

M.L 2017 Project Abstract

For the Period Ending June 30, 2019

PROJECT TITLE: County Geologic Atlases - Continuation

PROJECT MANAGER: Barbara Lusardi

AFFILIATION: Minnesota Geological Survey, University of Minnesota

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FUNDING SOURCE: Environment and Natural Resources Trust Fund

LEGAL CITATION: M.L. 2017, Chp. 96, Sec. 2

APPROPRIATION AMOUNT: \$2,000,000

AMOUNT SPENT: \$2,000,000

AMOUNT REMAINING: \$0

Sound bite of Project Outcomes and Results

Geologic atlases provide maps and databases essential for management of water resources. Of the 16 county atlases covered by this grant, 5 are complete and 6 are past the halfway mark.

Overall Project Outcome and Results

The grant funds have been completely expended. This grant funded work in 16 counties including: Lake and St. Louis (\$583,175), Kandiyohi (\$225,315), Hennepin (\$117,254), Hubbard (\$100,206), Aitkin (\$227,156), Isanti (\$37,780), Cass (\$110,692), Rock and Nobles (\$261,732), Steele (\$60,389), Pennington (\$27,824), Lac Qui Parle (\$53,801), Lincoln and Pipestone (\$18,167), and Otter Tail (\$106,227) counties. An additional \$36,000 supported initiation of work in new project areas and \$34,277 was spent to characterize glacial sediments using geochemistry. Atlases for Kandiyohi, Hennepin, Hubbard, Isanti, and Cass are complete. At this time bedrock and surficial mapping in Lake and St. Louis counties is about 75% complete. Good progress has been made on associated databases. Federal cost-sharing has been applied to this work each year. Effort on Olmsted and Dodge counties have been shifted to another funding source, and both should be complete by the end of the summer. In Aitkin County, the bedrock map is nearly ready for review; the bedrock topography is about 75% complete. The Aitkin surficial map is nearly complete, and work on the cross sections and sand models is underway. For the Rock and Nobles CGAs the bedrock maps are about 85% complete and the bedrock topography is nearly ready for review. The surficial geology for both counties is complete, and the work on the cross sections and sand models is underway. Similarly, in Steele County all bedrock and surficial maps are near completion and work on the cross sections and sand models is underway. The work in Pennington, Lac Qui Parle, Lincoln and Pipestone, and Ottertail counties is still in the early stages with mostly field work underway to support maps. We will conduct rotary sonic drilling in all of these counties (underlined) starting this fall. Counties that are not yet complete have been shifted to the LCCMR18 contract funding.

Project Results Use and Dissemination

Completed atlas products have been posted to the MGS website and linked to the University's Digital Conservancy as noted above. PDF products as well as all of the related GIS data are available on these pages. In addition, the MGS hosts an [Open Data Portal](#) on which many of our county geologic atlases are presented as "Story Maps" that allow for direct access of the data without any special software or interface.

The Hennepin County workshop was held on April 22 at the County Library in Ridgedale. An article about the atlas and related workshop was published by the [SWNewsMedia](#). Formal presentations for [Cass](#) and Hubbard counties were held on March 6 in Backus and Park Rapids, respectively. An update to the Cass County Board was held last summer and written up by the [Echo Journal](#).



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2017 LCCMR Work Plan

Date of Submission: 06/28/2019
Date of Next Status Update Report: FINAL
Date of Work Plan Approval: 06/07/2017
Project Completion Date: 6/30/2019
Does this submission include an amendment request? No

PROJECT TITLE: County Geologic Atlases – Continuation

Project Manager: Barbara A. Lusardi
Organization: Minnesota Geological Survey, University of Minnesota
Mailing Address: 2609 Territorial Road
City/State/Zip Code: St. Paul, MN 55114-1009
Telephone Number: (612) 626-5119
Email Address: luser001@umn.edu
Web Address: <http://www.mngs.umn.edu>

Location: statewide -work will occur in multiple counties potentially including existing projects in Lake, St. Louis, Aitkin, Cass, Olmsted, Dodge, Isanti, Kandiyohi, Rock, Nobles, and new projects not yet determined.

Total ENRTF Project Budget:	ENRTF Appropriation:	\$2,000,000
	Amount Spent:	\$2,000,000
	Balance:	\$0

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 03a

Appropriation Language:

\$2,000,000 in fiscal year 2017 is from the trust fund to the Board of Regents of the University of Minnesota, Minnesota Geological Survey, to continue acceleration of the production of county geologic atlases for the purpose of sustainable management of surface water and groundwater resources. This appropriation is to complete Part A of county geologic atlases, which focuses on the properties and distribution of earth materials in order to define aquifer boundaries and the connection of aquifers to the land surface and surface water resources. This appropriation is available until June 30, 2020, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Minnesota Geological Survey Geologic Atlases for Water Management

II. PROJECT STATEMENT: Geologic atlases provide maps and databases essential for improved management of ground and surface water resources. This is foundational data that supports water management activities to the benefit of drinking water and aquatic habitat. 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. Geologic Atlases define aquifer boundaries and the connection of aquifers to the land surface and to surface water resources to enable a comprehensive water management effort. The program goal of atlas coverage statewide has benefited from long-term support of LCCMR to accelerate the work.

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 (funded separately) 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 are required to provide funds or in-kind service, typically by establishing accurate locations for water wells. The construction records of water wells are a fundamental data source that describe subsurface conditions, and also tell us where the population is obtaining water.

Atlases enhance natural resource management and regulation, and facilitate wise use of water resources. They support water management activities for sustainable water use and protection and improvement of water quality such as: permitting, land use planning, wellhead protection, remediation, nutrient management, monitoring, modeling, and well construction. Atlas information is used by citizens, local government, counties, and state agencies (SWCDs, MDH, DNR, MPCA, Ag). The atlases document existing conditions so that changes in the water system can be recognized and evaluated. A User's Guide to geologic atlases supports and educates users of all backgrounds.

This project continues an effort to provide county geologic atlases statewide. The first atlas was initiated in 1979. Funding from ENRTF in the early 1990s and from 2007 to the present has greatly accelerated production (see attached map). At this time 48 of the 87 counties (55%) have a completed Part A atlas, or a project underway (30 complete, 13 underway, 3 revised, 2 revisions underway). Annual funding of \$1,927,000 (aggregate from all sources) would achieve statewide coverage in about 11 years. We are creating atlases at a rate of about 5 per year.

This project originally requested \$3,784,700 to accomplish the equivalent of 10 county atlases. The award is 53% of the request, and the project will now accomplish the equivalent of 5 atlases. The term equivalent is used because these funds will finish some atlases already underway, and some that are started will not be complete at the end of the grant. Because of the lower award we anticipate more emphasis on existing projects and fewer new project starts.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of 12/31/2017: Work continues on pre-existing projects in St. Louis, Lake, Kandiyohi, Hennepin, Hubbard, Aitkin, Isanti, Cass, Rock, and Nobles counties, and new projects have been initiated in Steele, Pennington, Lac Qui Parle, and Otter Tail counties. We expect to finish work in Hennepin, Hubbard, Isanti, and Cass counties in the period ahead. Work is progressing in Olmsted, Dodge, and Dakota counties on non-ENRTF funding. In St. Louis and Lake counties we have open-filed completed subproject products so that they can be used immediately. This includes bedrock mapping for about two-thirds of the area, and surficial mapping for about half of the area. We are aware that these products are in use by agencies. Federal cost-sharing funds have been applied to the bedrock maps. A Rotasonic drilling program has been completed in the southern portion of the St. Louis and Lake projects, and in Kandiyohi, Rock, and Nobles counties. Drilling is underway in Dodge and Olmsted counties. Drilling generally marks the culmination of field operations and a shift from geology at the land surface to subsurface elements. This marks about two-thirds completion of an atlas. In the new project areas the focus is on the water well database and surficial geology. Work in Steele County is just slightly ahead of progress in Pennington, Lac Qui Parle, and Otter Tail counties.

Project Status as of 6/30/2018: Maps and databases are complete for Hennepin County and the products are being readied for printing. All work is complete for Isanti County, the maps are printed, a workshop has been held, and the digital products are distributed and posted to our website. All work is complete for Cass County, the maps are printed and the digital products are distributed and posted to our website. A workshop has been scheduled. Maps and databases are complete for Hubbard County and the products have been sent to printing. The bedrock map for St. Louis County is being compiled and completed this year with federal cost-sharing. The bedrock map for Lake County will follow in the year after (under a new grant). Glacial mapping in these counties is about two-thirds complete and another round of drilling will take place this winter. We continue to post interim products for these counties and they are in use by agencies. In Kandiyohi County the bedrock map, the well database, and the surficial map are complete. Mapping of the subsurface portion of the glacial sediments will be completed this year. In Aitkin County the field work for the glacial mapping is done, drilling and completion of the bedrock map will take place this winter. The surficial maps of Rock and Nobles counties are complete and the subsurface portion will be done this winter. Bedrock mapping is also scheduled for this winter. The Steele, Pennington, Lac Qui Parle, Lincoln, and Pipestone CGAs have been started with field work underway. The Otter Tail CGA is in its second year which will focus on field work. Work is progressing in Olmsted, Dodge, and Dakota counties on non-ENRTF funding.

Amendment Request of 10/15/2018: We have slightly exceeded our budgeted wages and travel expenses. We anticipate spending less than budgeted for geochronology, printing, equipment/supplies, and the vehicle costs. Most of these deviations are caused by setting a budget before the actual counties where the work will take place are known. This affects travel and wages especially. Printing costs vary over time, and were slightly lower than anticipated. The largest deviation is in the geochemistry/geochronology budget. This is the first project that we have employed these techniques. We sent out a large group of samples and received excellent results. However, we believe it would be best to take time to review that data and understand it more completely before going forward with more testing. This will ensure more useful results. The review will be supported by our base funds, not LCCMR funds. We have budgeted for this kind of work in our 2018 grant and can resume the process with those funds. The vehicle cost is lower than anticipated because of University fleet buying power. We would like to amend the plan to instead spend unused funds from geochronology, equipment, vehicle, and printing to cover more wages. This is the best way to move these county atlas projects toward completion. Actual figures may deviate slightly from the figures shown as "anticipated", but they should be reasonably close.

Amendment Approved 10/25/2018

Project Status as of 10/15/2018: The products for Hennepin County have been printed, but not yet invoiced. A user's workshop will be held, and the digital products posted to our website. In Kandiyohi County the subsurface products are nearly ready for review. When they pass review they will be readied for printing. Bids have been received and sites chosen for drilling in Aitkin, St. Louis, and Steele counties. The rotasonic funds remaining in this grant will be applied to the work in St. Louis County, and the remaining work will be paid for by DNR drilling augmentation funds. The products for Hubbard are printed, and digital versions posted. A workshop for Hubbard and Cass will be combined. Any unfinished projects will be continued on our 2018 grant.

Project Status as of 12/31/2018: The funds for this project are nearly depleted, and those that remain are mostly allocated to the geophysical logging transport vehicle. Delivery is expected in January and installation of the existing equipment will begin immediately. Drilling has been completed in St. Louis, Lake, Aitkin, and Steele counties. All of the unfinished county projects are now operating under the 2018 grant, and a progress report for that grant will be submitted nearly simultaneously with this one.

Amendment Request of 6/11/2019: We have exceeded our budgeted wages, supplies, and travel expenses. We spent less than budgeted for drilling, geochronology, printing, and the vehicle costs. Most of these deviations are caused by setting a budget before the actual counties where the work will take place are known.

This affects travel and wages especially. Printing and drilling costs vary over time, and were slightly lower than anticipated. The vehicle cost is lower than anticipated because of University fleet buying power. We would like to amend the plan to instead spend unused funds to cover the overages in wages, supplies, and travel as shown in the budget spreadsheet.

Amendment Approved by LCCMR 06/21/2019

Overall Project Outcomes and Result as of 6/28/2019 (FINAL): The grant funds have been completely expended. This grant funded work in 16 counties including: Lake and St. Louis (\$583,175), Kandiyohi (\$225,315), Hennepin (\$117,254), Hubbard (\$100,206), Aitkin (\$227,156), Isanti (\$37,780), Cass (\$110,692), Rock and Nobles (\$261,732), Steele (\$60,389), Pennington (\$27,824), Lac Qui Parle (\$53,801), Lincoln and Pipestone (\$18,167), and Otter Tail (\$106,227) counties. An additional \$36,000 supported initiation of work in new project areas and \$34,277 was spent to characterize glacial sediments using geochemistry. Atlases for Kandiyohi, Hennepin, Hubbard, Isanti, and Cass are complete. At this time bedrock and surficial mapping in Lake and St. Louis counties is about 75% complete. Good progress has been made on associated databases. Federal cost-sharing has been applied to this work each year. Effort on Olmsted and Dodge counties have been shifted to another funding source, and both should be complete by the end of the summer. In Aitkin County, the bedrock map is nearly ready for review; the bedrock topography is about 75% complete. The Aitkin surficial map is nearly complete, and work on the cross sections and sand models is underway. For the Rock and Nobles CGAs the bedrock maps are about 85% complete and the bedrock topography is nearly ready for review. The surficial geology for both counties is complete, and the work on the cross sections and sand models is underway. Similarly, in Steele County all bedrock and surficial maps are near completion and work on the cross sections and sand models is underway. The work in Pennington, Lac Qui Parle, Lincoln and Pipestone, and Ottertail counties is still in the early stages with mostly field work underway to support maps. We will conduct rotary sonic drilling in all of these counties (underlined) starting this fall. Counties that are not yet complete have been shifted to the LCCMR18 contract funding.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Work to complete unfinished atlases from previous grants, and possibly start some new projects.

Description: Current atlas projects in St. Louis, Lake, Olmsted, Dodge, Cass, Isanti, Aitkin, Hennepin, Rock, Nobles, and Kandiyohi, and Hubbard counties are those most likely to need funding from this grant to sustain progress.

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 geophysical surveys, pit excavations, and shallow and deep drilling programs. Lab analysis of glacial sediment samples at MGS yields textural and sand grain rock type data. Analysis of the chemical composition and age of the samples helps define and correlate geologic units, including aquifers. Consideration 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 work will begin in counties that have committed as cooperators and have begun the well location task. Contact will be made with new 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.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 2,000,000
Amount Spent: \$ 2,000,000
Balance: \$ 0

Outcome	Completion Date
1. Completion of atlases initiated on prior grants (see list above). St. Louis and Lake may not be completely finished by this date.	12/31/2019
2. Continuing digital release of geologic mapping and databases for subproject areas of the Lake and St. Louis project. The series of subprojects that cover parts of these counties allows us to put more people on the job with fewer delays. This will also allow us to complete and digitally publish subproject maps much sooner than maps of the entire county.	2 of 3 bedrock subprojects, and 2 of 4 surficial subprojects by 1/1/2018
3. Progress on new atlas projects (mapping and associated databases). Projects are waiting for attention in Pipestone, Lincoln, Lac Qui Parle, Otter Tail, Steele, Cook, and Pennington counties. Discussions are underway with several other counties likely to pursue atlas projects. We especially pursue those where water sensitivity, population, growth, water growth, or other management issues are present.	6/30/2019

Activity 1 Status as of 12/31/2017: The Hennepin, Hubbard, Isanti, and Cass atlases should be complete at the end of the next period. The Kandiyohi, Rock, and Nobles atlases still have about a year of work to complete. Aitkin is at about the halfway mark. The St. Louis and Lake atlases will not likely be totally complete within the term of this grant, but we will continue to open-file interim products as they are completed. A draft of the final component of the bedrock map will be completed in the period ahead. As existing projects are completed new projects will be initiated. It is likely that Lincoln and Pipestone counties will be the next to begin.

Activity 1 Status as of 6/30/2018: The atlases of Hubbard, Isanti, Cass, and Hennepin counties are complete, or in the production and printing stage. New atlases have been initiated in Lac Qui Parle, Lincoln, and Pipestone counties. We may complete Kandiyohi, Rock, and Nobles if funding is sufficient. St. Louis, Lake, Aitkin, Pennington, and Otter Tail will not likely be completed before this grant is spent out. Olmsted, Dodge, and Dakota are being funded through DNR or Clean Water Funds. DNR has indicated they may suspend our contract for the year ahead and this would likely halt our progress on one or more of those atlases. Cook County is establishing locations for wells, Mille Lacs and Yellow Medicine counties are considering initiating projects.

Activity 1 Status as of 10/15/2018: The atlases of Hubbard, Isanti, Cass, and Hennepin counties are complete, or in the production and printing stage. New atlases have been initiated in Lac Qui Parle, Lincoln, and Pipestone counties. St. Louis, Lake, Aitkin, Pennington, Rock, Nobles, Kandiyohi, and Otter Tail will not likely be completed before this grant is spent out. Olmsted, Dodge, and Dakota are being funded through DNR or Clean Water Funds. DNR has reduced the size of our contract for the year ahead by \$100,000. Cook County is establishing locations for wells, Mille Lacs is considering initiating a project, and Yellow Medicine County has signed an agreement and is starting the well location work.

Activity 1 Status as of 12/31/2018: The atlases of Hubbard, Isanti, Cass, and Hennepin counties are complete, printed, and digital files posted. New atlases have been initiated in Lac Qui Parle, Lincoln, and Pipestone counties. St. Louis, Lake, Aitkin, Pennington, Rock, Nobles, Kandiyohi, and Otter Tail will not be completed before this grant is spent out. Olmsted, Dodge, and Dakota are being funded through DNR or Clean Water Funds. Cook County is establishing locations for wells, Mille Lacs is considering initiating a project, and Yellow Medicine County has signed an agreement and is starting the well location work. Additional counties have been contacted about starting geologic atlas projects and commitments are expected soon.

Activity 1 Status as of 6/28/2019 (FINAL):

Atlases for Kandiyohi, Hennepin, Hubbard, Isanti, and Cass are complete, printed, and delivered. At this time bedrock and surficial mapping in Lake and St. Louis counties is about 75% complete. Field work is essentially complete for both the bedrock and surficial. We are using federal funds to cost-share the compilation of the mapping into one map for each county. In Aitkin County, the bedrock map is nearly ready for review; the bedrock topography is about 75% complete. The Aitkin surficial map is nearly complete, and work on the cross sections and sand models is underway. For the Rock and Nobles CGAs the bedrock maps are about 85% complete and the bedrock topography is nearly ready for review. The surficial geology for both counties is complete, and the work on the cross sections and sand models is underway. Similarly, in Steele County all bedrock and surficial maps are near completion and work on the cross sections and sand models is underway. The work in Pennington, Lac Qui Parle, Lincoln and Pipestone, and Ottertail counties is still in the early stages with mostly field work underway to support maps. We will conduct rotary sonic drilling in all of these counties (underlined) starting this fall.

Final Report Summary: We have accomplished the expected outcomes of the project, on schedule. Several of the projects to which this grant was applied are particularly resource intensive (St. Louis, Lake, Hennepin). This is due to the size of the study areas, the amount of data to be processed, geologic complexity, travel distance, and previous work. The progress on Lake and St. Louis has exceeded expectations, but it took nearly a third of the grant to accomplish that. Of the 16 atlases covered by this grant, 5 are complete and delivered, and 6 are past the halfway mark. The number of projects that reach completion within a grant period varies greatly, but the amount of progress within a grant is generally very consistent.

V. DISSEMINATION:

Description: Every atlas is produced in portable document format, as geographic information systems files, and in printed form. The digital files are available as a DVD, and are also available from the University of Minnesota Digital Conservancy, and via link from the MGS web page http://www.mngs.umn.edu/county_atlas/countyatlas.htm. Each project culminates with a meeting held in the project area to present the results to the county staff, and any other interested parties. At these meetings the products are described, access to the products is explained, and examples of applications of the products to common resource management situations are demonstrated. The products of subprojects in St. Louis and Lake counties are being released in digital form immediately following technical review. When all the subproject areas are complete county-wide compilations will be created and distributed digitally and in print. The printed copies are shared with the county, who in turn can distribute them to libraries, schools, townships, and other agencies. They are also distributed by the MGS map sales office. We are currently contacting earth science teachers and other educators about using available printed atlases in classroom exercises. Atlas products are also displayed and explained at educational events for SWCD staff and onsite sewage treatment system contractors.

Status as of 12/31/2017: Components of the St. Louis and Lake atlas products are being open-filed as they are completed for immediate use. When all components are complete they will be compiled and printed as atlas packages for each county. At that time a workshop will be held to introduce the products and demonstrate their applications.

Status as of 6/30/2018: Printed products and digital files have been distributed for Isanti and Cass counties. A workshop was held in Isanti and one is planned for Cass. The Hennepin and Hubbard products are about to go to printing. Digital files are prepared. We continue to post interim products for Lake and St. Louis counties, to

present them at meetings as requested, and to report progress in the Minnesota Ground Water Association newsletter.

Status as of 10/15/2018: The Cass and Hubbard workshops will be held jointly as soon as agreement on a date is reached. A workshop for Hennepin will be scheduled. Digital files are posted for Isanti, Cass, and Hubbard, and Hennepin is nearly ready. Printed products are ready for all four counties. An article on the interim atlas products for Lake and St. Louis counties was published in the most recent issue of the MGWA newsletter.

Status as of 12/31/2018: The Cass and Hubbard workshops will be held jointly in the next few months. A workshop for Hennepin will be scheduled. Digital files are posted for Isanti, Cass, and Hubbard, and Hennepin is nearly ready. Printed products are ready for all four counties. An article on the interim atlas products for Lake and St. Louis counties was published in the most recent issue of the MGWA newsletter.

Status as of 6/28/19 (FINAL): Completed atlas products have been posted to the MGS website and linked to the University’s Digital Conservancy:

- Kandiyohi, C-46 (2019) < <https://conservancy.umn.edu/handle/11299/202737>>
- Hennepin, C-45 (2018) < <https://conservancy.umn.edu/handle/11299/200919>>
- Hubbard, C-41 (2018) < <https://conservancy.umn.edu/handle/11299/198898>>
- Cass, C-43 (2018) < <https://conservancy.umn.edu/handle/11299/197690>>
- Isanti, C-44 (2017) < <https://conservancy.umn.edu/handle/11299/192515>>

Interim products that will become the St. Louis and Lake County Atlases are also available:
 OFR-16-4 < <https://conservancy.umn.edu/handle/11299/183258>>

Final Report Summary:

Completed atlas products have been posted to the MGS website and linked to the University’s Digital Conservancy as noted above. PDF products as well as all of the related GIS data are available on these pages. In addition, the MGS hosts an [Open Data Portal](#) on which many of our county geologic atlases are presented as “Story Maps” that allow for direct access of the data without any special software or interface.

The Hennepin County workshop was held on April 22 at the County Library in Ridgedale. An article about the atlas and related workshop was published by the [SWNewsMedia](#) . Formal presentations for [Cass](#) and Hubbard counties were held on March 6 in Backus and Park Rapids, respectively. An update to the Cass County Board was held last summer and written up by the [Echo Journal](#).

VI. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview:

***This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 1,473,035	A team of 20 to 25 MGS staff; includes 27.2 to 33.5% fringe cost depending on class
Professional/Technical/Service Contracts:	\$ 279,000	\$225,000 for drilling; Drilling costs are \$45 to \$75 per foot, depth dependent; this covers 4,700 feet of drilling. Drilling augmented with DNR funds. \$54,000 for analytical services (1,000 geochem analyses @\$40 and 14 geochron analyses @\$1,000; both chosen by competitive bidding.

Equipment/Tools/Supplies:	\$ 34,500	Core boxes (about 2,700 boxes), Giddings Probe expendables (augers, parts , other \$2,750 per county) maps, lab water
Capital Expenditures over \$5,000:	\$ 34,000	Dedicated transport for geophysical logging
Printing:	\$ 72,500	Competitive bid for offset printing; 6 plates 3' by 3', four color per county; 350 to 500 copies per county; 25,000 to 36,000 maps. This would cover printing of about 5 atlases.
Travel Expenses in MN:	\$ 106,965	This covers the cost of putting teams of geologists in the field. It includes meals, lodging, and vehicle rental costs. Most projects require months of field time. Vehicles are rented for field time only.
TOTAL ENRTF BUDGET:		\$ 2,000,000

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: Dedicated transport for geophysical logging equipment, some of which was purchased on LCCMR grants. This equipment is deployed about 200 days per year and supports County Geologic Atlases, other MGS research (including some supported by LCCMR), and also supports MN Dept. of Health well construction regulation.

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: about 18 FTE

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: drilling contract 1 FTE; printing contract 0.2 FTE; analytical services contract 0.5 FTE; total 1.7 FTE

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
USGS STATEMAP cost share	\$315,000	\$155,183	\$98,494 for year ahead, CGA mapping cost-share (spent \$55,996 as of this report)
USGS Great Lakes cost share	\$43,403	\$0	CGA mapping cost-share
State			
DNR contract	\$551,000 \$457,000	\$420,653	CGA mapping, drilling augmentation, award reduced to \$457,000
Clean Water Funds	\$250,000	\$92,446	CGA mapping
TOTAL OTHER FUNDS:	\$1,065,403	\$668,282	

VII. PROJECT STRATEGY:

A. Project Partners: Under a separate workplan and budget DNR Waters and Ecological Services is receiving funds to work on Part B of County Geologic Atlases, and county partners will supply in-kind services.

Partners receiving ENRTF funding

- None in this round of funding. DNR Waters and Ecological Services has grants in place.

Partners NOT receiving ENRTF funding

- DNR Waters and Ecological Services produces Part B of the county geologic atlases- funded separately.
- County partners participate in establishing well locations. They are self-funded.

B. Project Impact and Long-term Strategy:

C. Funding History:

Funding Source and Use of Funds	M.L. 2007 or FY08-10	M.L. 2008 or FY09-12	M.L. 2009 or FY10-13	M.L. 2010 or FY11-14	M.L. 2011 or FY12-14	M.L. 2013 or FY14-16	M.L. 2015 or FY16-18
ENRTF Benton and Chisago CGAs	\$400,000						
ENRTF Blue Earth, Nicollet, Sibley CGAs		\$706,000					
ENRTF Anoka and Wright CGAs			\$820,000				
ENRTF Sherburne and Morrison CGAs and related research				\$1,130,000			
ENRTF Redwood, Meeker, Brown					\$1,200,000		
ENRTF Wadena, Hubbard, Becker						\$1,200,000	
ENRTF St. Louis, Lake, Olmsted update, Kandiyohi, Aitkin							\$2,040,000
Clean Water Funds (Houston, Winona)				\$305,000			
Clean Water Funds (Cass, Isanti, Hennepin update, Dodge, other)						\$1,230,000	

VIII. REPORTING REQUIREMENTS:

- The project is for 2 years, will begin on 07/01/2017, and end on 06/30/2019.
- Periodic project status update reports will be submitted December 31 and June 30 of each year.
- A final report and associated products will be submitted between June 30 and August 15, 2019.

IX. VISUAL COMPONENT or MAP(S): see attached map of County Geologic Atlas Part A Status

**Environment and Natural Resources Trust Fund
M.L. 2017 Project Budget**



Project Title: Minnesota Geological Survey Geologic Atlases for Water Management

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 03a

Project Manager: Barbara A. Lusardi

Organization: Minnesota Geological Survey, University of Minnesota

M.L. 2017 ENRTF Appropriation: \$ 2,000,000

Project Length and Completion Date: 2 Years, June 30, 2019

Date of Report: 06/28/2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget 6/21/19	Amount Spent	Activity 1 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM					
Personnel (Wages and Benefits)					
Between 20 and 25 MGS staff (mostly geologists but also GIS, hydrogeologist, editor, database specialists, field assistants) will be assigned to work on geologic atlases on a part time basis; chosen based on the skill sets necessary for the geology of the selected counties. The total effort averages about 4 FTE per atlas or about 18 FTE for this proposal. The cost includes the University fringe benefits (27.2% to 33.5% depending on class).	\$1,526,226	\$1,526,226	\$0	\$1,526,226	\$0
Professional/Technical/Service Contracts					
Rotary-sonic test hole drilling (awarded by a competitive bidding process). Generally 4-6 holes per county for 7 counties drilling this year. Rotasonic method yields 4" undisturbed core of unconsolidated deposits. Average hole cost is \$12,767 but varies with depth. Depth corresponds to depth of bedrock surface. Drilling costs are shared with support from our DNR contract (about one third)	\$208,080	\$208,080	\$0	\$208,080	\$0
Printing					
Offset printing; awarded by competitive bid; typically 500 copies of each of 6 plates (each 3' by 3' and four color) per county, current prices about \$14,000 per county. Print run has been lowered as there are more online users, and we are exploring means to lower this further. This amount would cover about 5 counties	\$62,481	\$62,481	\$0	\$62,481	\$0
Professional/Technical/Service Contracts					
Geochemical and geochronological analyses to support aquifer correlation and delineation; laboratories will be evaluated based on cost and capabilities in accordance with U of M purchasing rules. Contracts or bids as necessary. We anticipate about 1,000 geochem analyses (\$40,000) and 14 geochron analyses (\$14,000).	\$34,277	\$34,277	\$0	\$34,277	\$0
Equipment/Tools/Supplies					
Field and lab expendables (batteries, sample bags, augers, Giddings Probe repair parts, maps, core boxes (\$21,000), distilled water)	\$31,547	\$31,547	\$0	\$31,547	\$0
Travel expenses in Minnesota					
Travel: vehicle rental and mileage (approx. \$245 to \$275 per week, \$0.17 to \$0.37 per mile); meals (up to \$46 per day); lodging (\$89 to \$142 per day). Amounts cannot be calculated until project locations (counties) are known. Rentals from U Fleet Services as needed, typically on weekly basis. All costs in accordance with U of M policy	\$111,098	\$111,098	\$0	\$111,098	\$0
Other					
Replacement of dedicated transport for borehole geophysical logging equipment. The equipment is permanently mounted in the vehicle. Borehole geophysics operations support atlases, but also Department of Health operations, DNR observation well program, and other uses.	\$26,291	\$26,291	\$0	\$26,291	\$0
COLUMN TOTAL	\$2,000,000	\$2,000,000	\$0	\$2,000,000	\$0

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	TOTAL BUDGET	TOTAL BALANCE	
BUDGET ITEM	<i>Initiate new geologic atlases and complete</i>					
Personnel (Wages and Benefits)						
Between 20 and 25 MGS staff (mostly geologists but also GIS, hydrogeologist, editor, database specialists, field assistants) will be assigned to work on geologic atlases on a part time basis; chosen based on the skill sets necessary for the geology of the selected counties. The total effort averages about 4 FTE per atlas or about 18 FTE for this proposal. The cost includes the University fringe benefits (26% to 31.8% depending on class).	\$3,345,625	\$0	\$3,345,625	\$3,345,625	\$3,345,625	\$1,473,035
Professional/Technical/Service Contracts						
Rotary-sonic test hole drilling (awarded by a competitive bidding process). Generally 4-6 holes per county for 7 counties drilling this year. Rotasonic method yields 4" undisturbed core of unconsolidated deposits. Average hole cost is \$12,767 but varies with depth. Depth corresponds to depth of bedrock surface. Drilling costs are shared with support from our DNR contract (about one third).	\$687,500		\$687,500	\$687,500	\$687,500	\$225,000
Printing						
Offset printing; awarded by competitive bid; typically 500 copies of each of 6 plates (each 3' by 3' and four color) per county, current prices about \$14,500 per county. Print run has been lowered as there are more online users, and we are exploring means to lower this further. This amount would cover about 5 counties.	\$175,000		\$175,000	\$175,000	\$175,000	\$72,500
Professional/Technical/Service Contracts						
Geochemical and geochronological analyses to support aquifer correlation and delineation; laboratories will be evaluated based on cost and capabilities in accordance with U of M purchasing rules. Contracts or bids as necessary. We anticipate about 1,000 geochem analyses (\$40,000) and 14 geochron analyses (\$14,000).	\$131,250		\$131,250	\$131,250	\$131,250	\$54,000
Equipment/Tools/Supplies						
Field and lab expendables (batteries, sample bags, augers, Giddings Probe repair parts, maps, core boxes (\$21,000), distilled water)	\$106,250		\$106,250	\$106,250	\$106,250	\$34,500
Travel expenses in Minnesota						
Travel: vehicle rental and mileage (approx. \$245 to \$275 per week, \$0.17 to \$0.37 per mile); meals (up to \$46 per day); lodging (\$89 to \$142 per day). Amounts cannot be calculated until project locations (counties) are known. Rentals from U Fleet Services as needed, typically on weekly basis. All costs in accordance with U of M policy.	\$249,375		\$249,375	\$249,375	\$249,375	\$106,965
Other						
Replacement of dedicated transport for borehole geophysical logging equipment. The equipment is permanently mounted in the vehicle. Borehole geophysics operations support atlases, but also Department of Health operations, DNR observation well program, and other uses.	\$34,000		\$34,000	\$34,000	\$34,000	\$34,000
COLUMN TOTAL	\$4,729,000	\$0	\$4,729,000	\$4,729,000	\$4,729,000	\$2,000,000