	southWest
Definition	Coordinate of the south-west corner of the tile.
Cardinality	1..1
Value type	Coordinate

Name	northEast
Definition	Coordinate of the north east-corner of the tile.
Cardinality	1..1
Value type	Coordinate

Name	southEast
Definition	Coordinate of the south-east corner of the tile.
Cardinality	1..1
Value type	Coordinate

D.14 Feature Type GeographicCorner

Type name	GeographicCorner
Definition	Southwest geographic coordinate of NTS tile.
isAbstract	false

D.15 Attributes GeographicCorner

Name	longitude
Definition	Longitude of the south-west geographic coordinate of NTS tile.
Cardinality	1..1
Value type	DMS

Name	latitude
Definition	Latitude of the south-west geographic coordinate of NTS tile.
Cardinality	1..1
Value type	DMS

D.16 Feature Type DMS

Type name	DMS
Definition	An angle represented in degrees, minutes and seconds.
isAbstract	false

D.17 Attributes DMS

Name	degrees
Definition	Number of degrees of the angle.
Cardinality	1..1
Value type	integer

Name	minutes
Definition	Number of minutes of the angle.
Cardinality	1..1
Value type	integer

Name	seconds
Definition	Number of seconds of the angle.
Cardinality	1..1
Value type	real

D.18 Feature Type ElevationExtent

Type name	ElevationExtent
Definition	Minimum and maximum values to describe the range of elevations.
isAbstract	false

D.19 Attributes ElevationExtent

Name	minimumElevation
Definition	Minimum elevation value. MinimumElevation does not consider -32767 (void) area as a value, except when the entire profile is -32767.
Cardinality	1..1
Value type	Real

Name	maximumElevation
Definition	Maximum elevation value. Maximum Elevation does not consider -32767 (void) area as a value, except when the entire profile is -32767.
Cardinality	1..1
Value type	Real

D.20 Feature Type Resolution

Type name	Resolution
Definition	Representation of the resolution in three elements xResolution, yResolution, and zResolution.
isAbstract	false

D.21 Attributes Resolution

Name	xResolution			
Definition	Resolution	Area	Scale	
	0.75	A	1:50 000	Up to 68° latitude
	1.5	B	1:50 000	68° to 80° latitude
	3	C	1:50 000	80° to 90° latitude
	3	A	1:250 000	Up° to 68° latitude
	6	B	1:250 000	68° to 80° latitude
	12	C	1:250 000	80° to 90° latitude
Cardinality	1..1			
Value type	Real			

Name	yResolution			
Definition	Resolution	Area	Scale	
	0.75	A	1:50 000	Up to 68° latitude
	0.75	B	1:50 000	68° to 80° latitude
	0.75	C	1:50 000	80° to 90° latitude
	3	A	1:250 000	Up° to 68° latitude
	3	B	1:250 000	68° to 80° latitude
	3	C	1:250 000	80° to 90° latitude
Cardinality	1..1			
Value type	Real			

Name	zResolution			
Definition	Resolution	Area	Scale	
	1	A	1:50 000	Up to 68° latitude
	1	B	1:50 000	68° to 80° latitude
	1	C	1:50 000	80° to 90° latitude
	1	A	1:250 000	Up° to 68° latitude
	1	B	1:250 000	68° to 80° latitude
	1	C	1:250 000	80° to 90° latitude
Cardinality	1..1			
Value type	Real			

D.22 Feature Type Dimension

Type name	Dimension
Definition	representation of the dimension in terms of number of row and number of columns
isAbstract	false

D.23 Attributes Dimension

Name	numberOfRow
Definition	Representation of the number of rows.
Cardinality	1..1
Value type	Integer = 1

Name	numberOfColumn
Definition	Representation of the number of columns.
Cardinality	1..1
Value type	Integer

D.24 Feature Type Edition

Type name	Edition
Definition	Representation of the edition of a CDED tile.
isAbstract	false

D.25 Attributes Edition

Name	cdedEdition
Definition	The edition number of the CDED tile.
Cardinality	1..1
Value type	Integer

Name	cdedVersion
Definition	The version number of the CDED tile.
Cardinality	1..1
Value type	Integer

Name	productSpecificationEdition
Definition	The edition number of the product specification.
Cardinality	1..1
Value type	Integer

Name	productSpecificationVersion
Definition	the version number of the product specification.
Cardinality	1..1
Value type	Integer

D.26 Feature Type ProfileID

Type name	ProfileID
Definition	Representation of the profile identifier in terms of row identifier and column identifier.
isAbstract	false

D.27 Attributes ProfileID

Name	rowid
Definition	The row identifier number.
Cardinality	1..1
Value type	Integer

Name	columnid
Definition	The column identifier number.
Cardinality	1..1
Value type	Integer

D.28 Feature ProfileDimension

Type name	ProfileDimension
Definition	The representation of a profile dimension.
isAbstract	false

D.29 Attributes ProfileDimension

Name	numberOfRows
Definition	The number of rows or nodes in the profile.
Cardinality	1..1
Value type	Integer

Name	numberOfColumns
Definition	The number of columns in the profile (1 column per profile).
Cardinality	1..1
Value type	Integer = 1

Appendix E

(Normative)

CDED Collection Level Metadata Record

E.1 Overview

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Entity and Attribute Information
- Distribution Information
- Metadata Reference Information

E.2 Identification Information:

Citation:

Citation Information:

Originator:

Government of Canada, Natural Resources Canada, Earth Sciences Sector, Centre for Topographic Information

Publication Date: 2000-09

Title:

Canadian Digital Elevation Data

Geospatial Data Presentation Form:

raster digital data

Publication Information:

Publication Place:

Sherbrooke, Quebec, Canada

Publisher:

Government of Canada, Natural Resources Canada, Earth Sciences Sector, Centre for Topographic Information

Other Citation Details:

English, GeoBase

Online Linkage

<http://www.geobase.ca/GeoBase/en/data/cded/index.html>

Online Linkage:

<http://ftp2.cits.rncan.gc.ca/pub/GeoBase/official/cded/wmc/cded.xml>

Description:**Abstract:**

The Centre for Topographic Information (CTI) jointly produces the CDED with federal, provincial and territorial government agencies, as well as, the private sector.

A CDED consists of an ordered array of ground or reflective surface elevations, recorded in meters, at regularly spaced intervals. The source digital data for CDED is extracted from the hypsographic and hydrographic elements of the National Topographic Data Base (NTDB) at scales of 1:50 000 and 1:250 000, or the Geospatial Data Base (GDB), or various scaled positional data acquired by the provinces and territories, or remotely sensed imagery.

Purpose:

CDED plays the same role as contours and relief shading on conventional paper maps. CDED serves as a key primary data in a range of applications critical to achieving sustainable development.

These applications include environmental and ecological impact assessments, water flow and water quality analysis, climate change studies, forest regeneration planning and wildlife habitats.

In addition, CDED can be used in the generation of three-dimensional graphics displaying terrain slope, profiles and line of sight. Non-graphic applications include geoid calculations, terrain modeling, flood simulations and telecommunication studies.

Time Period of Content:**Time Period Information:****Range of Dates/Times:****Beginning Date:**

1945-01-01

Status:**Progress:**

In Work

Maintenance and Update Frequency:

Not applicable

Spatial Domain:**Bounding Coordinates:**

West Bounding Coordinate: -141

East Bounding Coordinate: -52

North Bounding Coordinate: 84

South Bounding Coordinate: 41

Keywords:**Theme:**

Theme Keyword Thesaurus: GCMD

Theme Keyword: Earth Science > Land Surface > Topography>Contours

Theme Keyword: Earth Science > Land Surface > Topography>Terrain Elevation

Theme Keyword: Earth Science > Land Surface > Topography>Topographic Effects

Theme Keyword: Earth Science > Land Surface > Topography > Topographical Relief

Theme:**Theme Keyword Thesaurus:** None**Theme Keyword:** Elevation**Theme Keyword:** DEM**Theme Keyword:** DTM**Theme Keyword:** Digital Elevation Model**Place:****Place Keyword Thesaurus:** GCMD**Place Keyword:** Global Regions > Mid-latitude**Place Keyword:** Global Regions > North America**Place Keyword:** Global Regions > Northern Hemisphere**Place Keyword:** Global Regions > Western Hemisphere**Place:****Place Keyword Thesaurus:** none**Place Keyword:** Continent > North America > Canada**Place Keyword:** Continent > North America > Canada>Alberta**Place Keyword:** Continent > North America > Canada>British Columbia**Place Keyword:** Continent > North America > Canada>Manitoba**Place Keyword:** Continent > North America > Canada>New Brunswick**Place Keyword:** Continent > North America > Canada>Newfoundland and Labrador**Place Keyword:** Continent > North America > Canada>Northwest Territories**Place Keyword:** Continent > North America > Canada>Nova Scotia**Place Keyword:** Continent > North America > Canada>Nunavut**Place Keyword:** Continent > North America > Canada>Ontario**Place Keyword:** Continent > North America > Canada>Prince Edward Island**Place Keyword:** Continent > North America > Canada>Quebec**Place Keyword:** Continent > North America > Canada>Saskatchewan**Place Keyword:** Continent > North America > Canada>Yukon**Access Constraints:** User registration is required to have access to the data**Use Constraints:**Data are subject to the GeoBase Unrestricted Use Licence Agreement (<http://www.geobase.ca/en/licence.jsp>)**Point of Contact:****Contact Information:****Contact Organization Primary:****Contact Person:** GeoBase Technical Support**Contact Organization:**

Government of Canada, Natural Resources Canada, Centre for Topographic Information

Contact Address:**Address Type:**

Mailing and physical

Address:

2144, King Street West, Suite 010

City:
Sherbrooke

State or Province:
Quebec

Postal Code:
J1J 2E8

Country:
Canada

Contact Voice Telephone:
+01-819-564-4857 / 1-800-661-2638 (Canada and USA)

Contact Facsimile Telephone:
+01-819-564-5698

Contact Electronic Mail Address:
SupportGeoBase@NRCan.gc.ca

E.3 Data Quality Information

Logical Consistency Report:

Canada's coastline, oceans and estuaries at mean sea level, are assigned an elevation value of zero meters. However, the Nova Scotia coastline, oceans, and estuaries are depicted at the mean high water level (MHWL), which has varying elevations across the province. All MHWL elevation values are with reference to the Canadian Geodetic Vertical Datum 1928 (CGVD28).

For CDED produced using ground elevations, water bodies are naturally occurring areas of constant elevation (lakes) or having a small slope (rivers). Water bodies are assigned their known elevations or estimated values. Lakes are represented flatter and lower than the surrounding terrain (one elevation per lake) and the shore shall be clearly discernible. A water body of unknown elevation is assigned an interpolated elevation that is at least one metre lower than the contour elevation surrounding its shores. Drainage (rivers and streams) shall be continuous (no gaps), have constant water flow and a descending order of z-values.

For CDED produced using reflective surface elevations, water bodies (lakes) may not have a constant elevation. They may have a small slope to indicate the direction of the water flow.

Quality control shall assure that the CDED is smooth within the grid and continuous from node to node, except at natural break points such as streams, cliffs, and craters.

Completeness Report:

The content of the CDED1 data sets is constant since the number of elevation points per profile and the number of profiles per cell are constant for all CDED1 files (1201 x 1201).

Positional Accuracy:

Horizontal Positional Accuracy:

Horizontal Positional Accuracy Report:

Accuracy evaluation is related to the data source(s) used to generate the CDED.

Vertical Positional Accuracy:

Vertical Positional Accuracy Report:

Accuracy evaluation is related to the data source(s) used to generate the CDED

E.4 Spatial Data Organization Information**Direct Spatial Reference Method:** Raster**Raster Object Information:****Raster Object Type:** Grid Cell**Row Count:** 1201**Column Count:** 1201**E.5 Spatial Reference Information****Horizontal Coordinate System Definition:****Geographic:****Latitude Resolution:** 0.0001**Longitude Resolution:** 0.0001**Geographic Coordinate Units:** Decimal seconds**Geodetic Model:****Horizontal Datum Name:**

NAD83 (North American Datum 1983 in Canadian Spatial Reference System)

Ellipsoid Name:

GRS80 (Geodetic Reference System 1980)

Semi-major Axis:

6378137

Denominator of Flattening Ratio:

298.257222101

Vertical Coordinate System Definition:**Altitude System Definition:****Altitude Datum Name:**

MSL (Mean Sea Level) / CGVD28 (Canadian Geodetic Vertical Datum of 1928)

Altitude Resolution: 1**Altitude Distance Units:** Meter**Altitude Encoding Method:** Implicit coordinate

E.6 Entity and Attribute Information

Overview Description:

Entity and Attribute Overview:

See details citation

Entity and Attribute Detail Citation:

Canadian Digital Elevation Data, Product Specifications. View the Product Specifications in the Documentation Section at <http://www.geobase.ca/GeoBase/en/data/cded/description.html>

E.7 Distribution Information

Distributor:

Contact Information:

Contact Organization Primary:

Contact Person:

GeoBase Technical Support

Contact Organization:

Government of Canada, Natural Resources Canada, Centre for Topographic Information

Contact Address:

Address Type:

Mailing and physical

Address:

2144, King Street West, Suite 010

City:

Sherbrooke

State or Province:

Quebec

Postal Code:

J1J 2E8

Country:

Canada

Contact Voice Telephone:

+01-819-564-4857 / 1-800-661-2638 (Canada and USA)

Contact Facsimile Telephone:

+01-819-564-5698

Contact Electronic Mail Address:

SupportGeoBase@NRCan.gc.ca

Distribution Liability:

Data are subject to the GeoBase Unrestricted Use Licence Agreement
(<http://www.geobase.ca/geobase/en/licence.jsp>)

Standard Order Process:**Digital Form:****Digital Transfer Information:****Format Name:**

CDED ASCII

File Decompression Technique:

WinZip compression software

Digital Transfer Option:

Online Option:

Computer Contact Information:**Network Address:****Network Resource Name:**

FTP site

Fees:

Gratuit-Free

E.8 Metadata Reference Information**Metadata Date:**

2003-10-28

Metadata Review Date:

2009-04-29

Metadata Future Review Date:

2010-12-25

Metadata Contact:**Contact Information:****Contact Organization Primary:**

Contact Person: GeoBase Technical Support

Contact Organization:

Government of Canada, Natural Resources Canada, Centre for Topographic Information

Contact Address:**Address Type:**

Mailing and physical

Address:

2144, King Street West, Suite 010

City:
Sherbrooke

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Quebec

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Country:
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Contact Voice Telephone:
+01-819-564-4857 / 1-800-661-2638 (Canada and USA)

Contact Facsimile Telephone:
+01-819-564-5698

Contact Electronic Mail Address:
SupportGeoBase@NRCan.gc.ca

Metadata Standard Name:
FGDC Content Standard for Digital Geospatial Metadata

Metadata Standard Version:
FGDC-STD-001-1998

Appendix F

(Informative)

Sample CDED Dataset Level Metadata Record Canadian Digital Elevation Data, Level 1 (CDED1) 082J11

F.1 Overview

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Entity and Attribute Information
- Distribution Information
- Metadata Reference Information

F.2 Example Identification Information:

Citation:

Citation Information:

Originator:

Base Mapping and Geomatic Services - British Columbia Government - Victoria, Alberta
Sustainable Resource Development - Alberta Government - Edmonton, Centre for Topographic
Information - Geomatics Canada - Ottawa

Publication Date:

2006-02-10

Title:

082J11

Edition:

Dataset: 1.0 Metadata: 1

Geospatial Data Presentation Form:

raster digital data

Series Information:**Series Name:**

Canadian Digital Elevation Data, Level 1 (CDED1)

Issue Identification:

None

Publication Information:**Publication Place:**

Sherbrooke, Quebec, Canada

Publisher:

Government of Canada, Natural Resources Canada, Centre for Topographic Information

Other Citation Details:
English, GeoBase

Online Linkage:
<http://www.geobase.ca/>

Description:

Abstract:

The Centre for Topographic Information (CTI) jointly produces the CDED with federal, provincial and territorial government agencies as well as the private sector.

A CDED consists of an ordered array of ground or reflective surface elevations, recorded in meters, at regularly spaced intervals. The source digital data for CDED is extracted from the hypsographic and hydrographic elements of the National Topographic Data Base (NTDB) at scales of 1:50 000 and 1:250 000, or the Geospatial Data Base (GDB), or various scaled positional data acquired by the provinces and territories, or remotely sensed imagery.

Purpose:

CDED plays the same role as contours and relief shading on conventional paper maps. CDED serves as a key primary data in a range of applications critical to achieving sustainable development.

These applications include environmental and ecological impact assessments, water flow and water quality analysis, climate change studies, forest regeneration planning and wildlife habitats.

In addition, CDED can be used in the generation of three-dimensional graphics displaying terrain slope, profiles and line of sight. Non-graphic applications include geoid calculations, terrain modelling, flood simulations and telecommunication studies.

Supplemental Information:

Minimum Elevation (Z): 1148 meters
Maximum Elevation (Z): 3427 meters
Elevation Type: ground

Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:
1985-08-01

Ending Date:
1996-06-04

Currentness Reference:
Ground condition and/or production

Status:

Progress:
Complete

Maintenance and Update Frequency:
As needed

Spatial Domain:**Bounding Coordinates:****West Bounding Coordinate:**

-115.5

East Bounding Coordinate:

-115

North Bounding Coordinate:

50.75

South Bounding Coordinate:

50.5

Keywords:**Theme:****Theme Keyword Thesaurus:**

GCMD

Theme Keyword:

EARTH SCIENCE > LAND SURFACE > TOPOGRAPHY > CONTOURS

Theme Keyword:

EARTH SCIENCE > LAND SURFACE > TOPOGRAPHY > TERRAIN ELEVATION > DEM

Theme Keyword:

EARTH SCIENCE > LAND SURFACE > TOPOGRAPHY > TOPOGRAPHIC RELIEF > DEM

Theme Keyword:

EARTH SCIENCE > LAND SURFACE > TOPOGRAPHY > TOPOGRAPHIC EFFECTS

Theme Keyword:

DEM

Theme Keyword:

DTM

Theme Keyword:

ELEVATION

Place:**Place Keyword Thesaurus:**

CEONET

Place Keyword:

Continent > North America > Canada > Alberta

Place Keyword:

Continent > North America > Canada > British Columbia

Place Keyword:

KANANASKIS LAKES

Place Keyword:

082J11

Access Constraints:

Data are subject to the GeoBase Unrestricted Use Licence Agreement (<http://www.geobase.ca/>- in the Data section).

Use Constraints:

Data are subject to the GeoBase Unrestricted Use Licence Agreement (<http://www.geobase.ca/>- in the Data section).

Point of Contact:

Contact Information:

Contact Organization Primary:

Contact Organization:

Government of Canada, Natural Resources Canada, Centre for Topographic Information

Contact Person:

GeoBase Technical Support

Contact Address:

Address Type:

mailing and physical

Address:

2144, King Street West, Suite 010

City:

Sherbrooke

State or Province:

Quebec

Postal Code:

J1J 2E8

Country:

Canada

Contact Voice Telephone:

+01-819-564-4857 / 1-800-661-2638 (Canada and USA)

Contact Facsimile Telephone:

+01-819-564-5698

Contact Electronic Mail Address:

SupportGeoBase@NRCan.gc.ca

Hours of Service:

8:30 to 12:00 and 13:00 to 16:30 EST

Data Set Credit:

Base Mapping and Geomatic Services - British Columbia Government - Victoria, Alberta

Sustainable Resource Development - Alberta Government - Edmonton, Centre for
Topographic Information - Geomatics Canada

F.3 Example Identification Information:

Logical Consistency Report:

Canada's coastline, oceans and estuaries at mean sea level, are assigned an elevation value of zero meters. However, the Nova Scotia coastline, oceans, and estuaries are depicted at the mean high water level (MHWL), which has varying elevations across the province. All MHWL elevation values are with reference to the Canadian Geodetic Vertical Datum 1928 (CGVD28).

For CDED produced using ground elevations, water bodies are naturally occurring areas of constant elevation (lakes) or having a small slope (rivers). Water bodies are assigned their known elevations or estimated values. Lakes are represented flatter and lower than the surrounding terrain (one elevation per lake) and the shore shall be clearly discernible. A water body of unknown elevation is assigned an interpolated elevation that is at least one metre lower than the contour elevation surrounding its shores. Drainage (rivers and streams) shall be continuous (no gaps), have constant water flow and a descending order of z-values.

For CDED produced using reflective surface elevations, water bodies (lakes) may not have a constant elevation. They may have a small slope to indicate the direction of the water flow.

Quality control shall assure that the CDED is smooth within the grid and continuous from node to node, except at natural break points such as streams, cliffs, and craters.

Completeness Report:

The content of the CDED1 data sets is constant since the number of elevation points per profile and the number of profiles per cell are constant for all CDED1 files (1201 x 1201).

Positional Accuracy:

Horizontal Positional Accuracy:

Horizontal Positional Accuracy Report:

Accuracy evaluation is related to the data source(s) used to generate the CDED.

BC-TRIM Data Source:

Ninety percent of all well-defined planimetric features are coordinated to within 10 meters (0.5mm x 20,000) of their true position. This corresponds to the following:

Bivariate:

CMAS = $2.146\sigma_c \leq 10.00$ meters (90.00%)

CSE = $1.000\sigma_c \leq 4.66$ meters (39.35%)

MSEP = $1.000\sigma_{xy} \leq 6.60$ meters (63.21%)

MSEP = $1.000\sigma_{xy} \leq 10.03$ meters (90.00%)

Rejection (blunders):

MSEP = $2.47\sigma_{xy} \leq 16.31$ meters (99.78%)

CMAS = $3.5\sigma_c \leq 16.31$ meters (99.78%)

True position is defined as the coordinates which would be obtained from positioning with high order ground methods.

Alberta Base Features Data Source:

90% of all points and well-defined hydrographic features are coordinated to within 10 m of their true position. Tested using conventional survey methods with approximately 30 points. The RMSE was 3 m.

NTDB data in Banff and Jasper National Parks:

90% of all points and well-defined hydrographic features are coordinated to within 25 m of their true position

NTDB data in Wood Buffalo National Park (74L and 74M):

90% of all points are coordinated to within 125 m of their true position

90% of all well-defined hydrographic features are coordinated to within 25 m of their true position

Quantitative Horizontal Positional Accuracy Assessment:

Horizontal Positional Accuracy Value:

10

Horizontal Positional Accuracy Explanation:

Circular Map Accuracy Standards (CMAS) for ABBF sources from Alberta (in meters).

Quantitative Horizontal Positional Accuracy Assessment:

Horizontal Positional Accuracy Value:

100

Horizontal Positional Accuracy Explanation:

Circular Map Accuracy Standards (CMAS) for NTDB sources from Centre for Topographic Information (in meters).

Quantitative Horizontal Positional Accuracy Assessment:

Horizontal Positional Accuracy Value:

10

Horizontal Positional Accuracy Explanation:

Circular Map Accuracy Standards (CMAS) for TRIM sources from British Columbia (in meters).

Vertical Positional Accuracy:

Vertical Positional Accuracy Report:

Accuracy evaluation is related to the data source(s) used to generate the CDED.

BC-TRIM Data Source:

Ninety percent of all discrete spot elevations and DEM points are accurate to within 5 meters of their true elevation. This corresponds to the following:

Univariate:

$LMAS = 1.640\sigma \leq 5.00$ meters (90.00%) probability

$LSE = 1.000\sigma \leq 3.00$ meters (68.27%) probability,

NOTE: Linear Standard Error $\leq$ Mean Standard Error in Height $LSE = MSEH$

Rejection (blunders):

Univariate = $3.0\sigma \leq 9.00$ meters (99.73%) probability,

True elevation is defined as the coordinates that would be obtained from positioning with high order ground methods.

Accuracies relating to elevations relate to ground not sufficiently obscured by vegetation or other features to cause significant error.

Alberta Base Features Data Source:

The original data is accurate within 5 m of their true elevations at 90%. Tested using airborne laser profiling system with 4456 points. The RMSE was 2 m.

The derived data is accurate with respect to the original data at one standard deviation as follows:

- 5 m for 50 ft or less contour interval as per 1:50K NTS
- 13 m for 20 m or greater contour interval as per 1:50K NTS

NTDB data in Banff and Jasper National Parks:

The original data is accurate within 20 m of their true elevations at 90%. The derived data is accurate with respect to the original data at one standard deviation as follows:

- 18 m for 40 m or less contour interval as per 1 :50k NTS
- 24 m for 50 m or greater contour interval as per 1 :50k NTS

NTDB data in Wood Buffalo National Park (74L and 74M):

The original data is accurate within 25 m of their true elevations at 90%. The derived data is accurate with respect to the original data at one standard deviation as follows:

- 17 m for 40 m or less contour interval as per 1:50K NTS
- 23 m for 50 m or greater contour interval as per 1:50K NTS.

Based on the average of standard deviations of the differences between the derived and original data computed for 83C as per the above groupings by contour interval.

Quantitative Vertical Positional Accuracy Assessment:**Vertical Positional Accuracy Value:**

5

Vertical Positional Accuracy Explanation:

Linear Map Accuracy Standards (LMAS) for ABBF sources from Alberta (in meters).

Quantitative Vertical Positional Accuracy Assessment:**Vertical Positional Accuracy Value:**

-1

Vertical Positional Accuracy Explanation:

The value "-1" is indicated when vertical positional accuracy is unknown.

Quantitative Vertical Positional Accuracy Assessment:**Vertical Positional Accuracy Value:**

5

Vertical Positional Accuracy Explanation:

Linear Map Accuracy Standards (LMAS) for TRIM sources from British Columbia (in meters).

Lineage:**Source Information:****Source Citation:****Citation Information:****Originator:**

Government of British Columbia

Publication Date:

2000-01-07

Title:

Terrain Resource Information Management Program, Edition 1.0 - 082J.053

Source Scale Denominator:

20000

Type of Source Media:

Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:

1996-06-04

Ending Date:

1996-06-04

Source Currentness Reference:

publication date

Source Citation Abbreviation:

TRIM-BC - 082J.053

Source Contribution:

TRIM DEM mass points and breaklines were used to produce the BC CDED files. The TRIM DEM data types used are:

Mass Points - definite/indefinite;

Breaklines - sharp/round - hypsographic/hydrographic/anthropogenic.

Source Information:

Source Citation:

Citation Information:

Originator:

Government of British Columbia

Publication Date:

2000-01-07

Title:

Terrain Resource Information Management Program, Edition 1.0 - 082J.054

Source Scale Denominator:

20000

Type of Source Media:

Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:

1996-06-04

Ending Date:

1996-06-04

Source Currentness Reference:

publication date

Source Citation Abbreviation:

TRIM-BC - 082J.054

Source Contribution:

TRIM DEM mass points and breaklines were used to produce the BC CDED files. The TRIM DEM data types used are:

Mass Points - definite/indefinite;

Breaklines - sharp/round - hypsographic/hydrographic/anthropogenic.

Source Information:**Source Citation:****Citation Information:****Originator:**

Government of British Columbia

Publication Date:

2000-04-05

Title:

Terrain Resource Information Management Program, Edition 1.0 - 082J.055

Source Scale Denominator:

20000

Type of Source Media:

Digital

Source Time Period of Content:**Time Period Information:****Range of Dates/Times:****Beginning Date:**

1985-08-01

Ending Date:

1985-08-01

Source Currentness Reference:

publication date

Source Citation Abbreviation:

TRIM-BC - 082J.055

Source Contribution:

RIM DEM mass points and breaklines were used to produce the BC CDED files.

The TRIM DEM data types used are:

Mass Points - definite/indefinite;
Breaklines - sharp/round - hypsographic/hydrographic/anthropogenic.

Source Information:

Source Citation:

Citation Information:

Originator:

Government of British Columbia

Publication Date:

2000-01-07

Title:

Terrain Resource Information Management Program, Edition 1.0 - 082J.063

Source Scale Denominator:

20000

Type of Source Media:

Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:

1996-06-04

Ending Date:

1996-06-04

Source Currentness Reference:

publication date

Source Citation Abbreviation:

TRIM-BC - 082J.063

Source Contribution:

TRIM DEM mass points and breaklines were used to produce the BC CDED files.

The TRIM DEM data types used are:

Mass Points - definite/indefinite;

Breaklines - sharp/round - hypsographic/hydrographic/anthropogenic.

Source Information:

Source Citation:

Citation Information:

Originator:

Government of British Columbia

Publication Date:
2000-04-05

Title:
Terrain Resource Information Management Program, Edition 1.0 - 082J.064

Source Scale Denominator:
20000

Type of Source Media:
Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:
1985-08-01

Ending Date:
1985-08-01

Source Currentness Reference:
publication date

Source Citation Abbreviation:
TRIM-BC - 082J.064

Source Contribution:
TRIM DEM mass points and breaklines were used to produce the BC CDED files.
The TRIM DEM data types used are:
Mass Points - definite/indefinite;
Breaklines - sharp/round - hypsographic/hydrographic/anthropogenic.

Source Information:

Source Citation:

Citation Information:

Originator:
Government of British Columbia

Publication Date:
2000-04-05

Title:
Terrain Resource Information Management Program, Edition 1.0 - 082J.073

Source Scale Denominator:
20000

Type of Source Media:
Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:
1985-08-01

Ending Date:
1985-08-01

Source Currentness Reference:
publication date

Source Citation Abbreviation:
TRIM-BC - 082J.073

Source Contribution:

TRIM DEM mass points and breaklines were used to produce the BC CDED files.

The TRIM DEM data types used are:

Mass Points - definite/indefinite;

Breaklines - sharp/round - hypsographic/hydrographic/anthropogenic.

Source Information:

Source Citation:

Citation Information:

Originator:
Government of British Columbia

Publication Date:
2000-04-05

Title:
Terrain Resource Information Management Program, Edition 1.0 - 082J.074

Source Scale Denominator:
20000

Type of Source Media:
Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:
1985-08-01

Ending Date:
1985-08-01

Source Currentness Reference:
publication date

Source Citation Abbreviation:

TRIM-BC - 082J.074

Source Contribution:

TRIM DEM mass points and breaklines were used to produce the BC CDED files.

The TRIM DEM data types used are:

Mass Points - definite/indefinite;

Breaklines - sharp/round - hypsographic/hydrographic/anthropogenic.

Source Information:**Source Citation:****Citation Information:****Originator:**

Government of Canada, Natural Resources Canada, Center for Topographic Information

Publication Date:

1998-04-06

Title:

National Topographic Data Base - 082J11-2.0

Source Scale Denominator:

50000

Type of Source Media:

Digital

Source Time Period of Content:**Time Period Information:****Range of Dates/Times:****Beginning Date:**

1994-01-01

Ending Date:

1994-01-01

Source Currentness Reference:

publication date

Source Citation Abbreviation:

NTDB - 082J11

Source Contribution:

The hypsographic and hydrographic elements of the source NDTB were used to produce the CDED. Special care was taken with regard to watercourse direction of flow and the flatness of the water surface.

Source Information:**Source Citation:****Citation Information:**

Originator:

Alberta Sustainable Resource Development - Alberta Government - Edmonton

Publication Date:

1990-09-01

Title:

Alberta Base Features - 82J11NE

Source Scale Denominator:

20000

Type of Source Media:

Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:

1990-09-01

Ending Date:

1990-09-01

Source Currentness Reference:

publication date

Source Citation Abbreviation:

Alberta Base Features - 82J11NE

Source Contribution:

Hypsography: Mass Points land/island. Hypsography and Hydrography: Breaklines soft/hard.

Source Information:

Source Citation:

Citation Information:

Originator:

Alberta Sustainable Resource Development - Alberta Government - Edmonton

Publication Date:

1990-09-01

Title:

Alberta Base Features - 82J11NW

Source Scale Denominator:

20000

Type of Source Media:

Digital

Source Time Period of Content:**Time Period Information:****Range of Dates/Times:****Beginning Date:**
1990-09-01**Ending Date:**
1990-09-01**Source Currentness Reference:**
publication date**Source Citation Abbreviation:**
Alberta Base Features - 82J11NW**Source Contribution:**
Hypsography: Mass Points land/island. Hypsography and Hydrography: Breaklines soft/hard.**Source Information:****Source Citation:****Citation Information:****Originator:**
Alberta Sustainable Resource Development - Alberta Government - Edmonton**Publication Date:**
1990-09-01**Title:**
Alberta Base Features - 82J11SE**Source Scale Denominator:**
20000**Type of Source Media:**
Digital**Source Time Period of Content:****Time Period Information:****Range of Dates/Times:****Beginning Date:**
1990-09-01**Ending Date:**
1990-09-01**Source Currentness Reference:**
publication date

Source Citation Abbreviation:

Alberta Base Features - 82J11SE

Source Contribution:

Hypsography: Mass Points land/island. Hypsography and Hydrography: Breaklines soft/hard.

Source Information:

Source Citation:

Citation Information:

Originator:

Alberta Sustainable Resource Development - Alberta Government - Edmonton

Publication Date:

1990-09-01

Title:

Alberta Base Features - 82J11SW

Source Scale Denominator:

20000

Type of Source Media:

Digital

Source Time Period of Content:

Time Period Information:

Range of Dates/Times:

Beginning Date:

1990-09-01

Ending Date:

1990-09-01

Source Currentness Reference:

publication date

Source Citation Abbreviation:

Alberta Base Features - 82J11SW

Source Contribution:

Hypsography: Mass Points land/island. Hypsography and Hydrography: Breaklines soft/hard.

Process Step:

Process Description:

BC CDED files are derived in the following manner:

- TRIM DEM mass points and breaklines were used to build a TIN. Only the most current data was used. All retired features were removed before building the TIN. All duplicate features were removed before building the TIN.
- All points and breaklines were added to the TIN with zero tolerance. No features were discarded as

unimportant.

- All mass points were added to the TIN model with equal weight. All Breaklines were added to the model as hard breaklines.
- Points were sampled from the TIN at 0.75" x 0.75" intervals using linear interpolation and written to CDED file format. Elevation value was sampled at the centre of each cell.

Process Date:

2006-02-10

Process Step:

Process Description:

The Alberta DEMs were created as follows:

- 1) Aerial photography was flown at 1:60 000 scale using wide angle camera with panchromatic film.
- 2) Survey control was established at a spacing of 20 km (X) X 10 km (Y) using inertial survey systems with 2nd order horizontal accuracy and 4th order vertical accuracy.
- 3) Survey control was targeted and photographed individually at a scale of 1:20 000.
- 4) Targets on the 1:20 000 photography were transferred to the 1:60 000 mapping photography using Wild Pug 4 point transfer device.
- 5) The 1:60 000 photography was triangulated using Wild BC1 analytical stereoplotter and adjusted using SPACE-M (Spatial Photogrammetric Adjustment for Control Extensions using independent Models).
- 6) DEMs were compiled using analytical stereoplotters at a regular spacing of mostly 100 m. Sometimes up to 250 m in flat areas. Random points and breaklines were measured in addition to the regular grid points. All measurements were done in stationary mode.
- 7) DEMs were generated using ArcInfo TIN (Triangulated Irregular Network). Breaklines were reconciled with the hydrographic data also compiled from the same photography using analytical stereoplotters. Any missing hydrographic features were copied from the hydrographic file in Base Features Hydrography and elevations were interpolated from the DEM.
- 8) In tiles with a mixture of NTDB and Alberta DEMs, the respective DEMs were combined seamlessly. The resolution of the Alberta DEM was 1 mm while that of the NTDB DEM was 1 m.

The NTDB DEMs in Banff & Jasper National Parks were created as follows:

- 1) 1:50 000 contours and spot elevations from NTDB were edge-matched with the adjoining Alberta DEMs.
- 2) DEMs were generated using ArcInfo TIN. The hydrographic data from NTDB were added as breaklines with elevations interpolated from the DEM.
- 3) In tiles with a mixture of NTDB and Alberta DEMs, the respective DEMs were combined seamlessly. The resolution of the Alberta DEM was 1 mm while that of the NTDB DEM was 1 m.

The NTDB DEMs in Wood Buffalo National Park (74L and 74M) were created as follows:

- 1) 1:50 000 contours, spot elevations and CDED data were edge-matched with adjoining Alberta DEMs.
- 2) DEMs were generated using ArcInfo TopoGrid. Hydrographic data from NTDB were added with elevations interpolated from the DEM.
- 3) In tiles with a mixture of NTDB and Alberta DEMs, the respective DEMs were combined seamlessly. The resolution of the Alberta DEM was 1 mm while that of the NTDB DEM was 1 m.

All of the DEMs were converted to CDED as follows:

- 1) Extracted the mass points and breaklines for each 1:20 000 file covering the entire 1:250 000 sheet including a buffer zone of one 1:20 000 file outside the mapsheet border.
- 2) Created ArcInfo TIN for each 1:20 000 file.
- 3) Created a 100 m ArcInfo GRID using linear interpolation.
- 4) Clipped each GRID file up to 100 m overedge.
- 5) Created a seamless ArcInfo GRID of all the files using ArcInfo MOSAIC command.
- 6) Converted the file to geographic coordinates.
- 7) Created a TIN file using ESRI 3D Analyst.
- 8) Interpolated the 0.75 X 0.75 second lattice.
- 9) Reformatted to CDED format.
- 10) A Gaussian smoothing filter was applied to the final CDED files (7 by 7 array).

Process Date:
2006-02-10

Process Step:

Process Description:

The steps undertaken by the Centre for Topographic Information-Ottawa to merge 1:50 000 CDED are:
In the situation where a CDED is partly covered by an adjacent province/territory, the two adjacent provinces/territories CDED files are merged in the following manner:

- 1) One province's CDED data is loaded and clipped according to the provincial/territorial, and international (if applicable), boundary lines found on the GeoBase Portal. All grid points outside this province are set to the void value of -32767. This CDED data set is updated.
- 2) This new CDED data set and the adjacent province/territory's CDED data set corresponding to the same cell are loaded and merged together. The adjacent provincial/territorial grid values are overwritten by the first province/territory's grid values. Void values are ignored in this process. The result is saved as a new merged CDED data set.
- 3) An in-house program is run on the new merged CDED data set to modify the original CDED Type A Logical Record, changing the CDED Responsibility Centre, the process code, the origin code, data edition/version number, void flag, void percentage and the minimum and maximum elevation fields.

Process Date:
2006-02-10

F.4 Example Spatial Data Organization Information

Direct Spatial Reference Method:
Raster

Raster Object Information:

Raster Object Type:
Grid Cell

Row Count:
1201

Column Count:
1201

F.5 Example Spatial Reference Information

Horizontal Coordinate System Definition:

Geographic:

Latitude Resolution:
0.75

Longitude Resolution:
0.75

Geographic Coordinate Units:
Decimal seconds

Geodetic Model:

Horizontal Datum Name:
North American Datum of 1983

Ellipsoid Name:
Geodetic Reference System 1980

Semi-major Axis:
6378137

Denominator of Flattening Ratio:
298.257222101

Vertical Coordinate System Definition:

Altitude System Definition:

Altitude Datum Name:
Mean sea level (MSL) / Canadian Geodetic Vertical Datum of 1928 (CGVD28)

Altitude Resolution:
1

Altitude Distance Units:
meters

Altitude Encoding Method:
Implicit coordinate

F.6 Example Entity and Attribute Information

Overview Description:

Entity and Attribute Overview:

See details citation

Entity and Attribute Detail Citation:
Canadian Digital Elevation Data, Level 1, Product Specifications, Edition 2.0, April 2004

F.7 Example Distribution Information

Distributor:

Contact Information:

Contact Organization Primary:

Contact Organization:
Government of Canada, Natural Resources Canada, Centre for Topographic Information

Contact Person:
GeoBase Technical Support

Contact Address:

Address Type:
mailing and physical

Address:
2144, King Street West, Suite 010

City:
Sherbrooke

State or Province:
Quebec

Postal Code:
J1J 2E8

Country:
Canada

Contact Voice Telephone:
+01-819-564-4857 / 1-800-661-2638 (Canada and USA)

Contact Facsimile Telephone:
+01-819-564-5698

Contact Electronic Mail Address:
SupportGeoBase@NRCan.gc.ca

Hours of Service:
8:30 to 12:00 and 13:00 to 16:30 EST

Distribution Liability:
Data are subject to the GeoBase Unrestricted Use Licence Agreement
(<http://www.geobase.ca/> - in the Data section).

Standard Order Process:

Digital Form:

Digital Transfer Information:

Format Name:
CDED ASCII

File Decompression Technique:
WinZip compression software

Digital Transfer Option:

Online Option:

Computer Contact Information:

Network Address:

Network Resource Name:

FTP site

Fees:
Free

F.8 Example Metadata Reference Information

Metadata Date:
2007-04-03

Metadata Contact:
Contact Information:

Contact Organization Primary:

Contact Organization:
Government of Canada, Natural Resources Canada, Centre for Topographic Information

Contact Person:
GeoBase Technical Support

Contact Address:

Address Type:
mailing and physical

Address:
2144, King Street West, Suite 010

City:
Sherbrooke

State or Province:
Quebec

Postal Code:
J1J 2E8

Country:
Canada

Contact Voice Telephone:
+01-819-564-4857 / 1-800-661-2638 (Canada and USA)

Contact Facsimile Telephone:
+01-819-564-5698

Contact Electronic Mail Address:
SupportGeoBase@NRCan.gc.ca

Hours of Service:
8:30 to 12:00 and 13:00 to 16:30 EST

Metadata Standard Name:
FGDC Content Standard for Digital Geospatial Metadata

Metadata Standard Version:
FGDC-STD-001-1998

Metadata Use Constraints:

Only the English XML metadata file is valid according to the XML (W3C) schema as defined by the Federal Geographic Data Committee (FGDC) (<http://www.fgdc.gov>). The French version of the XML metadata file does not respect the domain of values, which is only available in English in certain fields, and exists solely for the presentation of information.

Users shall ensure that they use the FGDC XML schema with the English version of the XML metadata to validate the metadata.

Withdrawn/Retirée

Appendix G

(Informative)

Bibliography

- [1] ISO 19131:2007 Geographic Information – Data Product Specifications
- [2] ANSI INCITS 4-1986 Information Systems - Coded Character Sets - 7-Bit American National Standard Code for Information Interchange (7-Bit ASCII)
- [3] Centre for Topographic Information, 2004, Generation of Digital Elevation Model for Canadian Digital Elevation Data(CDED), Production, Centre for Topographic Information, Ottawa, October 22, 2004
- [4] Federal Geographic Data Committee 1998, FGDC-STD-001-1998. Content standard for digital geospatial metadata (revised June 1998).
- [5] USGS 1997, USGS Standards for Digital Elevation Models, US Geological Survey National Mapping Program Technical Instruction, Reston Va, USA, <http://rockyweb.cr.usgs.gov/nmpstds/demstds.html>
- [6] NRCan 2010, Canadian Digital Elevation Data, Level 1, Product Specification, ed. 3.1, Natural Resources Canada, Centre for Topographic Information, Sherbrooke, Quebec, Canada