2011 Project Abstract
For the Period Ending June 30, 2015

PROJECT TITLE: County Geologic Atlases for Sustainable Water Management
PROJECT MANAGER: Dale R. Setterholm
AFFILIATION: Minnesota Geological Survey
MAILING ADDRESS: 2609 Territorial Road
CITY/STATE/ZIP: St. Paul, MN 55114
PHONE: 612-626-5119
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WEBSITE: www.mngs.umn.edu/
FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 03b1

APPROPRIATION AMOUNT: $1,200,000

Overall Project Outcome and Results

The Minnesota Geological Survey maps sediment and rock because these materials control where water can enter the subsurface (recharge), where and how much water can reside in the ground (aquifers), where the water re-emerges (discharge), and at what rates this movement occurs. This information is essential to managing the quality of our water and the quantity that can be sustainably pumped. This project substantially completed geologic atlases for Meeker, Redwood, and Brown counties, and contributed to atlas work in Anoka and Wright counties. Information about the geology is gleaned from the records of domestic wells, and from drilling conducted for this project. In Meeker County we used 3,600 wells and 6 cores, in Redwood we used 1,900 wells and 10 cores, and in Brown County we used 1,700 wells and 8 cores, and soil borings and geophysical surveys. From the data we created maps of the geology immediately beneath the soil; the aquifers within the glacial sediment; and the shape, elevation, and rock types of the bedrock surface. These maps and data support monitoring, wellhead protection, water appropriation, clean-ups, and supply management.
In large portions of Brown and Redwood counties the glacial materials are relatively thin, and most of the bedrock types present do not provide much water. This makes the mapping of glacial sand bodies, which are potential aquifers, very important. Our maps will guide wise use and protection of these water supplies. In Meeker County, the glacial deposits can be very thick, and the bedrock includes some formations that can serve as aquifers. This is a more diverse and complicated ground water distribution. In all three counties the database of well construction records we have compiled is an excellent indicator of which aquifers the population is currently relying on.

Project Results Use and Dissemination

County geologic atlases are distributed in print and digital formats. The digital format allows us to include all the data that support the maps and the ability to change the maps or create new ones. The products are available from the MGS web site (http://www.mngs.umn.edu/index.html). We also conduct post-project workshops in the map area to familiarize users with the products and their applications. The products are also distributed to libraries.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2011 Work Plan Final Report

Date of Status Update:	2/4/2015		
Final Report:	2/14/2015		
Date of Work Plan Approval:	6/23/2011		
Project Completion Date:	2/4/2015	**Is this an amendment request?**	yes

Project Title: County Geologic Atlases for Sustainable Water Management

Project Manager: Dale Setterholm

Affiliation: U of MN - MN Geological Survey

Address: 2609 Territorial Road

City: St. Paul **State:** MN **Zip code:** 55114

Telephone Number: (612) 626-5119

Email Address: sette001@umn.edu

Web Address: http://www.geo.umn.edu/mgs

Location:

Counties Impacted: Redwood, Meeker, Brown

Ecological Section Impacted: Minnesota and Northeast Iowa Morainal (222M), North Central Glaciated Plains (251B)

Total ENRTF Project Budget:	**ENRTF Appropriation $:**	1,200,000
	Amount Spent $:	1,200,000
	Balance $:	0

Legal Citation: M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 03b1

Appropriation Language:
$900,000 the first year and $900,000 the second year are from the trust fund to accelerate the production of county geologic atlases to provide information essential to sustainable management of ground water resources by defining aquifer boundaries and the connection of aquifers to the land surface and surface water resources. Of this appropriation, $600,000 each year is to the Board of Regents of the University of Minnesota for the Geologic Survey and $300,000 each year is to the commissioner of natural resources. This appropriation is available until June 30, 2015, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: County Geologic Atlases for Sustainable Water Management

II. FINAL PROJECT STATEMENT: The Minnesota Geological Survey maps sediment and rock because these materials control where water can enter the subsurface (recharge), where and how much water can reside in the ground (aquifers), where the water re-emerges (discharge), and at what rates this movement occurs. This information is essential to managing the quality of our water and the quantity that can be sustainably pumped. This project substantially completed geologic atlases for Meeker, Redwood, and Brown counties, and contributed to atlas work in Anoka and Wright counties. Information about the geology is gleaned from the records of domestic wells, and from drilling conducted for this project. In Meeker County we used 3,600 wells and 6 cores, in Redwood we used 1,900 wells and 10 cores, and in Brown County we used 1,700 wells and 8 cores. These are augmented with soil borings and geophysical surveys. From the data we created maps of the geology immediately beneath the soil; the aquifers within the glacial sediment; and the shape, elevation, and rock types of the bedrock surface. These maps and data support monitoring, wellhead protection, water appropriation, clean-ups, and water supply management.
In large portions of Brown and Redwood counties the glacial materials are relatively thin, and most of the bedrock types present do not provide much water. This makes the mapping of glacial sand bodies, which are potential aquifers, very important. Our maps will guide wise use and protection of these water supplies. In Meeker County, the glacial deposits can be very thick, and the bedrock includes some formations that can serve as aquifers. This is a more diverse and complicated ground water distribution. In all three counties the database of well construction records we have compiled is an excellent indicator of which aquifers the population is currently relying on.

PROJECT SUMMARY: Geologic atlases provide maps and databases necessary for sustainable management of water resources. County Geologic Atlases are specifically identified as essential data in the Statewide Conservation Plan, and in the efforts of the Environmental Quality Board, DNR Waters, and the Water Resources Center at the University of Minnesota to design a sustainable water management process. They define aquifer boundaries and the connection of aquifers to the land surface and surface water resources to enable a comprehensive water management effort. A complete geologic atlas consists of Part A constructed by the Minnesota Geological Survey (MGS) and focused on geology and the County Well Index, and Part B constructed by the DNR Division of Waters and focused on hydrology. Local participation is a primary factor in determining which counties are chosen for this work, while ground water sensitivity, water demand, and the size of the population served are also considerations. The counties must provide funds or in-kind service to participate. Atlases facilitate and enhance the operations of natural resource management and regulation by state and local government units. They support management activities designed to evaluate sustainable water use and to protect water quality such as: permitting, land use planning, wellhead protection, remediation, monitoring, modeling, and well construction.

III. PROJECT STATUS UPDATES:

Project Status as of *December 31, 2011*: MGS has reached agreements with Redwood, Meeker, and Brown counties to create geologic atlases. The counties will establish accurate locations for wells with construction records as their contribution to the project. MGS will create maps and databases based, in part, on that well information. The well-locating efforts are underway.

Project Status as of *June 30, 2012***:** The counties have completed establishing accurate locations for wells with construction records. The database for Meeker County has more than 3,600 wells with 2,900 of them added for this project. The database for Redwood County has nearly 1,900 wells with 1,250 added for this project. The database for Brown County has almost 1,700 wells with just a couple of hundred added for this project. MGS staff are completing the work necessary to enter this data in the County Well Index database including geologic interpretations of the material descriptions provided by

the drillers. MGS geologists are conducting field work this spring and summer, specifically focusing on the geology of the land surface. They are describing and sampling exposures of the glacial materials, and drilling shallow boreholes. Samples are returned to MGS for analysis in our sediment laboratory. The surficial geologic maps of Meeker ($39,684) and Redwood ($27,993) counties have been accepted for cost-sharing by the USGS STATEMAP program. Work on the bedrock maps of these areas has been initiated with passive seismic surveys, examination of archived bedrock core, and collection of exploration drilling data.

Project Status as of *December 31, 2012***:** Well locating and data entry is complete except for some bedrock interpretations that will be made as the bedrock geologic map is compiled. The surficial maps of all three counties are in draft stage. The surficial maps of Redwood and Meeker will be completed this period with matching funds from the USGS STATEMAP program. These are supported by Giddings probe samples and outcrop samples which have been analyzed for texture and grain lithology. Work on bedrock geologic maps is underway. Some cores have been examined and outcrops have been mapped in Redwood County. Draft versions of bedrock topography are available for all three counties. These are based on well records and passive seismic surveys. Approximately 8 rotasonic drillholes will be completed in Meeker County in this period. That represents three holes from this budget, and additional holes paid for with Clean Water Funds provided by DNR to augment our coverage. Remaining products for the Anoka and Wright CGAs are being finalized and the budgets reported here include salaries and fringes in the amount of $22,123 and $26,862 respectively spent on those projects.

Project Status as of *June 30, 2013***:** County Well Index data is complete for all 3 counties, although some additional data generated during the project will be added as necessary. Surficial geologic maps are in review for all 3 counties with the Meeker and Redwood maps submitted to USGS as STATEMAP cost-shared products. The bedrock map of Meeker County has been accepted as a STATEMAP product and will receive $18,598 in Federal cost-share. Bedrock mapping in Brown and Redwood counties is underway with field work scheduled this season. The characterization of subsurface glacial materials is based on rotasonic coring, examination of exposures (river banks, roadcuts, other), examination of drill cuttings, and Giddings soil probe drilling (<25' deep). Coring was completed this winter in Meeker County, and will take place this coming winter in Redwood and Brown. River cuts provide deep exposure in Redwood and Brown counties and work on foot and by canoe is underway there. Giddings drilling is nearly complete in Meeker, and underway in Redwood and Brown. The shape and elevation of bedrock surfaces (topographies) are in draft form for all counties.

Amendment Request (09/06/2013): The rotasonic drilling in Brown and Redwood counties is planned to begin in late October of this year. We are preparing the bid documents that will be used to choose a drilling contractor. The drilling programs for County Geologic Atlases are expanded with funds provided by the DNR to facilitate more, and deeper, test holes. The amount available at this time to augment the drilling is less than was anticipated when the project budget was written. For that reason we would like to slightly increase the portion of the project budget dedicated to drilling, and we will decrease the amount dedicated to salaries. These changes are not expected to negatively affect the quality of our products, or the schedule of the project. Changes of this magnitude are well within the variability expected in our estimating and project design. If this request is not approved we will adjust the drilling program to fit the original budget, and the project will go forward with less drilling.

Amendment Approved 9/6/13

Project Status as of *December 31, 2013***:** The CWI database is complete for all three counties. Surficial geologic maps are complete for all three counties. Bedrock topographic maps are drafted for all counties but may be revised slightly. Bedrock geologic maps are underway. Rotasonic drilling and auger drilling are complete for all counties and the cores are described for Meeker County. Descriptive work on the cores and cuttings is underway in Brown and Redwood where drilling was just completed a few weeks ago (not yet billed). The cross-sections and sand body mapping are underway and are furthest along in Meeker County. This level of progress fits the work plan.

Project Status as of *June 30, 2014***:** For all three counties, the CWI database, the surficial geology, the drilling, and the bedrock topography map are complete. For each county, the subsurface Quaternary mapping, technical review/revision, editing, and printing remain. Meeker County is slightly ahead of the other two. The remaining funds in this grant are not sufficient to finish the products and will be expended before the project end date. The size of the grant was sufficient for three county atlases, but we started this series of grants in 2007 with a partial award that was insufficient for the work undertaken. In each successive grant we have utilized funds to complete unfinished work from the previous grant and this is part of each workplan. The work in Redwood, Brown, and Meeker counties that remains when this grant is spent will be funded by our 2013 grant to finish the products, and we expect completion in 12 months or less.

Amendment Request (7/16/14): Our spending has exceeded the budget in some categories, and we would like to shift funds from categories where they are not needed to cover these costs. We would like to move $8,437 from the printing services category and $7,538 from the travel expense category into the scientific drilling budget. This will eliminate a deficit from that category. We will spend the remainder of the budget in the next 6 months. If this amendment is approved there will be funds in the personnel category, the equipment/supplies category, and in the travel category. These balances may also require adjustment as the funds are expended. These adjustments could be approved now, or we could request an amendment after those exact balances are known.

Amendment Approved 7/17/14

Final Project Status (2/4/15): The maps for Meeker County have been proofed, and will go to the printer as soon as next week. The digital files of these works will be compiled as a DVD on about the same schedule. This county will be complete with the exception of a product introduction meeting in the county yet to be scheduled.
In Redwood County the database, bedrock topography, and surficial geology products are complete. The bedrock geology is about one month from completion. The sand model and Quaternary stratigraphy products always come last, and these should be done in about 2 months. The production and printing processes will follow, and should be complete by the end of June.
The work on Brown County is less complete. The database, bedrock topography, and draft surficial geology maps are nearly complete. The bedrock geology is in review, and therefore nearly complete. The subsurface cross-sections that lead to the sand model will take another 3 months, and GIS and production work will follow. I expect the final products will not quite be completed at the end of June, but will be soon after.
Including the support for unfinished projects from prior grants this project has succeeded in supporting the creation of three new county geologic atlases as designed.

Amendment Request (2/4/15): Our final accounting shows a spending distribution quite close to the original design of the project. The deviations include spending about $47,000 less on salaries and wages, about $8,500 less on printing, about $30,000 less on travel and vehicles, about $80,000 more on drilling, and about $7,000 more on equipment, tools, and supplies. These variations are expected when the budget is designed before the actual counties in which we will work are known. The last amendment request was made just after our accountant suddenly left the organization. Our new accountant has helped me make some corrections and this changed the picture slightly. The increase in drilling funding I had requested in July was larger than needed. A charge against this project was reversed. Our drilling contracts typically cover several projects, sometimes funded by different accounts. Attachment A shows our final spending distribution and I request an amendment as shown. Our new accountant has brought us up to date with current University procedures and this will make future reporting less difficult, and less reliant on a single person.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Create geologic atlases for 3 or more counties (Redwood, Meeker, Brown)

Description: Atlases begin with compilation of a database of subsurface information. The most abundant data source is the construction records of water wells. With the cooperation of the local project partner, accurate digital locations are established for these wells to support their use in mapping. Concurrently, geologists visit the project area to describe and sample landforms, and exposures of rock or sediment. An initial assessment of the geologic data is then completed to focus additional data gathering including shallow and deep drilling programs. Analysis of the complete data set is then completed and maps and associated databases are formalized and prepared for use in geographic information systems and distribution via DVD and web. Most of the products are also printed for use in the field, and by users who prefer this format. As soon as the funds for this project are secured counties will be contacted to find willing and able local partners. This effort will begin with counties prioritized on the basis of need that may be driven by growth, resource demand, resource vulnerability, or opportunities for cooperation with other water management activities. When counties join this project progress and budgeting will be reported as Activity 1A, 1B, and 1C.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 1,200,000
Amount Spent: $ 1,200,000
Balance: $ 0

Activity Completion Date:

Outcome	Completion Date	Budget
1. Create database of well construction records to support the mapping, to document water use in specific aquifers, and to help resolve well problems	June 30, 3013	$120,000
2. Complete any unfinished ENRTF supported County Geologic Atlas projects (ex: from 2010 appropriation).	June 30, 2014	$100,000
3. Make progress on maps of bedrock geology, surficial geology, subsurface Quaternary geology, bedrock topography, and thickness of glacial deposits.	June 30, 2015	$980,000

Activity Status as of *December 31, 2011*: Having reached agreement with the counties, MGS staff visited each county to provide training and materials for establishing accurate well locations. MGS staff are monitoring this activity and will also check this work in the field. An internal MGS work plan with staffing and effort levels has been established for each county. We have also proposed the surficial geologic maps of each county for federal cost-sharing under the STATEMAP program.

Activity Status as of *June 30, 2012***:** The counties have completed establishing accurate locations for wells with construction records. The database for Meeker County has more than 3,600 wells with 2,900 of them added for this project. The database for Redwood County has nearly 1,900 wells with 1,250 added for this project. The database for Brown County has almost 1,700 wells with just a couple of hundred added for this project. MGS staff are completing the work necessary to enter this data in the County Well Index database including geologic interpretations of the material descriptions provided by the drillers. MGS geologists are conducting field work this spring and summer, specifically focusing on the geology of the land surface. They are describing and sampling exposures of the glacial materials, and drilling shallow boreholes. Samples are returned to MGS for analysis in our sediment laboratory. The surficial geologic maps of Meeker ($39,684) and Redwood ($27,993) counties have been accepted for cost-sharing by the USGS STATEMAP program. Work on the bedrock maps of these areas has been initiated with passive seismic surveys, examination of archived bedrock core, and collection of exploration drilling data.

Activity Status as of *December 31, 2012***:** Well locating and data entry is complete except for some bedrock interpretations that will be made as the bedrock geologic map is compiled. The surficial maps of all three counties are in draft stage. The surficial maps of Redwood and Meeker will be completed this period with matching funds from the USGS STATEMAP program. These are supported by Giddings probe samples and outcrop samples which have been analyzed for texture and grain lithology. Work on bedrock geologic maps is underway. Some cores have been examined and outcrops have been mapped in Redwood County. Draft versions of bedrock topography are available for all three counties. These are based on well records and passive seismic surveys. Approximately 8 rotasonic drillholes will be completed in Meeker County in this period. That represents three holes from this budget, and additional holes paid for with Clean Water Funds provided by DNR to augment our coverage.

Activity Status as of *June 30, 2013***:** County Well Index data is complete for all 3 counties, although some additional data generated during the project will be added as necessary. Surficial geologic maps are in review for all 3 counties with the Meeker and Redwood maps submitted to USGS as STATEMAP cost-shared products. The bedrock map of Meeker County has been accepted as a STATEMAP product and will receive $18,598 in Federal cost-share. Bedrock mapping in Brown and Redwood counties is underway with field work scheduled this season. The characterization of subsurface glacial materials is based on rotasonic coring, examination of exposures (river banks, roadcuts, other), examination of drill cuttings, and Giddings soil probe drilling (<25' deep). Coring was completed this winter in Meeker County, and will take place this coming winter in Redwood and Brown. River cuts provide deep exposure in Redwood and Brown counties and work on foot and by canoe is underway there. Giddings drilling is nearly complete in Meeker, and underway in Redwood and Brown. The shape and elevation of bedrock surfaces (topographies) are in draft form for all counties.

Activity Status as of *December 31, 2013***:** The CWI database is complete for all three counties. Surficial geologic maps are complete for all three counties. Bedrock topographic maps are drafted for all counties but may be revised slightly. Bedrock geologic maps are underway. Rotasonic drilling and auger drilling are complete for all counties and the cores are described for Meeker County. Descriptive work on the cores and cuttings is underway in Brown and Redwood where drilling was just completed a few weeks ago (not yet billed). The cross-sections and sand body mapping are underway and are furthest along in Meeker County. This level of progress fits the work plan.

Activity Status as of *June 30, 2014***:** For all three counties, the CWI database, the surficial geology, the drilling, and the bedrock topography map are complete. For each county, the subsurface Quaternary mapping, technical review/revision, editing, and printing remain. Meeker County is slightly ahead of the other two. We expect all of the products to be complete in 12 months, which corresponds to the grant end date. The bedrock geology map of Meeker County received federal cost-sharing of $18,598.

Final Activity Status as of *February 5, 2015***:**
The Meeker CGA products are complete, and will be printed in the coming weeks. All but one of the Redwood products are substantially complete and this atlas should be finished by the project end date. The products of the Brown CGA are mostly complete with the exception of the subsurface glacial products. These are underway and should be complete by the project end date, although printing will likely take place a month or so later.

Final Report Summary: Different geologic settings require different techniques or shifts in the resources devoted to each method. These three counties have relatively lower population density, and therefore fewer well records to describe subsurface conditions. This requires that we do more drilling, both shallow auger drilling and deeper Rotasonic drilling, and more geophysical investigations to improve map accuracy. The increase in drilling requires more time to collect, describe, and analyze samples, but improves the accuracy of the maps. Redwood and Brown counties also include parts of the Minnesota River valley where exposed bedrock provides an opportunity to examine it in the field

and map the outcrops and bedrock topography in detail. Mapping in those parts of the counties will show a much higher resolution than the portions of the counties where the bedrock is buried. Completion of these Part A products will be followed by effort from our DNR counterparts to produce the Part B products focused on water composition, water levels, aquifer characteristics, and sensitivity.

V. DISSEMINATION:

Description: County Geologic Atlases are created in digital and print forms. Printed copies are useful in the field, and for users without computers. The printed copies are shared with the county and also distributed by the MGS. The atlas content is also provided as portable document files (pdfs) that can be accessed by free software, as geographic information system (GIS) files that can be accessed and manipulated to create new or customized maps by those with GIS software, and as GIS files that can be accessed by free GIS software. The digital files are available on a DVD, from the county, or from a digital conservancy through the MGS web site.

MGS provides project status reports to each county, and at the completion of our work we hold a workshop in the county to introduce the products and demonstrate their uses. A field trip is usually conducted to relate the map units to landforms and geologic materials at locations around the county.

Status as of *December 31, 2011*: Met with Meeker County Planning Commission and Meeker County Board, Redwood County Planning Commission, and the Brown County Board.

Status as of *June 30, 2012***:** Working with county staff on well locations.

Status as of *December 31, 2012***:** Some interaction with Meeker County on sites for drilling. Working with all counties and well drillers to establish locations on a few more wells.

Status as of *June 30, 2013***:** Surficial geologic maps of Redwood and Meeker counties have been submitted to the USGS, and posted to the MGS web site, and the National Geologic Map Database.

Status as of *December 31, 2013***:** Counties assisted with siting the drill holes.

Status as of *June 30, 2014***:** Bedrock geologic map of Meeker County has been submitted to the USGS, and will be posted to the MGS web site and the National Geologic Map Database.

Status as of *February 5, 2015***:** We will deliver the printed products to the counties as they are completed, and also a DVD with all the digital files and data. Then a meeting in each county will be held to introduce the products to users.

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget:

Budget Category	$ Amount	Explanation
Personnel:	$877,636	approx. 10.6 FTE civil service and student workers
Professional/Technical Contracts:	$188,364	rotasonic drilling- awarded by bid process; costs generally range from $30 to $60 per foot (more expensive at depth) plus $8 per foot for abandonment. This amount would likely drill about 9 holes- 3 per county averaging 200 feet deep. This is typically the minimal coverage and may be augmented if conditions require.
Equipment/Tools/Supplies:	$38,000	expendables for field and laboratory work

Printing:	$36,000	bid process; typically 6 plates per county (size about 3' by 3'), four color, and 1,500 copies of each for 3 counties equals 27,000 maps
Travel Expenses in MN:	$60,000	food, lodging, vehicle rental from University Fleet as necessary for field work (typically weekly)
TOTAL ENRTF BUDGET:	**$1,200,000**	

Explanation of Capital Expenditures Greater Than $3,500: none

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation: approx. 10.6, cannot calculate until counties are chosen and staff are assigned based on skills required for those counties.

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
STATEMAP, Great Lakes Geologic Mapping Coalition (both are federal cost-sharing)	$127,354	$32,386	Awarded $86,275 from STATEMAP for surficial maps of Meeker and Redwood, and bedrock map of Meeker. No GLGMC award for these projects
State			
Clean Water Legacy Funds	$305,000	$	Dedicated to Houston and Winona CGA projects, not this proposal
TOTAL OTHER FUNDS:	**$430,000**	**$**	

VII. PROJECT STRATEGY:

A. Project Partners: Under a separate workplan and budget DNR Waters and Environmental Services will receive $600,000 to work on Part B of County Geologic Atlases

B. Project Impact and Long-term Strategy: MGS is the geologic mapping agency of the state and is striving to provide comprehensive geologic mapping and associated databases at appropriate scales statewide as quickly as possible. The County Geologic Atlas program is the primary vehicle for completing this goal. Atlases are complete or under construction for 32 of the 87 counties in Minnesota. The MGS receives $150,000 to $200,000 per year from DNR Waters, and also leverages federal cost share dollars from the National Cooperative Geologic Mapping Program of the United States Geological Survey and the Great Lakes Geologic Mapping Coaltion. MGS competes for these cost share dollars annually and they cover half of the costs of each map product incurred in that one-year window. MGS intends to propose project map elements for cost share and if successful may garner an additional $125,000. MGS atlas development is also supported by Clean Water Funds (one grant of $305,000 beginning July 2010).

C. Spending History:

Funding Source	M.L. 2005 or FY 2006-07	M.L. 2007 or FY 2008	M.L. 2008 or FY 2009	M.L. 2009 or FY 2010	M.L. 2010 or FY 2011
Benton and Chisago CGAs		$400,000			
Blue Earth, Nicollet, Sibley CGAs			$706,000		
Anoka and Wright CGAs				$820,000	
Sherburne and Morrison					$800,000

CGAs; St. Lawrence Confinement Study, Rochester Geochem Study					and $330,000

VIII. MAP(S): map of CGA program progress and funding sources

IX. REPORTING REQUIREMENTS:
Periodic work plan status update reports will be submitted not later than December 31, 2011, June 30, 2012, December 31, 2012, June 30, 2013, December 31, 2013, June 30, 2014, December 31, 2014. A final report and associated products will be submitted between June 30 and August 1, 2015 as requested by the LCCMR.

Final Attachment A: Budget Detail for M.L. 2011 (FY 2012-13) Environment and Natural Resources Trust Fund Projects

Project Title: County Geologic Atlases for Sustainable Water Management

Legal Citation: M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 03b1

Project Manager: Dale Setterholm

M.L. 2011 (FY 2012-13) ENRTF Appropriation: $1,200,000

Project Length and Completion Date: 4 years; June 30, 2015

Date of Update: 2/5/15

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget 7/16/14	Activity 1 Revised Budget 2/5/15	Amount Spent	Balance	TOTAL BALANCE
BUDGET ITEM					
Personnel (Wages and Benefits)					
Approximately 10.6 FTE in a team of database managers, surficial geologists, bedrock geologists, geophysicists, student lab technicians, editor, and GIS scientists. Salary 58.7%, fringes 41.3%, except for students (100% salary). Assignments will be made when project locations (counties) are chosen.	~~$ 877,636~~	$ 910,796	910,796	0	~~33,160~~
Professional/Technical Contracts					
Scientific drilling services TBD by bidding process; about 9 holes averaging 200' deep including abandonment; may be augmented as necessary	~~$ 204,339~~	$ 187,856	187,856	0	~~16,483~~
Printing services TBD by bidding process (typically 6 plates, 1,500 copies, 3 counties; yields 27,000 3' by 3' maps in color	~~$ 27,563~~	$ 27,563	27,563	0	~~0~~
Equipment/Tools/Supplies					
(2) hand-held GPS units and map files	~~$ 700~~	$ 500	500	0	~~200~~
photocopying, maps, publications, sample envelopes and bags, core boxes, pallet banding, sieves, batteries	~~$ 37,300~~	$ 23,338	23,338	0	~~13,962~~
Printing (see professional contract above)					
Travel expenses in Minnesota vehicle rental and mileage (approx. $40 to $47 per day, $0.17 to $0.37 per mile), mileage on MGS geophysics van ($0.51 per mile); meals (up to $46 per day); lodging (up to $77 per day). Amounts cannot be calculated until project locations (counties) are known. Rentals from U Fleet Services as needed, typically on weekly basis.	~~$ 52,462~~	$ 49,947	49,947	0	~~2,515~~
COLUMN TOTAL	**~~$ 1,200,000~~**	**$ 1,200,000**	**$1,200,000**	**0**	**~~$0~~**

2011 Project Abstract
For the Period Ending June 30, 2015

PROJECT TITLE: County Geologic Atlases for Sustainable Water Management
PROJECT MANAGER: Jan Falteisek
AFFILIATION: MN DNR
MAILING ADDRESS: 500 Lafayette Rd
CITY/STATE/ZIP: St. Paul, MN 55155te Rd
PHONE: 651-259-5665
E-MAIL: jan.falteisek@state.mn.us
WEBSITE: http://mndnr.gov
FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 03b2

APPROPRIATION AMOUNT: $600,000

Overall Project Outcomes and Results

Geologic atlases provide information essential to sustainable management of groundwater resources. Atlases define aquifer boundaries, the connection of aquifers to the land surface, and the connection of aquifers to surface water resources. They facilitate and enhance the operations of natural resource management and regulation by state and local government units.

County Geologic Atlases are specifically identified as essential data in the Statewide Conservation Plan, and in the efforts of the Environmental Quality Board, DNR Waters, and the Water Resources Center at the University of Minnesota to design a sustainable water management process. County geologic atlases facilitate management activities to identify sustainable water use and to protect water quality

This project continued the acceleration of County Geologic Atlases, Part B by DNR initiated under M.L. 2009 that provided ENRTF funding through June 30, 2012. This work plan provided support for ongoing Part B atlases in Carlton, Benton, McLeod, Carver, and Chisago counties and to initiate seven new Part B atlases over the project period including Blue Earth, Nicollet, Sibley, Anoka, Clay, Renville, and Wright counties. The Carlton, Benton, McLeod, Carver, and Chisago county geologic atlases, Part B were completed, printed, and distributed; local training workshops were held for all completed atlases. Blue Earth, Nicollet, Sibley, Anoka, Clay, Renville, and Wright county Part B geologic atlases were all initiated. Project staff also assisted the initiation of the Part B Sherburne county geologic atlas.

All initiated projects completed initial analysis and groundwater sample collection with only carbon-14 sample collection and analysis remaining for the Renville atlas project. Well owners received reports of the chemical analysis of samples from their well. The format for new atlas reports was redesigned to a USGS-style science report format that will allow an expansion of the information presented in the report. All future atlas reports beginning with Blue Earth will use the new report format. The Blue Earth report is in final draft in the new format with reports for the Nicollet and Sibley atlases in development. Technical analysis and map development for other projects is underway.

The County Geologic Atlas series of reports is a long-term joint effort by the Minnesota Geological Survey and DNR to complete County Geologic Atlases for all counties in the state. Initiated Part B atlas projects mentioned above will be completed with additional existing ENRTF funding. Future Part B atlases are planned for Part A atlases that have been completed by the MGS, including Morrison, Houston, the Winona revision, and Meeker. Ten additional Part A county geologic atlases are currently underway by the MGS.

Project Results Use and Dissemination

The Carlton, Benton, McLeod, Carver, and Chisago county geologic atlases, Part B were completed and printed in paper format and distributed to county, libraries, state agencies, and other organizations. Printed reports are available for sale at the MGS. PDF versions of all printed reports were posted to the DNR web site at http://www.dnr.state.mn.us/waters/groundwater_section/mapping/status.html Through DNR gov.delivery subscription, (sign up on DNR home page http://www.dnr.state.mn.us/index.html) interested persons may self-subscribe to be notified of completed projects and other DNR county geologic atlas news. Project data of completed reports, including water chemistry data and GIS data were also posted to the DNR web site. Following publication of each Part B report, a local workshop was held to introduce the report content and train users in its application. At the completion of each report, the report author prepares an article of atlas highlights for the Minnesota Ground Water Association newsletter. The membership of the MGWA includes many professional hydrogeology colleagues who use the atlas reports.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2011 Work Plan Final Report

Date of Status Update: **January 20, 2016**
Date of Next Status Update: **Final Report**
Date of Work Plan Approval: 06/23/2011
Project Completion Date: 06/30/2015 **Is this an amendment request? ____NO_**

Project Title: County Geologic Atlases for Sustainable Water Management

Project Manager: Jan Falteisek
Affiliation: MN DNR
Address: 500 Lafayette Rd
City: St Paul **State:** MN **Zipcode:** 55155

Telephone Number: (651) 259-5665
Email Address: jan.falteisek@state.mn.us
Web Address: http://mndnr.gov

Location:

Counties Impacted: Anoka, Benton, Blue Earth, Carlton, Carver, Chisago, Clay, McLeod, Nicollet, Renville, Sibley, Wright

Ecological Section Impacted: Minnesota and Northeast Iowa Morainal (222M), North Central Glaciated Plains (251B), Northern Minnesota Drift and lake Plains (212N), Northern Superior Uplands (212L), Red River Valley (251A), Southern Superior Uplands (212J), Western Superior Uplands (212K)

Total ENRTF Project Budget:		
	ENRTF Appropriation $:	**600,000**
	Amount Spent $:	**597,773**
	Balance $:	**2,227**

Legal Citation: M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 03b2

Appropriation Language:
$900,000 the first year and $900,000 the second year are from the trust fund to accelerate the production of county geologic atlases to provide information essential to sustainable management of ground water resources by defining aquifer boundaries and the connection of aquifers to the land surface and surface water resources. Of this appropriation, $600,000 each year is to the Board of Regents of the University of Minnesota for the Geologic Survey and $300,000 each year is to the commissioner of natural resources. This appropriation is available until June 30, 2015, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: County Geologic Atlases for Sustainable Water Management (DNR)

II. FINAL PROJECT SUMMARY:

Geologic atlases provide information essential to sustainable management of groundwater resources. Atlases define aquifer boundaries, the connection of aquifers to the land surface, and the connection of aquifers to surface water resources. They facilitate and enhance the operations of natural resource management and regulation by state and local government units.

County Geologic Atlases are specifically identified as essential data in the Statewide Conservation Plan, and in the efforts of the Environmental Quality Board, DNR Waters, and the Water Resources Center at the University of Minnesota to design a sustainable water management process. County geologic atlases facilitate management activities to identify sustainable water use and to protect water quality

This project continues the acceleration of County Geologic Atlases, Part B by DNR initiated under M.L. 2009 that provides funding through June 30, 2012. This work plan provides support for ongoing Part B atlases in Carlton, McLeod, Carver, Benton, and Chisago counties and initiates seven new Part B atlases over the project period FY12-13. The seven new Part B atlases to be initiated include Blue Earth, Nicollet, Sibley, Anoka, Clay, Renville, and Wright counties. The County Geologic Atlases, Part A, for these seven counties are currently in progress by the Minnesota Geological Survey. Publication of the Part B reports initiated during this project is planned for 2014 or 2015. This is a long-term joint effort by the Minnesota Geological Survey and DNR; the MGS will prepare a separate, coordinated proposal.

III. PROJECT STATUS UPDATES:

Project Status as of January 15, 2012:

The Carlton County Geologic Atlas, Part B was published and delivered. Work continues to develop the Benton, McLeod, Carver, and Chisago Part B reports. Preliminary work began on the Blue Earth Part B project.

Project Status as of July 15, 2012:

The Benton County Geologic Atlas, Part B was printed. The Carver, McLeod, and Chisago Part B reports are in preparation for printing.

Substantial work was completed on the Blue Earth County Geologic Atlas, Part B project with the collection of planned groundwater samples. Collection of groundwater samples is well underway on the Nicollet and Sibley projects.

Project Status as of January 15, 2013:

All work on the Benton County Geologic Atlas, Part B, was completed. Report The Carver, McLeod, and Chisago Part B reports are in preparation for printing.

All water samples for the Blue Earth County Geologic Atlas, Part B, project collected and all data received. Data analysis continuing; preliminary work on the report has begun. Collection of groundwater samples for the Nicollet and Sibley County Geologic Atlas, Part B, projects is nearly complete. Collection of the remaining water samples are planned for early spring.

Program and project staff changes have resulted in two atlas program vacancies; both vacancies will be filled as soon as possible.

Project Status as of September 11, 2013:

McLeod CGA, Part B, report was printed and distributed. The workshop for this project will be held in conjunction with the Carver CGA, Part B project this fall. Report preparation work on the Carver and Chisago reports is continuing and a first draft completed of the Blue Earth CGA, Part B. All data for the Nicollet and Sibley projects have been collected and received. Data analysis for the reports is ongoing; preliminary development of the reports is underway. The next project to start will be Anoka, which will be underway the next review period.

Program and project staff changes during the reporting period include hiring the program GIS specialist (ITS2 - embedded MNIT staff), continuing a temporary project hydrologist staff reassignment to the project hydrologist vacancy, the project editor vacancy, and the GIS specialist vacancy.

Project Status as of March 7, 2014 [budget update as of December 31, 2013] :

The workshop for the McLeod CGA Part B was held in conjunction with the Carver CGA, Part B project on October 10, 2013. The Carver CGA Part B report is in final draft. Report preparation work on the Chisago report is continuing and is in complete draft stage. Technical work continued on the Nicollet and Sibley CGA Part B reports. Further development of the Blue Earth CGA, Part B report temporarily delayed. The Anoka CGA, Part B began with collection of about 85 percent of the planned groundwater samples.

Program and project staff changes during the report period included filling the project hydrologist 2 and GIS specialist vacancies. Unfortunately the project hydrologist 2 took another position in DNR in January 2014. The vacant editor position was finally filled in January 2014.

Project Status as of July 15, 2014 (reported December 26, 2014) [work plan/project and budget update as of June 30, 2014]:

The Carver CGA Part B report was published in June 2014. Printed copies were delivered to Carver County. The Chisago CGA Part B report in final draft. Other projects underway include Blue Earth CGA Part B with a redesign to a USGS-style science report format, which allows an expansion of the information presented in the report. Other reports underway and future reports will be in this new format, including Nicollet, Sibley, Anoka, and Sherburne. Project funds supported collection of groundwater samples for the Sherburne CGA Part B and background work for the Houston CGA Part B.

Program project staff changes during the report period that required project manager attention included filling the vacant editor position in January 2014, the new Science Reports Lead position was hired in January 2014; a senior project hydrologist vacancy was filled by an existing project staff, creating a project hydrologist 2 vacancy; the vacancy in the project hydrologist 2 for the Nicollet and Sibley projects continued; using other atlas project funding the vacant field hydrologist 1 position was filled; and a temporary field hydrologist was hired.

Project Status as of January 15, 2015 [budget update as of December 31, 2014]:

Two new Part B projects were initiated during this report period: Wright and Renville counties and included collection of planned groundwater samples for each project.

Report development continues for several projects, including Chisago (in final pre-printing review), Blue Earth (in final preparation for technical review), Nicollet, Sibley, and Anoka counties. Clay County may be initiated during the final six months of this project.

Atlas program project staff changes during the reporting period included filling one of the vacant project hydrologist 2 positions; the vacancy in the other project hydrologist 2 continues after two attempts. Using other atlas project funding a "trainee" project hydrologist 1 position was created and filled; this project hydrologist 1 has been assigned to atlas project tasks under the direction of more experienced staff. Both field hydrologist 1 positions (permanent and temporary) (funded with other atlas program funding) were vacant at the end of the reporting period. It is expected that at least the permanent field hydrologist 1 position (using other atlas project funds) will be filled during the next reporting period.

Overall Project Outcome and Results

Geologic atlases provide information essential to sustainable management of groundwater resources. Atlases define aquifer boundaries, the connection of aquifers to the land surface, and the connection of aquifers to surface water resources. They facilitate and enhance the operations of natural resource management and regulation by state and local government units.

County Geologic Atlases are specifically identified as essential data in the Statewide Conservation Plan, and in the efforts of the Environmental Quality Board, DNR Waters, and the Water Resources Center at the University of Minnesota to design a sustainable water management process. County geologic atlases facilitate management activities to identify sustainable water use and to protect water quality

This project continued the acceleration of County Geologic Atlases, Part B by DNR initiated under M.L. 2009 that provided ENRTF funding through June 30, 2012. This work plan provided support for ongoing Part B atlases in Carlton, Benton, McLeod, Carver, and Chisago counties and to initiate seven new Part B atlases over the project period including Blue Earth, Nicollet, Sibley, Anoka, Clay, Renville, and Wright counties. The Carlton, Benton, McLeod, Carver, and Chisago county geologic atlases, Part B were completed, printed, and distributed; local training workshops were held for all completed atlases. Blue Earth, Nicollet, Sibley, Anoka, Clay, Renville, and Wright county Part B geologic atlases were all initiated. Project staff also assisted the initiation of the Part B Sherburne county geologic atlas.

All initiated projects completed initial analysis and groundwater sample collection with only carbon-14 sample collection and analysis remaining for the Renville atlas project. Well owners received reports of the chemical analysis of samples from their well. The format for new atlas reports was redesigned to a USGS-style science report format that will allow an expansion of the information presented in the report. All future atlas reports beginning with Blue Earth will use the new report format. The Blue Earth report is in final draft in the new format with reports for the Nicollet and Sibley atlases in development. Technical analysis and map development for other projects is underway.

The County Geologic Atlas series of reports is a long-term joint effort by the Minnesota Geological Survey and DNR to complete County Geologic Atlases for all counties in the state. Initiated Part B atlas projects mentioned above will be completed with additional existing ENRTF funding. Future Part B atlases are planned for Part A atlases that have been completed by the MGS, including Morrison, Houston, the Winona revision, and Meeker. Ten additional Part A county geologic atlases are currently underway by the MGS.

Project Results Use and Dissemination

The Carlton, Benton, McLeod, Carver, and Chisago county geologic atlases, Part B were completed and printed in paper format and distributed to county, libraries, state agencies, and other organizations. Printed reports are available for sale at the MGS. PDF versions of all printed reports were posted to the DNR web site at http://www.dnr.state.mn.us/waters/groundwater_section/mapping/status.html Through DNR gov.delivery subscription, (sign up on DNR home page http://www.dnr.state.mn.us/index.html)

interested persons may self-subscribe to be notified of completed projects and other DNR county geologic atlas news. Project data of completed reports, including water chemistry data and GIS data were also posted to the DNR web site. Following publication of each Part B report, a local workshop was held to introduce the report content and train users in its application. At the completion of each report, the report author prepares an article of atlas highlights for the Minnesota Ground Water Association newsletter. The membership of the MGWA includes many professional hydrogeology colleagues who use the atlas reports.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: County Geologic Atlases, Part B.

Description: This project will complete five ongoing and initiate seven new County Geologic Atlases, Part B. A County Geologic Atlas is a single report that includes two parts, Part A, geology, completed by the Minnesota Geologic Survey and Part B, groundwater and pollution sensitivity, completed by DNR. Part A is completed first, followed by Part B, which uses and builds upon the geologic data assembled, analyzed and interpreted in Part A. The groundwater portion of the atlas includes maps of aquifers, groundwater flow, and pollution sensitivity.

Summary Budget Information for Activity 1:

ENRTF Budget:	**$ 600,000**
Amount Spent:	**$ 597,773**
Balance:	**$ 2,227**

Activity Completion Date:

Outcome	Completion Date	Budget
1. Support completion of ongoing County Geologic Atlas, Part B reports for Carlton, McLeod, Carver, Benton, and Chisago counties. Includes final assembly of data layers; analysis of chemistry data; development of maps of aquifers; geophysics field data collection and analysis; technical analysis of aquifers and groundwater systems; construction of hydrogeologic cross sections; maps of pollution sensitivity, preparation of final atlas report and publication, training of local atlas users, and dissemination of data. Publication is planned for FY12 or FY13. Part B Atlas program hydrogeologists supported by General Fund will be assigned to several of these projects so funds from both General Fund and ENTRF will be used to complete these atlases.	30 June 2013	$100,000
2. Initiate County Geologic Atlas, Part B atlases for Blue Earth, Nicollet, Sibley, Anoka, Clay, Renville, and Wright counties. Includes assembly of data layers and development of conceptual hydrogeologic models; development of preliminary maps of the water table; groundwater sample collection and analysis; geophysics field data collection and analysis; preliminary technical analysis and maps of groundwater systems; construction of preliminary hydrogeologic cross sections; and preliminary maps of pollution sensitivity. Publication is planned for FY14 or FY15. Part B Atlas program hydrogeologists supported by General Fund will be assigned to several of these projects so therefore funds from both General Fund and ENTRF will be used to complete these atlases.	Initiate by 30 June 2014.	$500,000

Activity Status as of January 15, 2012:

The Carlton County Geologic Atlas, Part B was printed and delivered to Carlton County and the Fond du Lac Band of Lake Superior Chippewa, followed by a training workshop in October. Development of the Benton County Geologic Atlas, Part B continued during this period with a peer review draft nearly complete. Work continued on the McLeod and Carver Part B reports, report production will begin in early 2012. Work progress on the Chisago Part B report improved greatly with the hire of the project hydrogeologist in September.

Initial work began on the Blue Earth Part B, using preliminary data layers from the Minnesota Geological Survey for the Part A report. Because of the state shutdown in July and delay in executing laboratory contracts, groundwater sampling work could not begin before winter weather set in for the season. Groundwater sampling for the project will begin as soon as weather conditions permit in spring 2012. Preliminary work on the Nicollet and Sibley Part B projects is expected to be underway during the next reporting period.

Activity Status as of July 15, 2012:

The Benton County Geologic Atlas, Part B was printed; the project electronic data will be posted to the DNR web site, the printed reports will be distributed, and a local training workshop will be held during the next reporting period. The Carver and McLeod Part B reports are in preparation for printing and will be printed the next reporting period. The Chisago Part B report is making good progress and entering the print production phase; the report will be printed about December-January.

Substantial work was completed on the Blue Earth project with the collection of 100 planned groundwater samples for natural chemistry, trace elements, tritium, and stable isotopes. When the chemistry and isotope data are available, up to 10 groundwater samples for carbon-14 age dating will be collected and analyzed. Good progress was also made on the Nicollet and Sibley projects. Those two projects have each completed about 50% of the planned groundwater sample collection of 100 samples per project. This work will be completed early in the next reporting period. Initial plans will be made to collect the carbon-14 samples in the two project areas and sampling conducted if possible.

Activity Status as of January 15, 2013:

Benton CGA, Part B, workshop and public informational meeting held in December; reports and electronic data distributed. This project is now complete. Report preparation work on the McLeod, Carver, and Chisago reports continuing. By the end of the reporting period, the McLeod project was in final editing prior to publication in early 2013. The Carver and Chisago report progress continuing with publication planned the end of the next review period.

All groundwater samples for the Blue Earth have been collected and data received. Data analysis for the report is ongoing; preliminary development of the report underway. All water samples for the Nicollet and Sibley report have been collected with the exception of up to 10 carbon-14 samples for each atlas that are planned for early spring.

Program and project personnel changes toward the end of the reporting period have affected progress somewhat. The LCCMR project hydrologist for the Nicollet and Sibley projects took another job at DNR in December. The work has been temporarily reassigned to other atlas program staff and will be paid with LCCMR project funds. The position will be backfilled as soon as possible. In addition, the program GIS specialist (ITS2 - embedded MNIT staff) was reassigned in November to other work at DNR. Backfilling the position thru MNIT is underway. The LCCMR atlas project GIS specialist (Research Analyst) is working to continue progress as much as possible during the ITS2 position hiring process.

Amendment Request January 15, 2013

A minor budget amendment is requested to cover the current cost of planned report production software licenses and upgrades. This request is to move $50 from the Travel Expense budget item to the Other expense budget item. Progress on field work has been better than expected and as a result planned travel expense funds are available.

Amendment request approved February 25, 2013

Activity Status as of September 11, 2013*:*

McLeod CGA, Part B, report was printed and distributed. Printed reports were delivered to the county, informational presentation to county staff, and electronic data distributed. The workshop for this project will be held in conjunction with the Carver CGA, Part B project this fall. Report preparation work on the Carver and Chisago reports is continuing. The Carver and Chisago report publication planned to be completed by the end of the next review period. Drafting of the Blue Earth CGA, Part B, began and a first draft completed.

All groundwater samples for the Nicollet and Sibley projects have been collected and data received. Data analysis for the report is ongoing; preliminary development of the report underway. The next project to start will be Anoka, which will be underway the next review period.

Program and project personnel changes during the reporting period have affected progress this report period. The LCCMR project hydrologist for the Nicollet and Sibley projects took another job at DNR in December 2012. The project work has been temporarily reassigned to other atlas program hydrologist staff and will be paid with LCCMR project funds. The vacant project hydrologist position will be backfilled as soon as possible. In March, the LCCMR report editor resigned and the editor position remained vacant for the remaining report period. The editor vacancy will be filled as soon as possible. In addition, the program GIS specialist (ITS2 - embedded MNIT staff) was reassigned in November 2012 to other work at DNR. The hiring for that position was completed in April by promoting the LCCMR atlas project GIS specialist (Research Analyst). The vacant LCCMR atlas project GIS specialist position will be backfilled as soon as possible.

Amendment Request September 11, 2013

This amendment request is being submitted concurrently and in coordination with a related amendment request for the M.L. 2013 Chp. 52, Sec. 2, Subd. 03c County Geologic Atlas Part B project.

During this final year of this project, planned groundwater sampling will take place April through June 2014. The samples collected will include tritium isotope samples. The laboratory requires up to three months to complete analysis of these samples and report the results. Therefore, the analyses and reporting is not expected to be completed under this project. To resolve this, this amendment requests that laboratory expense in this project be reduced $83,000 and personnel salary be increased $83,000. Concurrently, an amendment of the M.L. 2013 budget is requested to increase the laboratory budget $83,000 and decrease the personnel salary $83,000. In these amendment requests, the timing of the expected laboratory expense for the samples is addressed, the overall budget of each project is not changed, and the laboratory budget and personnel budget of the combined 2011 and 2013 projects is not changed.

Also, during this final year of the project, expected travel expenses are estimated to be less than planned because several of the atlas projects are closer to the DNR offices and therefore require less mileage and travel expense to complete the planned sampling. In addition, the personnel cost expense

for the project was estimated several years ago. Since then, personnel cost increases have been legislatively approved. This amendment requests reducing the travel budget $2,950 and increasing the personnel cost budget by $2,950.

Amendment Request Approved September 17, 2013

Activity Status as of March 7, 2014 [budget update as of December 31, 2013] ***:***

The workshop for the McLeod CGA Part B was held in conjunction with the Carver CGA, Part B project on October 10, 2013. The Carver CGA Part B report is in final draft. Report preparation work on the Chisago report is continuing and is in complete draft stage. Lack of an editor this review period has limited the ability to take the Carver report to printing. The Carver and Chisago report publication are planned to be completed by the end of the next review period. Further development of the Blue Earth CGA, Part B, report has been temporarily delayed. Technical work on the Nicollet and Sibley CGA Part B projects continued, and included preliminary drafts of main report elements such as water table elevation and near-surface sensitivity to pollution. The Anoka CGA Part B started this review period and included collection and submission for analysis of approximately 85 percent of the planned groundwater samples. The remaining samples, including the planned 10 carbon-14 samples for the project will be completed the next review period. By the end of the review period and early in 2014 the Minnesota Geological Survey released Part A data for Renville, Wright, and Sherburne counties. These projects will be next to start; the preliminary plan is to start collection of groundwater samples in those counties beginning spring 2014.

Program and project personnel changes during the reporting period have affected progress this report period. The vacant project hydrologist 2 position was filled in September by existing program staff working on the Nicollet and Sibley Part B projects. Unfortunately, that person took another job at DNR in January 2014; the vacant project hydrologist 2 position was immediately posted for application. The projects will be reassigned to other atlas program staff. The vacant atlas project GIS specialist position was filled in October 2013. The editor position was vacant for most of the report period, but the position was finally filled in January 2014.

Activity Status as of July 15, 2014 (reported December 26, 2014) [work plan/project and budget update as of June 30, 2014]:

The Carver CGA Part B report was published in June 2014. Printed copies were delivered to Carver County. The Chisago CGA Part B report is in final draft awaiting final internal review and printing. Other projects underway include Blue Earth CGA Part B with a redesign to a USGS-style science report format that will allow an expansion of the information presented in the report. The report will include several fold-in maps. The entire report will posted as a PDF on-line. The GIS data for all geospatial data will be provided on-line. Other reports underway and future reports will be in this new format, including Nicollet, Sibley, Anoka, and Sherburne. Project funds supported collection of groundwater samples for the Sherburne CGA Part B and background work for the Houston CGA Part B. Groundwater sample collection for the Sherburne CGA Part B was completed during the reporting period.

Program project staff changes during the report period that required project manager attention included filling the vacant editor position in January 2014, the new Science Reports Lead position was hired in January 2014; a senior project hydrologist vacancy was filled by an existing project staff, creating a project hydrologist 2 vacancy; the vacancy in the project hydrologist 2 for the Nicollet and Sibley projects continued; using other atlas project funding the vacant field hydrologist 1 position was filled; and a temporary field hydrologist was hired.

Activity Status as of January 15, 2015 [budget update as of December 31, 2014]*:*

Two new Part B projects were initiated during this report period: Wright and Renville counties. Project funds were used to support collection of the planned groundwater samples (100 each) for each project and submit them for chemistry and isotope analysis. Laboratory data from samples submitted for the Anoka atlas project has been received and will be sent to well owners.

Report development continues for several projects, including Chisago (in final pre-printing review), Blue Earth (in final preparation for technical review), Nicollet, Sibley, and Anoka counties. Clay County may be initiated during the final six months of this project.

Atlas program project staff changes during the reporting period included filling one of the vacant project hydrologist 2 positions; the vacancy in the other project hydrologist 2 continues after two attempts. Using other atlas project funding a “trainee” project hydrologist 1 position was created and filled; this project hydrologist 1 has been assigned to atlas project tasks under the direction of more experienced staff. Both field hydrologist 1 positions (permanent and temporary) were vacant at the end of the reporting period. It is expected that at least the permanent field hydrologist 1 position will be filled during the next reporting period. A decision whether to hire an atlas program temporary field hydrologist for the calendar 2015 field season will be considered early in the next reporting period based on expected field work.

A final amendment request will be submitted in February or March 2015 requesting approval for budget adjustments and redirection at the end of the project.

Amendment Request April 10, 2015

This amendment request is being submitted for approval of some adjustments to the project budget during the final quarter of the project as final or near-final expenses are becoming available. Changes to several budget items are requested as described below.

Professional/Technical Contracts - Laboratory expense: Reduce the laboratory expense budget by $4,000 and increase the Personnel budget by $4,000. This represents unused laboratory expense mainly due to a new state contract that had reduced sample charges.
Equipment/Tools – Water sampling tools: Reduce the water sampling equipment budget by $4,000 and increase the Personnel budget by $4,000. This is unused estimated budget for water sampling tools, meters, and related equipment.
Printing: Reduce the printing budget by $3,000 and increase the Personnel budget by $3,000. Printing costs of atlases were less than estimated partly because fewer copies are now printed.
Travel expense: Reduce the travel expense budget by $3,000 and increase the Personnel budget by $3,000. This is unused travel expense budget which was somewhat overestimated originally.
Other – report production software: Reduce the report production software budget by $11 and increase the Personnel budget by $11. This represents the unused portion of the final expense for this budget item.
Other – shipping: Reduce the budget for shipping by $2,000 and increase the Personnel budget by $2,000. This represents unused shipping budget intended for costs of shipping laboratory samples to the laboratory. The charges for shipping for this project were much less than estimated and not charged to the project.

The result of these changes reduces non-Personnel budget items by $16,011 and increases the Personnel budget by $16,011, which was originally underestimated somewhat. The personnel budget increase will be used by a project hydrologist 2 at 50% of position salary to continue the hydrologic analysis of the Renville County Geologic Atlas Part B from the time of amendment approval to June 30, 2015. The personnel budget increase will also be used by the program supervisor at 50% of position

salary for atlas program supervision and project management from the time of amendment approval to June 30, 2015.

Amendment Request Approved by the LCCMR April 16, 2015

Final Report Summary:

The Carlton, Benton, McLeod, Carver, and Chisago county geologic atlases, Part B were completed, printed, and distributed; local training workshops were held for all completed atlases. Blue Earth, Nicollet, Sibley, Anoka, Clay, Renville, and Wright Part B county geologic atlases were all initiated. Project staff also assisted the initiation of the Part B Sherburne county geologic atlas. All initiated projects completed initial analysis and groundwater sample collection with only carbon-14 sample collection and analysis remaining for the Renville atlas. Well owners received reports of the chemical analysis of samples from their well. The format of new atlas reports was redesigned to a USGS-style science report format that will allow an expansion of the information presented in the report. The report will include several fold-in maps. All future atlas reports beginning with Blue Earth report will use the new report format. The Blue Earth report is in final draft in the new format with reports for the Nicollet and Sibley atlases in development. Technical analysis and map development for other projects is underway.

V. DISSEMINATION:

Description: Each county geologic atlas, Part B completed is printed in paper format distributed to county, libraries, state agencies, and other organizations. They are available for sale at the MGS. PDF versions of the report are posted to the DNR web site and are available through http://www.dnr.state.mn.us/waters/groundwater_section/mapping/status.html . Project data, including water chemistry data and GIS data are also posted to the DNR web site. Following publication of each Part B report, a local workshop is held to introduce the report content and train users in its application.

Status as of January 15, 2012:

The Carlton County Geologic Atlas, Part B was published, delivered to local sponsors, and distributed to library collections around the state. Additional copies were delivered to the Minnesota Geological Survey and made available to the public through their Map Sales Office. Project data, including chemistry data and groundwater GIS data layers, have been posted to the web via the DNR web site.

Status as of July 15, 2012:

The Benton County Geologic Atlas, Part B was published at the end of the reporting period. Complete distribution as described above for the Carlton report will be completed the next reporting period.

Status as of January 15, 2013:

The Benton County Geologic Atlas, Part B, reports were distributed as described above for the Carlton Part B report; a training workshop and public information meeting were held in December; and project electronic data posted to the web. The Benton project results were presented at the Fall 2012 Midwest Ground Water Conference.

Status as of July 15, 2013*:*

The McLeod County Geologic Atlas, Part B, reports were distributed as described above for the Carlton Part B report. A training workshop and public information meeting is in preparation to be held in

conjunction with completion of the adjacent Carver County Geologic Atlas. The workshop is planned for fall 2013. The McLeod CGA Part B project electronic data has been posted to the web.

Status as of March 7, 2014 [budget update as of December 31, 2013] *:*

The training workshop and public information meeting for both McLeod and Carver CGAs Part B was held October 10, 2013. A follow up workshop or other presentation of the Carver project following publication has been requested.

Status as of July 15, 2014 (reported December 26, 2014) [work plan/project and budget update as of June 30, 2014] *:*

Development of project material using the GovDelivery service at DNR underway, along with draft development of a newsletter article for the Minnesota Ground Water Association. Delivery of printed Carver reports is planned, along with a follow up presentation to county staff and local users.

Status as of January 15, 2015 [budget update as of December 31, 2014]*:*

In July we experimented with using the DNR gov.delivery subscription service as an additional tool for notifying interested subscribers of completed county atlases and related news. The DNR gov.delivery subscription service is also a more efficient way to develop and manage mailing lists. Anyone can sign up by going to http://www.dnr.state.mn.us/emailupdates/index.html and providing an email address. An article describing the highlights of the Carver County Geologic Atlas, Part B was prepared and published in the December 2014 Minnesota Ground Water Association Newsletter. MGWA members can go to the newsletter issue at http://www.mgwa.org/ and read the article on-line. At the request of Mower County staff, DNR atlas staff will prepare and provide a review of their Part B atlas in early January 2015. Mower County has had nearly complete turnover of staff since the Part B atlas was published in 2002.

Final Report Summary:

The Carlton, Benton, McLeod, Carver, and Chisago county geologic atlases, Part B were completed and printed in paper format and distributed to county, libraries, state agencies, and other organizations. Printed reports are available for sale at the MGS. PDF versions of all printed reports were posted to the DNR web site at http://www.dnr.state.mn.us/waters/groundwater_section/mapping/status.html Through DNR gov.delivery subscription, (sign up on DNR home page http://www.dnr.state.mn.us/index.html) interested persons may self-subscribe to be notified of completed projects and other DNR county geologic atlas news. Project data of completed reports, including water chemistry data and GIS data were also posted to the DNR web site. Following publication of each Part B report, a local workshop was held to introduce the report content and train users in its application. At the completion of each report, the report author prepares an article of atlas highlights for the Minnesota Ground Water Association newsletter. The membership of the MGWA includes many professional hydrogeology colleagues who use the atlas reports.

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget: See also M.L. 2011 Attachment A: Budget Detail

Budget Category	$ Amount	Explanation
Personnel:	$451,961	Hydrologist Supervisor (classified), Project Manager/Technical Supervisor: $100,000 (79%

		salary, 21% benefits); 50% FTE; FY12-13. Hydrologist 2 (unclassified), $65,000 (68% salary, 32% benefits); 95% FTE; FY13. Hydrologist 2 (unclassified): $63,000 (75% salary, 25% benefits); 100% FTE; FY13. Information Officer 2 (technical editor) (unclassified): $66,000 (68% salary, 32% benefits); 90% FTE; FY13. Research Analyst–GIS (unclassified): $56,000 (63% salary, 37% benefits); 100% FTE; FY13.
Professional/Technical Contracts:	$98,000	Laboratory analysis and interpretation of water samples for natural and isotope chemistry.
Equipment/Tools/Supplies:	$18,000	Water sampling tools and field analytical meters and equipment. Supplies, including expendable water sampling supplies.
Printing:	$9,000	
Travel Expenses in MN:	$20,000	Mileage, lodging, meals.
Other:	$3,039	Report production software licenses and software upgrades. Report production software licenses and software upgrades (Adobe Illustrator, Photoshop, InDesign; Avenza Map Publisher). Report production software licenses and upgrades are the responsibility of the work unit. Shipping costs for water samples to laboratory.
TOTAL ENRTF BUDGET:	**$ 600,000**	

Explanation of Use of Classified Staff: Any classified position paid for with LCCMR funds will either be 1) backfilled with a new position or 2) the work previously done by this position will be delayed, eliminated, or completed by the start of the project.

There is one classified position working on this project to be paid partially by this grant. The hydrologist supervisor provides overall atlas program direction, on-going program management, and is the technical supervisor for staff assigned to specific atlas projects or who support the atlas program as GIS or report production specialists. A portion of the hydrologist supervisor's time (0.5 FTE) will be paid by this grant and the remaining portion will be paid by General Fund, subject to an approved DNR budget.

Explanation of Capital Expenditures Greater Than $3,500: No capital expenditures greater than $3,500 are planned.

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation: 0.5 in FY12; 4.35 in FY13.

Number of Full-time Equivalent (FTE) estimated to be funded through contracts with this ENRTF appropriation: N/A

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
State			

Other State $ Being Applied to Project During Project Period: General Fund, atlas staff and support, estimated $660,000 for 2-year project period to initiate three and complete two Part B atlases in base program. Clean Water Fund, M.L. 2009 Ch 172 Art 2 Sec 5(f) for July 1, 2009 thru December 31, 2014; estimated $500,000 of CWF appropriation will be used during project period.	$ 1,160,000	$	Personnel, laboratory analysis and interpretation, printing, travel expenses, water sampling equipment and supplies, and related expenses. Clean Water Funds primarily intended to expand and improve subsurface data acquisition in support of atlases.
Remaining $ from Current ENRTF Appropriation: M.L. 2009 Ch 143 Sec 2 Subd 3 ENTRF to DNR $890,000 (county geologic atlas portion). An additional $52,300 of the unspent balance is encumbered for FY11, primarily for laboratory services.	$ 580,000 (as of May 2011)		Personnel, laboratory analysis and interpretation, printing, travel expenses, water sampling equipment and supplies, and related expenses.
Minnesota DNR's In-kind Contribution: $64,000 for shared services and governance. General fund and other funds as appropriate.	$ 64,000		Shared Services (operations support governance) are services that DNR relies on in order to conduct business and support the work of the department. These services are more efficient when shared.
In-kind Services During Project Period: County assistance to arrange sampling access and sponsor local training workshop	$ 5000		County assists staff in local access to well owners and sponsors the training workshop at the conclusion of the project.
TOTAL OTHER FUNDS:	**$ 1,809,000**	**$**	

VII. PROJECT STRATEGY:

See also MGS Atlas FY12-13 Work Plan to be submitted separately to LCCMR.

A. Project Partners: The Minnesota Geological Survey completes Part A of county geologic atlases (see MGS Work Plan for county atlas continuation). At the completion of the Part A work, DNR Waters Division completes Part B, the groundwater portion, of the atlases. To initiate a project, the MGS will require that the counties participate either with funding, or with in-kind services. Local participation is a primary factor in determining which counties are chosen for this project. Groundwater sensitivity, resource demand, and the size of the population served are also considerations. The DNR does not require additional local funding or in-kind services to do the Part B portion of an atlas. However, DNR does request local government sponsorship of the training workshop for local staff and the public that is held at the completion of a Part B atlas. The local government makes the arrangements and DNR atlas

project staff present the training program. The workshop program transfers knowledge and data acquired during the atlas project to local users and managers for improved decision-making and long-term resource protection.

B. Project Impact and Long-term Strategy: MGS is the geologic mapping agency of the state and intends to provide comprehensive geologic mapping and associated databases at appropriate scales statewide as quickly as possible. The County Geologic Atlas program is the primary vehicle for completing this goal. Atlases are complete or under construction for 32 of the 87 counties. The MGS receives funding from DNR, and also leverages federal dollars from the National Cooperative Geologic Mapping Program of the USGS. The MGS competes for these cost share dollars annually and they cover half of the costs of each map product incurred in that one-year window. MGS intends to continue cost sharing several of the map products associated with their work plan. MGS Part A atlas development is also supported by ENRTF and Clean Water Fund direct appropriations to MGS.

DNR has been a cooperator and funding partner with the MGS since the early 1990's. For each Part A atlas completed by the MGS, DNR completes a Part B atlas. The Part B atlases are currently supported by a combination of state general fund, ENRTF, and Clean Water Fund appropriations to DNR.

C. Spending History:

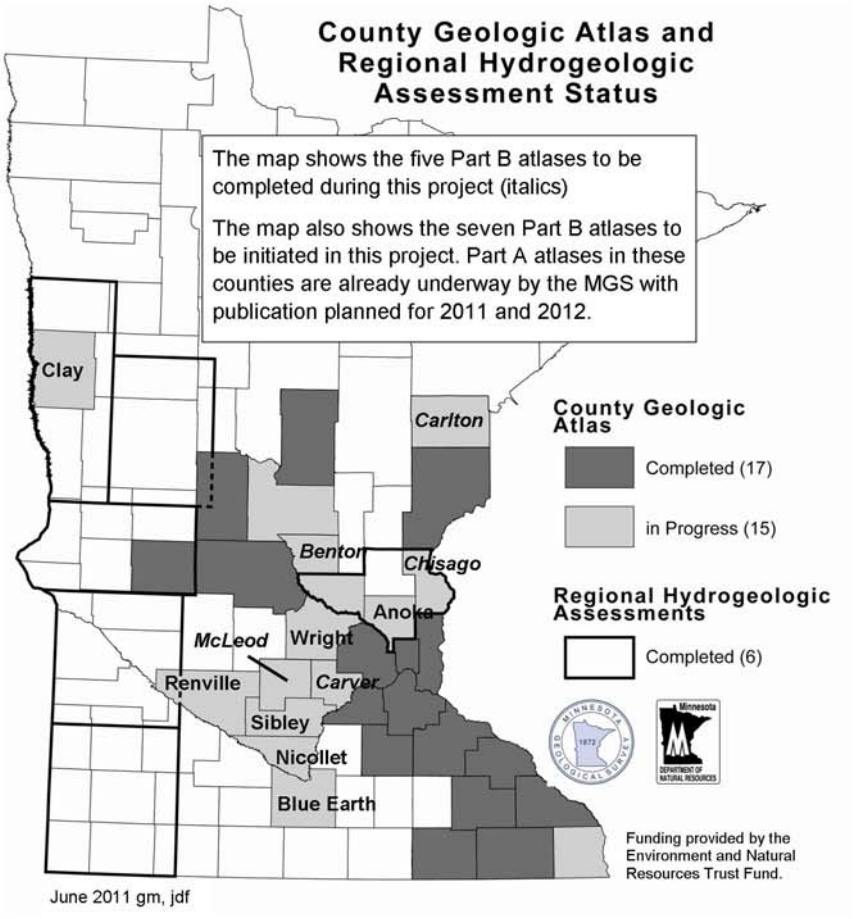
Funding Source	**M.L. 2005 or FY 2006-07**	**M.L. 2007 or FY 2008**	**M.L. 2008 or FY 2009**	**M.L. 2009 or FY 2010**	**M.L. 2010 or FY 2011**
ENRTF (FY10-12) to DNR				$890,000 Subd. 3(b)	

VIII. ACQUISITION/RESTORATION LIST: N/A

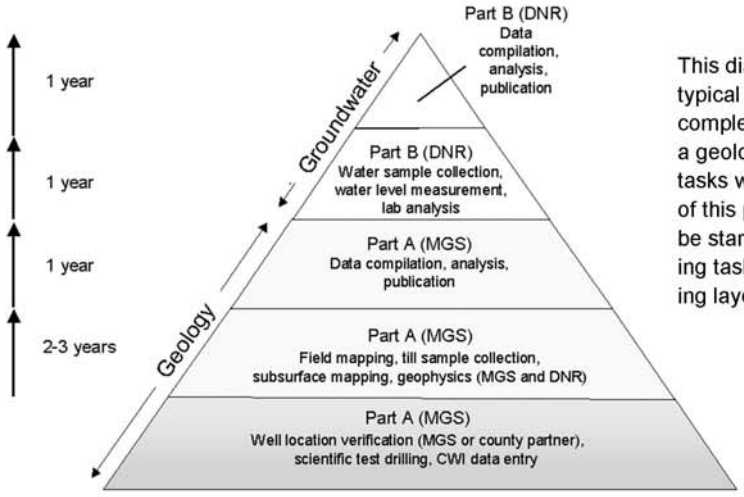
IX. MAP: See attached map of Part B atlases to be completed and initiated.

X. RESEARCH ADDENDUM: N/A

XI. REPORTING REQUIREMENTS:
Periodic work plan status update reports will be submitted not later than January 15, 2012, July 15, 2012, and July 15, 2013. A final report and associated products will be submitted between June 30 and August 1, 2013 as requested by the LCCMR.



County atlas tasks and dependencies



This diagram shows the typical tasks involved in completing both parts of a geologic atlas. The tasks within each layer of this pyramid can only be started after completing tasks in the underlying layer.

MNDNR_LCCMR2011 atlas continuation work plan

Final Attachment A: Budget Detail for M.L. 2011 (FY 2012-13) Environment and Natural Resources Trust Fund Projects					
Project Title: County Geologic Atlases for Sustainable Water Management (DNR)					
Legal Citation: *M.L. 2011, First Special Session, Chp. 2, Art. 3, Sec. 2, Subd. 03b2*					
Project Manager: Jan Falteisek					
M.L. 2011 (FY 2012-13) ENRTF Appropriation: $ 600,000					
Project Length and Completion Date: Two years, June 30, 2013, appropriation available until June 30, 2015					
Date of Update: Final January 20, 2016					
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	**Revised Activity 1 Budget 04/13/2015**	**Amount Spent thru 6/30/2015**	**Balance**	**TOTAL BUDGET**	**TOTAL BALANCE**
BUDGET ITEM	**Complete five (5) and initiate seven (7) County Geologic Atlases, Part B**				
Personnel (Wages and Benefits)	$451,961	$451,961	$0	$451,961	$0
Hydrologist Supervisor (classified), Project Manager/Technical Supervisor: $100,000 (79% salary, 21% benefits); 50% FTE; FY12-13					
Hydrologist 2 (unclassified), $65,000 (68% salary, 32% benefits); 95% FTE; FY13					
Hydrologist 2 (unclassified): $63,000 (75% salary, 25% benefits); 100% FTE; FY13					
Information Officer 2 (technical editor) (unclassified): $66,000 (68% salary, 32% benefits); 90% FTE; FY13					
Research Analyst - GIS (unclassified): $55,000 (63% salary, 37% benefits); 100% FTE; FY13					
Professional/Technical Contracts					
Laboratory analysis and interpretation of water samples for natural and isotope chemistry	$98,000	$97,516	$484	$98,000	$484
Equipment/Tools/Supplies					
Water sampling tools and field analytical meters and equipment	$6,000	$5,897	$103	$6,000	$103
Supplies, including expendable water sampling supplies	$12,000	$11,239	$761	$12,000	$761
Printing	$9,000	$8,872	$128	$9,000	$128
Travel expenses in Minnesota					
Mileage, lodging, meals	$20,000	$19,249	$751	$20,000	$751
Other					
Report production software licenses and software upgrades (Adobe Illustrator, Photoshop, InDesign; Avenza Map Publisher). Report production software licenses and upgrades are the responsibility of the work unit.	$3,039	$3,039	$0	$3,039	$0
Shipping costs for water samples to laboratory	$0	$0	$0	$0	$0
COLUMN TOTAL	**$600,000**	**$597,773**	**$2,227**	**$600,000**	**$2,227**