A Brief Documentation of the Idaho Geological Survey's Digital Geologic Map Data Model, Version 2.1: A Variant of the North American Digital Geologic Map Data Model, Version 4.3

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INTRODUCTION

AUTHOR DISCLAIMER

My understanding of digital geologic map data results from more than ten years of digital production experience with geologic mapping at the Idaho Geological Survey. The Idaho Geological Survey's Digital Geologic Map Data Model Version 2.1, documented here, is a variant model and not meant to compete or replace the valuable work done on the North American Digital Geologic Map Data Model, Version 4.3 (NADM). Hopefully it adds a practical dimension and demonstrates the potential of the NADM.

HISTORY

The Idaho Survey began making "GIS" geology maps in 1992. In 1996 it began to collect metadata and object-level source data on all map objects and attach a very primitive digital legend, a data model of sorts, to each geologic map. However, to ask and get meaningful answers to questions about information in a geologic map requires a more comprehensive data model. Preferably, search engine tools that worked in a commonly used GIS would be included. With this goal in mind, work began on the Idaho Survey's data model during the summer of 1999.

PURPOSE

"The purpose of a data model for digital geologic maps is to provide a structure for the organization, storage, and use of geologic map data in a computer." (Johnson and others, 1999). In other words a digital geologic map data model is the design of the geologic map databases and how they relate to one another to supply reasonable interpretations of the map.

The Idaho Survey has been generating new compilations of geologic map data for several years and needs a data model for two reasons. First, our users need digital geologic map data and the associated digital map legends to facilitate the best use of our map data. Secondly, the Idaho

Survey needs a mechanism for storing geologic map data and related legend information as maps are completed.

The data model presented here is a relational model designed to work in ArcView 3.2 GIS. The data stored in the model could be migrated to most other GIS data structures with a little work.

DESIGN OBJECTIVES

The main objectives for the Idaho variant model are:

- The model must provide a framework on which to store geologic map data and corollary legend information created by the survey.
- The data model will work with in-house systems and procedures for collecting and attributing geologic map data.
- The model should work with ESRI ArcView and ArcInfo GIS.
- The model should, where possible, use the structure and design developed for North American Digital Geologic Map Data Model 4.3.
- The model should be expandable to handle new data types as the need arises.
- Data stored in the model framework should be transferable and able to update to other format structures in the future.
- If possible, tools to access the data stored in the data model structure should be developed.

DATA FORMAT

Each digital geologic map released by the Idaho Survey comes with the spatial GIS in ArcInfo format and the metadata and legend database in dBase and Microsoft Access formats.

DOCUMENTATION OF THE IDAHO GEOLOGICAL SURVEY'S DIGITAL GEOLOGIC MAP DATA MODEL, VERSION 2.1, A NADM VERSION 4.3 VARIANT

The following is a brief description of the relational database making up the Idaho variant model. Detail about each table in the model and its relationship to the entire model and other tables can be found in the Idaho Geological Survey's Digital Geologic Map Data Model Structure and Connection Diagram (http://www.idahogeology.org/Lab/datamodel.htm) and the Data Dictionary

Table (see the Appendix). For the purposes of discussion the model can be divided into three sections: the metadata, the spatial database (GIS), and the legend database.

METADATA

Metadata documents all the background information about a data set in a standard form and content. The metadata section includes FGDC compliant metadata stored in a relational database, a map unit history table, and data dictionary tables.

Formal Metadata

Formal Metadata are stored in a stand-alone relational database. This database is used in generating metadata records on the fly. A detailed table and field description of the formal metadata is not shown here except for the Source Identify Table. This table supplies entity level map-source metadata to the rest of the data model through a link to the *source_id* item. Source codes are attached to all entity-level objects in the spatial database. For example, a source item query in the digital geologic map could allow one to find all work done by J.D. Mapper at a scale of 1:24,000 or greater.

Compilation Unit-History Table stores information about the history of geologic map units from the various map sources used in the compilation data set. Its linking item is the *unit_id* field. With this table the original name given to a map unit can be found. For example, J.D. Mapper mapped Kgd (granodiorite) in her original map which has been changed to Kbgd (biotite granodiorite) for this compilation.

Master Data Dictionary Table provides a detail listing of all tables and fields in the tables contained in the Idaho Survey's variant data model. This table is especially useful to anyone linking tables or setting up ODBC connections.

Symbol Table is a lookup table that provides information about each geologic point symbol used in Idaho Survey data sets. For symbols queries link to the Symbol Table using the *sym_name* item. For example, one could use this table to find a description of the parameters for a "strike and dip" symbol.

Line Type Table stores lookup table information about the line-types used in Idaho Survey data sets and their accuracy. The *linetype* item is used to link to any GIS line table in the model.

Structure Type Table is a lookup table storing information about linear structure symbols in Idaho Survey data sets. The *type* item is used to link to any GIS line table in the model.

SPATIAL DATABASE

The Spatial Database stores GIS data for the data set. The GIS software for Idaho Survey data sets is ArcInfo. In addition, each data set is specifically set up to load into ArcView as a project. Exchange files are also provided for import into another GIS. In the following discussion, only fields storing data-model attribute information will be mentioned. A full listing of all spatial fields is located in the Data Dictionary Table located in the Appendix or in the "/metadata" folder

in the data set.

Polygon Tables store standard polygon GIS information for map units in each data set. The *unit_id* item links to the Map Unit Table in the legend database. Additional overlaying polygon themes can also be linked to the Map Unit Table in the same data set as long as *unit_id* records are unique. The *object_id* field stores names of individual polygon map features. For example, the Granite unit Kg contains hundreds of polygons on the map but only three get labeled the "Hayden Lake Stock."

Line Tables include geologic contact, fault, fold and dike tables. Standard GIS data are stored in each table. In addition, each table includes an *object_id* field for storing unique map name features. For example, a fault or fold name can be stored here. Fault movement (*fside*), fault type (*ftype*), and line-type (*linetype*) are stored in the appropriate fields in each Line Table.

Point Tables store information about geologic map point symbols, sample locations, or other point data. Standard GIS data are stored in each table. Additional fields may include symbol type (*symbol*), AutoCAD azimuth, (*angle*), compass azimuth (*azimuth*), dip angle (*dip*), map unit (*unit_id*), sample identifier (*sample_id*), data set identifier (*map_id*), and source identifier (*source_id*).

The **Polygon-To-Line Relate Table** links geologic contacts, (lines stored in rocks.aat) to their associated polygons in the map unit polygon table (rocks.pat). Source identifiers and linetype (accuracy) and can be tied to polygons using this link. NOTE: the polygon-to-line relate table is stored in the Legend Database.

LEGEND DATABASE

The Legend Database stores map legend information including map unit descriptions, time correlation, origin, formal units, and form or landform. Like the Metadata Database these data are captured and updated in an Access database. Tables primarily link to polygon tables in the Spatial Database through the *unit_id* item in the Map Units Table. For the convenience of discussion, the Legend Database is divided into seven sections: Map units, origin and form, time, formal units, lithologic description, map features, and related data.

Map Units

The Map Units section is made up of three tables: Map Units Table, Special Unit Relationship Table, and the Class Type Table.

The **Map Unit Table** is roughly equivalent to the Rock Unit Table in NADM 4.3 and delivers some of the functions of a compound object achieve (COA) in NADM, 4.3. It contains fields for map unit name (*map_name*), class (*class*), and thickness (*max_thick, min_thick, typ_thick)*. The *class* item refers to map unit categories. These may be rock units categories or other polygon overlay types. The Map Unit Table includes a *merge_name* item for the merging of two or more map tiles (untested). This table acts as the main linking table for the Legend Database via its *map_unit* field.

The **Special Unit Relationship Table** stores information about the relationships between two units. The linking items are the *unit_id* and the *rel_unit_id*. An example of a special unit relationship is: unit "A" overlays unit "B" or unit "A" intrudes "unit "B".

The **Class Table** is a lookup table storing class types for the Map Unit Table. Class types include the basic rock type categories or categories that apply to any polygon overlays. Examples include igneous, volcanic, or, in the case of a metamorphic overlay, metamorphic grade.

Origin and Form

This section contains information about the landform, form, and genetic environment or environment of origin.

The **Form/Landform Table** stores form and landform information about map units. A lookup table supplies a pick list for input. The *unit_id* item links to the Map Unit Table. Form refers here to the shape and size of a rock body. Examples of form are dike or sill for igneous rocks or bed for sedimentary rock. For surficial units, form refers to the landform(s) of the unit, where appropriate. These tables would benefit from a NADM standard pick list.

The **Genetic/Environment Table** provides the environment of origin or the genetic origin of map units. The *unit_id* links to the Map Unit Table. The Genetic/Environment Origin lookup table supplies a hierarchical pick list and the Genetic/Environment Origin Tree Table allows for parent-child relationships. A typical search would be "find map units with a fluvial origin." These tables would benefit from a NADM standard pick list and hierarchy list.

Time

Geochronologic time for map units is handled via the Stratigraphic Map Unit Age, Stratigraphic Map Unit Age Relate, Stratigraphic Time, Stratigraphic Tree, and Stratigraphic Rank tables in the Time section. This section follows closely the organization of the NADM with the additions of an age sorting item, maximum-minimum relationship indicator item, and a table for storing all possible unit ages.

The **Stratigraphic Map Unit Age Table** is the main relate table for this section. The *unit_id* item links to the Map Unit Table. This table stores the minimum and maximum geochronologic ages for map units, age sorting number (*strat_seq*), and maximum-minimum relationship indicator (*relation*). This item is used to indicated whether the minimum age relationship to maximum is an "or" or an "and" relationship. For example, a map unit may be Tertiary *or* Cretaceous, or Tertiary *and* Cretaceous.

The **Stratigraphic Map Unit Age Relate Table** stores all possible ages for map units and relates between the Stratigraphic Map Unit Age Table and the Stratigraphic age lookup tables via the *map_unit* and *age* items, respectfully.

The **Stratigraphic Time Table** is a lookup table that stores information about geochronologic time units. For example, the time intervals for the Quaternary, maximum and minimum age, and rank are stored here. This table is linked to the Stratigraphic Map Unit Age Relate Table via the *Strat_name* item. It also links to the Stratigraphic Tree Table.

The **Stratigraphic Tree Table** stores parent-to-child relationships for stratigraphic time units. This provides, for example, the ability to find all Cenozoic age map units with a relatively simple search.

The **Stratigraphic Rank Table** stores lookup information about stratigraphic rank to aid in queries.

Formal Units

The **Formation Lookup**, **Formation Tree**, and **Formation Rank** tables provide the user the ability to search the data set by Formal Lithostratigraphic Unit.

The **Formation Lookup Table** stores name and map unit code information about formal lithostratigraphic units in Idaho. It links to the Formation Tree Table, Map Unit Table or Lithologic Description section via the *formal_id* item. It also stores ranks codes for linking to the Formation Rank Table.

The **Formation Tree Table** supplies parent-to-child relationships to the Formation Lookup Table. For example, a query of this table could give all formations in the data set that are Belt Supergroup rocks.

The **Formation Rank Table** stores ranking level codes. With these ranks, the Formation Lookup Table can be queried by supergroup or member, for example.

Lithologic Description

All tables in this section store lithologic modifiers, or their lookup tables, which promote simple but powerful map-unit lithologic searches of the data set. Multiple modifiers about multiple lithologies for each map unit in the digital geology can be stored. All tables link to the Rock Description Table via the *sub_unit* item which in tern links to the Map Unit Table through the *map_unit* item. Most of the tables in this section of the Idaho model are not found in NADM 4.3. The developers of the Idaho model felt that using limited standard-lithology hierarchy along with related modifier tables could provide the best accessability in lithology searches. This entire section of tables would greatly benefit from standardized lists of lithologies and lithologic modifiers like those being worked on by technical teams under the authority of the North American Digital Geologic Map Data Model Steering Committee. For the purpose of developing the Idaho Survey's variant quickly, we have organized our own "in-house standard" lithology and modifier hierarchy.

Using a limited lithology-hierarchy approach means that lithologic names are not taken to the bottom rung of the hierarchy ladder. Instead lithologies are stopped at a "common" or mid point in the hierarchy and modifiers attached to the lithology are used to fill out the description. For example, a foliated, hornblende biotite granite is stored in the Idaho Survey's model as:

lithology----------granite
mineral modifier 1----------hornblende
mineral modifier 2----------biotite
texture, igneous, grain arrangement----foliated

Each lithology and modifier can be searched on separately.

The **Rock Description Table** stores one or more lithology names for each map unit. Each

lithology receives a unique *sub_unit* code. Two lithology names are stored with each sub-unit lithology. The author lithology name (*author_name*) might contain, for example, the authors name for the lithology in question or the name found in the map description text. It is not standardized. The second lithology name (*lith_name*) must be picked from a standardized Lithology Table.

Relative abundance of the each lithology for a map unit is stored in the *relative* item where the integer "1" represents the most abundant. The *quality* field gives a rating to the accuracy of the relative abundance number. The authors of the Idaho variant chose not to assign percent values to relative abundance as called for in NADM 4.3.

Describe fields are located in this table. They are used to store additional comments or description facts associated with each lithology of a map unit.

The **Lithology Table** and **Lithology Tree Table** store an Idaho Survey standard lithology hierarchy and the parent-to-child relationships associated with it.

The **Lithology Structures Table** provides a place to store unlimited lithologic structures for each sub-unit. It has an associated lookup table which provides a dynamic pick list. Examples include "parting", "flat-laminated", or "columns".

The **Lithology Mineral Modifier Table** stores one or more minerals associated with each lithology. A lookup table provides a dynamic pick list. Each modifier is stored with a relative *order* item. For example, in the lithology "biotite hornblende granite" "biotite" is stored as *order* =1 and "hornblende" as *order*=2.

The **Lithology Textures Table** provides a location for one or more clast or grain size (*size*) or clast or grain arrangement, distribution, or shape (*arr_dis*) attributes for each sub-unit. The table links to lookup tables (textr_lp, arr_dis) where a texture pick lists are stored by rock class type. Examples include "aphanitic" (grain size), "foliated" (grain arrangement), and "porphyritic" (grain distribution).

The **Lithology Colors Table** stores one or more colors for each sub-unit lithology. Examples of colors include "weathers orange", "stained yellow", or grey.

The **Lithology Abundance Table** stores values for those sub-unit lithologies which include abundance descriptors. For example, a garnet schist could be described as "minor".

The **Lithology Fossil Table** provides a location for storing fossil names for each sub-unit (untested).

The **Lithology Composition/Texture Table** provides a place to differentiate lithology values for each sub-unit by whether the lithology is composition-based or texture-based. This allows for searches based purely on composition or texture.

The **Lithology Modifier Table** stores modifiers not handled by the other modifier tables. An example of modifiers stored here is "impure".

Map Features

The **Map Object Name Table** stores the names and spatial data type of named map features and provides a way to single out one map object from a class of geologic objects. For example, a stock or pluton name can be assigned to a few polygons of a larger map unit. This table links to the appropriate spatial table via the *object_id* item.

Related Data

The IGS variant model includes several designed tabes or databases that are currently not implemented. The most important to the Idaho Survey and its customers are geochemistry data, map mineral-mode data, and radiometric age data.

The **Map Mineral Mode Table** supplies mode percent values of mineral for samples collected from sub-units of map units.

The **Geochemistry Table** stores data for map unit samples taken in the data-set study area.

The **Radiometric Age Table** stores absolute age dates, and the metadata about the dating method, for map unit samples.

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DATA MODEL DESIGN TEAM

Idaho Geological Survey's Digital Geologic Map Data Model, Version 2.1, a NADM Version 4.3 variant, design team members:

Loudon R. Stanford–primary designer
Vance T. MacKubbin–browser and query tools designer and development assistance
Reed L. Lewis–lithologic description design assistance
Ben Studer–database and metadata design assistance
Robert Anton-Eric–early development assistance

REFERENCES

Johnson, B.R., Boyan Brodaric, G.L. Raines, J.T.. Hastings, and Ron Wahl, 1999, Digital geologic map data model, version 4.3(a): American Association of State Geologists / U.S. Geological Survey unpublished draft document, 69 p., <http://geology.usgs.gov/dm/model/Model43a.pdf>

APPENDIX

DATA DICTIONARY

(For *Item Type*: C = Character, I = Integer. For *Item Length*: dbl = double precision, blank = single precision or integer, auto = auto number field, int = integer)

Table	Item Name	Item Type	Item Length	Item Define
abundanc	abundance	C	50	abundance of rock type
abundanc	sub_unit	I		ID used for linking
arr_dis	type	C	255	clast or grain, distribution, arrangement, or shape
arr_dis	describe	C	255	definition
arr_tree	type	C	255	clast or grain, distribution, arrangement, or shape
arr_tree	class	C	255	rock class type
clastype	type_code	I		abundance of rock type
clastype	type	C	50	Class type [Links to Map Unit Tables]
color	sub_unit	I		ID used for linking to Rx_desc table
color	color	C	50	color of rock sample, repeat as needed
compose	sub_unit	I		ID used for linking
compose	texture	C	50	texture term that best fits for this rock type
compose	compose	C	70	Lithology term that best fits for this rock type; from lithology lookup table
data_dic	a_values1	C	255	5.1.2.4.1: enumerated domain; members of an established set of valid values (will usually refer the user to a lookup table)
data_dic	a_name	C	50	5.1.2.2: attribute definition; description of the attribute
data_dic	item_name	C	20	5.1.2.1: attribute label; name of the attribute
data_dic	table	C	25	spatial data set table
data_dic	e_name	C	50	5.1.1.1: entity type label;
data_dic	a_source	C	100	5.1 2.3: attribute definition source; authority (??) of the definition
data_dic	a_values2	C	200	5.1.2.4.1.1: enumerated domain value; name or label of a member of the set
data_dic	item_type	C	12	table item or field type for the spatial data set table
data_dic	item_lengt	C	200	table item length for the spatial data set table
data_dic	units	C	10	units for the table item for the spatial data set

Table	Item Name	Item Type	Item Length	Item Define
data_dic	itemalliase	C	20	common full name for item
data_dic	comments	C	254	
data_dic	item_def	C	255	5.1.2.2: attribute definition; description of the attribute
dikes.aat	Layer	C	16	AutoCAD layer name
dikes.aat	Unit_id			
dikes.aat	Refid5	C	20	map (unassigned)
dikes.aat	Refid4	C	20	map object name
dikes.aat	Refid3	C	20	map id (unassigned)
dikes.aat	Refid2	C	20	map id (entire database) source maps identifier
dikes.aat	Igs-dikeid	N	11	IGS id
dikes.aat	Linetype	C	10	geology line type
dikes.aat	Dikes-id	N	11	arc id
dikes.aat	Dikes#	N	11	arc id
dikes.aat	Length	N	13	arc (line) length
dikes.aat	Refid1	C	20	map id (entire database) tile map identifier
faults.aat	Length	N	13	arc (line) length
faults.aat	Faults-id	N	11	arc id
faults.aat	Faults#	N	11	arc id
faults.aat	Refid4	C	20	map id object name
faults.aat	Layer	C	16	AutoCAD layer name
faults.aat	Linetype	C	10	geologic map line type
faults.aat	Lpoly	C	10	left polygon name
faults.aat	Refid5	C	20	map id (unassigned)
faults.aat	Rpoly	C	10	right polygon name
faults.aat	Ftype	C	10	geologic fault type
faults.aat	Fside	C	1	fault symbol side
faults.aat	Igs-faultid	N	11	IGS id
faults.aat	Refid1	C	20	map (entire database) tile identifier
faults.aat	Refid2	C	20	map (entire database) source maps identifier
faults.aat	Refid3	C	20	map (unassigned)
foldaxis.aat	Foldaxis-id	N	11	arc id
foldaxis.aat	Igs-foldid	N	11	IGS id
foldaxis.aat	Foldaxis#	N	11	arc id
foldaxis.aat	Layer	C	16	AutoCAD layer name

Table	Item Name	Item Type	Item Length	Item Define
foldaxis.aat	Linetype	C	10	geology line type
foldaxis.aat	Refid1	C	20	map (entire database) tile identifier
foldaxis.aat	Refid4	C	20	map object name
foldaxis.aat	Refid2	C	20	source maps identifier
foldaxis.aat	Refid3	C	20	map id (unassigned)
foldaxis.aat	Refid5	C	20	map (unassigned)
foldaxis.aat	Length	N	13	arc (line) length
form_lup	formal	C	100	Formal Units that appear on a map
form_lup	formal_id	C	10	Map Unit ID of a Formal Unit
form_lup	rock_rank	I		Formal unit rank: link on RockUnitRank Table
formrank	id	I	dbl	
formrank	rock_rank	C	254	Formal lithostratigraphic ranking
formrank	rock_level	I	dbl	Level assigned lithostratigraphic ranking
formrank	describe	C	255	Description of formal lithostratigraphic rank
formtree	id	I		
formtree	formal_id	C	10	Formal unit code; code used on map
formtree	parent	C	10	Formal unit parent code; code used on map
fossil	describe	C	255	comments or description
fossil	sub_unit	I		ID used to link to rx_desc table
fossil	fossil	C	150	name of fossil
gen_lp	level	I		hierarchy level
gen_lp	describe	C	255	describe
gen_lp	sort	I		internal IGS use code
gen_lp	class	C	50	rock genetic class
gen_lp	gen_org	C	50	genetic or environmental origin
gen_orig	unit_id	C	10	Map unit code
gen_orig	gen_org	C	60	Genetic origin [from lookup]
gen_tree	gen_org	C	50	Genetic origin
gen_tree	parent	C	50	Genetic origin parent(s)
grn_dis	grain_dist	C	70	grain distribution
grn_arr	grain_arr	C	70	grain arrangement
landform	unit_id	C	10	Map unit code
landform	form	C	50	Landform or form associated with unit
lform_lp	class	C	25	Rock class associated with unit
lform_lp	form	C	60	Landform or form associated with unit

Table	Item Name	Item Type	Item Length	Item Define
lform_lp	describe	C	255	Description of term
linetype	geol_name	C	50	Geologic name for contact, fault, or other linear feature line type; accuracy
linetype	line_type	C	50	AutoCAD contact, fault, or other linear feature line type; accuracy
linetype	acur_level	I	int	Relative accuracy number; 1 highest
linetype	describe	C	255	Describe line type
linetype	usgs_name	C	50	USGS name for line type
linetype	usgs_code	I	int	USGS name for line type
linetype	id	I	Auto	
lith	lith_level	I	int	Number assign to lithology name
lith	DESCRIBE	C	254	Description of lithology
lith	lith_id	I	int	Number assign to lithology name
lith	lith_name	C	50	Lithology name
lith	type	C	50	type of lithology: composition, textural, both
lithtree	lith_name	C	50	Lithology name
lithtree	parent_id	I	int	Parent name number
lithtree	parent	C	50	Parent name
lithtree	lith_id	I	int	Number assign to lithology name
lstrc_lp	describe	C	255	Definition of structure
lstrc_lp	class	C	25	Rock class for unit
lstrc_lp	structure	C	50	Lithologic structure
l_struct	sub_unit	I		linking id for sub units of map units
l_struct	unit_id	C	10	Map unit code
l_struct	structure	C	50	lith structures
map_unit	unit_id	C	10	Map Unit Identification Code
map_unit	typ_thick	I		map unit typical thickness
map_unit	sort_order	I		sorting number only
map_unit	describe	C	255	map unit description
map_unit	min_thick	I		map unit minimum thickness
map_unit	max_thick	I		map unit maximum thickness (feet)
map_unit	type	C	50	Class Type of Map Unit: link to ClassType Table
map_unit	merge_name	C	100	Simplified name for geologic unit; used for when 2 or more maps are merged
map_unit	map_name	C	100	Name of Map Unit
map_unit	polarity	C	50	magnetic polarity

Table	Item Name	Item Type	Item Length	Item Define
min_mods	sub_unit	I		sub unit of map unit; linking id
min_mods	min_mods	C	50	Mineral modifiers for unit
min_mods	unit_id	C	10	Map unit code
min_mods	order	I		Order of mineral modifier as in description; first, second, third, etc.
modify	unit_id	C	10	Map unit code
modify	sub_unit	I		sub unit of map unit; linking id
modify	modifier	C	50	Modify terms; not found in other modify tables
ob_name	table	C	25	Spatial attribute table where object is stored
ob_name	label	C	70	Name of Object
ob_name	object_id	C	50	Name/ID of map object or feature
ob_name	describe	C	255	Description of named map object
rocks.aat	Length	N	13	arc (line) length
rocks.aat	Rocks-id	N	11	arc id
rocks.aat	Layer	C	16	AutoCAD layer name
rocks.aat	Linetype	C	10	geologic map line type
rocks.aat	Lpoly	C	10	left polygon name
rocks.aat	Rpoly	C	10	right polygon name
rocks.aat	lgs-arcid	N	11	IGS id
rocks.aat	Refid5	C	20	map id (unassigned)
rocks.aat	Ftype	C	10	geologic fault type
rocks.aat	Fside	C	1	fault symbol side
rocks.aat	Refid3	C	20	map id (unassigned)
rocks.aat	Refid1	C	20	map (entire database) tile identifier
rocks.aat	Rocks#	N	11	arc id
rocks.aat	Rpoly#	N	11	right polygon number
rocks.aat	Lpoly#	N	11	left polygon number
rocks.aat	Refid4	C	20	map object name
rocks.aat	Tnode#	N	11	to node
rocks.aat	Fnode#	N	11	from node
rocks.aat	Refid2	C	20	map id source maps identifier
rocks.pat	Rocks-id	n	11	arc info table id
rocks.pat	Perimeter	n	13	perimeter of polygon
rocks.pat	Rocks#	n	11	arc id
rocks.pat	Unit/value	C	10	geologic rock unit

Table	Item Name	Item Type	Item Length	Item Define
rocks.pat	Layer	C	16	AutoCAD layer name
rocks.pat	Area	n	13	area of polygon
rocks.pat	Igs-polyid	N	11	IGS id
rx_desc	sort_order	I	int	relative order of sub units (for sorting purposes)
rx_desc	relative	I		Relative abundance order; 1 is first and most abundant
rx_desc	lith_id	I	int	lithology id from lith lookup table; used to link to lith table
rx_desc	formal_id	C	10	Formation ID
rx_desc	quality	C	10	Qualitative term describing accuracy of relative abundance item
rx_desc	map_unit	C	10	map unit short hand
rx_desc	sub_unit	I		ID used for linking to composition etc. lookup tables
rx_desc	describe	C	255	use if additional comments needed from map unit table
rx_desc	m_describe	C	255	merge describe; use for additional comments; used for merged versioning
rx_desc	alith_name	C	125	author lithology
rx_desc	lith_class	C	100	IGS standard lithology
sources	best_date	C	255	2.5.1.4-9.1.1 Calendar Date <caldate> (Publication date for the dataset)
sources	citation	C	255	2.5.1.5 Source Citation Abbreviation; srccitea (OF99-34)
sources	current	C	255	2.5.1.4.1: Source Currentness Reference; srccurr (publication date)
sources	source_des	C	255	description of source map data
sources	scale	I		2.5.1.2.: source scale denominator for map digitized (if primary source); denominator of the representative fraction on a map; srcscale
sources	map_id	C	14	internal IGS identification code
sources	citnum	C	50	Idaho Geological Survey citation number
sources	title	C	254	8.4: title; name by which the source information for this data set known
sources	author	C	254	8.1: authors of science used in data set
sources	publisher	C	100	8.8.2: name of an organization or individual that developed the source information for this data set: publisher
sources	pubplace	C	50	8.8.1: city of publication add state if needed
sources	series	C	100	8.7.1: name of the series publication of which the data set is a part

Table	Item Name	Item Type	Item Length	Item Define
sources	issue	C	50	8.7.2: info identifying the issue of the series publication of which the data set is a part
sources	pub_id	C	14	2.5.1.5: source citation abbreviation; short-form alias for the source citation
sources	pub_date	C	25	8.2: date when the source information for this data set was published or otherwise made available for release
sources	field_date	C	50	date when the bulk of the field work for this data set was done
sources	source_id	C	15	2.5.1.1: source identifier; reference for a source data set
sources	pub_scale	I		2.5.1.2.2: : source scale denominator for the published geologic map; denominator of the representative fraction on a map
sources	contribute	C	255	2.5.1.6: source contribution; brief statement identifying the information contributed by the source to the data set
sources	base_name	C	25	common name for map or quadrangle source map
sources	base_scale	I		Base map scale
sources	base_date	C	10	Date of base map publication
sources	w_long	I	dbl	1.5.1.1: western-most coordinate of the limit of source map in longitude; decimal degrees
sources	e_long	I	dbl	1.5.1.2: eastern-most coordinate of the limit of source map in longitude; decimal degrees
sources	n_lat	I	dbl	1.5.1.3: northern-most coordinate of the limit of source map in latitude; decimal degrees
sources	s_lat	I	dbl	1.5.1.4: southern-most coordinate of the limit of source map in latitude; decimal degrees
sources	media	C	15	2.5.1.3: type of source media; medium of the source data set
sources	digi_scale	I		scale at which map was digitized
sources	digi_sourc	C	50	digitize from source map (primary); or transferred to other base and digitized (secondary); or imported data (inherited)
sources	rms_digi	I		Root Mean square (RMS) error average for source map transformations
sources	processing	C	255	2.5.2.1: process description; explanation of the events and related parameters or tolerances
sources	proc_date	C	16	2.5.2.3: process date;
sources	field_scale	I		2.5.1.2.1: source scale denominator for field map; denominator of the representative fraction on a map
str_rank	strat_levl	I	dbl	Geochronologic time hierarchy numeric ranking
str_rank	strat_rank	C	50	Geochronologic time hierarchy ranks

Table	Item Name	Item Type	Item Length	Item Define
str_rank	id	I	dbl	Table ID
str_time	min_age	I	dbl	Minimum age in millions of years
str_time	strat_name	C	50	Geochronologic unit name
str_time	strat_id	I	dbl	Geochronologic time ID
str_time	id	I	dbl	Table ID
str_time	max_age	I	dbl	Maximum age in millions of years
str_time	strat_rank	C	30	Geochronologic time hierarchy ranks
str_tree	parent_id	I	dbl	Geochronologic time parent ID
str_tree	strat_name	C	255	Geochronologic unit name
str_tree	id	I	dbl	Table ID
str_tree	parent_nam	C	255	Geochronologic unit name
str_tree	strat_id	I	dbl	Geochronologic time ID
struage	min_strat	C	25	Minimum stratigraphic age of the Map Unit
struage	max_strat	C	25	Maximum stratigraphic age of the Map Unit
struage	relation	C	10	relationship of minimum age to maximum age
struage	strat_seq	I	dbl	Sequence of stratigraphic layers
struage	unit_id	C	10	Map Unit whose Stratigraphic Age is being recorded
structlp	movement	C	250	Description of movement
structlp	describe	C	255	Structure description
structlp	type	C	50	Structure type
structlp	modifier	C	50	Modifier for structure
structlp	id	I	Auto	Table ID
strutree	id	I	auto	Table ID
strutree	unit_id	C	10	Map unit code
strutree	age	C	25	Geochronologic time unit
symbols	sym_name	C	50	AutoCAD symbols name
symbols	attributes	C	100	Attributes attached to symbol; (see spatial point table)
symbols	sym_type	C	50	Symbol type; attitude, linear, or just line or point
symbols	id	I	Auto	Table ID
symbols	describe	C	255	Description of symbol
symbols	usgs_name	C	50	USGS name for symbol
symbols	usgs_code	I		USGS code for symbol
symbols	defin_orig	C	250	Definition of symbol origin
symbols.pat	Refid1	C	20	map id (entire database) tile map identifier

Table	Item Name	Item Type	Item Length	Item Define
symbols.pat	Azimuth	N	13	azimuth compass****corrected***
symbols.pat	Att2	C	20	attribute value for tag2
symbols.pat	Att3	C	20	attribute value for tag 3
symbols.pat	Tag3	C	10	attribute field name 3
symbols.pat	Refid4	C	20	map object name
symbols.pat	Refid2	C	20	map id (entire database) source maps identifier
symbols.pat	Refid5	C	20	map id (unassigned)
symbols.pat	Angle	N	13	symbol rotation, azimuth compass****uncorrected***
symbols.pat	Tag2	C	10	attribute field name 2
symbols.pat	Att1	C	20	attribute value for tag 1: usually DIP angle
symbols.pat	Blockname	C	10	AutoCAD symbol name
symbols.pat	Layer	C	16	AutoCAD layer name
symbols.pat	Symbols-id	N	11	arc id; could be "attitude", or "linear", or "other"
symbols.pat	Symbols#	N	11	arc id
symbols.pat	Refid3	C	20	map id (unassigned)
symbols.pat	Igs-symid	N	11	IGS id
symbols.pat	Tag1	C	10	attribute field name 1
textr_lp	describe	C	255	Definition of texture
textr_lp	class	C	35	Rock class
textr_lp	texture	C	50	Texture name
texture	sub_unit	I		ID used for linking to rx_desc table
texture	grain_distr	C	50	grain distribution
texture	grain_arr	C	50	grain arrangement
texture	class	C	50	Rock class
texture	texture	C	50	grain size of rock sample
unit_his	unit_id	C	255	Compilation code assigned to map unit; Map unit code
unit_his	source_id	C	255	Bibliographic source code; links to source table
unit_his	Description	C	255	Description of original geologic map unit
unit_his	comp_id	C	255	Unit code used in original geologic map or study
unit_rel	unit_id	C	10	map unit id
unit_rel	rel_unit_id	C	10	related map unit id
unit_rel	relation	C	255	relationship type
unit_rel	describe	C	255	comments