

**NSDI Cooperative Agreements Program  
FGDC-endorsed Standards Implementation Training and Outreach Project  
Interim Project Report**

**Date: November 9, 2012**

**Agreement Number:** G12AC20145

**Project title:** Transitioning to the FGDC Draft Geologic Map Database Standard: A Washington State Geologic Survey Pilot Project

**Interim report**

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**Executive Summary**

The Division of Geology and Earth Resources (DGER) at the Washington State Department of Natural Resources (WADNR) recognizes the importance of disseminating digital geological map data in a format that insures the highest level of quality, consistency and accuracy for our users. As such, we have undertaken a pilot project with the assistance of an NSCI CAP grant to implement and explore the process of converting a single digital geological map (a legacy quadrangle) as a test case from our own agency's schema to a draft-standard schema (NCGMP09), currently under consideration by the FGDC. At the halfway point in this project, we have established good working relationships with the NCGMP09 standard authors/developers, as well as with other users who have already adopted this model; their advice has proved invaluable in increasing the efficiency of our efforts. We have maintained a steady stream of communication with our collaborators through email, telephone, and a project tracking website that we built for this purpose. Thus far we have successfully completed approximately 50% of the feature class migrations, have made good headway in creating the required related tables in the geodatabase, and have begun generation of the related NCGMP09- required elements (e.g. MXD, style file). We have kept continual documentation of our procedures and made an official presentation of our progress at the URISA GISPro 2012 conference. Our experiences have already informed decisions made by our agency's mappers and data developers, and have influenced tools and documentation provided by NCGMP09 developers to help other agencies make a similar transition.

**Project Narrative**

Our pilot project includes the following phases: research of the NCGMP09 geodatabase design, formulation and modification of data migration tools and procedures, and evaluation of how well the draft-standard schema performs in meeting our needs for data representation and dissemination. Each phase is accompanied by detailed documentation of our process and our experiences.

During the first half of this project's timeline, we were able to establish important collaborations and working relationships with key developers and users of the National Cooperative Geologic Mapping Program (NCGMP) draft standard for digital geologic information (a.k.a. NCGMP09). Specifically, attendance at the 2012 Digital Mapping Techniques (DMT) meeting in May allowed the principal investigator to begin dialog with Dave Soller and Ralph Haugerud (USGS, NCGMP09 developers), and Ryan Clark and Janel Day (AZGS, NCGMP09 users). Subsequent conversations and data element and code sharing have kept this project on track. Additionally, these communications have had the added advantage of benefiting the draft standard developers by the continual stream of questions and feedback stemming from our work. A primary goal of this pilot project is to provide the NCGMP09 developers with valuable feedback resulting from our experiences with implementing the draft standard, and we are pleased that the developers have already been able to improve their documentation and tools based on our discussions, leading to a positive feedback cycle that is benefiting both our efforts.

At the heart of our effort to migrate a legacy geologic map geodatabase from our agency schema to the NCGMP09 schema (diagrammatically depicted in Figure 1) is the need to transfer polygon, line, and point data from seven feature classes (3 point, 3 line, 1 poly) to eight feature classes (3 point, 3 line, 2 polys) with three related tables, not including optional feature datasets that can be added to the geodatabase to accommodate cartographic elements, such as correlation of map unit (CMU) and cross section diagrams. To obtain an empty geodatabase container in NCGMP09 format ready to house our migrated data, we ran an ArcGIS Toolbox Python script, supplied by the NCGMP09 developers (Ralph Haugerud), which provides the option of adding additional feature class and cartographic elements based on user need and input. Our approach has been to begin each individual feature class migration into the empty NCGMP09 geodatabase by mapping fields between the feature classes within our in-house geodatabase schema (DGER) and the corresponding mandatory and necessary (i.e. not mandatory by default, but required in order to capture the complete body of geologic information contained within our legacy, pilot-project dataset) feature classes and tables of the NCGMP09 schema. We have done this both graphically and in tabular formats (MS Excel workbook). At present, we have full field mappings for all polygon and line feature classes and have established a reliable workflow to move forward in mapping fields for the three point-type feature classes.

In general, the migration procedure that we have established involves writing and running a Python script for each initial feature class migration between schemas (essentially a field mappings and field calculations script from DGER to NCGMP09), which is then followed by running an ArcGIS Toolbox Python script (again supplied by NCGMP09 developer Ralph Haugerud) that works by building a Python data dictionary from a text file list of relationships generated by the user. Within the text file, the user specifies values for a key attribute, and the associated values for other fields of that feature's record that are based on the value of the key. The script uses this information to populate the target feature class table based on those defined relationships, which have been stored in its data dictionary.

Related tables in the draft standard geodatabase must be populated by a combination of programmatic and manual methods. The DescriptionOfMapUnits table was completed by constructing a MS Word file from the map unit descriptions found on the pilot project map's plate. A script, supplied by NCGMP09 developer Ralph Haugerud, was modified to

accommodate DGER's map unit description style, and subsequently run to extract certain information required by the NCGMP09 schema. We then built a Python script that uses a data dictionary to fill in the remaining required information. The DescriptionOfMapUnits table is the most complex of the three tables, and lessons learned from its creation will undoubtedly improve our strategy and increase our efficiency when completing the other two tables (DataSources and Glossary), which must be performed after all feature classes have been migrated to the NCGMP09 geodatabase.

An easy-to-read, tabular view of our overall progress in this data standard evaluation and adoption project is detailed in the table below. Furthermore, we assembled a project tracking website, <https://sites.google.com/site/wadnrncgmp09/>, to facilitate communication and data sharing among project participants, and to record project milestones. A screen capture image of our website is shown in Figure 2.

### *Challenges*

When this data migration project was planned, the PI assumed that comprehensive metadata existed for the legacy data used in the pilot project, and that those metadata would be migrated to the new data schema in a process devised by the project participants. However, it turns out that this is not the case; metadata were never created for our pilot project dataset. Thus, the investigators are tasked with creating FGDC-compliant metadata for each feature class in the new schema, based on a few recovered documents that pertain to some metadata details about the pilot project map. Creating full metadata for the NCGMP09 elements from the ground up is a time-consuming process, and one not budgeted for in the initial planning stages of this project. Therefore, this complication might mean forgoing the addition of some of optional NCGMP09 elements (e.g. the CMU and/or cross sections) in lieu of spending the time to generate the lacking metadata. Furthermore, due to (project participants') time constraints and readiness levels, it is unlikely that the use of cartographic representations to symbolize data in the NCGMP09 draft standard schema will be thoroughly examined. Apart from these challenges, however, no other major deviations have been taken or are currently planned.

### **Next Steps**

Next steps for individual project elements are documented in the table below. We will first complete the migration process of point feature classes before moving on to the completion of the two unfinished related tables (Glossary and DataSources). We will then turn our attention to creating metadata and generating the other extra-geodatabase components required by the NCGMP09 data model. Finally, as time permits, we will work on adding optional elements that the draft standard geodatabase can accommodate, such as cross sections and other cartographic elements.

We already envision extending our investigation beyond the time limit for this grant in continuing to address in-agency questions of how we may implement the standard effectively, and in joining the pool of agencies with experience in the data conversion process that are able to assist other agencies making the transition. We expect our detailed documentation to be a key resource used to aid both developers and users of NCGMP09 in the immediate future. We hope to give a final report at the Digital Mapping Techniques (DMT) 2013 meeting, and provide the attendees with a list of resources helpful to the goal of moving towards a common, national

standard for digital geologic map information. Lastly, we have exceeded this project's planned deliverables by generating a publically available online version of the digital geologic map that is served through our agency's ArcGIS Online for Organizations account. A screen capture image of that map is given in Figure 3. Working with ArcGIS Online as a vehicle to disseminate our data has the implications of reaching a wider audience and increasing the visibility of our agency and our products, but is also fraught with the difficulties involved in using an outside infrastructure to accurately render the very complex and advanced symbology inherent in a geologic map. We are currently troubleshooting these issues, and we hope that we will have an ArcGIS Online map associated with this NSDI CAP grant project ready for public release before the end of the project's timeline.

Task	Percent Complete	Most Recent Accomplishment	Next Steps
<b>Fieldmapping geodatabase migration from DGER to NCGMP09</b>	50	Fieldmapping MapUnitPolys and all line features complete.	Fieldmapping of point feature classes.
<b>Migrating Polygon Feature Classes</b>	100	MapUnitPolys and DataSourcePolys migration complete.	Explore ways in which DataSourcePolys can be used to add valuable information to our dataset.
<b>Migrating Line Feature Classes</b>	100	Linear feature class migration complete.	Populate Glossary table with mandatory elements used in the linear feature class tables.
<b>Migrating Point Feature Classes</b>	0	Fieldmapping for OrientationPoints feature class is in progress.	Complete OrientationPoints migration and move on to GeochronPoints and Stations feature class migration.
<b>Populating related tables</b>	35	DescriptionOfMapUnits table population complete.	Begin populating Glossary table with mandatory terminology used in the feature class tables. DataSources table will be constructed last.
<b>Metadata</b>	10	Elements for the legacy metadata have been located (the metadata were not complete in the database of the legacy map).	Metadata must be recreated as best as possible from the preserved metadata elements recovered for this map.
<b>Miscellaneous optional NCGMP09 geodatabase feature datasets</b>	0	The NCGMP09 schema has optional CMU (correlation of map units) and CrossSection feature datasets that can be added to the final geodatabase. We have added the option for two cross sections, but they are unpopulated as of yet.	Investigate how these elements (that have no geographic reference) are migrated to and represented in a GIS geodatabase.
<b>Supplemental required elements (MXD, simple GDB, open database version, browse graphic, style file)</b>	25	The MXD and style file are in draft version, subject to future changes.	Finalize MXD and style file and generate simple and open databases and thumbnail graphic.
<b>Documentation (Cookbook and Feedback)</b>	50	Documentation updated through linear feature class migration. Feedback with NCGMP09 developers is constant and continual.	Document point feature class migration.
<b>Share Results (GISPro 2012, DMT 2013)</b>	50	Presented interim status at GISPro, Oct 2012.	Final status report at DMT 2013, if possible.

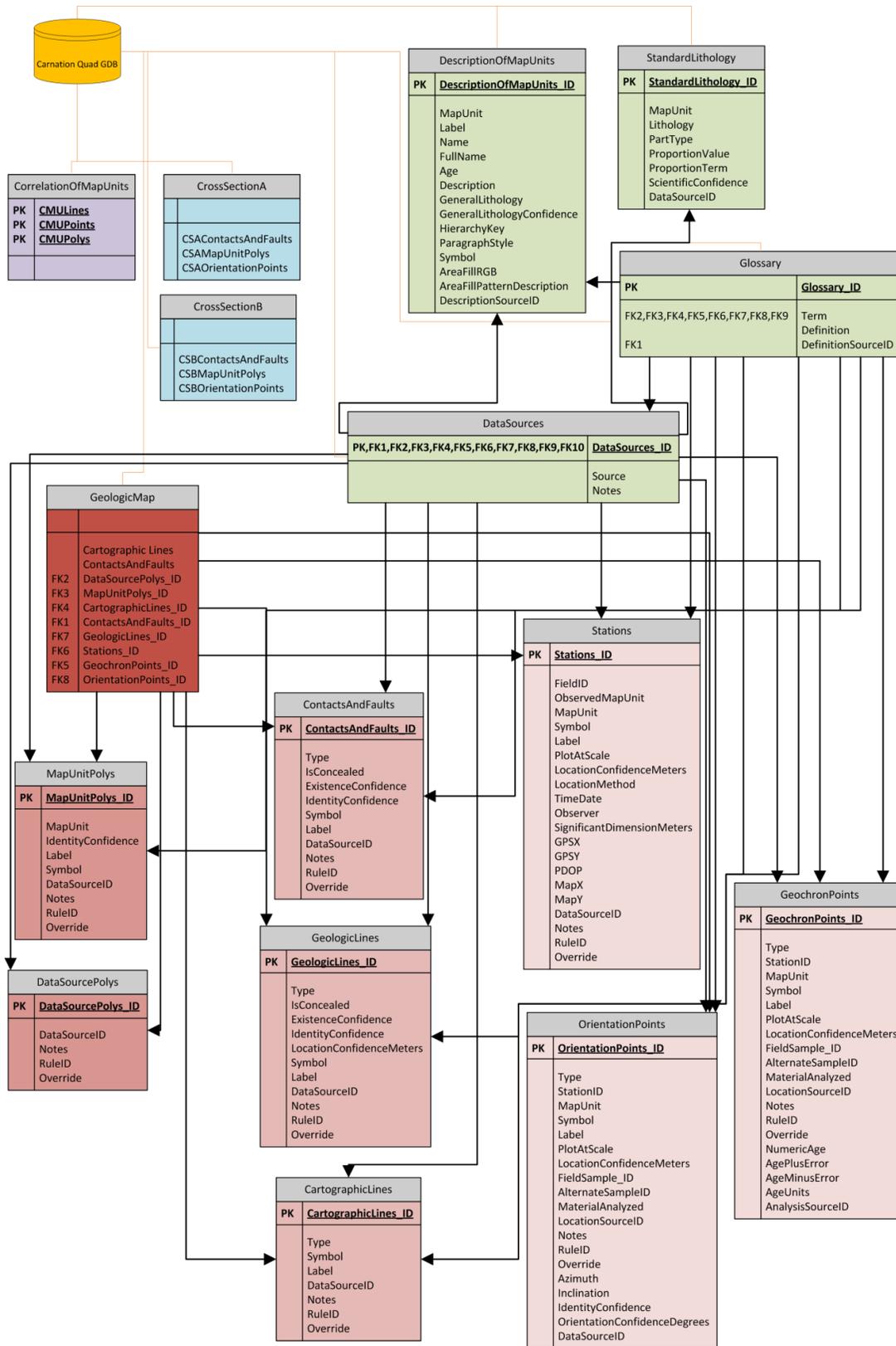


Figure 1. Simplified flowchart diagram showing NCGMP09 draft standard geodatabase feature class relationships between themselves and related tables and other feature datasets.

WADNR\_NCGMP09

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**Welcome to the NCGMP09 migration pilot project**

I'm just getting started with documenting our progress in this Google webpage. It seems reasonable to keep a timeline, progress tracker and notes together in a single space that can be shared by all.

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Welcome to the Project Tracking Workspace for the 2012 NSDI Cooperative Agreements Program Awards, Award Number G12AC20145, Category 5: FGDC-endorsed Standards Implementation Training and Outreach

## Transitioning to the FGDC Draft Geologic Map Database Standard: A Washington State Geologic Survey Pilot Project

This is a pilot project to develop a process to adopt the draft standard format for digital publication of geologic maps (NCGMP09) for use at Washington State Department of Natural Resources, Division of Geology and Earth Resources (WADGER) which will also result in a model that can be used by other state geological surveys in their USGS mapping endeavors. The NCGMP09 model is a geodatabase storage format for geologic feature data and associated information; it is currently available online as part of a USGS Open File Report titled “[Digital Mapping Techniques '09—Workshop Proceedings](#).” The NCGMP09 geodatabase model builds on an established FGDC symbol standard “[FGDC/USGS Digital Cartographic Standard for Geologic Map Symbolization](#)” (FGDC Document Number FGDCSTD- 013-2006). This project will involve customization of the NCGMP09 model to include terminology and symbology applicable to Washington State geology. They will use the Carnation 7.5-minute USGS quadrangle, King County, Washington geologic map database as the transition subject for this NCGMP09 in the development of a “cook book” and “lessons learned” documentation that will serve as feedback for the standard developers, and assist other users of geologic data helping to smooth their transition to the FGDC-endorsed geologic map standard.

Figure 2. Screen capture image of the project tracking website <https://sites.google.com/site/wadnrncgmp09/>.

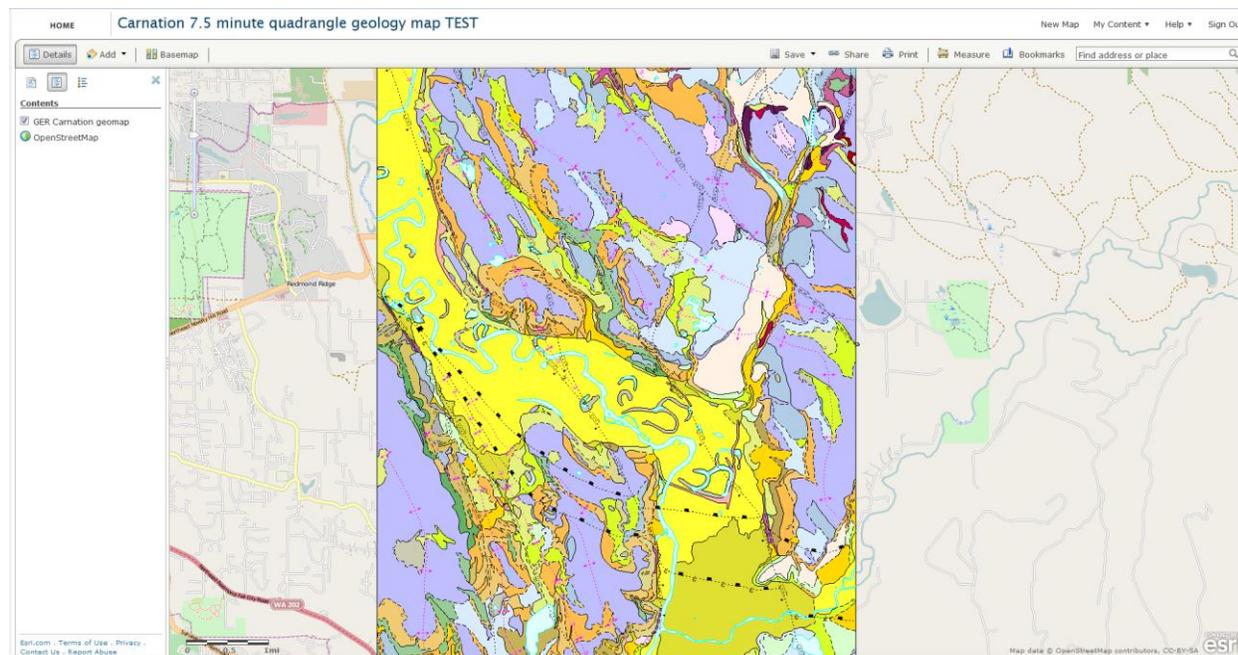


Figure 3. Screen Capture image of the ArcGIS Online version of the pilot project map, currently under development.