GSC'S BEDROCK GEODATABASE: MODEL DESIGN AND DESCRIPTION

VERSION 2.6

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INTRODUCTION

The GSC BedrockGDB Model design is heavily influenced by some of the GSC's corporate requirements, including that to comply with the Geological Map Flow (GMF) process for the production of CGM maps (i.e. Canadian Geoscience Map), and the obligation to use the ESRI® commercial platform. The latter requires the addition of proprietary functionalities of the ESRI® File Geodatabase such as *SubTypes*, *Domain Values* and *Relationship Class*.

Based on a data-centric approach, this normalized model extends data management beyond the standard geological map. It covers the essentials for managing a bedrock mapping project including its governance and all associated metadata.

NAMING CONVENTION

A naming convention for all the database components is presented here. The names of these components (*Feature Dataset*, *Feature Class*, *Table* and *Domain Values*) were chosen based on the following criteria:

- the names must be simple and comprehensible to geoscientists,
- the names must make it possible to situate each element in the general context of the model:
    - for field data, the name begins with the prefix "F_" (Field)
    - for corporate, or master, data, the name begins with the prefix "M_" (Master)
    - for project-specific data, the name begins with the prefix "P_" (Project)
- the names must be in upper case letters, but their alias in upper case/lower case letters
- the name of a *Domain Value* must reflect its level, whether corporate or project-specific:
    - if corporate and controlled by a *Subtype*, the name ends with the suffix "_SID"
    - if corporate but not controlled by a *Subtype*, the name ends with the suffix "_DID"
    - if non-corporate but project-specific, the name ends with the suffix "_PID"
- the use of the suffix "ID" is reserved for attributes used as a primary key.

Another convention, used for the writing of this document, is intended to facilitate understanding of the text by highlighting the various database components as well as the terms more specific to the ArcGIS™ platform. It was therefore decided to adopt the following rules:

- the terms specific to the ArcCatalog™ and ArcMap™ software are shown in italics (e.g. *Geodatabase, Feature Class, Subtype, Domain Values*)
- the name of a *Feature Dataset* is shown in upper case, bold (e.g. **FIELD_OBS**)
- the name of a *Feature Class* or *Table* is shown in upper case, bold/italics (e.g. ***GEO_LINES, P_SOURCE***)
- the name of an attribute is replaced by its alias and shown in upper case/lower case, bold/italics (e.g. ***StationID***, ***Report Link***)
- the name of a *Domain Value* is shown in upper case/lower case, bold/italics (e.g. ***Participant_PID***, ***MapUnit_PID)***

1 GEODATABASE DESIGN

As mentioned in the introduction, the GSC BedrockGDB is designed to manage all the data generated by a geological mapping project and is based on a modular approach (figure 1).

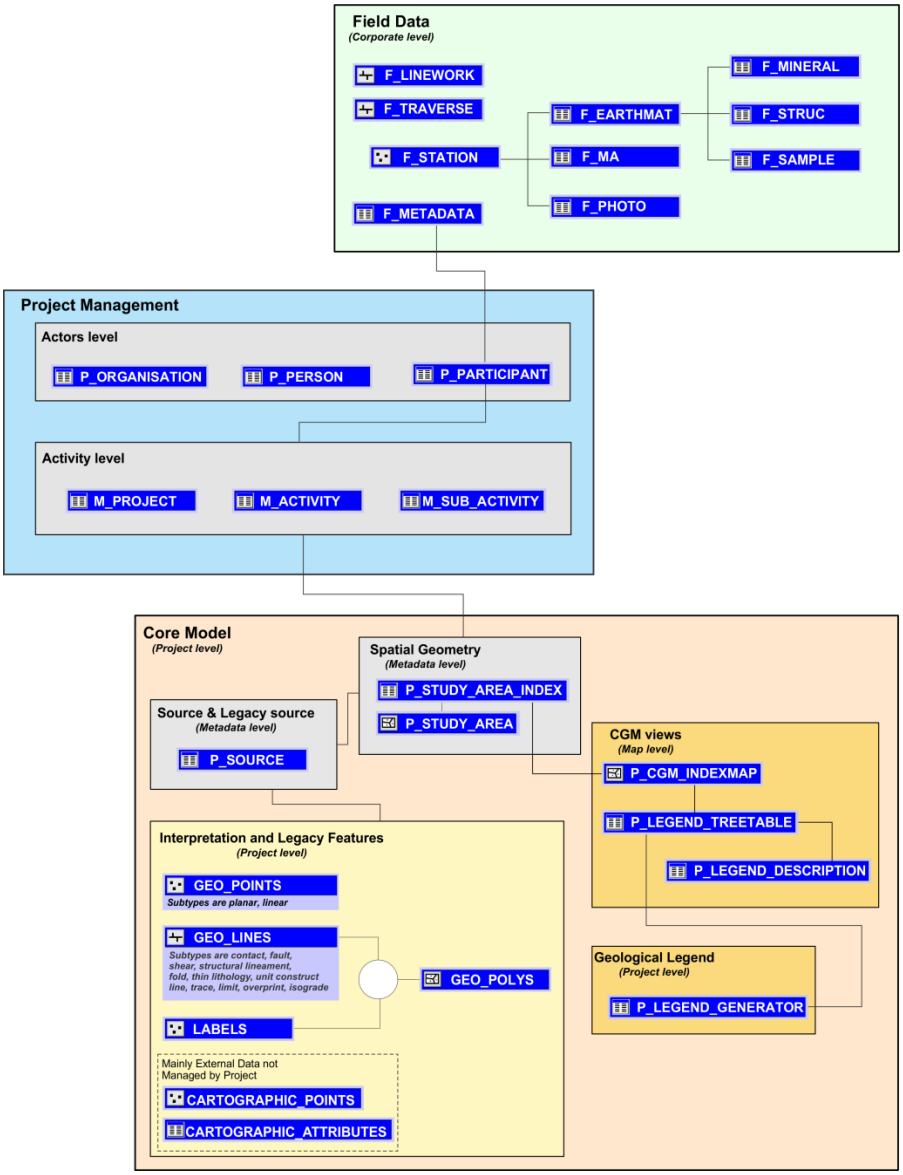

Figure 1 - Simplified schema of the GSC BedrockGDB model

1.1 FIELD DATA MODULE

The **Field Data** module contains all the field data acquired using GanFeld, a portable digital data acquisition system developed at the GSC (Shimamura et al., 2008). This module contains all the elements from the direct translation of the GanFeld system (based on ShapeFiles) to a normalized entity-relationship model in a geodatabase. Figure 2 provides an overview of the data flow imposed by the structure of the GanFeld data model.

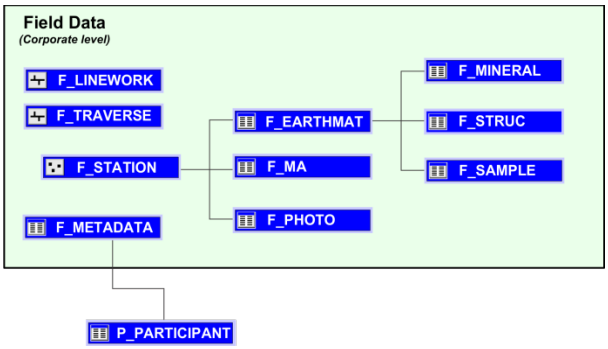

Figure 2 - Field data module

The modular nature of the model is clearly shown here, with only one functional link with the other modules, centred on the ***F_METADATA*** and ***P_PARTICIPANT*** metadata tables. The model can therefore be quickly adapted to any change in the data acquisition system.

1.2 PROJECT MANAGEMENT MODULE

As mentioned in the introduction, one of the requirements of the model concerns the management of all aspects of the governance of a geological mapping project. The **Project Management** module (figure 3) provides this management functionality for the project-related activities and sub-activities, as well as for the participating individuals. More specifically, the **Actors level** sub-module makes it possible to manage the relevant participant-related information, while the **Activity level** sub-module preserves the relationships between a project, its main activities and its sub-activities. The link between this module and the **Core Module** is provided by the **Spatial Geometry** metadata sub-module, whose sole function is to store the geometry (i.e. spatial extension) of the feature of the area covered by a project or its activities.

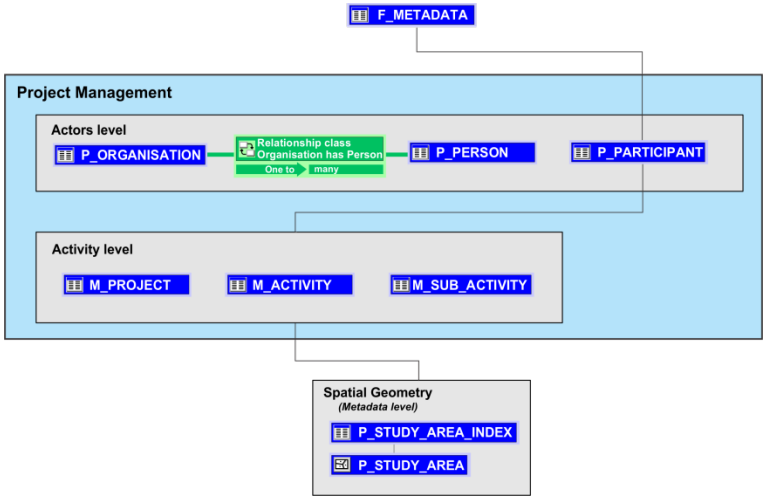

Figure 3 - Project Management module

Some of the data recorded in the various tables of this module serve a two-fold function as both data and metadata. For example, the data recorded in the ***P_PARTICIPANTS*** and ***M_SUB_ACTIVITY*** tables can become metadata for the elements of interpretation of ***GEO_LINES*** or ***GEO_POINTS***.

1.3 CORE MODULE

The **Core** module includes all the basic functionalities required to create, edit and store geological interpretations or compilations, as well as a series of tables enabling this information to be structured in a format compatible with the creation of legends (figure 4). The components of this module are also responsible for managing and generating all the CGM maps of a project.

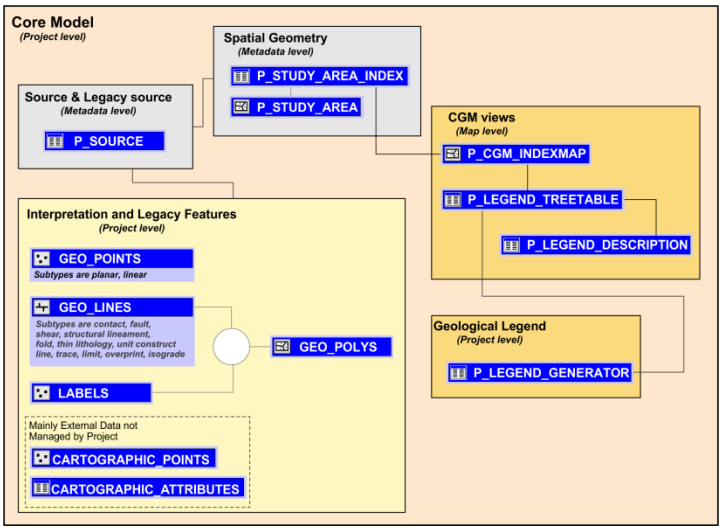

Figure 4 - Core module

The **Interpretation and Legacy Feature** sub-module contains the ***GEO_LINES*** and ***LABELS*** *Feature Classes* which are used to create the geological polygons (i.e. map units) recorded in ***GEO_POLYS***. Unlike certain other models, the approach used here relies on the combined digitization of lines and points (labels) during geological interpretation or compilation, rather than on the direct digitization of polygons. The entire geological interpretation is then recorded in ***GEO_LINES*** and ***LABELS*** and the polygons resulting from this interpretation can be easily created or recreated if necessary.

The ***GEO_POINTS*** *Feature Class* contains all the structural point data of a project. The structural data acquired in the field using the GanFeld system are automatically transferred from the ***F_STRUC*** table of attributes to ***GEO_POINTS***, while the data from compilation work are recorded directly into ***GEO_POINTS*** .

The information recorded in ***CARTOGRAPHIC_POINTS*** and ***CARTOGRAPHIC_ATTRIBUTES*** concerns external datasets, not managed by the model, but which are indispensable to the user during the process of geological interpretation. For example, drilling data or geochronological ages can be decisive during the interpretation of a geological concept (contact, fault, etc.).

The ***P_LEGEND_GENERATOR*** table of the **Geological Legend** sub-module contains all the common and reusable legend items for each of the CGM maps of a project, while the tables of the **CGM views** sub-module are used to manage the description of each of these legend items.

2 GEODATABASE DESCRIPTION

The following sections provide a brief explanation of the Geodatabase followed by a complete description of all the elements of the model that may be included in a publication. Depending on the objectives of each mapping project and their internal governance process, each publication will include a subset of the following *Feature Classes* and *Tables.*

Figure 5 provides an overview of the tree structure of the database in the ArcCatalog™ environment. This structure includes a series of *Feature Classes*, *Tables* and *Relationship Classes,* as well as two *Feature Datasets* called **FIELD_OBS** and **GEO**. The **FIELD_OBS** *Feature Dataset* contains all the elements downloaded from the GanFeld system, while **GEO** contains the four *Feature Classes* that are used to create and then manage the geological interpretation. Two different *Feature Datasets* are used since the field observation data is often in a different projection than the interpreted/published data.

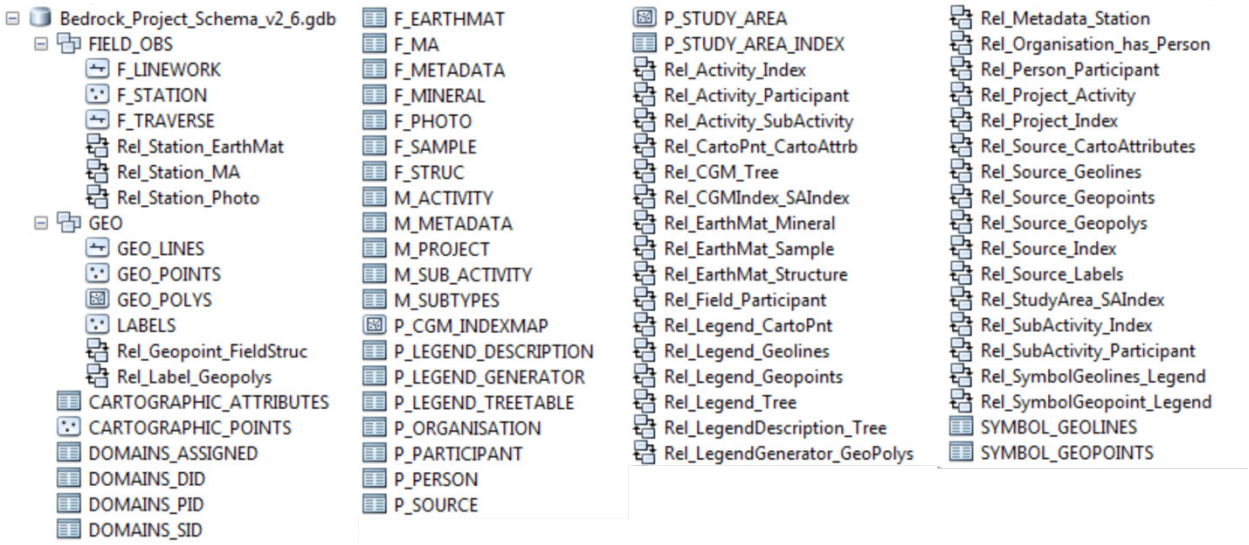

Figure 5 - ArcCatalog view of the GSC BedrockGDB version 2.6

2.1 FIELD DATA MODULE DESCRIPTION

The **Field Data** module contains all the field observation data acquired using the GanFeld system, version 2013.

2.1.1 F_TRAVERSE FEATURE CLASS

F_TRAVERSE is a line *Feature Class* containing the traces of the geological traverses recorded in the GanFeld application.

Field	DataType	Length	AliasName	Description	IsNullable
TRAVERSEID	String	25	TraverseID	Sequential traverse number (1, 2, 3, etc.)	FALSE
TRAVERSENO	SmallInteger	2	TraverseNo	Sequential traverse number (1, 2, 3, etc.)	FALSE
VISITDATE	Date	8	Visit Date	Date of traverse (numerical mm/dd/yy)	FALSE
PARTNER	String	50	Partner	Traverse partner	TRUE
NOTES	String	254	Notes	Remarks or notes on the traverse	TRUE

Table 1 – Field properties and description for *F_TRAVERSE*

2.1.2 F_LINEWORK FEATURE CLASS

This line *Feature Class* contains the elements of geological interpretation recorded by the GanFeld application. These linear elements generally represent contacts, faults or folds derived from the preliminary interpretation made by the geologist directly in the field.

Field	DataType	Length	AliasName	Description	IsNullable
LINEWORKID	String	25	LineworkID	Unique identifier for the linework	FALSE
LINEWORKNO	SmallInteger	2	LineworkNo	Sequential number for linework (1, 2, 3, etc.)	FALSE
LINETYPE	String	50	Line Type	Type of feature represented by the line (contact, fault, fold, etc.)	FALSE
LINEDETAIL	String	50	Line Detail	The details of the line (examples: thrust, dextral, anticline)	TRUE
CONFIDENCE	String	25	Confidence	Confidence in the position of the line	TRUE
NOTES	String	254	Notes	Notes or remarks about line	TRUE

Table 2 - Field properties and description for *F_LINEWORK*

F_STATION FEATURE CLASS

F_STATION is a point *Feature Class* which identifies and describes a geographic location for which geological observations are made. It contains the geographic coordinates as well as a series of attributes which describe the type and quality of the observation locality.

Field	DataType	Length	AliasName	Description	IsNullable
STATIONID	String	25	StationID	Unique station ID (2 digit year, 2 or 3 letter officer code, three digit station #)	FALSE
STATIONNO	Integer	4	StationNo	The sequential number of the station, used for administrative purposes (e.g. 1, 2, 3, 4)	FALSE
TRAVNO	SmallInteger	2	TraverseNo	Sequential traverse number (1, 2, 3, etc.)	TRUE
VISITDATE	Date	8	Visit Date	Date of traverse (numerical mm/dd/yy)	FALSE
VISITTIME	String	50	Visit Time	Time of day for station observation (hh:mm:ss AM/PM)	FALSE
LATITUDE	Double	8	Latitude	Latitude in decimal degrees	FALSE
LONGITUDE	Double	8	Longitude	Longitude in decimal degrees	FALSE
EASTING	Double	8	Easting	UTM Easting (to 2 decimal places - cm precision)	FALSE
NORTHING	Double	8	Northing	UTM Northing (to 2 decimal places - cm precision)	FALSE
DATUMZONE	String	25	Datum Zone	UTM longitudinal zone (9, 10, 11, etc.)	FALSE
ELEVATION	Single	4	Elevation	Elevation in metres	TRUE
ELEVMETHOD	String	15	Elevation Method	Method of elevation capture	TRUE
ENTRYTYPE	String	7	Entry Type	Method of location entry (built-in GPS, manual coordinate entry, screen tap)	TRUE
PDOP	Single	4	PDOP	Position error factor	TRUE
SATSUSED	SmallInteger	2	Sat Used	Number of satellites used in GPS position fix	TRUE
OBSTYPE	String	25	Observation Type	Nature of station (visited outcrop, photograph only, etc.)	TRUE
OCQUALITY	String	25	Outcrop Qual	Quality of outcrop	TRUE
PHYSENV	String	25	Physical Environment	Physical environment of the station (ridgeline, shoreline, etc.)	TRUE
OCSIZE	String	50	Outcrop Size	Outcrop size estimate	TRUE
NOTES	String	254	Notes	Notes or remarks about the station	TRUE
SLSNOTES	String	254	SLS Notes	Notes or remarks about what was seen between this station and the last	TRUE
AIRPHOTO	String	50	Airphoto No	Air photo number	TRUE
METAID	String	30	MetaID	For internal use only. Added by the GanFeld Data Management Tools to maintain a unique Station code. Composed of the [YearofFieldwork][OfficerCode] [ProjectCode].	FALSE
REPORT_LINK	String	254	Report Link	Link to an XML document which is a summary of the field observation of the STATIONID	TRUE

Table 3 - Field properties and descriptions for *F_STATION*

The ***MetaID*** and ***Report Link*** attributes were added to the original GanFeld structure to accommodate new processes. ***MetaID*** thus provides a link between the geological observation stations and the **Project Management** module, while the information stored in ***Report Link*** makes it possible to activate the hyperlink that provides access to a summary of the geological observations, in the form of an XML document.

2.1.3 F_EARTHMAT TABLE

The ***F_EARTHMAT*** table contains the lithological observations made at each station of ***F_STATION.*** A "one-to-many" type relationship (*Relationship Class*) named ***Rel_Station_EarthMat*** exists between the two. In other words, a station can have one or more earth materials.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
STATIONID	String	25	STATIONID	The unique identification of each outcrop or point where observations were made.	FALSE	n.a.
EARTHMATLT	String	5	EARTHMATLT	Sequential letter for lithologies at a station	FALSE	n.a.
EARTHMATNO	SmallInteger	2	EARTHMATNO	Sequential number for lithologies at this station	FALSE	n.a.
EARTHMATID	String	25	EARTHMATID	Unique identifier	FALSE	n.a.
LITHGROUP	String	50	LITHGROUP	The general rock grouping (for GanFeld functionality).	FALSE	n.a.
LITHTYPE	String	50	LITHTYPE	The subdivision of the general rock grouping (for GanFeld functionality).	FALSE	n.a.
LITHDETAIL	String	50	LITHDETAIL	The detailed rock name. This field stores the functional rock name and is the only required field for rock names.	FALSE	n.a.
MAPUNIT	String	50	MAPUNIT	The map unit to which the lithology belongs.	TRUE	n.a.
OCCURAS	String	50	OCCURAS	The nature of the occurrence within the station.	TRUE	n.a.
MODSTRUC	String	254	MODSTRUC	Qualifiers relating to primary structures within the lithology.	TRUE	n.a.
MODTEXTURE	String	254	MODTEXTURE	Qualifiers relating to textural properties of the lithology.	TRUE	n.a.
MODCOMP	String	254	MODCOMP	Qualifiers relating to the composition of the lithology.	TRUE	n.a.
GRCRYSIZE	String	254	GRCRYSIZE	Lithology grain size	TRUE	n.a.
DEFFABRIC	String	254	DEFFABRIC	Deformational fabrics or structures within the lithology	TRUE	n.a.
BEDTHICK	String	254	BEDTHICK	Bedding thickness	TRUE	n.a.
MINERAL	String	254	MINERAL	A list of minerals present in the lithology with mode (from GanFeld).	TRUE	n.a.
MINNOTE	String	254	MINNOTE	Notes on minerals present.	TRUE	n.a.
COLOURF	String	50	COLOURF	Fresh colour	TRUE	n.a.
COLOURW	String	50	COLOURW	Weathered colour	TRUE	n.a.
COLOURIND	SmallInteger	2	COLOURIND	The colour index value from 0 to 100.	TRUE	n.a.
MAGSUSCEPT	Double	8	MAGSUSCEPT	The magnetic susceptibility value of the lithology (in SI units).	TRUE	n.a.
FOSSILS	String	254	FOSSILS	A list of fossils present in the lithology.	TRUE	n.a.
FOSSILNOTE	String	254	FOSSILNOTE	Notes on the fossils present.	TRUE	n.a.
CONTACT	String	254	CONTACT	Further notes or remarks about the contacts	TRUE	n.a.
CONTACTUP	String	50	CONTACTUP	The nature of upper contact.	TRUE	n.a.
CONTACTLOW	String	50	CONTACTLOW	The nature of lower contact.	TRUE	n.a.
INTERP	String	254	INTERP	An interpretation of the genetic origin or protolith of the lithology.	TRUE	n.a.
INTERPCONF	String	10	INTERPCONF	The level of confidence with the lithology interpretation.	TRUE	n.a.

Table 4 - Field properties and description for *F_EARTHMAT*

2.1.4 F_MINERAL TABLE

The ***F_MINERAL*** table has a "one-to-many" type relationship (*Relationship Class*) with the ***F_EARTHMAT*** table (***Rel_EarthMat_Mineral***). In other words, an earth material can have one or more minerals. This table contains all the attributes necessary to record the observations related to the form of the mineral, its mode of occurrence, size and colour.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
STATIONID	String	25	STATIONID	The unique identifier for the station at which the mineral occurs.	FALSE	n.a.
EARTHMATID	String	25	EARTHMATID	The unique identifier for the lithology in which the mineral occurs.	FALSE	n.a.
MINERALID	String	25	MINERALID	The unique identifier for the lithology mineral occurrence.	FALSE	n.a.
MINERALNO	SmallInteger	2	MINERALNO	Sequential number of mineral within this lithology (Ex: 1, 2, 3)	FALSE	n.a.
MINERAL	String	25	MINERAL	The mineral being described.	FALSE	n.a.
FORM	String	25	FORM	The form of the mineral (e.g. euhedral, anhedral, subhedral)	TRUE	n.a.
HABIT	String	25	HABIT	The habit of the mineral (Ex: acicular, columnar, equant, fibrous)	TRUE	n.a.
OCCURRENCE	String	25	OCCURRENCE	The nature of the occurrence of the mineral in the lithology (e.g. accessory, constituent, clot, phenocryst, porphyroblast)	TRUE	n.a.
COLOUR	String	25	COLOUR	The colour of the mineral.	TRUE	n.a.
SIZEMINMM	SmallInteger	2	SIZEMINMM	The minimum size of the mineral in mm.	TRUE	n.a.
SIZEMAXMM	SmallInteger	2	SIZEMAXMM	The maximum size of the mineral in mm.	TRUE	n.a.
MODE	SmallInteger	2	MODE	The proportion of rock unit comprised by the mineral (value range 0-100).	FALSE	n.a.
NOTES	String	254	NOTES	Further explanatory notes on the mineral.	TRUE	n.a.

Table 5 - Field properties and description for *F_MINERAL*

2.1.5 F_SAMPLE TABLE

This table contains a list of all the samples collected in the field for each of the lithologies being described. It therefore has a "one-to-many" type relationship (*Relationship Class*) with the ***F_EARTHMAT*** table (***Rel_EarthMat_Mineral***). In other words, an earth material can have one or more samples.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
STATIONID	String	25	STATIONID	The unique identification of the station where the sample was taken.	FALSE	n.a.
EARTHMATID	String	25	EARTHMATID	Unique lithology identifier.	FALSE	n.a.
SAMPLEID	String	25	SAMPLEID	The unique sample number as recorded in the field.	FALSE	n.a.
SAMPLENO	SmallInteger	2	SAMPLENO	Sequential sample number for specific lithology (Ex: 1, 2, 3, etc.)	FALSE	n.a.
SAMPLETYPE	String	25	SAMPLETYPE	The sample type or morphology (e.g. hand, oriented; chip sample; core, ...)	FALSE	n.a.
PURPOSE	String	254	Purpose	The primary reason sample was collected.	FALSE	n.a.
FORMAT	String	25	Format	The format of measurement for oriented samples (e.g. RHR (right-hand rule), DDD (dip direction, dip), TRND-PLNG (trend and plunge))	TRUE	n.a.
AZIMUTH	SmallInteger	2	AZIMUTH	For oriented samples, the strike, dip direction or trend of measurement in degrees.	TRUE	n.a.
DIPPLUNGE	SmallInteger	2	DIPPLUNGE	For oriented samples, the dip or plunge of measurement in degrees.	TRUE	n.a.
SURFACE	String	10	SURFACE	An indication of whether the upper or lower surface of the oriented sample was marked in the field.	TRUE	n.a.
NOTES	String	254	NOTES	Remarks about the sample.	TRUE	n.a.
SMID	LongInteger		SMID	Unique identifier granted by SMS	TRUE	n.a.
CURATIONID	String	25	CurationID	Curation number granted by SMS	TRUE	n.a.

Table 6 - Field properties and description for *F_SAMPLE*

2.1.6 F_STRUC TABLE

The ***F_STRUC*** table also has a "one-to-many" type relationship (*Relationship Class*) with the ***F_EARTHMAT*** table (***Rel_EarthMat_Structure***). In other words, an earth material can have one or more structures. It contains all the structural data measured for each of the lithologies being described. The design of the ***F_STRUC*** table makes it possible to record both planar and linear structural measurements.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
STATIONID	String	25	STATIONID	The unique identification of the station where the measurements were taken.	FALSE	n.a.
EARTHMATID	String	25	EARTHMATID	The unique identifier for the lithology in which the measurement was taken.	FALSE	n.a.
STRUCID	String	25	STRUCID	The unique identification for each planar or linear measurement.	FALSE	n.a.
STRUCNO	SmallInteger	2	STRUCNO	Sequential number of structural measurement for a specific lithology (e.g. 1, 2, 3, etc.)	FALSE	n.a.
STRUCCLASS	String	10	STRUCCLASS	Class of structural feature (linear or planar).	FALSE	n.a.
STRUCTYPE	String	30	STRUCTYPE	Subdivision of structural feature (to help sort DETAIL)	FALSE	n.a.
DETAIL	String	50	DETAIL	The type of planar or linear feature or fabric (e.g. bedding, fault plane, fracture, joint, cleavage, schistosity)	FALSE	n.a.
METHOD	String	50	METHOD	The method of acquisition (Ex: measured at station, estimated at station, calculated from data)	FALSE	n.a.
FORMAT	String	25	Format	Format of measurement (strike/dip, trend/plunge, etc.)	FALSE	n.a.
ATTITUDE	String	50	Attitude	The attitude of planar feature (Ex: upright, overturned (180, vertical)	TRUE	n.a.
YOUNGING	String	50	YOUNGING	The confidence in attitude of primary layering as assessed from evidence for younging direction (e.g. known, sedimentary structure; inferred, stratigraphic order; assumed, no evidence)	TRUE	n.a.
GENERATION	String	50	Generation	The phase of generation.	TRUE	n.a.
STRAIN	String	50	STRAIN	The strain intensity associated with this fabric measurement (e.g. no strain, weak, moderate, intense)	TRUE	n.a.
FLATTENING	String	50	FLATTENING	The relative intensity of planar (S) fabric over linear (L) fabric (e.g. L tectonite, L)S, L=S, L(S, S tectonite)	TRUE	n.a.
RELATED	String	50	RELATED	The unique identifier for related planar or linear measurements.	TRUE	n.a.
FABRIC	String	254	FABRIC	Fabric defining elements within the lithology (e.g. muscovite (schistosity), flattened or stretched quartz (mylonitic foliation), crenulations (cleavage))	TRUE	n.a.
SENSE	String	254	SENSE	The sense of movement indicated by the feature (e.g. sinistral, down to northeast)	TRUE	n.a.
AZIMUTH	SmallInteger	2	AZIMUTH	Strike, dip direction or trend of measurement [Range=0-360]	FALSE	n.a.
DIPPLUNGE	SmallInteger	2	DIPPLUNGE	The dip value of the planar feature or the plunge value of the linear feature in degrees. [Range=0-90]	FALSE	n.a.
SYMANG	SmallInteger	2	SYMANG	Rotational angle for plotting symbol.	TRUE	n.a.
NOTES	String	254	NOTES	Notes relating to the measurement.	TRUE	n.a.

Table 7 - Field properties and description for *F_STRUC*

2.1.7 F_PHOTO TABLE

The ***F_PHOTO*** table is used to save the information collected while taking photographs for all the stations being described. It therefore has a "one-to-many" type relationship (*Relationship Class*) with the ***F_STATION*** *Feature Class* (***rel_Station_Photo***). In other words, a station can have one or more photographs.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
STATIONID	String	25	STATIONID	The unique identification of the station at which the photograph was taken.	FALSE	n.a.
PHOTOID	String	25	PHOTOID	The unique identification for the photograph.	FALSE	n.a.
PHOTONO	SmallInteger	2	PHOTONO	Sequential photo number for specific station (e.g. 1, 2, 3, etc.)	FALSE	n.a.
CATEGORY	String	50	CATEGORY	The general subject matter for the photograph (e.g. outcrop, structure, landscape, wildlife)	FALSE	n.a.
FILENO	SmallInteger	2	FILENO	Sequential number or frame of the photo as assigned by the users camera (e.g. 1, 2, 3, etc.).	TRUE	n.a.
FILENAME	String	25	FILENAME	The file name assigned by the camera (e.g. DSC_087. IMG_088)	TRUE	n.a.
DIRECTION	SmallInteger	2	DIRECTION	The direction (value in degrees) in which the photograph was taken.	TRUE	n.a.
CAPTION	String	254	CAPTION	Short description of the photograph.	TRUE	n.a.
PHOTO_LINK	String	254	PHOTO_LINK	Relative path location of the photograph	TRUE	n.a.

Table 8 - Field properties and description for F_PHOTO

2.1.8 F_MA TABLE

This table includes elements relevant to the identification of mineralization and/or alteration for each of the stations being described. It therefore has a "one-to-many" type relationship (*Relationship Class*) with the ***F_STATION*** *Feature Class* (***rel_Station_MA***). In other words, a station can have one or more mineralizations and/or alterations.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
STATIONID	String	25	STATIONID	The unique identifier for the station at which the alteration or mineralization occurs.	FALSE	n.a.
MAID	String	25	MAID	The unique identifier for the occurrence of alteration or mineralization.	FALSE	n.a.
MANO	SmallInteger	2	MANO	Sequential number for alteration/mineralization at this station (1, 2, 3, etc.)	FALSE	n.a.
MA	String	15	MA	The type of feature (alteration or mineralisation)	FALSE	n.a.
UNIT	String	15	UNIT	The outcrop unit of rock in which the alteration or mineralization occurs.	TRUE	n.a.
MINERAL	String	100	MINERAL	The alteration mineral or economic mineral.	TRUE	n.a.
MODE	SmallInteger	2	MODE	The proportion (%) of the rock unit comprised by the mineral (range is 0-100).	TRUE	n.a.
DISTRIBUTE	String	100	DISTRIBUTE	The nature of distribution of alteration mineral or economic mineral.	TRUE	n.a.
NOTES	String	254	NOTES	Further explanatory notes on the alteration or mineralization.	TRUE	n.a.

Table 9 - Field properties and description for *F_MA*

2.2 PROJECT MANAGEMENT MODULE DESCRIPTION

This module contains the minimum data required to manage the elements essential to the governance of a geological mapping project. Depending on the objectives of each mapping project and their internal governance process, each publication may include only a subset of the following *Tables.*

2.2.1 M_PROJECT TABLE

The ***M_PROJECT*** table contains the essential project-related data. Although the design of the model permits multi-project management, the current version of the implementation process can only manage one project per database.

The ***ProjectID*** attribute is the primary key of this table and usually, uses the project number assigned by the GEM program (e.g. MGM2013). The ***Project Name*** and ***Nom Projet*** attributes provide the bilingual functionality required by the North American Profile of ISO Standard 19115 (NAP), and ***Project Abbreviation*** makes it possible to define an abbreviated project name that can be used as an annotation in the ArcMAP™ environment.

Field	DataType	Length	AliasName	Description	IsNullable
PROJECTID	String	25	ProjectID	Internal GSC project code used as primary key; (e.g. MGM2013)	FALSE
PROJECTNAME	String	255	Project Name	Name of the project (e.g. GEM2 - Hudson-Ungava)	FALSE
PROJETNOM	String	255	Nom Projet	Nom du Projet	FALSE
PROJECTABBREV	String	25	Project Abbreviation	Project abbreviation name (e.g. HUDSON-UNGAVA)	FALSE
STARTDATE	Date	8	Start Date	Start date of the project	FALSE
ENDDATE	Date	8	End Date	End date of the project	TRUE
REMARKS	String	255	Remarks	Clarifying comments regarding the Project	TRUE
WEBLINK	String	50	Web Link	Link key to the corporate system for more metadata	TRUE

Table 10 - Field properties and description for *M_PROJECT*

2.2.2 M_ACTIVITY AND M_SUB_ACTIVITY TABLES

These two tables follow the organizational structure of the GEM 2 program, where there are six projects, each composed of main activities and sub-activities. The structure of these tables is very similar to the structure of ***M_PROJECT***. The ***Abbreviation*** attribute present in both tables also makes it possible to assign an abbreviated name for an activity or sub-activity, while the secondary keys ***ProjectID*** in ***M_ACTIVITY*** and ***Main_ActivityID*** in ***M_SUB_ACTIVITY*** make it possible to associate each of the sub-activities with a main activity and then with a project.

Field	DataType	Length	AliasName	Description	IsNullable
M_ACTIVITYID	String	25	Main_ActivityID	Main Activity code used as primary key; best practice would be to use the ProjectID code + incremented numbers (e.g. MGM2013-1, MGM2013-2, etc.)	FALSE
M_ACTIVITYNAME	String	255	Main_Activity Name	Name of the activity (e.g. Core Zone Integrated Geoscience, Romanet Horts - IOCG, …)	FALSE
ABBREVIATION	String	25	Abbreviation	Abbreviation name that will be used as label in ArcMAP (e.g. CORE ZONE, ROMANET-IOCG, …)	FALSE
STARTDATE	Date	8	Start Date	Start date of the activity	FALSE
ENDDATE	Date	8	End Date	End date of the activity	TRUE
DESCRIPTION	String	255	Description	Short description of the activity	TRUE
PROJECTID	String	25	ProjectID	Foreign key to M_PROJECT table	FALSE

Table 11 - Field properties and description for *M_ACTIVITY*

The model proposes to treat CGM maps as a particular case of sub-activity. Although it shares the same properties as all the other sub-activities, the workflow of the model is modified for this sub-activity. In order to ensure that this particular type of sub-activity is clearly recognized, the model imposes a ***Sub_Activity_Name*** with the prefix **Build_CGMMap**.

Field	DataType	Length	AliasName	Description	IsNullable
S_ACTIVITYID	String	25	Sub_ActivityID	Sub-Activity code used as primary key; best practice would be to use the M_ActivityID code + incremented letters (e.g. MGM008-1A, MGM008-2B, ...)	FALSE
S_ACTIVITYNAME	String	255	Sub_Activity Name	Name of the activity (e.g. Field work 2013, **Build_CGMMap_1**, Schefferville aeromag survey, ...)	FALSE
ABBREVIATION	String	25	Abbreviation	Abbreviation name that will be used as label in ArcMAP (e.g. FW2013, CGMMap_1, SCHEFFER_MAG, …)	FALSE
STARTDATE	Date	8	Start Date	Start date of the activity	FALSE
ENDDATE	Date	8	End Date	End date of the activity	TRUE
DESCRIPTION	String	255	Description	Short description of the activity	TRUE
M_ACTIVITYID	String	25	Main_ActivityID	Foreign key to M_ACTIVITY table	FALSE

Table 12 - Field properties and description for *M_SUB_ACTIVITY*

2.2.3 P_PERSON AND P_ORGANIZATION TABLES

The structure of these two tables accurately reproduces the minimum basic information required by the model to manage the participants in a project. ***P_PERSON*** makes it possible to manage the information related to the person, while ***P_ORGANISATION*** links the contact information of the organization to which the person belongs.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
PERSONID	Long Integer		PersonID	Unique identifier (AutoNumber field)	FALSE	n.a.
FNAME	String	50	First Name	Person first name	FALSE	n.a.
MNAME	String	25	Mid Name	Person middle name	TRUE	n.a.
LNAME	String	50	Last Name	Person last name	FALSE	n.a.
ALIAS	String	8	Alias	For NRCAN employees, Alias = username (e.g. pbrouill)	TRUE	n.a.
ABBREVNAME	String	50	Name Abbreviation	Abbreviation name (e.g. Brouillette, P.)	FALSE	n.a.
PHONE	String	25	Phone	Phone number (format: AreaCode-PhoneNo-Ext)	TRUE	n.a.
EMAIL	String	50	Email	Email address	TRUE	n.a.
ORGID	String	25	OrganizationID	Foreign key to P_ORGANIZATION table	TRUE	Organisation_PID

Table 13 - Field properties and description for *P_PERSON*

The ***PersonID*** attribute of the ***P_PERSON*** table constitutes the primary key that is controlled and managed by the application. The secondary key ***OrgID*** makes it possible to link the person to their organization.

Field	DataType	Length	AliasName	Description	IsNullable
ORGID	String	25	OrganizationID	Abbreviated organization name (e.g. GSC-Q)	FALSE
ORGNAME	String	255	Organization Name	Name of the organization	FALSE
ORGADD	String	255	Organization Address	Business address of the organization	FALSE
ORGPHONE	String	25	Organization Phone	Business phone number of the organization (format: AreaCode-PhoneNo-Ext)	FALSE
ORGEMAIL	String	50	Organization Email	Business Email address of the organization	TRUE
ORGWWW	String	50	Organization WEB	Business WEB address of the organization	TRUE

Table 14 - Field properties and description for *P_ORGANIZATION*

2.2.4 P_PARTICIPANT TABLE

The concept of "Participant" ensures the functional link between the **Project Level** and **Actors Level** levels of the metadata module. Concretely, the ***P_PARTICIPANT*** table is used to manage the link between a person and an activity, or sub-activity, by means of a role. This concept therefore authorizes a person to participate in an activity, or sub-activity, in more than one role.

ParticipantID is the primary key of this table. It is obtained by the concatenation of the ***P_PERSON.Alias*** field and a sequential number. To ensure the integrity of the database when creating a record, the model imposes a list of values for the ***Participant_Role*** attribute. This list is implemented in a *Domain Value* called ***ActivityRole_DID***.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
PARTICIPANTID	String	15	ParticipantID	Primary Key composed by P_PERSON.ALIAS + sequential number (e.g. pbrouill1)	FALSE	n.a.
PERSONID	Long Integer		PersonID	Unique identifier (AutoNumber field)	FALSE	n.a.
M_ACTIVITYID	String	25	M_ActivityID	Foreign key to table M_ACTIVITY	TRUE	n.a.
S_ACTIVITYID	String	25	S_ActivityID	Foreign key to table S_ACTIVITY	TRUE	n.a.
PARTROLE	String	50	Participant Role	Role of the person in each specific activity (e.g. bedrock mapper, GIS specialist, ...)	TRUE	ActivityRole_DID
ROLEDESC	String	255	Role Description	Brief description of the role of the participant	TRUE	n.a.
GEOLCODE	String	10	Geologist Code	GSC Officer code (usually a combination of the project leader Officer Code with the first letter of the participant last name)	TRUE	n.a.
STARTDATE	String	10	Start Date	Participant start date for a specific activity (format : yyyy-mm-dd)	TRUE	n.a.
ENDDATE	String	10	End Date	Participant end date for a specific activity (format : yyyy-mm-dd)	TRUE	n.a.
REMARKS	String	255	Remarks	Clarifying comments regarding the participant	TRUE	n.a.
METAID	String	30	MetaID	MetaID value used in FeatureClass F_STATION of the FieldGDB (e.g. 10CXAB_MGM008) Used as foreign key to F_STATION	TRUE	n.a.

Table 15 - Field properties and description for *P_PARTICIPANT*

The ***MetaID*** attribute is the secondary key which links the **Field Data** module through the ***F_METADATA*** metadata table.

2.2.5 P_SOURCE TABLE

This table is one of the essential elements of the model because it makes it possible to associate a source with all the spatial objects of the database. This table has a simple unique identifier stored in ***SourceID*** and the values of this attribute are autogenerated by the application.

Field	DataType	Length	AliasName	Description	IsNullable
SOURCEID	String	15	SourceID	Unique identifier (AutoNumber field)	FALSE
SOURCENAME	String	255	Source Name	Abbreviated publication reference for the original data source (e.g. Gordon, T; Okulitch, A.V., 1977, Open File 442)	TRUE
DOI	String	25	DOI	Unique digital object identifier (e.g. doi:10.4095/290088)	TRUE
ABBREVIATION	String	25	Abbreviation	Abbreviation name that will be used as label in ArcMAP (e.g. OF442)	FALSE
FILEPATH	String	200	File Path	Complete path of the input dataset	TRUE
REMARKS	String	1000	Remarks	Clarifying comments regarding the sources	TRUE

Table 16 - Field properties and description for *P_SOURCE*

The ***P_SOURCE*** table makes it possible to manage the minimum information required to identify a source (***SourceName***) and locate its presence on the web (***DOI***).

2.2.6 P_STUDY_AREA AND P_CGM_INDEXMAP FEATURES

The ***P_STUDY_AREA*** polygon *Feature Class* makes it possible to record the geometry of the metadata that may have a spatial reference, such as the area covered by a project, activity, sub-activity or source.

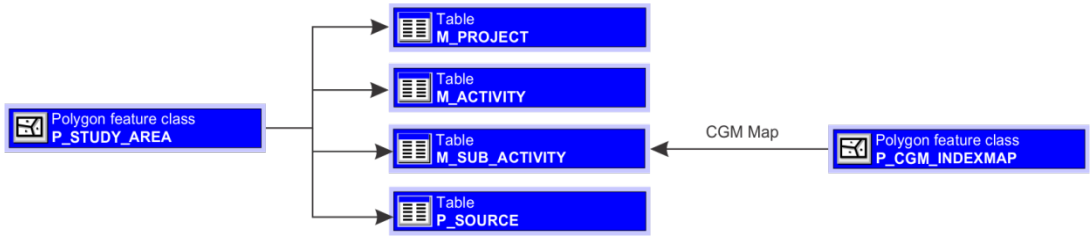

Figure 6 – Subset of the Data Model illustrating relationships between P_STUDY_AREA, P_CGM_INDEXMAP and their associated attribute tables

In the particular case of a sub-activity associated with the preparation of CGM maps, the footprint of these maps is managed by the ***P_CGM_INDEXMAP*** *Feature Class* (figure 6). This geometry, commonly named "*Neatline*", delimits the spatial extent (bounding box coordinates) of a CGM map.

For these two *Feature Classes*, data entry for the ***Abbreviation*** and ***Table_RelatedID*** attributes is entirely controlled by the application. The ***Abbreviation*** attribute is assigned the values recorded in the fields of the same name of the ***M_PROJECT***, ***M_ACTIVITY***, ***M_SUB_ACTIVITY*** or ***P_SOURCE*** tables, while ***Table_RelatedID*** is the secondary key pointing to the ***P_STUDY_AREA_INDEX*** index table.

Field	DataType	Length	AliasName	Description	IsNullable
TABLE_RELATEDID	String	25	Table RelatedID	Foreign key used to link each polygon from the Study Area Feature Class to their attribute tables through the Study Area Index table	TRUE
EAST_EXTENT_COORD	Double	8	East extent coordinate	The eastern-most coordinate of the limit of the study area	TRUE
WEST_EXTENT_COORD	Double	8	West extent coordinate	The western-most coordinate of the limit of the study area	TRUE
NORTH_EXTENT_COORD	Double	8	North extent coordinate	The northern-most coordinate of the limit of the study area	TRUE
SOUTH_EXTENT_COORD	Double	8	South extent coordinate	The southern-most coordinate of the limit of the study area	TRUE
ABBREVIATION	String	25	Abbreviation	Label text to be used for display in ArcMap. This field is entirely controlled by the data entry interface and values are from the ABBREVIATION field of the M_ACTIVITY, S_ACTIVITY AND P_SOURCE tables, and the PROJECTABBR field of the M_PROJECT.P_SOURCE table, and the PROJECTABBR field of the M_PROJECT table.	FALSE
REMARKS	String	255	Remarks	Clarifying comments regarding the study area	TRUE

Table 17 - Field properties and description for *P_STUDY_AREA*

As mentioned earlier, the ***P_CGM_INDEXMAP*** *Feature Class* is a particular case of Study Area essentially dedicated to CGM maps. For this reason, and for implementation considerations, this *Feature Class* contains additional attributes that serve to manage a dataset required for drawing up CGM maps. ***NAP_MetaID*** is the secondary key pointing to the ***M_METADATA*** table.

Field	DataType	Length	AliasName	Description	IsNullable
TABLE_RELATEDID	String	25	Table RelatedID	Foreign key used to link each polygon from the P_CGM_INDEXMAP Feature Class to the S_ACTIVITY table through the Study Area Index table	TRUE
CGM_MAPID	String	25	CGM_MapID	Unique identifier of a CGM map (e.g. CGM044). If the CGM map number is not available, the author can use a temporary ID like the NTS sheet number (e.g. 47A06) or a short intuitive term (e.g. PenrhynGroup_east)	FALSE
MAPNAME	String	255	Map Name	Map name as it will appear on the lower right corner of the paper map	FALSE
ABSTRACT	String	2147483647	Abstract	Text of the abstract as it will appear on the paper map (English version)	TRUE
RESUME	String	2147483647	Résumé	Text of the abstract as it will appear on the paper map (French version)	TRUE
DESCNOTE	String	2147483647	Descriptive Notes	Descriptive notes as they will appear on the paper map	TRUE
EAST_EXTENT_COORD	Double	8	East extent coordinate	EAST_EXTENT_COORD	TRUE
WEST_EXTENT_COORD	Double	8	West extent coordinate	WEST_EXTENT_COORD	TRUE
NORTH_EXTENT_COORD	Double	8	North extent coordinate	NORTH_EXTENT_COORD	TRUE
SOUTH_EXTENT_COORD	Double	8	South extent coordinate	SOUTH_EXTENT_COORD	TRUE
REMARKS	String	255	Remarks	Clarifying comments regarding the study area	TRUE
NAP_METAID	String	25	NAP MetaID	Foreign key to M_METADATA table	TRUE

Table 18 - Field properties and description for *P_CGM_INDEXMAP*

2.2.7 P_STUDY_AREA_INDEX TABLE

P_STUDY_AREA_INDEX is the index table which maintains the link between the geometry of the ***P_STUDY_AREA*** or ***P_CGM_INDEXMAP*** *Feature Classes* and a record in the ***M_PROJECT***, ***M_ACTIVITY***, ***M_SUB_ACTIVITY*** or ***P_SOURCE*** *tables*.

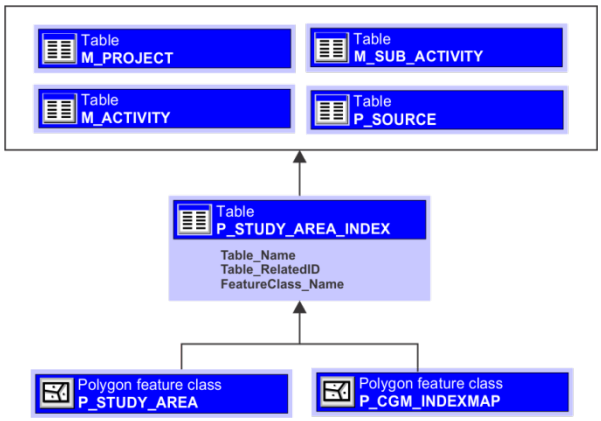

Figure 7 - Subset of the Data Model illustrating the role of the *P_STUDY_AREA_INDEX* index table

Management of the content of ***P_STUDY_AREA_INDEX*** is entirely controlled by the application and users must not attempt to edit its content, at the risk of altering the functional integrity of the table and, therefore, of the database.

Field	DataType	Length	AliasName	Description	IsNullable
TABLENAME	String	25	Table Name	Name of the table for which a StudyArea Index is created	TRUE
TABLE_RELATEDID	String	25	Table RelatedID	Key field used to link each polygon from either the P_STUDY_AREA or the P_CGM_INDEXMAP Feature Class to their specific attribute table.	TRUE
FC_NAME	String	15	FeatureClass Name	Name of the Feature Class for which a StudyArea Index is created	TRUE

Table 19 - Field properties and description for *P_STUDY_AREA_INDEX*

2.3 CORE MODULE DESCRIPTIONS

This section describes in detail the *Feature Classes* and the *Tables* comprising the core of the model. A brief explanation is provided for each of the mandatory fields

2.3.1 GEO_LINES FEATURE CLASS

The ***GEO_LINES*** *Feature Class* is one of the central components of the **Core module** because it contains all the linear elements supporting the interpretation of a geological mapping project. ***GEO_LINES*** is composed of eleven *Subtypes* (***Geoline Type***) (see ANNEX A), each representing a type of line required to create a geological interpretation. When combined with the values of the ***Geoline_Qualifier***, ***Confidence***, ***Attitude*** and ***Generation*** fields, these *Subtypes* define a set of more than 4,000 types of lines, all individually represented by a unique ***GEOLINEID***.

The ***GEO_LINES*** *Feature Class* also contains the attributes required to interpret the movement of certain linear geological concepts (***Fault Movement***, ***Hangwall Direction***, ***Fold Trend***) as well as attributes that serve to assign a name (***Geological Name***) and a time scale (***Minimum Age***, ***Maximum Age***) to all the linear elements.

The automated process of creating geological polygons is essentially controlled by the value contained in the ***Is Boundary*** attribute. The "Yes" or "No" value of this attribute therefore determines the selection of the linear elements that are used to create the polygons. For example, a normal fault limiting contact between two different geological units must have the value "Yes" in the ***Is Boundary*** attribute. In the current version of the model, the ***contact, unit construct line, isograd and overprint*** *Subtypes* have the ***Is Boundary*** attribute set to "Yes" by default.

GEO_LINES has five attributes to manage mandatory metadata. For each line feature, the application will automatically enter the data for ***CreatorID***, ***EditorID*** as well as for ***Create Date***, ***Edit Date*** and ***SourceID***.

FieldName	DataType	Length	AliasName	Description	IsNullable	Domain Name
GEOLINETYPE	Integer	4	GeoLine Type	SubType (Type of GeoLine)	FALSE	n.a.
QUALIFIER	String	4	GeoLine Qualifier	GeoLine Qualifier	FALSE	Controlled by the Subtype (see Annexe A)
CONFIDENCE	String	2	Confidence	Confidence in the position of the Feature	FALSE	Controlled by the Subtype (see Annexe A)
ATTITUDE	String	2	Attitude	Attitude of the fault, shear or fold	FALSE	Controlled by the Subtype (see Annexe A)
GENERATION	String	2	Generation	The phase of generation	FALSE	Controlled by the Subtype (see Annexe A)
NAME	String	255	Geological Name	Name of the geological Feature (Cadillac Fault, Mackenzie Dykes, Exshaw Formation, …)	TRUE	n.a.
MOVEMENT	String	2	Fault Movement	A description of vertical fault movement for faults where the hanging wall cannot be established (e.g. generic, steep dip faults)	TRUE	Controlled by the Subtype (see Annexe A)
HWALLDIR	String	2	HangWall Direction	The direction of the side of the fault on which the hanging wall occurs (for faults where a hanging wall can be identified, (e.g. normal, reverse, thrust).	TRUE	Controlled by the Subtype (see Annexe A)

FieldName	DataType	Length	AliasName	Description	IsNullable	Domain Name
FOLDTREND	String	2	Fold Trend	The approximate direction of plunge (e.g. trend) of the fold axis	TRUE	Controlled by the Subtype (see Annexe A)
FOLDPLUNGE	String	25	Fold Plunge	The approximate magnitude of plunge of the fold axis	TRUE	n.a.
ARROWDIR	String	2	Arrow Direction	Direction in which the arrows for the limbs point for overturned and monocline symbols, or direction of short arrow (steep limb) for asymmetrical fold symbols.	TRUE	Controlled by the Subtype (see Annexe A)
MINAGE	String	50	Minimum Age	Chronostratigraphic minimum age of the described geological Feature	TRUE	n.a.
MAXAGE	String	50	Maximum Age	Chronostratigraphic maximum age of the described geological Feature	TRUE	n.a.
ISBOUNDARY	String	2	Is Boundary	Identifies a line segment shared by more than one subtype (default is set to YES for SubTypes Contact, Unit Construct Line, Overprint and Isograd)	FALSE	Boundary_DID
CREATORID	String	25	CreatorID	The name of the user who created the line. Abbreviated creator name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	FALSE	Participant_PID
EDITORID	String	25	EditorID	The name of the user who edited the line. Abbreviated editor name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	TRUE	Participant_PID
CREATEDATE	Date	8	Create Date	The date and time the line was created	FALSE	n.a.
EDITDATE	Date	8	Edit Date	The date and time the line was last edited	TRUE	n.a.
GSC_SYMBOL	String	12	GSC_SYMBOL	GSC symbol value modified from the original FGDC symbol set (FGDC Digital Cartographic Standard for Geological Map Symbolization - FGDC-STD-013-2006)	TRUE	n.a.
GEOLINEID	String	12	GeoLineID	Calculated field obtained by concatenating the CODES associated with GeoLine SubType, Geoline_Qualifier, Location Confidence, Attitude and Generation	TRUE	n.a.
SOURCEID	String	15	SourceID	Foreign key to P_SOURCE	TRUE	SourceRef_PID
ORIGCODE	String	50	Original Code	Original code of the GEOLINE (original code assigned to a GEOLINE, from previous version, external database, etc…)	TRUE	n.a.
REMARKS	String	255	Remarks	Clarifying comments from the CREATORID	TRUE	n.a.
EDITREMARKS	String	255	Editing Remarks	Clarifying comments from the EDITORID	TRUE	n.a.
DISPLAYPUB	Short Integer		Display In Publication	To be published or not	TRUE	n.a.

Table 20 - Field properties and description for *GEO_LINES*

2.3.2 LABELS FEATURE CLASS

The ***LABELS*** *Feature Class* also constitutes a central component of the **Core module**. Used in conjunction with the ***GEO_LINES*** *Feature Class*, ***LABELS*** participates in the automated creation of geological polygons.

The data recorded in the ***Label*** attribute generally correspond to a *map unit* code and these values are used to generate the ***MapUnit_PID*** domain value. The application makes available to users a simple procedure that can be used to modify this value at any time. Also, users should never attempt to manually modify this value by directly editing the *Feature Class*, at the risk of altering the integrity of the database.

Just like for the ***GEO_LINES*** *Feature Class*, a series of attributes manages mandatory metadata which are automatically entered when the object is created.

FieldName	DataType	Length	AliasName	Description	IsNullable	Domain Name
LABELID	String	10	Label	L'usage courant pour LABELID est le code lithologique (annotation) utilisé pour une unité lithologique (i.e. Map Unit)	FALSE	MapUnit_PID
SOURCEID	String	15	SourceID	Reference of original data source. (foreing key to P_SOURCE table)	TRUE	SourceRef_PID
REMARKS	String	255	Remarks	Comment field available for further explanation of the Label	TRUE	n.a.
CREATORID	String	25	CreatorID	The name of the user who created the label. Abbreviated creator name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	TRUE	Participant_PID
CREATEDATE	Date	8	Create Date	The date and time the label was created	TRUE	n.a.
EDITORID	String	25	EditorID	The name of the user who edited the label. Abbreviated editor name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	TRUE	Participant_PID
EDITDATE	Date	8	Edit Date	The date and time the label was last edited	TRUE	n.a.

Table 21 - Field properties and description for *LABELS*

2.3.3 GEO_POLYS FEATURE CLASS

The ***GEO_POLYS*** *Feature Class* contains the geological polygons (i.e. *map unit polygons or map unit*) resulting from the interpretation recorded in the ***GEO_LINES*** and ***LABELS*** *Feature Classes*. The creation and editing of the data of this *Feature Class* are entirely controlled by the application developed in ArcMAP™, and users should never create or edit the polygons that are stored in it. As mentioned earlier, the polygons generated by the geological interpretation can easily be created or recreated at any time. All objects recorded in ***GEO_POLYS*** should be considered temporary until the interpretation has been finalized.

All the attributes of this *Feature Class* are of the metadata type, with the exception of ***Remarks***, which can be edited by the user following the creation of the polygons, while all the others are assigned the same values as those belonging to the ***LABELS*** *Feature Class* that were used to create the polygons.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
LABELID	String	10	Label	L'usage courant pour LABELID est le code lithologique (annotation) utilisé pour une unité lithologique (i.e. Map Unit)	FALSE	MapUnit_PID
SOURCEID	String	15	SourceID	Reference of original data source	TRUE	SourceRef_PID
REMARKS	String	255	Remarks	Comment field available for further explanation of the described geological polygon	TRUE	n.a.
CREATORID	String	25	CreatorID	The name of the user who created the polygon. Abbreviated creator name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	TRUE	n.a.
CREATEDATE	Date	8	Create Date	The date and time the polygon was created	TRUE	n.a.
EDITORID	String	25	EditorID	The name of the user who edited the polygon. Abbreviated editor name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	TRUE	n.a.
EDITDATE	Date	8	Edit Date	The date and time the polygon was last edited	TRUE	n.a.

Table 22 - Field properties and description for *GEO_POLY*

2.3.4 GEO_POINTS FEATURE CLASS

The ***GEO_POINTS*** *Feature Class* contains all the structural point data. The structural data that was acquired in the field using the GanFeld system and stored in the ***F_STRUC*** attribute table of the **Field Data** module can be transferred automatically to ***GEO_POINTS***. The structural data from compilation work (imported or digitized *in situ*) can also be imported or recorded automatically in ***GEO_POINTS***.

GEO_POINTS is characterized by two *Subtypes* (***GeoPoint Type***), which have the value of either *Planar* or *Linear*. When combined with the values of the ***GeoPoint_Subset***, ***GeoPoint_Attitude***, ***Structure_Generation***, ***Structure_Younging*** and ***Structure_Method*** fields, these *Subtypes* define a set of more than 9,000 types of points, all individually represented by a unique ***GEOPOINTID***.

The ***GEO_POINTS*** *Feature Class* also contains the attributes ***Azimuth*** and ***DipPlunge*** as well as the ***F_StrucID*** attribute which is used to link the structural elements to their original table ***F_STRUC***. The ***Display From*** and ***Display To*** attributes are used to manage the display of data based on a range of scales.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
GEOPOINTTYPE	Integer	4	GeoPoint Type	Type of GeoPoint (Valid GeoPoint Type are :planar and linear)	TRUE	n.a.
GEOPOINTSUBSET	String	4	GeoPoint Subset	SubsetType of GeoPoint. Values are controlled by domain values Subset_Planar_SID and Subset_Linear_SID. (e.g. bedding, axial plane, anitcline, ...)	TRUE	Controlled by the Subtype (see Annexe A)
STRUCATTITUDE	String	2	Structure Attitude	The attitude of the structural measurement (e.g. upright, overturned < 180, vertical, ...)	TRUE	Controlled by the Subtype (see Annexe A)

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
STRUCGENERATION	String	2	Structure Generation	The phase of generation (ex. primary, first, second, ...)	TRUE	Controlled by the Subtype (see Annexe A)
STRUCYOUNGING	String	2	Structure Younging	The confidence in attitude of primary layering as assessed from evidence for younging direction (e.g. known, stratigraphic order)	TRUE	Controlled by the Subtype (see Annexe A)
STRUCMETHOD	String	2	Structure Method	The method of acquisition (ex. measured at station, estimated remotely, ...)	TRUE	Controlled by the Subtype (see Annexe A)
RELATEDSTRUC	String	15	Related Structure	The unique identifier for related planar or linear measurements (e.g. StrucID value from F_STRUC table)	TRUE	n.a.
AZIMUTH	SmallInteger	2	Azimuth	The right-hand rule strike value of structural Feature (from 1 to 360)	TRUE	n.a.
DIPPLUNGE	SmallInteger	2	DipPlunge	The dip/plunge value of the structural Feature in degrees (from 0 to 90)	TRUE	n.a.
DIPDESC	String	30	Dip Description	To capture non-numerical dip values for dedicated symbols	TRUE	n.a.
SENSE_EVID	String	50	Sense Evidence	Evidence of sense of motion from kinematic indicators	TRUE	n.a.
STRAIN	String	2	Strain	The strain intensity associated with the fabric measurements	TRUE	Controlled by the Subtype (see Annexe A)
FLATTENING	String	2	Flattening	The relative intensity of planar (S) fabric over linear (L) fabric	TRUE	Controlled by the Subtype (see Annexe A)
F_STRUCID	String	25	F_StrucID	Foreign key to table F_STRUC	TRUE	n.a.
CREATORID	String	25	CreatorID	The name of the user who created the point. Abbreviated creator name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	TRUE	Participant_PID
CREATEDATE	Date	8	Create Date	The date and time the point was created	TRUE	n.a.
EDITORID	String	25	EditorID	The name of the user who edited the point. Abbreviated editor name: for NRCAN employees, Editor_ID = Alias name (e.g. pbrouill)	TRUE	Participant_PID
EDITDATE	Date	8	Edit Date	The date and time the point was last edited	TRUE	n.a.
GSC_SYMBOL	String	15	GSC_Symbol	GSC symbol value modified from the original FGDC symbol set (FGDC Digital Cartographic Standard for Geological Map Symbolization - FGDC-STD-013-2006)	TRUE	n.a.
GEOPOINTID	String	13	GeopointID	Calculated field obtained by concatenating the CODES associated with GeoPoints SubTypes (GeoPoint Type, GeoPoint Type Subset, Structure Attitude, Structure Generation, Structure Younging and Structure Method)	TRUE	n.a.
SOURCEID	String	15	SourceID	Reference of the original data source (foreign key to P_SOURCE)	TRUE	SOURCEID

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
ORIGCODE	String	50	Original Code	Original code of the GEOPOINT (original code assigned to a GEOPOINT, from previous version, external database, etc…)	TRUE	n.a.
REMARKS	String	255	Remarks	Clarifying comments regarding the GEO_POINT	TRUE	n.a.
EDITREMARKS	String	255	Editing Remarks	Clarifying comments from the EDITOR	TRUE	n.a.
DISPLAY_FROM	String	20	Display from	Minimum scale at which point objects must be displayed	TRUE	Scale_PID
DISPLAY_TO	String	20	Display To	Maximum scale at which point objects must be displayed	TRUE	Scale_PID
DISPLAYPUB	Short Integer		Display In Publication	To be published or not	TRUE	n.a.

Table 23 - Field properties and description for *GEO_POINTS*

2.3.5 P_LEGEND_GENERATOR, P_LEGEND_DESCRIPTION AND LEGEND_TREETABLE TABLES

The ***P_LEGEND_GENERATOR*** and ***LEGEND_TREETABLE*** tables combined with the ***P_CGM_INDEXMAP*** *Feature Class* make it possible to solve the problem related to the management of legends used in multiple CGM maps in the same database. The addition of the ***P_LEGEND_DESCRIPTION*** table makes it possible to meet the need to manage various descriptions for the same legend item found on more than one CGM map.

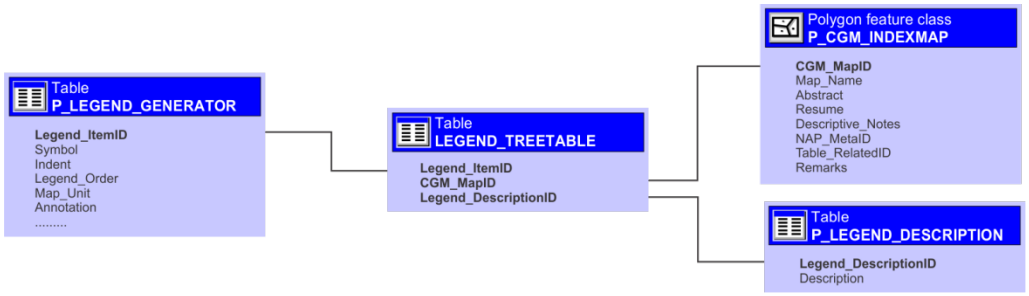

Figure 8 - Subset of the Data Model illustrating the role played by the table LEGEND_TREETABLE.

More simply, the ***LEGEND_TREETABLE*** table makes it possible to link a record in ***P_LEGEND_GENERATOR*** with one or more CGM maps from ***P_CGM_INDEXMAP***, and to associate that record with a description in ***P_LEGEND_DESCRIPTION***.

The ***P_LEGEND_GENERATOR*** table contains all the items needed to create a geological map legend, independently of the CGM map on which they appear. Ultimately, this table must be considered as THE general legend of the project. The items that are essential to create a geological legend include the ***Symbol_Type*** attribute, which is used to identify the type of legend item (line, header, marker point, etc.), as well as the ***Symbol***, ***Indent*** and ***Legend_Order*** attributes, which make it possible to symbolize each of the legend items and then position them correctly relative to each other (usually according to the geological time sequence). The ***Map_Unit*** and ***Annotation*** attributes are also used by cartographers to properly symbolize the legend and map annotations. Finally, ***Legend_ItemID*** is the unique identifier of a legend item (i.e. primary key), and its value is entirely controlled by the application.

Field	DataType	Length	AliasName	Description	IsNullable	Domain Name
LEGENDITEMID	String	36	Legend ItemID	Unique Legend Item identifier. Values stored in this field represent a legend item whether it's a Label name, a GeoPoint type or a GeoLine type (Values stored are either LabelID, GeoLineID, GeoPointID or headerID but the interface display the Description for all items)	TRUE	n.a.
GSC_SYMBOL	String	15	Symbol	GSC symbol value modified from the original FGDC symbol set (FGDC Digital Cartographic Standard for Geological Map Symbolization - FGDC-STD-013-2006)	TRUE	n.a.
SYM_TYPE	String	2	Symbol Type	Type of symbol : Header, fill, line or point/marker	FALSE	LegendSymbolType_DID
INDENT	Small Integer	2	Indent	A number from 0 to 6 indicating the amount of indent for the legend item	TRUE	n.a.
NAME	String	255	Geological Name	Geological Name of the legend item (e.g. Victoria Island formation, ...)	TRUE	n.a.
MAPUNIT	String	255	Map Unit	Coded value of the map unit as it appears on the map. e.g. the MAPUNIT of the Silurian Allen Bay Formation (Sa) is : (FNT name = "GSCGeology" size = "8")^A(/FNT)	TRUE	n.a.
ANNOTATION	String	255	Annotation	Coded value of the map unit as it appears on the legend of the map. e.g. the MAPUNIT of the Silurian Allen Bay Formation (Sa) is : ^A	TRUE	n.a.
GEOLRANK	String	25	Geological Rank	Geological rank (terms are from the 201202 CGI Simple Lithology vocabulary)	TRUE	RankTerm_DID
EON	String	25	Eon	Geological unit of time (terms from the International Commission on Stratigraphy)	TRUE	Eon_DID
ERA	String	25	Era	Geological unit of time (terms from the International Commission on Stratigraphy)	TRUE	Era_DID
PERIOD	String	25	Period	Geological unit of time (terms from the International Commission on Stratigraphy)	TRUE	Period_DID
LEGEND_ORD	Single	4	Legend_Order	Item order in the legend	TRUE	n.a.

Table 24 - Field properties and description for *P_LEGEND_GENERATOR*

The ***LEGEND_TREETABLE*** table is entirely controlled by the application and users should refrain from editing its content. This table contains only three attributes, each referring to the primary key of the related items, namely, ***P_LEGEND_GENERATOR*** (***Legend_ItemID***), ***P_LEGEND_DESCRIPTION*** (***Legend_DescriptionID***) and ***P_CGM_INDEXMAP*** (***CGM_MapID***).

Field	DataType	Length	AliasName	Description	IsNullable
LEGENDITEMID	String	36	Legend ItemID	Foreign key to P_LEGEND_GENERATOR	TRUE
CGM_MAPID	String	25	CGM_MapID	Primary key of P_CGM_INDEXMAP Feature Class	TRUE
LEGDESCRIPTIONID	Double	8	Legend DescriptionID	Foreign key to P_LEGEND_DESCRIPTION	TRUE

Table 25 - Field properties and description for *LEGEND_TREETABLE*

The ***P_LEGEND_DESCRIPTION*** table maintains the description of all the legend items for all the CGM maps.

Field	DataType	Length	AliasName	Description	IsNullable
LEGDESCRIPTIONID	Double	8	Legend DescriptionID	Unique identifier for a legend item description	TRUE
DESCRIPTION	String	2000	Description	Complete description of a legend item as it appears on the legend of a specific CGM Map.	TRUE

Table 26 - Field properties and description for P_*LEGEND_DESCRIPTION*

The example in figure 9 provides context to help users better understand the functional link between the CGM geological maps, the geological units that comprise them and the textual description of each of these units.

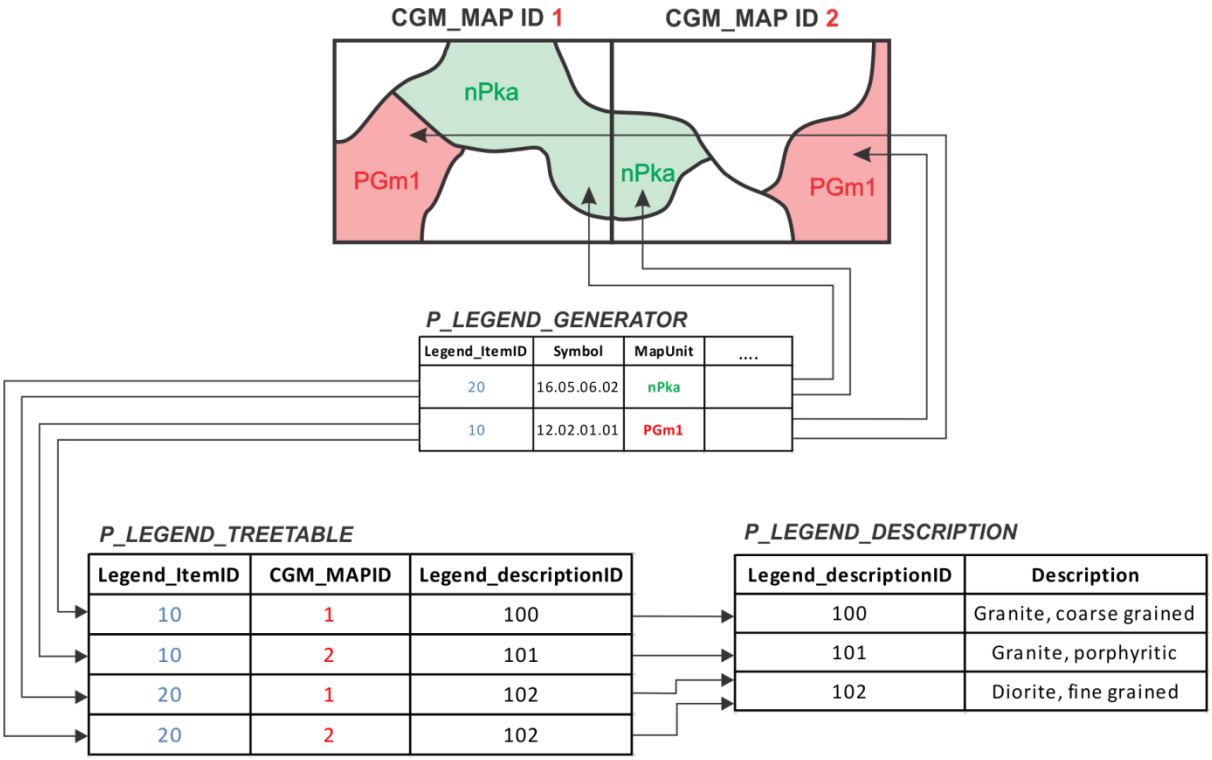

Figure 9 – Example showing the relationships between the CGM maps and the tables managing their respective map units description

It should be noted here that the application developed in ArcMAP™ entirely controls the sequence of data entry in these tables. The process is user-transparent and strictly follows the data flow presented in this example.

REFERENCES

Shimamura, K; Williams, SP; and Buller, G., (2008) GanFeld user guide: a map-based field data capture system for geologists; Geological Survey of Canada, Open File 5912, 2008; 90 p.; doi:10.4095/226214

ANNEXES

The following annexes describe the geological terminology used for the bedrock mapping project. They also help to understand the relationship between the subtypes, their associated domains values as well as the default values.

ANNEX A

Subtypes are used in *Features Class* ***GEO_LINES*** and ***GEO_POINTS***. The fields named ***Geoline Type*** and ***Geopoint Type*** controlled the value of the *Subtype*. The following table shows a list of the *Subtypes* used for the *Features Class* ***GEO_LINES*** with their code and respective description.

SUBTYPE FIELD	CODE	DESCRIPTION
GEOLINETYPE	10	contact
GEOLINETYPE	11	fault
GEOLINETYPE	12	shear
GEOLINETYPE	13	structural lineament
GEOLINETYPE	14	fold
GEOLINETYPE	15	thin lithology
GEOLINETYPE	16	unit construct line
GEOLINETYPE	17	trace
GEOLINETYPE	18	limit
GEOLINETYPE	19	overprint
GEOLINETYPE	20	isograde

As shown in Table 21 of section 2.3.1 several *Domain Values* are fully controlled by the value of the *Subtype*. The following tables show the list of *Domain Values* associated to eight different fields of the *Feature Class* ***GEO_LINES***, depending on the value of each *Subtype*.

Subtype Code: 10
Subtype Name: contact

FIELD NAME	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_contact_SID	1001
CONFIDENCE	Confid_contact_SID	01
ATTITUDE	NA_SID	99
GENERATION	NA_SID	99
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 11
Subtype Name: Fault

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_fault_SID	2001
CONFIDENCE	Confid_FaultShear_SID	01
ATTITUDE	Attitude_SID	01
GENERATION	Gen_FaultShear_SID	88
MOVEMENT	Fault_move_SID	88
HWALLDIR	Fault_direct_SID	88
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 12
Subtype Name: shear

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_shear_SID	2050
CONFIDENCE	Confid_FaultShear_SID	01
ATTITUDE	Attitude_SID	01
GENERATION	Gen_FaultShear_SID	88
MOVEMENT	Fault_move_SID	88
HWALLDIR	Fault_direct_SID	88
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 13
Subtype Name: structural lineament

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_lineam_SID	2077
CONFIDENCE	Confid_lineam_SID	01
ATTITUDE	NA_SID	99
GENERATION	Gen_undefined_SID	88
MOVEMENT	Fault_move_SID	88
HWALLDIR	Fault_direct_SID	88
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 14
Subtype Name: fold

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_fold_SID	3001
CONFIDENCE	Confid_fold_SID	01
ATTITUDE	Attitude_SID	01
GENERATION	Gen_fold_SID	88
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	Fold_direct_SID	88
ARROWDIR	Fold_direct_SID	88

Subtype Code: 15
Subtype Name: thin lithology

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_ThinLitho_SID	4001
CONFIDENCE	Confid_ThinLitho_SID	01
ATTITUDE	NA_SID	99
GENERATION	NA_SID	99
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 16
Subtype Name: unit construct line

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_construct_SID	5001
CONFIDENCE	NA_SID	99
ATTITUDE	NA_SID	99
GENERATION	NA_SID	99
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 17
Subtype Name: trace

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_trace_SID	5025
CONFIDENCE	NA_SID	99
ATTITUDE	NA_SID	99
GENERATION	NA_SID	99
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 18
Subtype Name: limit

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_limit_SID	5056
CONFIDENCE	NA_SID	99
ATTITUDE	NA_SID	99
GENERATION	NA_SID	99
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 19
Subtype Name: overprint

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_overprint_SID	6001
CONFIDENCE	Confid_overprint_SID	02
ATTITUDE	NA_SID	99
GENERATION	NA_SID	99
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

Subtype Code: 20
Subtype Name: isograd

FIELD	DOMAIN NAME	DEFAULT VALUE
QUALIFIER	Qualif_isograd_SID	7004
CONFIDENCE	Confid_isograd_SID	02
ATTITUDE	NA_SID	99
GENERATION	NA_SID	99
MOVEMENT	NA_SID	99
HWALLDIR	NA_SID	99
FOLDTREND	NA_SID	99
ARROWDIR	NA_SID	99

The following table shows a list of the *Subtypes* used for the *Features Class* ***GEO_POINTS*** with their code and respective description.

SUBTYPE FIELD	CODE	DESCRIPTION
GEOPOINTTYPE	1	planar
GEOPOINTTYPE	2	linear

As shown in Table 24 of section 2.3.4, several *Domain Values* are fully controlled by the value of the *Subtype*. The following two tables show the list of *Domain Values* associated to nine different fields of the *Feature Class* ***GEO_POINTS***, depending on the value of each *Subtype*.

Subtype Code: 1
Subtype Name: planar

FIELD	DOMAIN NAME	DEFAULT VALUE
GEOPOINTSUBSET	Subset_Planar_SID	1001
STRUCATTITUDE	Struc_Attitude_Planar_SID	05
STRUCGENERATION	Struc_Generation_SID	10
STRUCYOUNGING	Planar_Younging_SID	01
STRUCMETHOD	Struc_Method_SID	01
DIPDESC	Dip_Desc_SID	
SENSE_EVID	Sense_Evid_SID	
STRAIN	Struc_Strain_SID	
FLATTENING	Struc_Flattening_SID	

Subtype Code: 2
Subtype Name: linear

FIELD	DOMAIN NAME	DEFAULT VALUE
GEOPOINTSUBSET	Subset_Linear_SID	2029
STRUCATTITUDE	Struc_Attitude_Linear_SID	10
STRUCGENERATION	Struc_Generation_SID	01
STRUCYOUNGING	NA_SID	99
STRUCMETHOD	Struc_Method_SID	01
DIPDESC	NA_DID	99
SENSE_EVID	NA_DID	99
STRAIN	Struc_Strain_SID	
FLATTENING	Struc_Flattening_SID	

ANNEX B

This annex contains all corporate *Domain Values* controlled by the *Subtype*. A list of codes and descriptions are presented for each of the *Domain Values*.

Domain Name: Qualif_Contact_SID

Code	Description
1001	depositional
1002	depositional-conformable
1003	depositional-escarpment
1004	depositional-unconformable
1005	intrusive
1006	metamorphic
1007	sheared
1008	faulted
1009	faulted-escarpment
1010	facies change
1011	drift contact
1012	undefined

Domain Name: Qualif_Fault_SID

Code	Description
2001	normal
2002	reverse
2003	thrust
2004	dextral strike-slip
2005	sinistral strike-slip
2006	oblique-slip, dextral, normal
2007	oblique-slip, dextral, reverse
2008	oblique-slip, sinistral, normal
2009	oblique-slip, sinistral, reverse
2010	detachment
2011	transform
2012	back-thrust
2013	transverse, motion undefined
2014	generic, moderate dip
2015	generic, shallow dip
2016	generic, steep dip
2017	tear
2018	motion undefined

Domain Name: Qualif_Shear_SID

Code	Description
2050	normal
2051	reverse
2052	dextral strike-slip
2053	sinistral strike-slip
2054	oblique-slip, dextral, normal
2055	oblique-slip, dextral, reverse
2056	oblique-slip, sinistral, normal
2057	oblique-slip, sinistral, reverse
2058	detachment
2059	generic, moderate dip
2060	generic, shallow dip
2061	generic, steep dip
2062	motion undefined

Domain Name: Qualif_Lineam_SID

Code	Description
2075	generic, shallow dip
2076	generic, steep dip
2077	motion undefined

Domain Name: Qualif_Fold_SID

3001	**anticline**
3002	anticline, asymmetrical
3003	anticline, synformal
3004	syncline
3005	syncline, antiformal
3006	syncline, asymmetrical
3007	antiform
3008	antiform, asymmetrical
3009	antiformal sheath
3010	synform
3011	synform, asymmetrical
3012	synformal sheath
3013	monocline, anticlinal bend
3014	monocline, synclinal bend
3015	anticlinorium
3016	synclinorium
3017	neutral
3018	trough
3019	arch

Domain Name: Qualif_ThinLitho_SID

Code	Description
4001	dyke
4002	sill
4003	vein
4004	marker bed
4005	distinctive lithology
4006	thin stratigraphic unit
4007	discontinuous thin unit

Domain Name: Qualif_Construct_SID

Code	Description
5001	limit of mapping
5002	map neat line
5003	shoreline
5004	mapping precision change
5005	nomenclature change
5006	glacier edge
5007	other, see remarks

Domain Name: Qualif_Trace_SID

Code	Description
5025	bedding form line
5026	foliation form line
5027	undefined form line
5028	joint
5029	geophysical anomaly, positive
5030	geophysical anomaly, negative
5031	structural line of section
5032	seismic survey line
5033	geophysical survey line
5034	ductile structural trend
5035	other - see remark

Domain Name: Qualif_Limit_SID

Code	Description
5050	outcrop extent
5051	gas field
5052	oil field
5053	extent of bitumen
5054	geothermal field
5055	mine, surface
5056	quarry
5057	edge of sinkhole
5058	lava flow margin
5059	edge of crater
5060	edge of caldera
5061	front of penetrative strain
5062	extent of alteration
5063	extent of mineralization
5064	edge of contact metamorphism
5065	edge of regional metamorphism
5066	unique - see description

Domain Name: Qualif_Overprint_SID

Code	Description
6001	drift contact
6002	fault zone
6003	shear zone
6004	breccia zone
6005	alteration zone
6006	mineralization zone
6007	metamorphic facies zone

Domain Name: Qualif_Isograd_SID

Code	Description
7001	actinolite in
7002	andalusite in
7003	biotite in
7004	chlorite in
7005	clinopyroxene in
7006	cordierite in
7007	diopside in
7008	forsterite in
7009	garnet in
7010	hornblende in
7011	K-feldspar in
7012	kyanite in
7013	melt in
7014	muscovite in
7015	orthopyroxene in
7016	prehnite-pumpellyite in
7017	sillimanite in
7018	staurolite in
7019	tremolite in
7020	wollastonite in
7021	zeolite in

Domain Name: Confid_Contact_SID

Code	Description
01	defined
02	approximate
03	inferred
04	concealed
99	not applicable

Domain Name: Confid_FaultShear_SID

Code	Description
01	defined
02	approximate
03	inferred
04	concealed

Domain Name: Confid_Lineam_SID

Code	Description
01	defined
02	approximate
03	inferred
04	concealed

Domain Name: Confid_Fold_SID

Code	Description
01	defined
02	approximate
03	inferred
04	concealed

Domain Name: Confid_ThinLitho_SID

Code	Description
01	defined
02	approximate
03	inferred
04	concealed

Domain Name: Confid_Overprint_SID

Code	Description
01	defined
02	approximate
03	inferred
04	concealed

Domain Name: Confid_Isograd_SID

Code	Description
01	defined
02	approximate
03	inferred
04	concealed

Domain Name: NA_SID

Code	Description
99	not applicable

Domain Name: Attitude_SID

Code	Description
01	upright
02	overturned
03	upright, assumed from archival data
99	not applicable

Domain Name: Gen_FaultShear_SID

Code	Description
01	first
02	second
03	third
04	fourth
10	primary
20	multi-generation
88	undefined

Domain Name: Gen_Fold_SID

Code	Description
01	first
02	second
03	third
04	fourth
10	primary
20	multi-generation
88	undefined

Domain Name: Gen_Fold_SID

Code	Description
01	first
02	second
03	third
04	fourth
99	not applicable
88	undefined

Domain Name: Fault_Move_SID

Code	Description
01	N side down
02	NE side down
03	E side down
04	SE side down
05	S side down
06	SW side down
07	W side down
08	NW side down
88	undefined
99	not applicable

Domain Name: Fault_Direct_SID

Code	Description
01	N
02	NE
03	E
04	SE
05	S
06	SW
07	W
08	NW
09	inward
10	outward
88	undefined
99	not applicable

Domain Name: Fold_Direct_SID

Code	Description
01	N
02	NE
03	E
04	SE
05	S
06	SW
07	W
08	NW
88	undefined
99	not applicable

Domain Name: Subset_Planar_SID

Code	Description
1001	bedding
1002	eutaxitic layering
1003	igneous layering
1004	igneous layering, pillows
1005	flow layering
1006	compositional layering
1007	crossbed foreset
1008	contact
1009	dyke margin
1010	sill margin
1011	vein margin
1012	joint
1013	fracture
1014	fracture zone margin
1015	fault plane, unknown sense
1016	fault plane, normal
1017	fault plane, reverse
1018	fault plane, thrust
1019	fault plane, dextral
1020	fault plane, sinistral
1021	fault plane, oblique
1022	shear band, unknown sense
1023	shear band, normal
1024	shear band, reverse
1025	shear band, dextral
1026	shear band, sinistral
1027	shear zone, unknown sense
1028	shear zone, normal
1029	shear zone, reverse
1030	shear zone, dextral
1031	shear zone, sinistral
1032	shear zone, dextral-normal
1033	shear zone, dextral-reverse
1034	shear zone, sinistral-normal
1035	shear zone, sinistral-reverse
1036	axial plane
1037	axial plane, anticline
1038	axial plane, syncline
1039	axial plane, crenulation
1040	axial plane, kink-band
1041	axial plane, minor S fold
1042	axial plane, minor Z fold
1043	axial plane, minor U fold
1044	axial plane, transposition fold
1045	cleavage
1046	cleavage, slaty
1047	cleavage, spaced
1048	cleavage, crenulation
1049	schistosity
1050	gneissosity
1051	foliation
1052	foliation, mylonitic
1053	foliation, transposed bedding
1054	banding
1999	other, see remarks

Domain Name: Subset_Linear_SID

Code	Description
2001	symmetrical ripple crest
2002	asymmetrical ripple paleoflow
2003	imbrication paleoflow
2004	flute
2005	tool mark
2006	prod mark
2007	parting lineation
2008	trough axis
2009	slump fold hinge
2010	slump fold hinge, Z
2011	slump fold hinge, S
2012	igneous flow lineation
2013	fold hinge
2014	fold hinge, soft-sediment
2015	fold hinge, anticline
2016	fold hinge, syncline
2017	fold hinge, antiform
2018	fold hinge, synform
2019	fold hinge, minor S
2020	fold hinge, S crenulation
2021	fold hinge, minor Z
2022	fold hinge, Z crenulation
2023	fold hinge, minor U
2024	fold hinge, U crenulation
2025	fold hinge, crenulation
2026	axis of sheath fold
2027	axis of sheath antiform
2028	axis of sheath synform
2029	intersection lineation
2030	intersection, cleavage-bedding
2031	intersection, cleavage-cleavage
2032	fault striae
2033	fault grooves
2034	slickensides
2035	mineral growth fibres
2036	mineral lineation
2037	stretching lineation
2038	boudinage axis
2039	rodding
2040	mullions
2041	boudins
2042	glacial striae
2043	glacial grooves
2999	other, see remarks

Domain Name: Struc_Attitude_SID

Code	Description
01	inclined, upright
02	inclined, overturned < 180
03	inclined, overturned > 180
04	vertical
05	horizontal
06	inclined
07	horizontal, upright
08	horizontal, overturned
88	undefined
05	horizontal
10	plunging

Domain Name: Struc_Generation_SID

Code	Description
01	first
02	second
03	third
04	fourth
05	fifth
10	primary
11	multi-generation
88	undefined

Domain Name: Planar_Younging_SID

Code	Description
01	younging known, sedimentary structure
02	younging known, igneous structure
03	younging known, stratigraphic order
04	younging inferred, stratigraphic order
05	younging inferred, bedding-cleavage
06	younging evidence unknown, historical data
07	no younging evidence
99	younging evidence not applicable

Domain Name: Struc_Method_SID

Code	Description
01	measured at station
02	estimated at station
03	estimated remotely
04	calculated from data
05	calculated from imagery
06	acquired from historical data

Domain Name: Dip_Desc_SID

Code	Description
01	gently inclined (0-30)
02	moderately inclined (31-60)
03	steeply inclined (61-90)
99	not applicable

Domain Name: Sense_Evid_SID

Code	Description
01	asymmetric deformable fibres
02	asymmetric extensional shear bands
03	asymmetric fold
04	asymmetric inclusion trail
05	asymmetric rigid fibres
06	back-rotated swell
07	C/S fabric
08	deflection of foliation
09	foliation fish
10	mineral fibres
11	offset of marker
12	pressure fringes
13	pressure shadows
14	quarter structures
15	quartz fabric
16	rotated porphyroblast
17	sheath folds
18	sigmoid tension gashes
19	striae or grooves
20	winged inclusion
21	winged porphyroclast
22	no sense of motion evidence

Domain Name: Struc_Strain_SID

Code	Description
01	no strain
02	massive
03	weak
04	moderate
05	strong
06	intense

Domain Name: Struc_Flattening_SID

Code	Description
01	S tectonite
02	SSS
03	S>L
04	S>=L
05	S=L
06	S<=L
07	S<L
08	LLL
09	L tectonite
99	not applicable

ANNEX C

This annex contains all corporate *Domain Values* non-controlled by the *Subtype*. A list of codes and descriptions are presented for each of the *Domain Values*.

Domain Name: ActivityRole_DID

Code	Description
01	Project leader
02	Project co-leader
03	Activity leader
04	Activity co-leader
05	Geologist
06	Bedrock mapper
07	Surficial mapper
08	Assistant geologist
09	Student
10	Master degree student
11	PhD degree student
12	Student supervisor
13	IM specialist
14	GIS specialist
15	Scientific colleague
16	Volunteer

Domain Name: Boundary_DID

Code	Description
99	not applicable

Domain Name: Eon_DID

Code	Description
hadean	Hadean
archean	Archean
proterozoic	Proterozoic
phanerozoic	Phanerozoic

Domain Name: Era_DID

Code	Description
eo-archean	Eo-archean
paleo-archean	Paleo-archean
meso-archean	Meso-archean
neo-archean	Neo-archean
paleo-proterozoic	Paleo-proterozoic
meso-proterozoic	Meso-proterozoic
neo-proterozoic	Neo-proterozoic
paleozoic	Paleozoic
mesozoic	Mesozoic
cenozoic	Cenozoic

Domain Name: LegendSymbolType_DID

Code	Description
F	Fill
L	Line
L1	Line 1
L2	Line 2
L3	Line 3
L4	Line 4
L5	Line 5
H1	Header 1
H2	Header 2
H3	Header 3
M	Marker Point

Domain Name: NA_DID

Code	Description
99	not applicable

Domain Name: Period_DID

Code	Description
siderian	Siderian
rhyacian	Rhyacian
statherian	Statherian
calymmian	Calymmian
ectasian	Ectasian
stenian	Stenian
tonian	Tonian
cryogenian	Cryogenian
ediacaran	Ediacaran
cambrian	Cambrian
ordovician	Ordovician
silurian	Silurian
devonian	Devonian
carboniferous	Carboniferous
permian	Permian
triassic	Triassic
jurassic	Jurassic
cretaceous	Cretaceous
paleogen	Paleogen
neogen	Neogen
quaternary	Quaternary

Domain Name: Rank_DID

Code	Description
bed	Bed
complex	Complex
formation	Formation
group	Group
lithodem	Lithodem
megasequence	Megasequence
member	Member
not_specified	Rank not specified
sequence	Sequence
subgroup	Subgroup
suite	Suite
supergroupe	Supergroupe
supersequence	Supersequence
supersuite	Supersuite