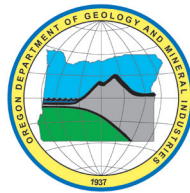


State of Oregon
Oregon Department of Geology and Mineral Industries
Ian P. Madin, Interim State Geologist

README FILE FOR OREGON GEOLOGIC DATA COMPILATION (OGDC)—RELEASE 6

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2015

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Spatial inaccuracies exist in this data set, and some functionalities of Oregon Geologic Data Compilation have changed from previous versions due to the transition to an Esri®-formatted geodatabase. Known issues include topology errors, small spatial data gaps, typographical errors, incomplete metadata, and other minor errors.

Oregon Department of Geology and Mineral Industries | Oregon Geologic Data Compilation, release 6
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1.0 INTRODUCTION

The Oregon Geologic Data Compilation (OGDC) is a statewide compilation of geologic data created by the Oregon Department of Geology and Mineral Industries (DOGAMI). The purpose of the compilation is to integrate and make available the best known geologic mapping for the state by combining maps and data into a single digital database. Sources of geologic mapping include state and federal agencies, student thesis work, and consultants.

Beginning in 2004, OGDC has been released five times, with each release building either geographically or qualitatively on previous releases. The most recent release, OGDC release 5 (OGDC-5), was published by DOGAMI in 2009 as the first geologic map compilation with full coverage of the state. OGDC-5 also serves as the Oregon Geologic Data Standard for the state as a data element component of the Geosciences Theme within the [Oregon Framework Themes](#). This sixth release of OGDC (OGDC-6) builds directly from data published in OGDC-5, but is driven by significant new mapping projects published in the five years since the 2009 release as well as a major format change to the data. Previously, OGDC was maintained and published as four Esri® shapefiles and a separate Microsoft® Access® database. While OGDC-6 carries forward the geologic data published in OGDC-5, it combines the Access database and shapefiles into a single Esri file geodatabase.

The intent of if this digital data release is threefold: 1) to add new geologic mapping completed by DOGAMI, 2) to move the statewide geologic data compilation to new technology formats, and 3) to serve as a pilot, or test database, for the development of an updated Oregon Geologic Data Standard. This report provides a brief summary of the new geologic data included with this release and the approach taken to convert the original shapefiles and Access database to a comprehensive file geodatabase.

2.0 NEW GEOLOGIC MAPPING

OGDC-5 comprised 345 separate geologic maps that were either provided in digital form or converted to digital form as part of the OGDC creation process. Original hardcopy paper maps were scanned and converted from raster to vector format (or heads-up digitized on the computer screen), and the data were structured according to a geologic data model adopted by the Oregon Geoscience Committee, part of the Oregon Framework Theme development process (Ma and others, 2009). For the OGDC-6 release, geologic data published by DOGAMI through 2013 were added to the compilation. It is important to note that while previous versions of OGDC contained unpublished mapping, this version (and, likely, future versions) is updated only with published maps. New geologic data added as part of the OGDC-6 release include areas along the southern Oregon coast (McClaghry and others, 2013); the Bear Creek Valley covering the cities of Medford and Ashland (Wiley and others, 2011); the southern Willamette Valley encompassing Albany, Corvallis, and the Eugene-Springfield metro area (McClaghry and others, 2010); parts of the Umatilla Plain and Blue Mountains around Pendleton (Ferns, 2006a,b; Ferns and Ely, 2006; Ferns and McConnell, 2006a,b,c; McConnell, 2006); and the lower Hood River Valley (McClaghry and others, 2012). New maps are “stamped into” the OGDC-5 compilation, completely replacing older or lower-resolution geology. For example, a broad 1:250,000-scale map area may be partly replaced by several higher-resolution (e.g. 1:24,000 scale) and/or more-recent mapping if they overlap. This design means that no map features (unit polygons, contacts, faults, etc.) should overlap between different map projects. At any given location, the geology is represented by the highest-resolution and/or most recent mapping available that meets DOGAMI’s criteria for inclusion in OGDC. OGDC-6 comprises 342 maps.

3.0 DATABASE CONVERSION APPROACH

3.1 Overview

For OGDC-6, significant changes have been made to the design of the compilation. Previously, OGDC was maintained and published as four Esri shapefiles and a separate Access database. While OGDC-6 carries forward geologic data published in OGDC-5, release 6 combines the Access database and shapefiles into a single Esri file geodatabase. This new format was adopted as a template for all geologic mapping projects at DOGAMI. It standardizes field formats, attribution values, and map data required for publication. It mirrors the older Access design by making extensive use of relationship classes and domains to standardize attribution and by maintaining relationships between spatial and nonspatial data. While the Access database had a useful interface for the original OGDC compilation process, the resulting product had a complicated table structure and required extensive joins or relates to format spatial data for OGDC releases. Also, the Access interface did not support the input of new geologic mapping conducted by DOGAMI. The new OGDC-6 file geodatabase format and schema provide for simpler OGDC updates and a standardized geologic data structure for new mapping projects.

3.2 Geodatabase Schema/Template Selection

The OGDC-6 file geodatabase schema is derived from two geologic mapping templates: the U.S. Geological Survey (USGS) National Cooperative Geologic Mapping Program ([NCGMP](#)) database template, and the Esri Geologic Mapping Template ([GMT](#)). Both of these database schemas are designed to aid users in creating a geologic map. DOGAMI contributes annually to the NCGMP through the State Geologic Survey Mapping ([STATEMAP](#)) Component, where the NCGMP database template and geologic mapping standards have traditionally been designed. DOGAMI has created a hybrid geodatabase of these two mapping templates in an effort to 1) move toward NCGMP database compliance while maintaining the detail currently within OGDC, and 2) to make it easier for GIS users to make a geologic map using the data provided in DOGAMI geologic mapping publications.

The Esri Geologic Mapping Template (GMT) “provides a standardized set of the most commonly used geologic and supporting cartographic symbols” (Frye and Day, 2010, p. 81). The GMT is designed to conform to the Federal Geographic Data Committee (FGDC) Digital Cartographic Standard for Geologic Map Symbolization. The GMT contains feature classes and attribution to describe the style, accuracy, and orientation of typical geologic map elements: contacts, map unit polygons, faults, folds, foliation, cleavage, jointing, geomorphic features, and so on. In order to symbolize these elements on a geologic map, the geodatabase template also includes numerous cartography-specific fields and built-in cartographic representations. These fields and representations are used by the FGDC reference numbers assigned to geologic features as defined in the FGDC Digital Cartographic Standard for Geologic Map Symbolization. Because the elements within OGDC-5 are not coded with these reference numbers, these additional cartography specific fields and representations are not included in the OGDC-6 geodatabase. However, DOGAMI is currently using these additional cartography-specific fields and representations within its new geologic mapping template and they will be provided as part of project-specific future geologic mapping publications.

The USGS NCGMP geodatabase format (NCGMP09) is designed for geologic maps made by the USGS and state geologic surveys. Like the Esri GMT, NCGMP09 makes compartments, or feature classes, for typical geologic map elements ([Figure 3-1](#)). Its design philosophy is that no one data template can satisfy the needs of all users or the data used in all types of geologic maps—hence it stipulates a bare minimum of required features and attribution while leaving room for more map features and detail if needed. As it is meant to be somewhat generic, the

NCGMP09 format takes less advantage of Esri-specific features than does the GMT. This generic format will allow DOGAMI to use the NCGMP09 schema when required for USGS funded projects. However, the NCGMP09 is lacking the cartographic pieces that novice GIS users need in order to make a geologic map with proper or standardized geologic symbology.

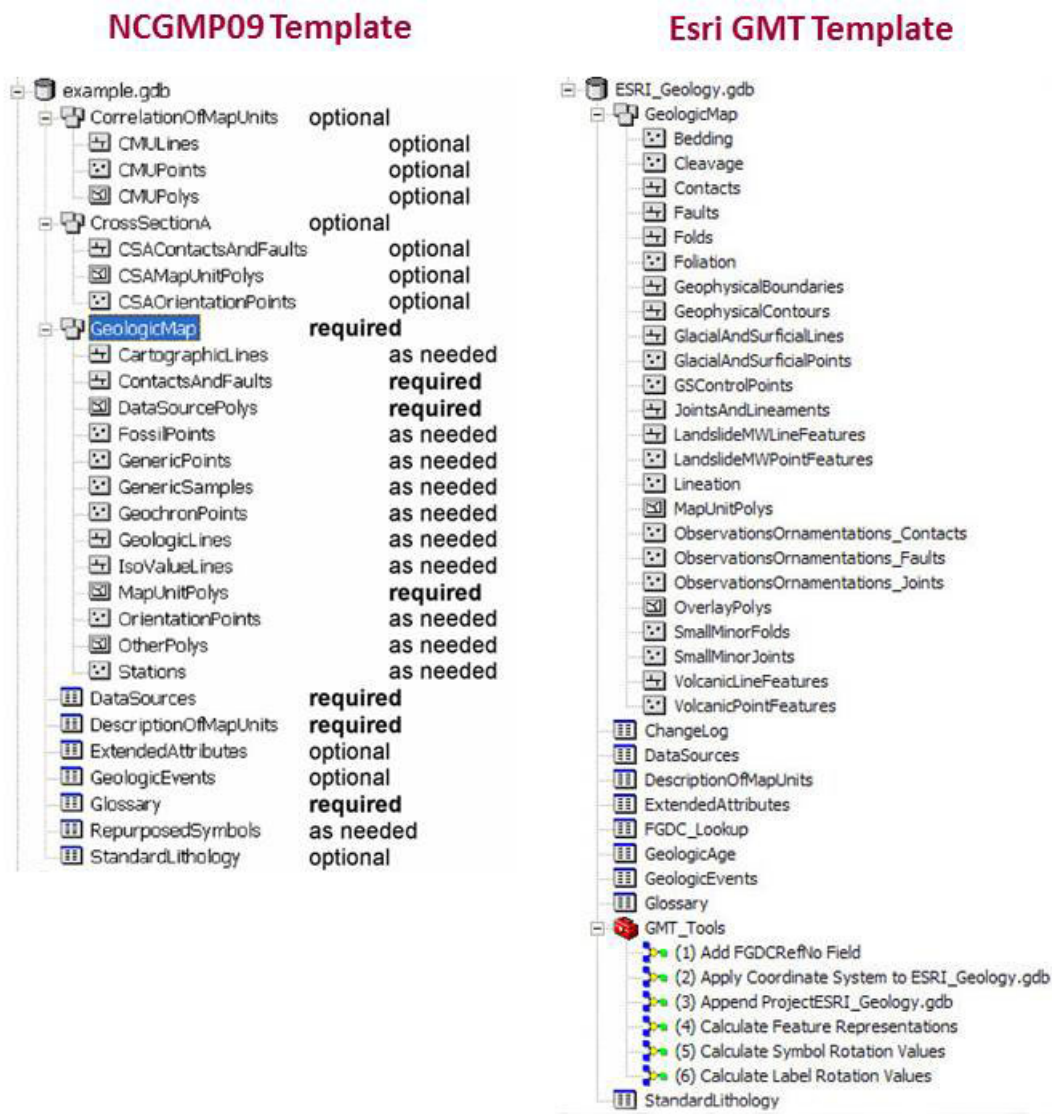


Figure 3-1. U.S. Geological Survey (USGS) National Cooperative Geologic Mapping Program (NCGMP) database template, and the Esri Geologic Mapping Template (GMT)..

The Esri GMT was made with knowledge of NCGMP09 and copies some features from it. However, the two are largely different schema. OGDC-6 combines elements of both GMT and NCGMP09 databases ([Figure 3-2](#)). Its feature classes, tables, and relationship classes are derived from the Esri GMT, although, as mentioned, most of the cartographic fields are removed. Some feature classes and tables, particularly the MapUnit polygons feature class, are carried forward from OGDC-5 without any modification. The remainder are derived or combined from NCGMP09 and the Esri GMT. See [Appendix A](#) for a detailed schema description for the OGDC-6 geodatabase.

OGDC-6 Database Design

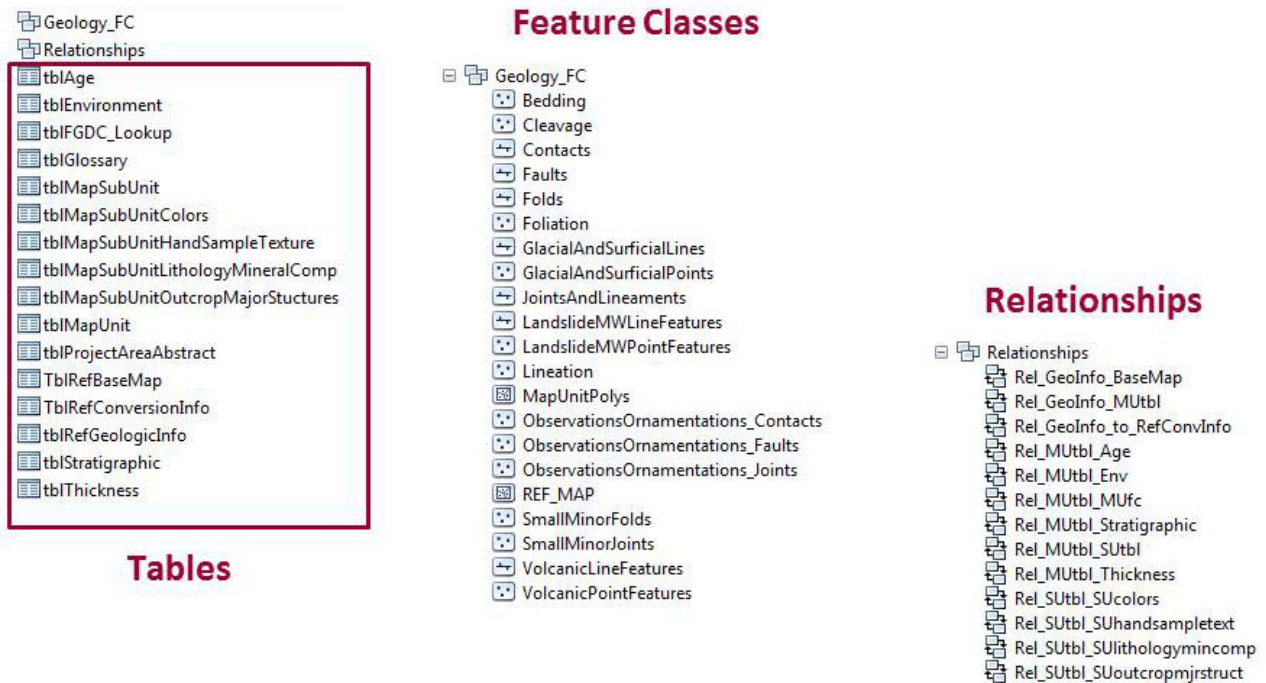


Figure 3-2. Oregon Geologic Data Compilation database design.

3.3 Conversion Methodology

OGDC-5 consists of four shapefiles; faults, folds, map_unit, and ref_map; and an Access database containing 14 standard tables and 40 look-up tables. **Figure 3-3** provides an example of the many relationships that exist within the OGDC-5 Access database.

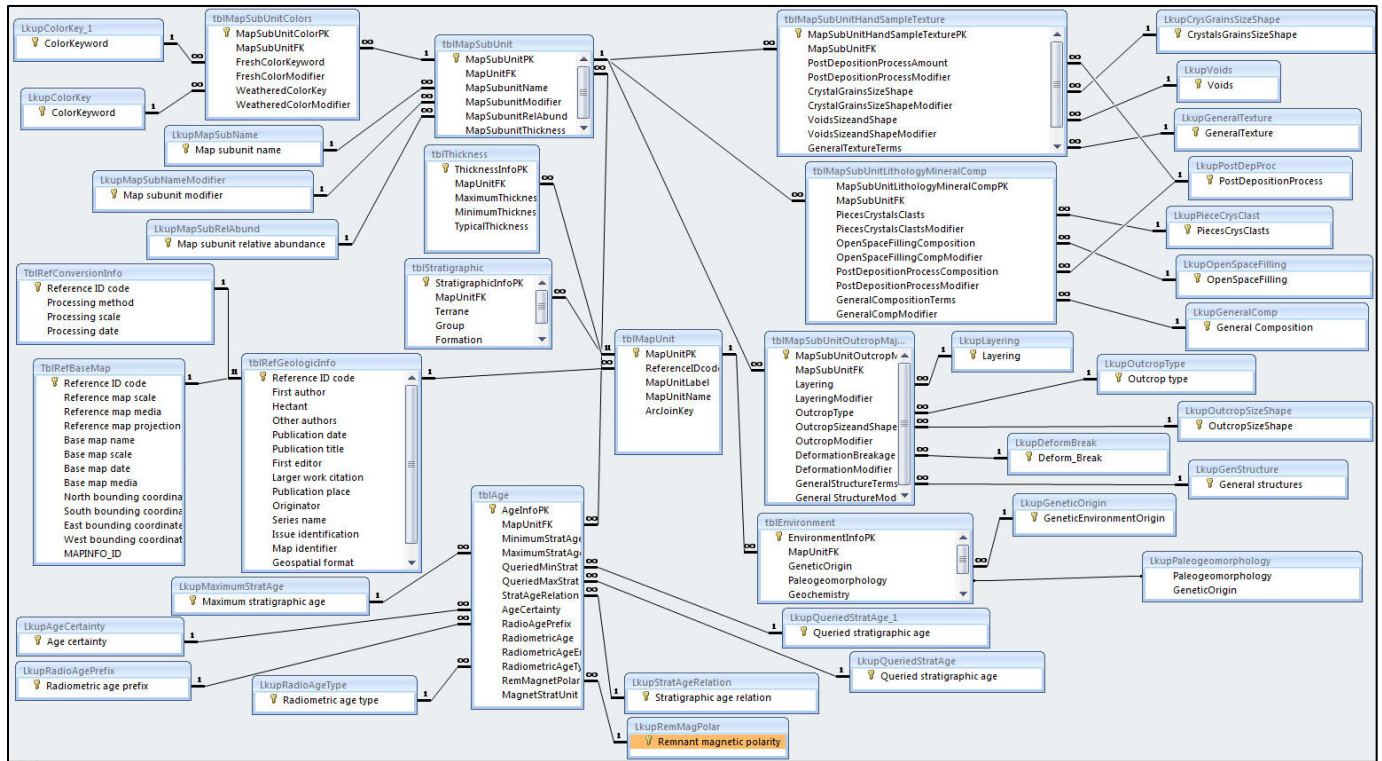


Figure 3-3. Example of the many relationships that exist among the look-up tables and the standard tables within the OGDC-5 Access database.

The conversion process required many steps to transfer properly both the spatial and nonspatial data to a geodatabase format. Here is a general summary describing these steps:

1. Imported/copied the four shapefiles. The map_unit and ref_map shapefiles were copied into the geodatabase with no changes because the attributes of the map_unit shapefile and the features of the ref_map shapefile are unique to OGDC and are not found in either the FGDC or the Esri geodatabase template. The faults and folds shapefiles were imported into new feature classes. The fault and fold certainty attributes were converted from a value contained in one attribute field, to the NCGMP09 format of two confidence (certainty) fields—ID/Existence Confidence and Location Confidence.

The certainty/confidence attribute discrepancy is an example of a case where the existing OGDC database did not comply with the NCGMP template, and an attribute conversion was performed to correct the non-compliance issue. OGDC-5 has one field representing the certainty of the feature. NCGMP has two fields that address certainty: a) the author's confidence in the features identification or existence, and b) the author's confidence in the location of the feature. **Figure 3-4** provides a cross-walk between the original certainty codes within the OGDC attributes and the resulting two-field equivalent in the new geodatabase format.

Original Certainty Code	→ ID/Existence Confidence	Location Confidence
No data	No data	No data
Approximate	Certain	Approximate
Approximate & Queried	Questionable	Approximate
Certain	Certain	Accurate
Certain & Queried	Certain	Approximate
Concealed	Certain	Concealed
Concealed & Queried	Questionable	Concealed
Inferred	Certain	Inferred
Inferred & Queried	Questionable	Inferred
Queried	Questionable	Approximate

Figure 3-4. Cross-walk between the original certainty codes within the OGDC attributes and the resulting two-field equivalent in the new OGDC-6 geodatabase format.

2. Exported all tables from Access to Excel format files; the lookup tables became domains in the geodatabase and all others became reference tables that remain as-is in the geodatabase.
3. Added the MapUnit primary key value to the MapUnit feature class to enable the creation of the only table to feature class relationship within the geodatabase. All other relationships in the geodatabase exist between the tables only.
4. Streamlined and cleaned up various lookup/domain tables by merging tables, editing tables to ensure the new domains match the relative unique values within the geodatabase, and removed duplicate values or records in tables.
5. Added new domains to tables and feature classes to simplify future editing/additions to the database.
6. Created the LineamentsandJoints feature class from a selection of records originally within the faults shapefile. These features are separate from faults as their own feature class in the new geodatabase template and within the sections of the FGDC standard.
7. Coded the OGDC-5 faults, folds, and lineaments to match the appropriate sections (1–18) of the FGDC standard. The new confidence fields discussed in step 1 were required in order to complete the coding of features to match the FGDC standard.
8. Added attributes where OGDC-5 did not meet the FGDC standard.
9. Calculated all “nd” and blank cells of tables to “no data”.
10. Created relationships for the tables and feature classes.

4.0 NEXT STEPS

Because OGDC-6 encompasses not just a new data format but a new mapping workflow, future OGDC releases may contain revisions to the geodatabase schema and data products. There are several reasons for this. First, changes may be made to enhance the mapping workflow of DOGAMI geologists and cartographers per their feedback. Changes may include adding or removing fields, feature classes, tables, domains, or redesigning relationship classes. Second, DOGAMI is evaluating the OGDC database structure and surveying OGDC users to determine which data in OGDC are most used or requested. Results of this survey may be used to substantially alter the OGDC format and the types of geologic data included in OGDC. Third, it is expected that a final version of the USGS NCGMP09 geodatabase template will be officially adopted and required for geologic mapping projects conducted by state geological surveys as part of the STATEMAP program. DOGAMI may need to modify the existing OGDC schema such that it can easily be translated in to NCGMP09-format geodatabases in the future. OGDC-6 serves as an intermediate transitional step in bringing the geologic data compilation to a current GIS database format in anticipation of additional future modifications to accommodate the needs of users and federal program requirements.

5.0 REFERENCES

- Ferns, M. L., 2006a, Preliminary geologic map of the Cayuse 7.5' quadrangle, Umatilla County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-06-08, scale 1:24,000, database files, 10 p.
- Ferns, M. L., 2006b, Preliminary geologic map of the Thorn Hollow 7.5' quadrangle, Umatilla County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-06-10, scale 1:24,000, database files, 10 p.
- Ferns, M. L., and Ely, K., 2006, Preliminary geologic map of the Mission 7.5' quadrangle, Umatilla County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-06-09, scale 1:24,000, database files, 10 p.
- Ferns, M. L., and McConnell, V. S., 2006a, Preliminary geologic map of the Cabbage Hill 7.5' quadrangle, Umatilla County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-06-14, scale 1:24,000, database files, 11 p.
- Ferns, M. L., and McConnell, V. S., 2006b, Preliminary geologic map of the McKay Reservoir 7.5' quadrangle, Umatilla County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-06-15, scale 1:24,000, database files, 9 p.
- Ferns, M. L., and McConnell, V. S., 2006c, Preliminary geologic map of the Table Rock 7.5' quadrangle, Umatilla County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-06-16, scale 1:24,000, database files, 11 p.
- Frye, C., and Day, J., 2010, The ESRI Geologic Mapping Template, *in* Soller, D.R., ed., Digital Mapping Techniques '09—Workshop Proceedings, Morgantown, West Virginia, May 10–13, 2009: U.S. Geological Survey Open-File Report 2010–1335, p. 81-92. [http://pubs.usgs.gov/of/2010/1335/pdf/usgs_of2010-1335_Frye.pdf]
- Ma, L., Madin, I. P., Olson, K. V., Watzig, R. J., Wells, R. E., and Priest, G. R., compilers, 2009, Oregon geologic data compilation [OGDC], release 5 (statewide): Oregon Department of Geology and Mineral Industries Digital Data Series OGDC-5, CD-ROM.
- McClaghry, J. D., Wiley, T. J., Ferns, M. L., and Madin, I. P., 2010, Geology of the Southern Willamette Valley, Benton, Lane, Linn, Marion, and Polk Counties, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-10-03, scale 1:63,360, database files, 117 p.
- McClaghry, J. D., Wiley, T. J., Conrey, R. M., Jones, C. B., and Lite, Jr., K. E., 2012, Digital geologic map of the Hood River Valley, Hood River and Wasco Counties, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-12-03, scale 1:36,000, database files, 143 p.
- McClaghry, J. D., Ma, L., Jones, C. D., Mickelson, K. A., and Wiley, T. J., 2013, Geologic map of the southwestern Oregon coast between Crook Point and Port Orford, Curry County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-13-21, 3 pl., scale 1:24,000, database files, 55 p.
- McConnell, V. S., 2006, Preliminary geologic map of the Service Buttes, Echo, Nolin, Barnhart, and Pendleton 7.5' quadrangles (west to east), Umatilla County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-06-20, 1 pl., scale 1:24,000, database files.
- Wiley, T. J., McClaghry, J. D., and D'Allura, J. A., 2011, Geologic database and generalized geologic map of the Bear Creek Valley area, Jackson County, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-11-11, scale 1:63,360, database files, 76 p.

6.0 APPENDIX A

6.1 OGDC-6 Feature Class Descriptions

Feature Class	Description
Bedding	Contains point features for Section 6 of the FGDC Standard.
Cleavage	Contains point features for Section 7 of the FGDC Standard.
Contacts	Contains line features for Section 1 of the FGDC Standard.
Faults	Contains line features for Section 2 of the FGDC Standard.
Folds	Contains line features for Section 5 of the FGDC Standard.
Foliation	Contains point features for Section 8 of the FGDC Standard.
GlacialAndSurficialLines	Contains line features for Section 13 of the FGDC Standard.
GlacialAndSurficialPoints	Contains point features for Section 13 of the FGDC Standard.
JointsAndLineaments	Contains line features for Section 4 of the FGDC Standard.
LandslideMWLineFeatures	Contains line features for Section 17 of the FGDC Standard.
LandslideMWPointFeatures	Contains point features for Section 17 of the FGDC Standard.
Lineation	Contains point features for Section 9 of the FGDC Standard.
MapUnitPolys	Contains map unit polygon features.
ObservationsOrnamentations_Contacts	Contains point features that represent line symbol decorations and notations for contacts, key beds and dikes. (Section 1.4)
ObservationsOrnamentations_Faults	Contains point features that represent line symbol decorations and notations for faults. (Section 2.11)
ObservationsOrnamentations_Joints	Contains points to represent observation and ornamentation symbols for Section 4.2 line features.
REF_MAP	Contains extent polygons that represent particular study areas where data was gathered and input into the OGDC geodatabase. (Also contains accompanying source information within the attribute table.)
SmallMinorFolds	Contains point features for Section 5.11 of the FGDC Standard.
SmallMinorJoints	Contains point features for Section 4.3 of the FGDC Standard.
VolcanicLineFeatures	Contains line features for Section 18 of the FGDC Standard.
VolcanicPointFeatures	Contains point features for Section 18 of the FGDC Standard.

6.2 OGDC-6 Table Descriptions

Table	Description
tblAge	Contains information about the stratigraphic and radiometric age of the map units, if available, given by the reference map's author(s). Linked to the tblMapUnit table.
tblEnvironment	Contains information about the genetic environment and landform, if available, given by the reference map's author(s), and whether or not information exists for geochemistry, paleontology or petrology. Linked to the tblMapUnit table.
tblFGDC_Lookup	Contains FGDC descriptions for the FGDC reference codes used to attribute the line and point features and to accurately depict the features using representations in ESRI's ArcMap software.
tblGlossary	Terminology used in the database or in a referenced external glossary.
tblMapSubUnit	Contains information about the components, or subunits, of the reference map unit. Linked to the tblMapUnit table.
tblMapSubUnitColors	Lists colors of the fresh and weathered rock surfaces for each subunit, if any, given by the reference map's author(s). Linked to the tblMapSubUnit table.
tblMapSubUnitHandSampleTexture	Contains information about the texture or appearance of each subunit at a hand sample level, if any, given by the reference map's author(s). Linked to the tblMapSubUnit table.
tblMapSubUnitLithologyMineralComp	Contains information of mineral or composition describers for each subunit, if any, given by the reference map's author(s). Linked to the tblMapSubUnit table.
tblMapSubUnitOutcropMajorStructures	Contains information about the structure of each subunit when viewed at the outcrop level, if any, given by the reference map's author(s). Linked to the tblMapSubUnit table.
tblMapUnit	Contains every reference map's unit geologic symbol and unit name. Linked to the MapUnitPolys feature class.
tblProjectAreaAbstract	Contains information about the study area and project from which the map units and associated geologic features are derived.
tblRefBaseMap	Contains the spatial information about the reference map and the reference map's base maps. Linked to the tblGeologicInfo table and within the REF_MAP feature class.
tblRefConversionInfo	Contains information about the conversion process to digital format of the reference geologic maps. Linked to the tblRefGeologicInfo table.
tblRefGeologicInfo	Contains the general bibliographic information about each reference map or database used to make the compilation. Linked to the tblMapUnit table.
tblStratigraphic	Contains formal or informal Stratigraphic classification and names of reference map units, if any, given by the reference map's author(s). Linked to the tblMapUnit table.
tblThickness	Contains information about the total thickness of the mapped unit, if available, given by the reference map's author(s). Linked to the tblMapUnit table.

6.3 OGDC-6 Geodatabase Schema Diagram

Simple feature class Bedding						Geometry <i>Point</i>		
						Contains M values	No	
						Contains Z values	No	
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	
OBJECTID	Object ID							
Shape	Geometry	Yes						
Azimuth	Float	No	0	Azimuth	0	0		
Inclination	Float	No	0	Inclination	0	0		
Label	String	Yes					256	
DataSources_ID	Long integer	No	-1		0			
Notes	String	Yes					memo	
FGDCRefNo	String	Yes	no data	Bedding_Ref_Codes			16	
FC_ID	Long integer	Yes	601	Feature Class	0			
IDConf	Short integer	No	1	Confidence	0			
LocConfMeters	Float	No	0		0	0		
Type	String	No	no data	Bedding_Type			255	

Contains point features for Section 6 of the FGDC Standard.

Direction of the intersection of the bedding plane and a horizontal surface
Max angle of the slope of the bed as measured from a horizontal surface
Inclination label
Data Source ID (from tblRefGeologicInfo)
Notes
FGDC Reference Code for point feature
Feature Class type
Identity Confidence
Location confidence measured in meters
General bedding type

Simple feature class Cleavage						Geometry <i>Point</i>		
						Contains M values	No	
						Contains Z values	No	
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	
OBJECTID	Object ID							
Shape	Geometry	Yes						
Azimuth	Float	No	0	Azimuth	0	0		
Inclination	Float	No	0	Inclination	0	0		
Label	String	Yes					256	
DataSources_ID	Long integer	No	-1		0			
Notes	String	Yes					memo	
FGDCRefNo	String	Yes	no data	Cleavage_Ref_Codes			255	
FC_ID	Long integer	Yes	701	Feature Class	0			
IDConf	Short integer	No	1	Confidence	0			
LocConfMeters	Float	No	0		0	0		
Type	String	No	no data	CleavageTypes			255	

Contains point features for Section 7 of the FGDC Standard.

Direction of the intersection of the bedding plane and a horizontal surface
Max angle of the slope of the bed as measured from a horizontal surface
Inclination label
Data Source ID (from tblRefGeologicInfo)
Notes
FGDC Reference Code for point feature
Feature Class type
Identity Confidence
Location confidence measured in meters
General cleavage type

Simple feature class Contacts						Geometry <i>Polyline</i>		
						Contains M values	No	
						Contains Z values	No	
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	
OBJECTID	Object ID							
Shape	Geometry	Yes						
Label	String	Yes	no data				256	
DataSources_ID	Long integer	No	-1		0			
Notes	String	Yes					memo	
FGDCRefNo	String	Yes	no data	Contacts_Ref_Codes			255	
FC_ID	Long integer	Yes	102	Feature Class	0			
Shape_Length	Double	Yes			0	0		
IDConf	Short integer	No	1	IDConfidence	0			
LocConf	Short integer	No	1	LocConfidence	0			
LocConfMeters	Float	No	0		0	0		
Type	String	No	no data	ContactType			255	
Adjacent_L	String	No	no data				255	
Adjacent_R	String	No	no data				255	
Reference_map_scale	String	Yes	no data				50	

Contains line features for Section 1 of the FGDC Standard.

Label
Data source ID from tblRefGeologicInfo
Notes
FGDC Reference Code for line feature
Feature Class Type
Identity Confidence
Location Confidence
Location Confidence measured in meters
General contact type
Map unit adjacent to contact line
Map unit adjacent to contact line (opposite Adjacent_L)
Reference map scale

Simple feature class Faults						Geometry <i>Polyline</i>		
						Contains M values	No	
						Contains Z values	No	
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	
OBJECTID	Object ID							
Shape	Geometry	Yes						
Imp_FType	String	Yes	no data	Fault Type			256	
Label	String	Yes					256	
DataSources_ID	Long integer	No	-1		0			
Notes	String	Yes					memo	
FGDCRefNo	String	Yes	no data	Faults_Ref_Codes			255	
FC_ID	Long integer	Yes	202	Feature Class	0			
ftpl_dir	String	Yes					20	
ftpl_deg	String	Yes					15	
ftl_age	String	Yes		Genl_Age_Name			30	
Shape_Length	Double	Yes			0	0		
IDConf	Short integer	Yes	1	IDConfidence	0			
LocConf	Short integer	Yes	1	LocConfidence	0			
LocConfMeters	Float	Yes	0		0	0		

Contains line features for Section 2 of the FGDC Standard.

Fault type
Fault Label
Data source ID from tblRefGeologicInfo
Notes
FGDC Reference Code for specific fault type/definition
Feature Class type
Fault Plane Direction (azimuth of the dip of the fault plane)
Fault Plane Degrees (Number of degrees down from horizontal of the dip of the fault plane)
Fault age (age of movement on the fault)
Identity Confidence
Location Confidence
Location Confidence measured in meters

(schema continued on next page)

(OGDC-6 geodatabase schema, page 2; continued from previous page)

Simple feature class Folds						Geometry	Polyline		
						Contains M values	No		
						Contains Z values	No		
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Imp_FType	String	Yes	no data	Fold Type			256	Fold Type	
Label	String	Yes					256	Label	
DataSources_ID	Long integer	No	-1			0		Data Source ID from tblRefGeologicInfo	
Notes	String	Yes					memo	Notes	
FGDCRefNo	String	Yes	no data	Folds_Line_Ref_Codes			255	FGDC Reference Code for specific fold type	
FC_ID	Long integer	Yes	502	Feature Class		0		Feature Class Type	
fldpl_dir	String	Yes					20	Fold Plane Direction	
fldpl_deg	String	Yes					15	Fold Plane Degrees	
Shape_Length	Double	Yes				0	0		
IDConf	Short integer	Yes	1	IDConfidence		0		Identity Confidence	
LocConf	Short integer	Yes	1	LocConfidence		0		Location Confidence	
LocConfMeters	Float	Yes	0			0	0	Location confidence measured in meters	

Contains line features for Section 5 of the FGDC Standard.

Simple feature class Foliation						Geometry	Point		
						Contains M values	No		
						Contains Z values	No		
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Azimuth	Float	No	0	Azimuth		0	0	Azimuth	
Inclination	Float	No	0	Inclination		0	0	Inclination	
Label	String	Yes					256	Label	
DataSources_ID	Long integer	No	-1			0		Data source ID from tblRefGeologicInfo	
Notes	String	Yes					Memo	Notes	
FGDCRefNo	String	Yes	no data	Foliation_Ref_Codes			255	FGDC Reference Code for specific foliation type	
FC_ID	Long integer	Yes	801	Feature Class		0		Feature class type	
IDConf	Short integer	No	1	Confidence		0		Identity Confidence	
LocConfMeters	Float	No	0			0	0	Location confidence measured in meters	
Type	String	No	no data	Foliation Type			255	General Foliation Type	

Contains point features for Section 8 of the FGDC Standard.

Simple feature class GlacialAndSurficialLines						Geometry	Polyline		
						Contains M values	No		
						Contains Z values	No		
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Label	String	Yes					256	Label	
LocationMethod	String	No	0				256	LocationMethod	
DataSources_ID	Long integer	No	-1			0		Data Source Identifier	
Notes	String	Yes					memo	Notes	
FGDCRefNo	String	Yes	no data	Glacial_Ref_Codes			255	FGDC Reference Code for specific glacial type	
FC_ID	Long integer	Yes	1202	Feature Class		0		Feature class type	
Shape_Length	Double	Yes				0	0		
Type	String	No	no data	Glacial_Types			255	Glacial or Glaciofluvial feature type	
IDConf	Short integer	Yes	1	IDConfidence		0		IdentityConfidence	
LocConf	Short integer	Yes	1	LocConfidence		0		LocationConfidence	
LocConfMeters	Float	Yes	0			0	0	Location Confidence measured in meters	


Contains line features for Section 13 of the FGDC Standard.


Simple feature class GlacialAndSurficialPoints						Geometry	Point		
						Contains M values	No		
						Contains Z values	No		
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Azimuth	Float	No	0	Azimuth		0	0	Azimuth or strike	
Inclination	Float	No	0	Inclination		0	0	Inclination or dip	
Label	String	Yes					256	Label	
LocationConfidenceMeters	Float	No	0			0	0	Location Confidence measured in meters	
IDConf	Short integer	No	1	Confidence		0		Identity Confidence	
DataSources_ID	Long integer	No	-1			0		Data Sources Identifier	
OrientationConfidenceDegrees	Float	No	0			0	0	Orientation Confidence Degrees	
Notes	String	Yes					memo	Notes	
FGDCRefNo	String	Yes	no data	Glacial_Ref_Codes			255	FGDC Reference Code for specific glacial type	
FC_ID	Long integer	Yes	1201	Feature Class		0		Feature class type	
Type	String	Yes	no data	Glacial_Types			255	Glacial or Glaciofluvial feature type	


Contains point features for Section 13 of the FGDC Standard.


(schema continued on next page)

(OGDC-6 geodatabase schema, page 3; continued from previous page)

 Simple feature class JointsAndLineaments		Geometry Polyline		Contains M values No		Contains Z values No		Contains line features for Section 4 of the FGDC Standard.	
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Imp_FType	String	Yes		JointType			256	Feature Type	
Label	String	Yes					256	Label	
DataSources_ID	Long integer	No	-1		0			Data source ID from tblRefGeologicInfo	
Notes	String	Yes					memo	Notes	
FGDCRefNo	String	Yes	no data	Lineaments.Joints_Ref_Codes_Line			255	FGDC Reference Code for specific feature type	
FC_ID	Long integer	Yes	402	Feature Class	0			Feature Class Type	
plane_dir	String	Yes	no data				20	Plane direction	
plane_deg	String	Yes	no data				15	Plane Degrees	
Shape_Length	Double	Yes			0	0			
IDConf	Short integer	Yes	1	IDConfidence	0			Identity Confidence	
LocConf	Short integer	Yes	1	LocConfidence	0			Location Confidence	
LocConfMeters	Float	Yes	0		0	0		Location confidence measured in meters	

 Simple feature class LandslideMWPointFeatures		Geometry Point		Contains M values No		Contains Z values No		Contains point features for Section 17 of the FGDC Standard.	
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Azimuth	Float	No	0	Azimuth	0	0		Azimuth or strike	
Inclination	Float	No	0	Inclination	0	0		Inclination or dip	
Label	String	Yes					256	Label	
IDConf	Short integer	No	1	Confidence	0			Identity Confidence	
DataSources_ID	Long integer	No	-1		0			Data Sources Identifier	
OrientationConfidenceDegrees	Float	No	0		0	0		Orientation Confidence Degrees	
Notes	String	Yes					memo	Notes	
FGDCRefNo	String	Yes	no data	Landslide_MW_RefCodes			255	FGDC Reference Code for specific feature type	
FC_ID	Long integer	Yes	1701		0			Feature Class Type	
LocConfMeters	Float	Yes	0		0	0		LocationConfidenceMeters	
Type	String	Yes	no data	Landslide_Types			100	Landslide Feature Type	

 Simple feature class LandslideMWLineFeatures		Geometry Polyline		Contains M values No		Contains Z values No		Type a description of this feature class or table in this placeholder text.	
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Label	String	Yes					256	Label	
LocationMethod	String	No	0				256	Location Method	
DataSources_ID	Long integer	No	-1		0			Data Source Identifier	
Notes	String	Yes					memo	Notes	
FGDCRefNo	String	Yes	no data	Landslide_MW_RefCodes			255	FGDC Reference Code for specific feature type	
FC_ID	Long integer	Yes	1702		0			Feature Class Type	
Shape_Length	Double	Yes			0	0			
IDConf	Short integer	Yes	1	IDConfidence	0			IdentityConfidence	
LocConf	Short integer	Yes	1	LocConfidence	0			LocationConfidence	
LocConfMeters	Float	Yes	0		0	0		LocationConfidenceMeters	
Type	String	Yes	no data	Landslide_Types			100	Landslide Feature Type	

 Simple feature class Lineation		Geometry Point		Contains M values No		Contains Z values No		Contains point features for Section 9 of the FGDC Standard.	
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length		
OBJECTID	Object ID								
Shape	Geometry	Yes							
Azimuth	Float	No	0	Azimuth	0	0		Azimuth	
Inclination	Float	No	0	Inclination	0	0		Inclination	
Label	String	Yes					256	Label	
DataSources_ID	Long integer	No	-1		0			Data source ID from tblRefGeologicInfo	
Notes	String	Yes					memo	Notes	
FGDCRefNo	String	Yes	no data	Lineation_Ref_Codes			255	FGDC reference code for specific lineation type	
FC_ID	Long integer	Yes	901	Feature Class	0			Feature class type	
IDConf	Short integer	No	1	Confidence	0			Identity Confidence	
LocConfMeters	Float	No	0		0	0		Location confidence measured in meters	
Type	String	No	no data	Lineation Type			255	General Type of feature	

(schema continued on next page)

(OGDC-6 geodatabase schema, page 4; continued from previous page)

Simple feature class		Geometry		Polygon			
MapUnitPolys		Contains M values		No			
		Contains Z values		No			
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
REF_ID_COD	String	Yes					25
MAP_UNIT_L	String	Yes	no data				12
MAP_UNIT_N	String	Yes	no data				100
G_MRG_U_L	String	Yes					60
GEO_GENL_U	String	Yes	no data	Geo_Genl_Unit			50
AGE_NAME	String	Yes	no data	Genl_Age_Name			50
TERRANE_GR	String	Yes	no data	Terrane_Grp_Name			50
FORMATION	String	Yes	No data	Formation_Name			200
MEMBER	String	Yes	No data	Member Name			50
UNIT	String	Yes	no data				50
G_ROCK_TYP	String	Yes	no data	Geo_Rock_Type			50
LITH_M_U_L	String	Yes	no data				50
LITH_GEN_U	String	Yes	no data	Lith_gen_u			75
LTH_RK_TYP	String	Yes	no data	Lithology_Rock_Type			50
LAYERING	String	Yes	no data	Genl_Layering			50
CR_GRN_SIZ	String	Yes	no data	Crystal_Grain_Sz			50
GETEC_PROP	String	Yes	no data	Geotech_Prop			50
GN_LITH_TY	String	Yes	no data	Genl_Lithology_Type			50
ArcJoinKey	String	Yes					37
MapUnitPK	Double	Yes			0	0	
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	
DataSources_ID	Long integer	Yes	-1		0		
IDConf	Short integer	Yes	1	IDConfidence	0		

Contains map unit polygon features.

Reference ID Code- Unique code for each original reference map, expressed as the first 4 letters of the first author's last name, first and middle initials, the year of publication, and occasionally a map identifier

Map Unit Label- Reference map unit label symbol taken from the original reference map

Map Unit Name- Reference map unit name taken from the map legend or explanation of map units on the original reference map

Geologic Merge Unit Label- Label (period delimited) assigned by area geologists that combines all the original map units into 7 different general geologic categories

Geology General Unit- General geologic rock type of the geologic merge unit label, expressed by the genesis of the unit

Age Name- Age of geologic merge unit based on the Geologic Time Scale

Terrane or Group Name- Stratigraphic name (formally or informally named) for the terrane or group

Formation Name- Stratigraphic name for the geologic formation

Member Name- Stratigraphic name for the member type

Unit Name- Stratigraphic name for the unit type

Geology Rock Type- Characteristic lithology type name for the geologic merge unit label

Lithology Merge Unit Label- Label assigned for the lithologic compilation merge unit

Lithology General Unit- Physical character of the rock expressed by the genesis of the unit

Lithology Rock Type- Characteristic lithology name taken from the original source data for the lithologic merge unit

Layering- Rock stratum or layering info taken from the original source data for the lithologic merge unit

Crystal/Grain Size- Crystal or grain size component of the different rock types taken from the original source data for the lithologic merge unit

Geotechnical Properties- Rock or structural properties for the lithologic merge unit

General Lithology Type- rock type name for the lithologic merged unit

ArcGIS Join Key- for use with joins or relates of data tables

Map Unit primary key used for relationship classes

Data source ID from tblRefGeologicInfo

Identity Confidence

Simple feature class		Geometry		Point			
ObservationsOrnaments_Contacts		Contains M values		No			
		Contains Z values		No			
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Azimuth	Float	No	0	Azimuth	0	0	
Inclination	Float	No	0	Inclination	0	0	
Label	String	Yes					256
DataSources_ID	Long integer	No	-1		0		
Notes	String	Yes					memo
FGDCRefNo	String	Yes	no data	Contacts_Ref_Codes_pts			255
FC_ID	Long integer	Yes	104	Feature Class	0		
IDConf	Short integer	No	1	Confidence	0		
LocConfMeters	Float	No	0		0	0	
Type	String	Yes	no data	ContactType			255

Contains points to represent observation and ornamentation symbols for Section 1 line features.

Azimuth

Inclination

label

Data Source ID (from tblRefGeologicInfo)

Notes

FGDC Reference Code for point feature

Feature Class type

Identity Confidence

Location confidence (in meters)

General contact type

(schema continued on next page)

(OGDC-6 geodatabase schema, page 5; continued from previous page)

Simple feature class						Geometry	Point
ObservationsOrnamentations_Faults						Contains M values	No
						Contains Z values	No
Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Azimuth	Float	No	0	Azimuth	0	0	
Inclination	Float	No	0	Inclination	0	0	
Label	String	Yes					256
DataSources_ID	Long integer	No	-1		0		
Notes	String	Yes					memo
FGDCRefNo	String	Yes	no data	Faults_Ref_Codes_pts			255
FC_ID	Long integer	Yes	204	Feature Class	0		
IDConf	Short integer	No	1	Confidence	0		
LocConfMeters	Float	No	0		0	0	
Type	String	Yes	no data	Fault Type			255

Contains points to represent observation and ornamentation symbols for Section 2 line features.

Simple feature class						Geometry	Point
ObservationsOrnamentations_Joints						Contains M values	No
						Contains Z values	No
Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Azimuth	Float	No	0	Azimuth	0	0	
Inclination	Float	No	0	Inclination	0	0	
Label	String	Yes					256
DataSources_ID	Long integer	No	-1		0		
Notes	String	Yes					memo
FGDCRefNo	String	Yes	no data	LineamentsJoints_OBS_Ref_Codes			255
FC_ID	Long integer	Yes	404	Feature Class	0		
IDConf	Short integer	No	1	Confidence	0		
LocConfMeters	Float	No	0		0	0	
Type	String	Yes	no data	JointType			255

Contains points to represent observation and ornamentation symbols for Section 4 line features.

Simple feature class						Geometry	Polygon
REF_MAP						Contains M values	No
						Contains Z values	No
Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
REF_ID_COD	String	Yes					25
Reference_ID_code	String	Yes					255
First_author	String	Yes					255
Hectant	String	Yes					255
Other_authors	String	Yes					255
Publication_date	String	Yes					255
Publication_title	String	Yes					255
First_editor	String	Yes					255
Larger_work_citation	String	Yes					255
Publication_place	String	Yes					255
Originator	String	Yes					255
Series_name	String	Yes					255
Issue_identification	String	Yes					255
Map_identifier	String	Yes					255
Geospatial_data_format	String	Yes					255
Reference_map_scale	String	Yes					255
Reference_map_media	String	Yes					255
Reference_map_projection	String	Yes					255
Base_map_name	String	Yes					255
Base_map_scale	String	Yes					255
Base_map_date	String	Yes					255
Base_map_media	String	Yes					255
North_bounding_coordinate	Double	Yes			0	0	
South_bounding_coordinate	Double	Yes			0	0	
East_bounding_coordinate	Double	Yes			0	0	
West_bounding_coordinate	Double	Yes			0	0	
Processing_method	String	Yes					255
Processing_scale	Double	Yes			0	0	
Processing_date	Date	Yes			0	0	8
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

Contains polygon features that correspond to individual study areas.

(schema continued on next page)

(OGDC-6 geodatabase schema, page 6; continued from previous page)

Simple feature class SmallMinorFolds						Geometry	Point
						Contains M values	No
						Contains Z values	No
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Azimuth	Float	No	0	Azimuth	0	0	
Inclination	Float	No	0	Inclination	0	0	
Label	String	Yes					256
DataSources_ID	Long integer	No	-1		0		
Notes	String	Yes					memo
FGDCRefNo	String	Yes	no data	SmallMinorFolds_Ref_Codes_pts			255
FC_ID	Long integer	Yes	501	Feature Class	0		
IDConf	Short integer	No	1	Confidence	0		
LocConfMeters	Float	No	0		0	0	
Type	String	Yes	no data				255

Contains point features for Section 5.11 of the FGDC Standard.

Azimuth
Inclination
Label
Data Source ID (from tblRefGeologicInfo)
Notes
FGDC Reference Code for point feature
Feature Class type
Identity Confidence
Location confidence measured in meters
General fold type

Simple feature class SmallMinorJoints						Geometry	Point
						Contains M values	No
						Contains Z values	No
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Azimuth	Float	No	0	Azimuth	0	0	
Inclination	Float	No	0	Inclination	0	0	
Label	String	Yes					256
DataSources_ID	Long integer	No	-1		0		
Notes	String	Yes					memo
FGDCRefNo	String	Yes	no data	LineamentsJoints_Point_Ref_Code			255
FC_ID	Long integer	Yes	401	Feature Class	0		
IDConf	Short integer	No	1	Confidence	0		
LocConfMeters	Float	No	0		0	0	
Type	String	Yes	no data				255

Contains point features for Section 4.3 of the FGDC Standard.

Azimuth
Inclination
Label
Data Source ID (from tblRefGeologicInfo)
Notes
FGDC Reference Code for point feature
Feature Class type
Identity Confidence
Location confidence measured in meters
General joint type

Simple feature class VolcanicLineFeatures						Geometry	Polyline
						Contains M values	No
						Contains Z values	No
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Label	String	Yes					256
LocationMethod	String	No	0				256
DataSources_ID	Long integer	No	-1		0		
Notes	String	Yes					memo
FGDCRefNo	String	Yes	no data	VolcanicFeatures_Ref_Codes			255
FC_ID	Long integer	Yes	1802		0		
Shape_Length	Double	Yes			0	0	
Type	String	Yes	no data	VolcanicFeature_Types			100
IDConf	Short integer	Yes	1	IDConfidence	0		
LocConf	Short integer	Yes	1	LocConfidence	0		
LocConfMeters	Float	Yes	0		0	0	

Contains line features for Section 18 of the FGDC Standard.

Label
Location Method
Data Source ID (from tblRefGeologicInfo)
Notes
FGDC Reference code for line feature
Feature Class Type
Volcanic Feature type
IdentityConfidence
LocationConfidence
Location Confidence measured in meters

Simple feature class VolcanicPointFeatures						Geometry	Point
						Contains M values	No
						Contains Z values	No
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Azimuth	Float	No	0	Azimuth	0	0	
Inclination	Float	No	0	Inclination	0	0	
Label	String	Yes					256
LocationConfidenceMeters	Float	No	0		0	0	
IDConf	Short integer	No	1	Confidence	0		
DataSources_ID	Long integer	No	-1		0		
OrientationConfidenceDegrees	Float	No	0		0	0	
Notes	String	Yes					memo
FGDCRefNo	String	Yes	no data	VolcanicFeatures_Ref_Codes			16
FC_ID	Long integer	Yes	1801		0		
Type	String	Yes	no data	VolcanicFeature_Types			100

Contains point features for Section 18 of the FGDC Standard.

Azimuth or strike
Inclination or dip
Label
Location Confidence measured in meters
Identity Confidence
Data Source ID (from tblRefGeologicInfo)
Orientation Confidence Degrees
Notes
FGDC Reference code for point feature
Feature Class Type
Volcanic Feature Type

6.4 OGDC-6 Relationship Descriptions

Relationship Name	Type	Cardinality	Origin Tbl/FC	PrimaryKey	ForeignKey	Destination Tbl/FC
Rel_GeoInfo_BaseMap	Composite	1-1	tblRefGeologicInfo	Reference_ID_code	Reference_ID_code	TblRefBaseMap
Rel_GeoInfo_ConvInfo	Composite	1-1	tblRefGeologicInfo	Reference_ID_code	Reference_ID_code	TblRefConversionInfo
Rel_GeoInfo_Mutbl	Composite	1-M	tblRefGeologicInfo	Reference_ID_code	ReferenceIDcode	tblMapUnit
Rel_MUtbl_Age	Composite	1-M	tblMapUnit	MapUnitPK	MapUnitFK	tblAge
Rel_MUtbl_Env	Composite	1-M	tblMapUnit	MapUnitPK	MapUnitFK	tblEnvironment
Rel_MUtbl_Mufc	Simple	1-M	tblMapUnit	MapUnitPK	MapUnitPK	MapUnitPolys
Rel_MUtbl_Stratigraphic	Composite	1-M	tblMapUnit	MapUnitPK	MapUnitFK	tblStratigraphic
Rel_MUtbl_SUtbl	Composite	1-M	tblMapUnit	MapUnitPK	MapUnitFK	tblMapSubUnit
Rel_MUtbl_Thickness	Composite	1-1	tblMapUnit	MapUnitPK	MapUnitFK	tblThickness
Rel_SUtbl_Sucolors	Composite	1-M	tblMapSubUnit	MapSubUnitPK	MapSubUnitFK	tblMapSubUnitColors
Rel_SUtbl_SUhandsampletext	Composite	1-M	tblMapSubUnit	MapSubUnitPK	MapSubUnitFK	tblMapSubUnitHandSampleTexture
Rel_SUtbl_SUlithologymincomp	Composite	1-M	tblMapSubUnit	MapSubUnitPK	MapSubUnitFK	tblMapSubUnitLithologyMineralComp
Rel_Sutbl_Suoutcropmjrstruct	Composite	1-M	tblMapSubUnit	MapSubUnitPK	MapSubUnitFK	tblMapSubUnitOutcropMajorStructures