



Natural Resources
Canada

Ressources naturelles
Canada

Canada Flood Map Inventory (CFM)

2024-07-04

**Natural Resources Canada
Strategic Policy and Innovation
Canada Centre for Mapping and Earth Observation
Emergency Geomatics Services**

Client Services

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Canada

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RELEASE HISTORY

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1 OVERVIEW

1.1 TITLE

Canada Flood Map Inventory – Product Specification

1.2 REFERENCE DATE

Data product specifications creation date:

2023-06-14

1.3 RESPONSIBLE PARTY

Natural Resources Canada
Strategic Policy and Innovation Sector
Canada Centre for Mapping and Earth Observation
Client Services

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URL: <https://open.canada.ca/en/open-maps>

1.4 LANGUAGE

eng – English

fra - French

1.5 ABBREVIATIONS AND ACRONYMS

AEP	Annual exceedance probability
CCMEO	Canada Centre for Mapping and Earth Observation
DEM	Digital Elevation Model
ESRI	Environmental Systems Research Institute, Inc.
FGDB	Esri File GeoDatabase
FTP	File Transfer Protocol
GIS	Geographic Information System
ISO	International Organization for Standardization
NAD83	North American Datum of 1983
NFHDL	National Flood Hazard Data Layer
NRCan	Natural Resources Canada
OGC	Open Geospatial Consortium

OGP	International Association of Oil and Gas Producers
SPI	Strategic Policy and Innovation Sector
UTC	Coordinated Universal Time
WMS	Web Map Service
ZIP	File compression format

1.6 INFORMAL DESCRIPTION OF THE DATA PRODUCT

Floods are common disasters that affect many Canadians. Flood hazard mapping provides information on the extents and characteristics of potential flood scenarios and is an essential tool for flood risk mitigation and reduction. Currently, the federal government lacks an authoritative source of information that provides accessible, consistent and comprehensive data on flood hazards across Canada.

The creation of Canada Flood Map Inventory (CFM) to store existing, high-quality flood hazard information collected by provinces, territories, municipalities and other authoritative sources across Canada, represents the critical first step in filling this information gap.

CFM shows the areas of Canada where a copy of a flood hazard map has been collected by Natural Resources Canada (NRCan). The inventory does not indicate flood zones or their extent, but provides information on how to access these maps. Depending on the license and state of public availability, the inventory may provide download links, as well as reference information to the original source and/or owner of the data.

NRCan works with provincial and territorial governments to collect flood hazard maps from provinces, territories, municipalities and other agencies responsible for flood mapping. The inventory is regularly updated to improve completeness and accuracy.

Disclaimer: The Canada Flood Map (CFM) inventory should not be regarded as the official repository of flood hazard maps in Canada. The inventory does not include all flood hazard maps in Canada and does not always reflect the most recent data sources. The absence of a map in the inventory does not mean that an area has not been mapped. The information provided is not guaranteed to be accurate or complete. Please consult the organization responsible in your province, territory or municipality for the most recent and official information on flood hazard maps.

Geospatial flood hazard data: existing coastal, pluvial and riverine flood hazard data developed using standard engineering practices (e.g., hydrodynamic and hydraulic modelling), and where the resulting flood hazard maps are applied to support development, policy and decision-making in jurisdictions. Information and data are sought in geospatial formats compatible with geographic information system (GIS); e.g. shapefiles, raster data, or geodatabases.

Metadata: all metadata or “readme” files associated with the flood hazard data.

Flood mapping reports: final engineering reports associated with the flood hazard data and maps.

CFM is a digital geospatial tool produced by Natural Resources Canada. It is supplied by the best authoritative data sources, covers the Canadian territory, offers quality flood information in vector format and complies with international geomatics standards. The inventory includes over 500

flood study areas, and is produced from multiple sources from Canadian provinces, territories and municipalities.

CFM can be used within Web Map Services (WMS) and Geographic Information Systems (GIS) applications to create flood information products and mitigation tools.

This product is the result of an improved data model and aims to provide a data layer with uniform coverage across Canada.

CFM is maintained in partnership with data-providing organizations.

2 SPECIFICATION SCOPE

This section provides a description of the scope that is referred to in the subsequent sections, which specifically describe the product.

2.1 SCOPE IDENTIFICATION

Main

2.2 LEVEL

This scope refers to the following level according to the ISO 19115 standard:

006 - Series

2.3 LEVEL NAME

Canada Flood Map Inventory

2.4 EXTENT

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

2.4.1 Description

Canadian territory

2.4.2 Vertical extent

The CFM product does not have a vertical element. There is no elevation (z) associated with the data.

2.4.2.1 Minimum value

Not applicable

2.4.2.2 Maximum value

Not applicable

2.4.2.3 Unit of measure

Not applicable

2.4.2.4 Vertical datum

Not applicable

2.4.3 Horizontal extent**2.4.3.1 West bounding longitude**

-141.0

2.4.3.2 East bounding longitude

-52.0

2.4.3.3 South bounding latitude

+41.0

2.4.3.4 North bounding latitude

+84.0

2.4.4 Temporal extent

The temporal extent is given by the following period of time:

2.4.4.1 Beginning date

1975

2.4.4.2 Ending date

Today

2.5 COVERAGE

Full extent

3 DATA PRODUCT IDENTIFICATION**3.1 TITLE**

Canada Flood Map Inventory

3.2 ABSTRACT

The Canada Flood Map Inventory (CFM) incorporates geospatial flood data into one consistent database, including metadata, which is stored and managed by NRCan and actively maintained in collaboration with authoritative data providers in the jurisdictions. The following information is included when provided with the authoritative source:

Geospatial flood hazard data: existing coastal, pluvial and riverine flood hazard data developed using standard engineering practices (e.g., hydrodynamic and hydraulic modelling), and where the resulting flood hazard maps are applied to support development, policy and decision-making in jurisdictions. Information and data is sought in geospatial formats compatible with geographic information system (GIS); e.g. shapefiles, raster data, or geodatabases.

Metadata: all metadata or “readme” files associated with the flood hazard data.

Flood mapping reports: final engineering reports associated with the flood hazard data and maps.

3.2.1 Product and Methodology Description

CFM was developed by combining various sources of geospatial data from the provinces, territories and municipalities into a common data model that was reviewed and endorsed by the stakeholders.

More than 600 datasets were collected and 400 were selected to be included in the product.

The datasets were selected/rejected based on the following criteria:

1. Not authoritative flood map (deprecated maps, not flood maps...]
2. Invalid or unusable data (pdf maps or corrupted files),
3. Incompatible with the data model (lines instead of polygons).

Various Extraction, Transformation and Loading software were used to convert the various datasets into the common schema of CFM.

3.3 OBJECTIVE

The purpose of this initiative is to create a ‘whole of Canada’ picture of flood hazards maps, by bringing together flood hazard data from different areas of the country, created using different methodologies, and presented using different schemas into one common and consistent data layer.

This product is the result of an improved data model with the goal of providing a seamless data coverage layer across Canada.

3.4 TOPIC CATEGORY

Main topics for the product, as defined by the ISO 19115-1:2014 standard:

001- farming

004 - climatologyMeteorologyAtmosphere

006 - elevation
 007- environment
 008 - geoscientificInformation
 012 - inlandWater
 014 - oceans
 017 - structure (man-made construction)
 018 - transportation
 019 - utilitiesCommunication

3.5 SPATIAL REPRESENTATION TYPE

001 - Polygon

3.6 SPATIAL RESOLUTION

Spatial resolution varies depending on the source, scale and methodology used to create each dataset.

3.7 GEOGRAPHIC DESCRIPTION

3.7.1 Authority

International Organization for Standardization (ISO)

3.7.1.1 Title

ISO 3166-1:2013 Codes for the representation of names of countries and their subdivisions – Part 1 Country codes

3.7.1.2 Date

Reference date of the ISO 3166-1:2013 standard: 2013-11-01

3.7.1.3 Date type

002 - Publication

3.7.2 Code

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

CA - Canada

3.7.3 Code Type

Type of code of the delimitation polygon of the extent according to the ISO 19115 standard:

1 - Inclusion (polygon delineation is inclusive)

3.8 REFERENCE TO SPECIFICATION SCOPE

Main

4 DATA CONTENT AND STRUCTURE

4.1 DESCRIPTION

The central feature is the flood map. The "flood map" feature is characterized by its geometry, which shows the location where NRCan has a copy of a flood map that meets the standards established by NRCan.

The other feature of the model is "provinces or territories". This is also characterized by its geometry, representing provincial and territorial boundaries. It provides links to web resources on flood zone mapping.

4.2 DATA MODELLING SCHEMA

4.2.1 Application schema

Figure 1 highlights the conceptual data model of CFM described above.

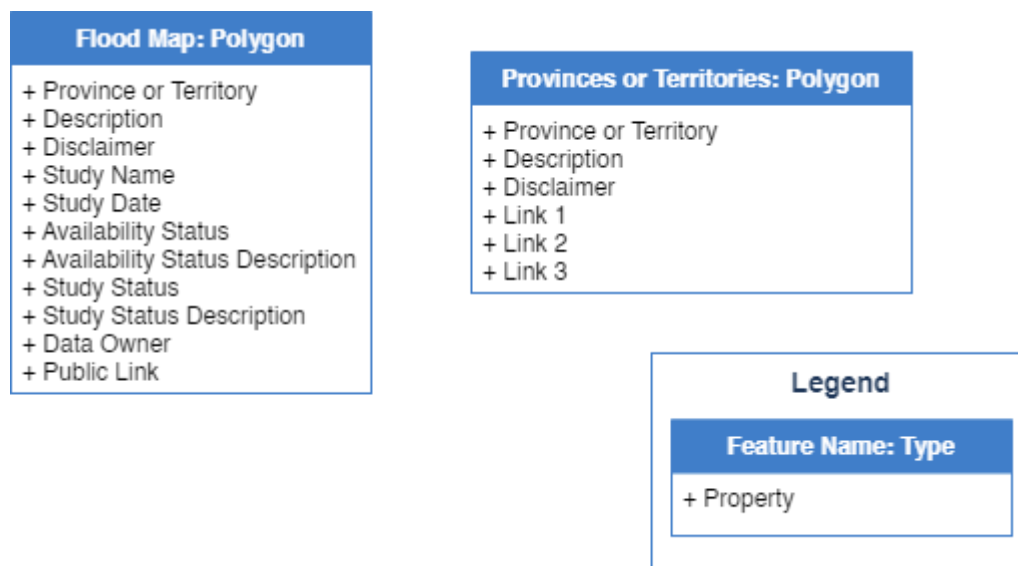


Figure 1: CFM conceptual data model. Boxes represent features, which are described by properties (bullet points).

Features presented in the conceptual model are stored in a vector database. CFM's vector database schema indicates that features are stored as polygons, with primary and foreign keys defined so that relationships between features are stored in the database. The schema of the vector database is presented in the form of a UML (Unified Modeling Language) diagram in figure 2 and summarized below:

- There must always be a flood_map feature (flood map) representing the spatial extent of a flood study, as defined by the study's authors, or the minimum delimitation area of related features.
- The two features are unrelated and mutually exclusive.

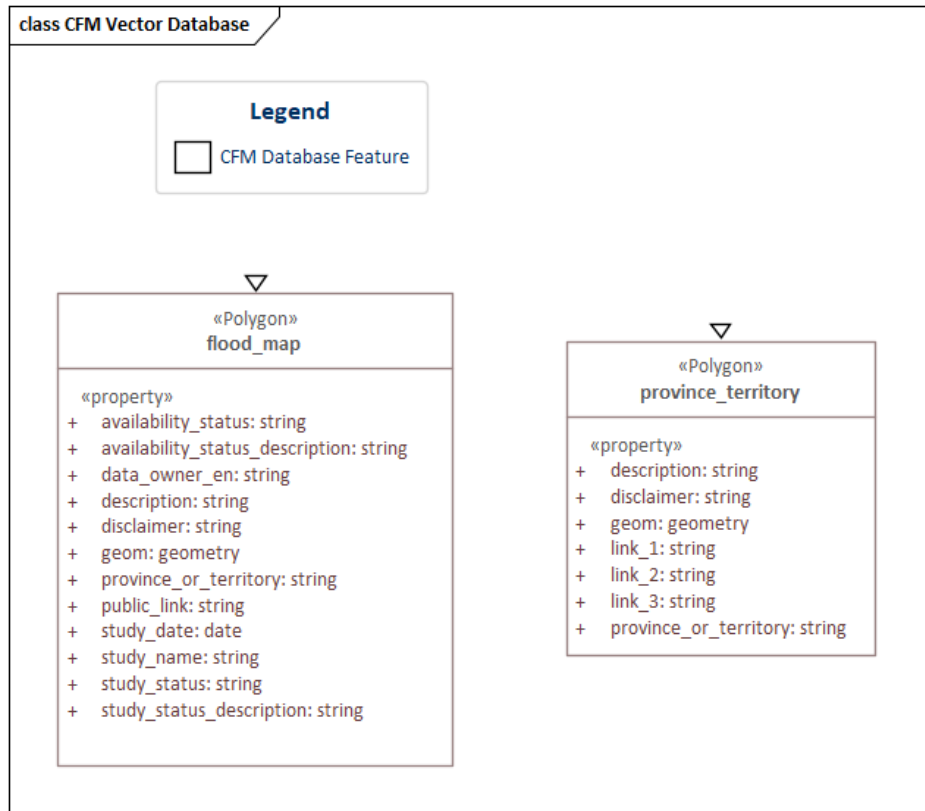


Figure 2: CFM vector database model and UML class diagram. As in the conceptual data model, each box represents a feature. Each feature is characterized by its properties, data type, and multiplicity for the property.

4.2.2 Feature catalogue

The files contained in the downloadable FGDB and GPKG files have the following structures.

4.2.2.1 Conceptual Model Features

Table 1 describes CFM at a conceptual level:

Table 1: Conceptual Features of CFM

Feature	Description
Flood Map	This is the central feature of the database. It delimits the spatial domain or extent of the location where NRCan has a copy of a flood map meeting the standards established by NRCan.

Province and Territory	This feature represents the delimitation of different provinces and territories, and provides information on online resources related to flood mapping.
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4.2.2.2 Generic Logical Data Model features

Detailed description of the polygon feature classes contained in CFM are presented in Table 2.

Table 2: Detailed Descriptions of Conceptual Features of CFM

Feature Name	Definition			
flood_map <<MultiPolygon>>	Location where NRCan has a copy of a flood map that meets NRCan standards.			
Property	Definition	Type	Mandatory	Maximum Number of Values
province_or_territory <<property>>	Full name of the province or territory within which the study was conducted (ex. BC).	String (50) Province Or Territory <<Code List>>	Y	1
description <<property>>	Layer content description	String (1000)	Y	1
disclaimer <<property>>	Warning on the use of the layer and its contents.	String (1000)	Y	1
study_name <<property>>	Unique name of the study area, typically the major watercourse or waterbody at risk of flooding or the municipality within which the flood hazard falls. If more than one study has the same name, it will be suffixed with a number (ex. Red River 1)	String (500)	Y	1
study_date <<property>>	Study completion date	String (10)	Y	1
availability_status <<property>>	Availability of data to the public.	String (50) Availability Status <<Code List>>	Y	1
availability_status_description <<property>>	Description of availability of data to the public.	String (250) Availability Status <<Code List>>	Y	1
study_status <<property>>	Status of the study.	String (100) Availability Status <<Code List>>	Y	1
study_status_description <<property>>	Description of the status of the study.	String (250) Availability Status <<Code List>>	Y	1
data_owner <<property>>	English name of the entity responsible for data maintenance and sharing.	String (500)	Y	1
public_link <<property>>	Public link of the province or territory.	String (1000)	N	1

geom <<geometry>>	The spatial index defining the coordinates of the polygonal study area.	Geometry (MultiPolygon)	Y	1
Feature Name	Definition			
province_territory <<MultiPolygon>>	Delineates the different provinces and territories and provides information on online resources related to flood mapping.			
Property	Definition	Type	Mandatory	Maximum Number of Values
province_or_territory <<property>>	Full name of the province or territory within which the study was conducted (ex. BC).	String (200)	Y	1
description <<property>>	Layer content description	String (1000)	Y	1
disclaimer <<property>>	Warning on the use of the layer and its contents.	String (1000)	Y	1
link_1 link_2 link_3 <<property>>	Links to various flood-related resources offered by different provinces and territories.	String (1000)	N	1
geom <<geometry>>	The spatial index defining the coordinates of the polygonal hazard area.	Geometry (MultiPolygon)	Y	1

4.2.3 Logical Data Model Code Lists

4.2.3.1 classDomain:

Table 3 presents the different domain values used for the NFHDL.

Table 1: Domain values used for CFM

Attribute	Value	Definition
Province or Territory	ab	Alberta
	bc	British Columbia
	mb	Manitoba
	nl	Newfoundland and Labrador
	nb	New Brunswick
	ns	Nova Scotia
	nt	Northwest Territories
	nu	Nunavut
	on	Ontario
	pe	Prince Edward Island
	qc	Québec
	sk	Saskatchewan
	yt	Yukon
Availability Status	not publicly available	Data was acquired via the data owner and is not available to the general public.
	fully or partially publicly available	Data and reports are publicly available in full or in part via a web map service or for download.
Study Status	final	Flood mapping studies are complete, including review and engagement, and not subject to change as part of this specific project.
	under review	Flood maps currently under-going review through local engagement activities. Final flood mapping results from this specific project may differ following the review.

4.3 REFERENCE TO SPECIFICATION SCOPE

Main

5 REFERENCE SYSTEMS

5.1 SPATIAL REFERENCE SYSTEM

Spatial data is available according to the North American Datum 1983 Canadian Spatial Reference System (NAD83/Canada Atlas Lambert - EPSG:3979) projection and (NAD83SCRS – EPSG:4617) for the web services.

5.1.1 Authority

5.1.1.1 Title

EPSG Geodetic Parameter Registry:

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

5.1.1.2 Date

Reference date:

2011-08-17

5.1.1.3 Date type code

Date type according to ISO 19115 standard:

002 - Publication

5.1.1.4 Responsible party

OGP - International Association of Oil and Gas Producers

URL : <http://www.epsg.org> (en anglais seulement)

5.1.2 Code

Coordinate reference system identifier (CRSID):

EPSG:3979 and 4617

5.1.3 Code space

EPSG - European Petroleum Survey Group

5.2 REFERENCE TO SPECIFICATION SCOPE

Main

6 DATA QUALITY

Disclaimer:

CFM is the result of the collection of datasets obtained from provinces, territories, and municipalities. Consequently, NRCan cannot guarantee the quality of the data. Please contact the data owner if you require further information about data quality.

6.1 COMPLETENESS

6.1.1 Commission

The data quality assessment (including completeness and thematic accuracy) is directly performed during data production process. The validation method applied depends on the data source used. CFM data comes from 3 different sources: Provinces, Territories and municipalities.

Data quality is ensured by the producer (and partners). The validation mechanism used may vary from one partner to another.

6.1.2 Omission

Methodology described to evaluate the “Commissions” is also applied to verify the omissions in the CFM product.

The data is coming from partnership agreements. The partner may have not picked one or more features specified in the data catalogue therefore, causing an omission. The partner is aware about this possibility and encouraged to take appropriate precautions.

6.2 CONSISTENCY

6.2.1 Conceptual Consistency

The rules of CFM conceptual schema are validated in the source database containing CFM product. This approach ensures the conceptual consistency between the conceptual schema and CFM product.

6.2.2 Domain Consistency

The domain of values included in the feature catalogue is validated in the source database containing the product. This approach ensures the domain consistency between the feature catalogue and the product.

6.2.3 Format Consistency

The use of well-established commercial software to generate distribution formats ensures format consistency for product distribution.

6.2.4 Topological Consistency

Not applicable

6.3 POSITIONAL ACCURACY

6.3.1 Absolute or external accuracy

Unknown

6.3.2 Relative or internal accuracy

Unknown

6.4 TEMPORAL ACCURACY

6.4.1 Accuracy of a Time Measurement

Not applicable

6.4.2 Temporal Consistency

Not applicable

6.4.3 Temporal Validity

1975-2020

6.5 THEMATIC ACCURACY

6.5.1 Classification Correctness

The methodology described to evaluate the “Commissions” is also applied to verify the classification correctness in the CFM product.

6.5.2 Non-Quantitative Attribute Correctness

The methodology described to evaluate the “Commissions” is also applied to verify the non-quantitative attribute correctness in the CFM product.

6.5.3 Quantitative Attribute Accuracy

The methodology described to evaluate the “Commissions” is also applied to verify the quantitative attribute correctness in the CFM product.

6.5.4 Reference to specification scope

Main

7 DATA CAPTURE

7.1 DESCRIPTION

Data acquisition methodology can be found on provincial and territorial websites. Some provinces or territories may not provide direct access to reports. Contact the responsible authority directly for more information.

7.2 REFERENCE TO SPECIFICATION SCOPE

Main.

8 DATA MAINTENANCE

8.1 DESCRIPTION

The maintenance of the features composing the CFM product comes from the Provinces, Territories, and municipalities and are based on agreements and the production activities of the CCMEQ.

The data production activities within the SPI of NRCan are determined based on current government priorities such as the development of the North and sustainable development of natural resources.

The update frequency for the CFM features varies a great deal and depends directly on the data producer agency (source).

The static CFM product is published at least once a year or when significant data changes occur. Each new publication includes updates gathered since the previous release.

8.2 REFERENCE TO SPECIFICATION SCOPE

Main

9 DATA PRODUCT DELIVERY

The product can be accessed in different formats.

- WMS and ESRI™ Rest Web Service: Allows you to display products dynamically according to the date and area of interest.
- Geographic database files (ESRI™ File Geodatabase): They are accessible via an FTP site.
- GeoPackage: They are accessible via an FTP site.

9.1 DELIVERY FORMAT INFORMATION: GEOPACKAGE

9.1.1 Format Name

GeoPackage Encoding Standard

9.1.2 Version

1.2.1

9.1.3 Specification

GeoPackage–1.2.1, OpenGIS® Implementation Specifications, OGC Recommendation Paper, 2018-09-06, OGC Document Number 12-128r15 (<http://www.geopackage.org/spec121/>)

9.1.4 Language

eng - English

fra – French

9.1.5 Character set

004 – UTF8

9.2 DELIVERY FORMAT INFORMATION: FGDB

9.2.1 Format Name

File Geodatabase - ESRI™

9.2.2 Version

Unknown (Outside the public domain)

9.2.3 Specification

Not available. This format was launched with the ArcGIS (ESRI™) software, version 9.2.

9.2.4 Language

eng - English

fra – French

9.3 DELIVERY MEDIUM INFORMATION FOR STATIC FILES

9.3.1 Units of delivery

Canada

9.3.2 Transfer Size

Variable

9.4 REFERENCE TO SPECIFICATION SCOPE

Main

10 ADDITIONAL INFORMATION

10.1 LIMITATION OF LIABILITY

Accordingly, the information contained on this website is provided on an “as is” basis and Natural Resources Canada makes no representations or warranties respecting the information, either expressed or implied, arising by law or otherwise, including but not limited to, effectiveness, completeness, accuracy or fitness for a particular purpose. Natural Resources Canada does not assume any liability in respect of any damage or loss based on the use of this website. In no event shall Natural Resources Canada be liable in any way for any direct, indirect, special, incidental, consequential, or other damages based on any use of this website or any other website to which this site is linked, including, without limitation, any lost profits or revenue or business interruption.

10.2 CREDIT

Use of this data for publications, posters, or presentations is encouraged. All use must include the following standard acknowledgement paragraph: "The flood map extent products are derived from a system developed and operated by the Strategic Policy and Innovation Sector of Natural Resources Canada © Department of Natural Resources Canada. All rights reserved".

10.3 POINT OF CONTACT

For questions and feedback please contact the Client Services of CCMEQ (geoinfo@nrca-nrcan.gc.ca).

11 METADATA

The metadata requirements follow the Government of Canada’s Treasury Board Standard on Geospatial Data (ISO 19115).

Metadata for each Flood in Canada product contains the following information:

- 1) Unique identification information
- 2) Date information
- 3) Series information
- 4) Brief description
- 5) Detailed description
- 6) Spatial reference information
- 7) Geographic extent information

- 8) Distribution information
- 9) Information on distribution constraints