GeoBase

Level 1

Canadian Digital Elevation Data
Product Specifications

Edition 2.1

2005-10-01

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REVISION HISTORY

Date	Ed/Vs	Section/sub-section	Description
January 2003	1.0	*Title:* GeoBase Canadian Digital Elevation Data Level 1 Product Specifications	Original version
April 2004	2.0	*Title:* GeoBase Level1, Canadian Digital Elevation Data Product Specifications	Former title: *GeoBase Canadian Digital Elevation Data Level 1 Product Specifications*
April 2004	2.0	*Acronyms for CDED Responsibility Centres*	Inclusion of a new title, *Acronyms for CDED Responsibility Centres.*
April 2004	2.0	*Terms and Definitions*	Additional definitions have been added for clarification purposes. Other definitions have been moved to the Canadian Digital Elevation Data Technical Specifications.
April 2004	2.0	*1. Overview*	Definitions for GeoBase and U.S. Federal Geographic Data Committee (FGDC) added.
April 2004	2.0	*2.8.1 Elevations*	Formerly under *2.7 Extent*
April 2004	2.0	*2.8.2 Water Areas*	Formerly under *2.7 Extent* and *7.4 Logical Consistency* Inclusion of one elevation per lake/interpolation of unknown water body/continuous drainage and descending order of z-value for drainage.
April 2004	2.0	*2.8.3 Void Areas*	Formerly under *2.7 Extent* Inclusion of the GeoBase portal's administrative boundaries for the purpose of clipping/merging of CDED Second inclusion: CDED Logical Record A showing 'void areas' and 'percent void' flags. Third inclusion: CDED are clipped within $\pm$1 pixel of resolution along the international boundary.
April 2004	2.0	*2.8.4 Quality Control*	Formerly under *7.4 Logical Consistency*
April 2004	2.0	*2.8.5 Exceptions*	Formerly under *2.7 Extent* Inclusion of the Nova Scotia coastline depicted at the Mean High Water Level (MHWL)
April 2004	2.0	*Comparison of CDED to Existing DTED*	Formerly under *2.8 Comparison of CDED to existing DTED* Table has been omitted.
April 2004	2.0	*3.2 Spatial Representation*	Information concerning the grid spacing, formerly under *7.5 Positional Accuracy,* has been moved to this section.

REVISION HISTORY (continued)

Date	Ed/Vs	Section/sub-section	Description
April 2004	2.0	*3.3 Coverage and Continuity*	Figure 1/Table 2/Table 3 formerly under 2.1 Spatial Resolution
April 2004	2.0	*6.0 Coordinate Reference System*	Amendment: the (X, Y, Z) value has been changed to (longitude, latitude and Z).
April 2004	2.0	*6.1.2 Unit of measure*	Correction: removal of entire second line (Coordinates are expressed in real values…)
April 2004	2.0	*7.4.1 Physical Structure of the CDED File*	Formerly under *Appendix B: CDED1 File Format/B.1 Physical Structure of the CDED File:* Inclusion of conventions 1, 2, 4 and 7 and additional information to convention 6.
April 2004	2.0	*7.4.2 Type A Logical Record*	Formerly under *Appendix B: CDED1 File Format/B.2 Type A Logical Record*
April 2004	2.0	*7.4.2 Type A Logical Record*	Amendment: see header. *Fortran* has been omitted and *Comments* has been changed to *Domain of Values/ Explanations.*
April 2004	2.0	*7.4.2 Type A Logical Record, Element 1 CDED Responsibility Centre*	Previously *Producer of Data*: renamed *CDED Responsibility Centre.* Under 'Domain of Values/Explanation': *Data producer* has been changed to *CDED responsibility centre.* First inclusion: the descriptor is now split into four sub-fields. Second inclusion: a note.
April 2004	2.0	*7.4.2 Type A Logical Record, Element 1 Process Code*	Under 'Domain of Values/Explanation': inclusion of a definition
April 2004	2.0	*7.4.2 Type A Logical Record, Element 5*	Inclusion of the 1:250 000 scale
April 2004	2.0	*7.4.2 Type A Logical Record, Element 12*	Inclusion of the -32767 value when the entire profile is void
April 2004	2.0	*7.4.2 Type A Logical Record, Element 15*	Correction: <u>1:50 000 CDED</u> 1.5, 0.75, 1 (Area B) 3, 0.75, 1(Area C) <u>1:250 000 CDED</u> 6, 3, 1 (Area B) 12, 3, 1 (Area C)
April 2004	2.0	*7.4.2 Type A Logical Record, Element 25*	Amendment: This field is set to "0" or "2".

REVISION HISTORY (continued)

Date	Ed/Vs	Section/sub-section	Description
April 2004	2.0	*7.4.2 Type A Logical Record, Element 28*	Amendment: Element name changed to Data edition/version, specifications edition/version
April 2004	2.0	*7.4.2 Type A Logical Record, Element 28*	Inclusion of an explanation and example for the data edition/version/specifications edition/version
April 2004	2.0	*7.4.2 Type A Logical Record, Element 29*	Amendment: this field has been activated
April 2004	2.0	*7.4.2 Type A Logical Record, Element 30*	Amendment of the following: 3 No match required Inclusion of the following for future use: 4 Edge not matched
April 2004	2.0	*7.5 Positional Accuracy*	Information concerning the grid spacing has been moved to *3.2 Spatial Representation.* Inclusion of a CDED definition.
April 2004	2.0	*7.6 Temporal Accuracy*	Amendment: the GeoBase Portal URL has replaced the reference to the source data capture date.
April 2004	2.0	*8.1 Collection Level Metadata*	Inclusion of additional collection (fixed) metadata requirements for CDED partners.
April 2004	2.0	*8.2 Product/Data Set Metadata*	Inclusion of additional product/data set (source) metadata requirements for CDED partners.
April 2004	2.0	*10.1 Format Information*	Inclusion of the USGS and GeoBase Portal URL.
April 2004	2.0	*10.2 CDED Directory and File Name Conventions*	Formerly *Appendix A: CDED Directory and File Name Conventions:* inclusion of new naming convention for first and second case, now referred to as *CDED Responsibility Centre* and *CDED Data Purchasers*
April 2004	2.0	*10.3 Medium Information*	Formerly 10.2 *Medium Information*: inclusion of the GeoBase Portal URL.
October 2005	2.1	*Acronyms for CDED Responsibility Centre*	Addition of ASRD, CTI, OMNR, and YEIM Removal of EYG
October 2005	2.1	*7.4.2 Type A Logical Record, Element 1*	Addition of Process Code Z Addition of 3-D Analyst to Code A Corrected explanation of Process Code

REVISION HISTORY (continued)

Date	Ed/Vs	Section/sub-section	Description
October 2005	2.1	*7.4.2 Type A Logical Record, Element 2*	Addition of Origin Codes ASDB and RS

FUTURE WORK

Key word	Ed/Vs	Section/sub-section	Description

TABLE OF CONTENT

ACRONYMS AND ABBREVIATIONS

CDED	Canadian Digital Elevation Data
CTI	Centre for Topographic Information
CVGD28	Canadian Vertical Geodetic Datum of 1928
DEM	Digital Elevation Model
FTP	File Transfer Protocol
GIS	Geographic Information System
MBR	Minimum-bounding Rectangle
MSL	Mean Sea Level
NAD83	North American Datum of 1983
NTDB	National Topographic Data Base
NTS	National Topographic System
USGS	United States Geological Survey

ACRONYMS FOR CDED RESPONSIBILITY CENTRES

ASRD	Alberta Sustainable Resource Development - AB Gov - Edmonton
BMGS-BC	Base Mapping and Geomatic Services - B.C. Gov. - Victoria
CFS-SSM	Landscape Analysis - Can. Forest Serv. - Sault Ste. Marie
CTI	Centre for Topographic Information, Geomatics Canada
CTI-O	Centre for Topographic Information, Geomatics Canada, Ottawa
OMNR	Ontario Ministry of Natural Resources
YEIM	Yukon Environment Information Management & Technology

TERMS AND DEFINITIONS

Cell

Each CDED cell corresponds to half an NTS tile, which means that there are <u>always</u> western and eastern CDED cells to an NTS tile.

Contour Line

An imaginary line on the ground connecting an infinite number of points of equal elevation recorded in metres or feet relative to Mean Sea Level (MSL) based on the North American Datum 1983 horizontal reference datum.

DEM

A numerical representation of the Earth's surface based on a collection of <u>ground elevations.</u>

Drain Line

A linear feature that marks the course followed by the natural flow of water on the Earth's surface, draining an area or another body of water. A drain line is similar to a stream. All <u>ground-elevation</u> points that define a drain line have a lower z-value than the ground on either side of the drain line. The drain line has a descending order of z-values.

Edge Matching

A process of matching elevation values along quadrangle edges or at the CDED.

Lake

A water body with a constant elevation value.

NTS Tile

The organizational unit of the National Topographic System (NTS).

Ridge Line

A line of high ground with minor variations in elevations along its crest. The ridge is not simply a line of hills: all <u>ground elevation</u> points that define a ridge have a higher z-value than the ground on either side of the ridge.

Source Data Set

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 various scaled positional data acquired from the provinces and territories.

1   Overview

GeoBase is base geospatial data, collected closest to the source and covering the Canadian landmass. The data that is currently available is of regional resolution, representing an average scale of 1:10 000 to 1:250 000 (GeoBase Level 1). National resolution data, representing scales of 1:1 000 000 and smaller (GeoBase Level 0) will soon be available. These product specifications apply to GeoBase Level 1, Canadian Digital Elevation Data (CDED) only.

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

The CDED consists of an ordered array of <u>ground elevations</u> 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 various scaled positional data acquired from the provinces and territories.

The tile reference scheme for CDED models the National Topographic System (NTS) mapping series. The coverage for each CDED corresponds to half an NTS tile, which means that there are <u>always</u> western and eastern CDED cells to an NTS tile. Cell coverage varies according to three geographic areas (see Section 3.3 for further details). CDED consists of <u>ground-elevation</u> data recorded in metres. The North American Datum 1983 (NAD83) is used as the reference system for planimetric coordinates. Elevations (h) are orthometric and expressed in reference to Mean Sea Level (Canadian Vertical Geodetic Datum 1928 (CVGD28)).

CDED plays the same role as contours and relief shading on conventional paper maps but is more powerful analytically. 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.

U.S. Federal Geographic Data Committee (FGDC) compliant metadata is collected to describe CDED data, as well as each contributing source data set. CDED metadata produced according to the *Canadian Digital Elevation Data Product Specifications Edition 2.0 (April 2004)* is FGDC compliant.

Note: CDED metadata produced according to the *Canadian Digital Elevation Data Standards and Specifications (September 2000)* does not comply with the FGDC standard.

2   Data Identification

2.1   Spatial Resolution ("scale")

The grid spacing is based on geographic coordinates at a maximum and minimum resolution of 0.75, 1.5 and 3 arc seconds for the 1:50 000, and 3, 6 and 12 arc seconds for the 1:250 000 respectively, depending on latitude (see Section 3.3 for further details).

2.2   Language

The language used within the data set is English.

2.3   Character Set

Data is written as ANSI Standard ASCII characters (ISO 646 US) and recorded in IBM Standards fixed-block format.

2.4   Topic Category

Elevations/heights above or below sea level relate to altitude, bathymetry, digital elevation models, slope and derived products.

2.5   Geographic Box

The geographic box or minimum-bounding rectangle (MBR) delineating the coverage of all existing and planned CDED in Canada is:

- West-bounding coordinate: 141° West   (or -141°)
- East-bounding coordinate: 52° West   (or -52°)
- North-bounding coordinate: 84° North   (or 84°)
- South-bounding coordinate: 41° North   (or 41°)

2.6   Geographic Description

The geographic area comprises of lands and waters falling under Canadian jurisdiction.

2.7   Extent

The temporal extent for the content of the data is from 1945 to present.

The vertical domain of the data set identifies the lowest and highest vertical extent contained within the data. The vertical extent is expressed in metres and for the most part, can vary from zero metre (Mean Sea Level) to 5,959 metres (Mount Logan) in Canada. Exceptions may occur: please see Collection Metadata for more details.

2.8   Supplemental Information

2.8.1   Elevations

Elevations are orthometric and expressed in reference to Mean Sea Level (Canadian Vertical Geodetic Datum 1928 (CVGD28)).

2.8.2   Water Areas

Canada's coastline, oceans and estuaries at Mean Sea Level, are assigned an elevation value of zero metre.

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.

Water bodies (lakes) are represented flatter and lower than the surrounding terrain (one elevation per lake) and the shore must be clearly discernible. A water body of unknown elevation is assigned an interpolated elevation that is less than one metre to the contour elevation surrounding its shores.

Drainage (rivers and streams) must be continuous (no gaps), have constant water flow and a descending order of z-values.

2.8.3   Void Areas

CDED data may contain void areas (no data) when they include lands or waters outside Canada's borders. Administrative boundaries from the GeoBase Portal are used for the purpose of clipping or merging CDED files.

CDED data produced according to the *Canadian Digital Elevation Data Product Specifications Edition 2.0 (April 2004)* will show the void areas (no data) as -32767. The CDED Logical Record A will show 'void area' and 'percent void' flags. CDED data will be clipped to within plus or minus one ($\pm$1) pixel of resolution along the international boundary.

Note: CDED data produced according to the *Canadian Digital Elevation Data Standards and Specifications (September 2000)* will show the void areas (no data) as having a value of zero metre.

2.8.4   Quality Control

The purpose of CDED production is to produce DEM data sets that represent elevations according to the source data (see Section 8, Metadata). Quality control must 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.

The digital data exchange format used to create the CDED is based on the USGS DEM format (please see http://rockyweb.cr.usgs.gov/nmpstds/demstds.html). The CDED quality control process ensures that the CDED producers take into consideration the watercourse direction of flow and the flatness of the water surface and surrounding area. In addition, quality control is carried out to eliminate nonsense drainage activity.

2.8.5   Exceptions

Ground elevation data having negative values may be found in certain areas of Canada (e.g., Lower Mainland British-Columbia) that naturally lie below Mean Sea Level (MSL).

3   Geospatial Characteristics

3.1   Spatial Representation Type

A grid format is used to represent the elevation data.

3.2   Spatial Representation

All cells contain the same number of nodes (elevations). Each cell holds 1201 profiles. All profiles are oriented south north and contain 1201 elevation points. Therefore, each cell contains 1201 profiles by 1201 points, for a total of 1 442 401 elevation points. Cell coverage varies according to the three geographic areas (please see Section 3.3, Figure 1 for further details).

For the 1:50 000 scale, the grid spacing is always 0.75 arc second along a profile in the south-north direction and varies from 0.75 to 3 arc seconds in the west-east direction, depending upon the three geographic areas (please see Section 3.3, Table 2 for further details).

For the 1:250 000 scale, the grid spacing is always 3 arc seconds in the south-north direction along a profile and varies from 3 to 12 arc seconds in the west-east direction, depending upon the three geographic areas (please see Section 3.3, Table 3 for further details).

3.3   Coverage and Continuity

The 1:250 000 CDED provides complete seamless coverage of the entire Canadian landmass. The 1:50 000 CDED currently provides partial coverage, with an anticipated seamless coverage in the future. CDED processing includes edge matching.

For each NTS tile, there are always eastern and western CDED cells.

Each profile has one point of overlap with the cell above it (to the North) and one with the cell below it (to the South). The first profile of the CDED cell coincides with the last profile of the adjacent CDED cell.

Figure 1: Coverage of the Three Geographic Areas

Table 1 – 1:50 000 CDED cell coverage according to the Three Geographic Areas

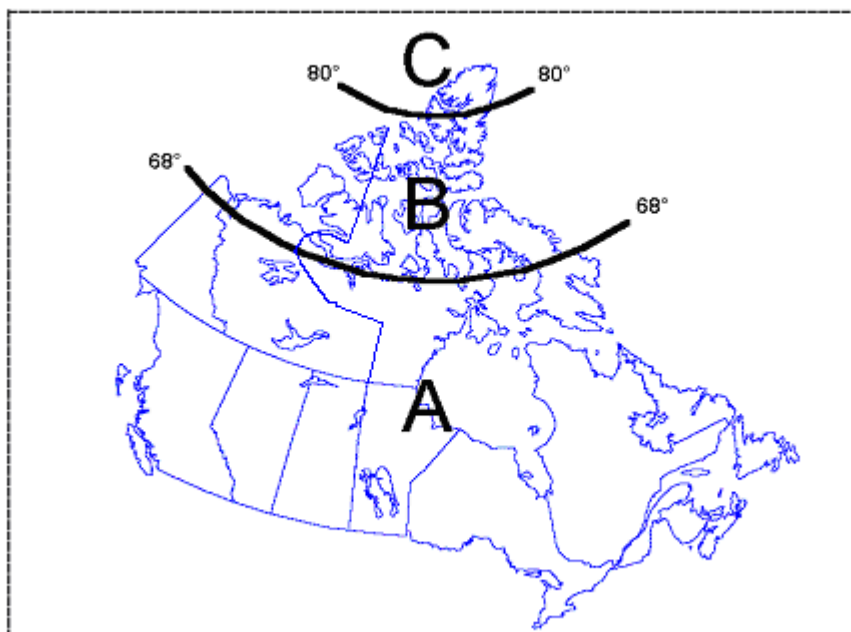| GEOGRAPHIC AREA	LATITUDE		SPACING (latitude and longitude in arc seconds)		SPACING (in metres, approximate)		CELL COVERAGE (latitude - longitude)		
	from	to	lat.	long.	N.-S.	E.-W.			
A	—	68°	0.75"	x 0.75"	23 m x 16-11 m		15'	x	15'
B	68°	80°	0.75"	x 1.5"	23 m x 17-8 m		15'	x	30'
C	80°	90°	0.75"	x 3"	23 m x 17-8 m		15'	x	1°

Table 2 – 1:250 000 CDED cell coverage according to the Three Geographic Areas

GEOGRAPHIC AREA	LATITUDE		SPACING (latitude and longitude in arc seconds)		SPACING (in metres, approximate)	CELL COVERAGE (latitude - longitude)	
	from	to	lat.	long.	N.-S. E.-W.		
A	—	68°	3" x	3"	93 m x 65-35 m	1° x	1°
B	68°	80°	3" x	6"	93 m x 69-32 m	1° x	2°
C	80°	90°	3" x	12"	93 m x 65-32 m	1° x	4°

3.4   Data Segmentation

NOT APPLICABLE

4   Data Model

NOT APPLICABLE

5   Data Dictionary/Feature Catalogue

NOT APPLICABLE

6   Coordinate Reference System

CDED uses a geocentric 3-dimensional reference system (longitude, latitude and Z).

6.1   Horizontal Reference System

North American Datum 1983 (NAD83) is used as the horizontal reference system.

6.1.1   Horizontal Coordinate System

Data is stored in geographic coordinates (longitude (λ) and latitude (Φ)).

6.1.2   Horizontal Unit of Measure (coordinate system axis units)

The unit of measure for storing horizontal data is arc seconds, given 4 significant digits after the decimal (1×10^{-4}).

6.2   Vertical Reference System

Elevations are orthometric and expressed in reference to Mean Sea Level (Canadian Vertical Geodetic Datum 1928 (CVGD28)).

6.2.1   Vertical Unit of Measure (coordinate system axis units)

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

7   Data Quality

7.1   Scope

The following information applies to the lineage and completeness of each spatial data set as well as its logical consistency and positional accuracy.

7.2   Lineage

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 or various scaled positional data acquired from the provinces and territories.

The horizontal reference system is North American Datum 1983: the vertical reference system is Canadian Vertical Geodetic Datum 1928 (CVGD28)).

Information about the process steps and source files is explained in the metadata.

7.3   Completeness

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

The 1:250 000 CDED provides complete seamless coverage for the entire country. The 1:50 000 CDED currently provides partial coverage, with an anticipated seamless coverage in the future.

See Section 2.8 Supplemental Information, sub-section 2.8.3 for Void Areas.

7.4   Logical Consistency

7.4.1   Physical Structure of the CDED File

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

Physical 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 1024 bytes of the physical record.

There is only one *Type A Logical Record* for each CDED file, and it appears as the first record in the data file. The *Type B Logical Record* 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. Therefore, the number of profiles covering the CDED area is the same as the number of Type B Records in the CDED.

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

1. All fields that are *left empty* must be blank, ASCII space (binary 0010 0000);

2. All character fields of no data value must be blank, ASCII space (binary 0010 0000);

3. All integer or character flagged fields of no data value but which default to zero must be ASCII zero (binary 0011 0000);

4. All integer fields of no data value but which default to zero must be ASCII zero (binary 0011 0000);

5. All real (non-integer) numeric fields must be populated. Default zero fill will respect the convention below;

6. All character fields must be in upper case, <u>except</u> for 'File name' and 'CDED Responsibility Centre' which can accommodate either upper or lower case;

7. **All fields are right justified, <u>except</u> for the 'Origin Code', which is <u>left justified</u>.**

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	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	D	+	0	0	
					.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

7.4.2   Type A Logical Record

Data Element	Contents	Format Type	ASCII	Domain of Values/ Explanation
1	File name	ALPHA	A40	Ex: 031a01DEMw
1	CDED responsibility centre Free format text (see page vi for *Acronyms for CDED Responsibility Centres*).	ALPHA	A60	Descriptor identifying the CDED responsibility centre. *The full name is used for a single responsibility centre: sub-fields and acronyms are used when there are multiple responsibility centres.*
1	Filler		9 bytes	Blank fill
1	SW geographic corner	INTEGER*2 REAL*8	2(I4,I2,F7.4)	SW geographic coordinates of NTS tile: Longitude SDDDMMSS.SSSS Latitude SDDDMMSS.SSSS
1	Process code	ALPHA	A1	8 ANUDEM™ 9 FME™ for LINUX, build 842 A TopoGrid™/3-D Analyst Z See CDED Process Description located in CDED metadata available on the GeoBase portal. http://www.geobase.ca *Software used to create DEM*
1	Filler		1 byte	Blank fill
1	Sectional indicator	ALPHA	A3	Not used in this case.
2	Origin code	ALPHA	A4	AB Alberta ASDB Aerial Survey Data Base BC British Columbia MB Manitoba MULT Multiple Sources NB New Brunswick NL Newfoundland/Labrador NS Nova Scotia NT Northwest Territories NTDB National Topographic Data Base NU Nunavut ON Ontario PE Prince Edward Island QC Quebec RS Remote Sensing SK Saskatchewan YT Yukon Territory *This field is left justified.*

Data Element	Contents	Format Type	ASCII	Domain of Values/ Explanation
3	DEM level code	INTEGER*2	I6	1 DEM-1 2 DEM-2 3 DEM-3 *This field is set to "1" for 1:50 000 and 1:250 000 CDED*
4	Code defining the elevation pattern (regular or random).	INTEGER*2	I6	1 regular 2 random *This field is set to "1"*
5	Code defining the ground horizontal reference system.	INTEGER*2	I6	0 Geographic 1 UTM 2 state plane (USA) Normally set to the value representing the geographic (lat/long) system for 1:50 000 and 1:250 000 CDED. *This field is set to "0"*
6	Code defining the zone in the ground horizontal 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 ground horizontal coordinates throughout the file.	INTEGER*2	I6	0 radians 1 feet 2 metres 3 arc seconds *This field is set to "3".*
9	Code defining the unit of measure for the (vertical) elevation coordinates throughout the file.	INTEGER*2	I6	1 feet 2 metres *This field is set to "2".*
10	Number 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 ground 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 row-wise as pairs of longitude and latitude in arc seconds.

Type A Logical Record (Continued)

Data Element	Contents	Format Type	ASCII	Domain of Values/ Explanation
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 (min., max.). 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 ground horizontal reference to the primary axis of the CDED horizontal local reference system.	REAL*8	D24.15	*Normally set to "0", to align with the coordinate system specified in element 5. Expressed in radians.*
14	Accuracy code for elevations	INTEGER*2	I6	When set to "0", this indicates that a record does not exist and that no Type C Record will follow. *Set to "0" as no Type C Record exists for this product (CDED).*
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	Normally, the row value m is set to "1". Thus, the n value normally describes the number of columns in the CDED file (1201).
17	Largest primary contour interval.	INTEGER*2	I5	Present only if two or more primary intervals exist. *This field is left empty.*

Type A Logical Record (Continued)

Data Element	Contents	Format Type	ASCII	Domain of Values/ Explanation
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 metres *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 smallest primary contour interval: 1 feet 2 metres *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".*

Type A Logical Record (Continued)

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	Data edition/version, specifications edition/ version	INTEGER*2	I4	Two first digits = data edition/ version (ex: 1.0) Two last digits = specifications edition/version (ex: 2.0) *Ex: 1020* represents data Edition 1/Version 0, based on CDED Product Specifications Edition 2/Version 0.
29	Percent void	INTEGER*2	I4	If element 25 indicates a void, this field (right justified) contains the percentage of nodes in the files set to void (-32767).
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	Vertical datum shift is normally set to "0". *This field is left empty.*

7.4.3   Type B Logical Record

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" and should be disregarded. 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 normally set to "1", specifying 1 column per profile.
3	A two-element array containing the ground horizontal coordinates of the first elevation in the profile.	REAL*8	2D24.15	Ground horizontal coordinates (longitude and latitude) in arc seconds according to element 8 in Logical Record Type A.
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 Logical Record Type A.
6	The array of m x n elevations for the profile. Elevations are expressed in units of resolution elements (metres).	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.

7.5 Positional Accuracy

CDED consists of a grid containing profiles spaced according to longitude. Each profile contains <u>ground elevations</u> spaced according to latitude. Positional accuracy depends on the original source data.

Please see the CDED metadata file for further information on the horizontal and vertical accuracy reports, and the horizontal and vertical accuracy values.

7.6 Temporal Accuracy

NOT APPLICABLE (Please see the GeoBase Portal at http://www.geobase.ca).

7.7 Thematic (attributes) Accuracy

NOT APPLICABLE

8. Metadata

There are 2 levels of metadata to describe CDED, as shown in Figure 2: collection and product/data set. The higher level of metadata covers the entire data collection: it applies to the series of available data sets. The lower level, called product/data set metadata gives specific information about each source data set.

Figure 2: Metadata Levels

COLLECTION LEVEL

ONE

MANY

PRODUCT/DATA SET LEVEL
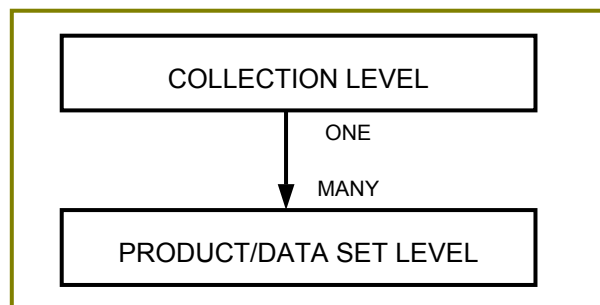
CDED metadata is available via the GeoBase Portal (in the Data section at http://www.geobase.ca), and the GeoConnections Discovery Portal (in the Data section at http://geodiscover.cgdi.ca).

In those instances where the source data is not NTDB, the respective contributing provincial/territorial partner is required to supply additional metadata for the collection and source data sets.

8.1 Collection Level Metadata

Applies to the entire provincial or territorial collection: one record = fixed metadata.

1. Source Horizontal Positional Accuracy Report,

2. Source Vertical Positional Accuracy Report,

3. Type of Source Media,

4. Source Citation Abbreviation,

5. Source Contribution,

6. Source Currentness Reference,

7. CDED Process Description.

8.2   Product/Data Set Level Metadata

Applies to individual source data sets: many records = variable metadata.

1. Identifier,

2. Edition,

3. Version,

4. Organization,

5. Source Data Type,

6. Source Product Name,

7. Source Validity: Beginning Date,

8. Source Validity: Ending Date,

9. Source Availability Date,

10. CDED Process Date,

11. Planimetric Accuracy,[1]

12. Planimetric Explanation Code,

13. Altimetric Accuracy,[1]

14. Altimetric Explanation Code,

15. First Spacing/Contour Interval,[1]

16. Second Spacing/Contour Interval,[1]

17. Scale,

18. NTS_50k_1,

19. NTS_50k_2,

20. NTS_50k_3,

21. NTS_50k_4.

[1] = Unit of measure is the metre

9.   Data Portrayal/Data Transfer Format/Physical Model

NOT APPLICABLE

10.   Data Delivery

10.1   Format Information

The physical structure of the CDED file, including Logical Records A & B, are described in Section 7.4 Logical Consistency of this document.

The digital data exchange format used to create the CDED is based on the USGS DEM format (please see http://rockyweb.cr.usgs.gov/nmpstds/demstds.html). The files are compressed and are available via the GeoBase Portal at http://www.geobase.ca

10.2   CDED Directory and File Name Conventions

10.2.1   CDED Responsibility Centres

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Example:

Name of the ".zip" file associated to a data set: **031k01.zip**

Name of the CDED files associated to a data set: **031k01_e.dem** *and* **031k01_w.dem**

</div>

1. All CDED files relating to a same NTS tile must be compressed when delivered.

2. Since an NTS tile covers two CDED cells, namely west and east cells, the two corresponding CDED files must be stored in one file and delivered simultaneously.

3. CDED file names correspond to the NTS tile number (6 characters in length), followed by an underscore, itself followed by one character indicating which cell (east or west) of the NTS the file is in, and completed by the ".dem" file extension.

    a) The first three characters of the NTS number have numeric values. For NTS numbers less than 100, the first character is padded with a zero (0).

    b) The fifth and sixth characters are numeric. The fifth character is padded with a zero (0) when the tile number is less than 10.

    c) For example, cells 031k01_e.dem and 031k01_w.dem respectively cover east and west cells of the NTS tile 031k01 at the scale of 1:50 000.

d) CDED files at the 1:250 000 scale are named similarly. For example, cells 031k_e.dem and 031k_w.dem respectively cover east and west cells of the NTS tile 031k at the scale of 1:250 000.

10.2.2 CDED Purchasers

Example:

Name of the ".zip" file associated to a data set: **011G13_1071673780004.zip**

Name of a CDED file associated to a data set: **011g13_0100deme.dem** *and*
                                                                        011g13_0100demw.dem

---

1. All CDED files relating to a same NTS tile are compressed (using the PKZIP compression software) when delivered.

2. Since an NTS tile covers two CDED cells, namely west and east cells, the two corresponding CDED files are stored in one file and delivered simultaneously.

3. The "zip " file name corresponds to the NTS tile, followed by an underscore "_" character, itself followed by a unique thirteen-character "time stamp" (automatically generated) and completed by the ".zip" file extension.

   For example, the ".zip" file name for 011G13 is:

   011G13_1071673780004.zip

4. The name of the CDED files within the ".zip" file refers to the NTS tile number (6 characters in length), followed by an underscore "_", followed by two characters specifying the CDED data set edition and two characters specifying the CDED data set version, itself followed by the three-character string "dem", followed by one character indicating which cell (east or west) of the NTS the file is in, and completed by the ".dem" file extension.

   For example, the CDED cell names for 011G13 at the scale of 1:50 000 are:

   011g13_0100deme.dem

   011g13_0100demw.dem

5. The ".zip" file also contains a metadata file in ".XML" format. The name of the metadata file within the ".zip" file refers to the NTS tile number (6 characters in length), followed by an underscore "_", itself followed by the word "meta" and the ".xml" file extension.

   For example, the metadata file name for CDED data set 011G13 is the following:

   011g13_meta.xml

6. CDED files at the 1:250 000 scale are named similarly.

10.3 Medium Information

The CDED data sets are available on-line directly via the GeoBase Portal at http://www.geobase.ca/ . The client is informed by E-mail when the process is complete and the file is available for transfer.

10.4 Constraints Information

The constraints information for data access and data use is defined in the GeoBase Unrestricted Use Licence Agreement (in the Data section at http://www.geobase.ca/) .

11 Data Capture and Maintenance

CDED data capture and maintenance is currently under negotiations with present and potential provincial and territorial partners