

# Final Abstract

Final Report Approved on November 27, 2024

## M.L. 2020 Project Abstract

For the Period Ending June 30, 2024

**Project Title:** County Groundwater Atlas

**Project Manager:** Vanessa Baratta-Person

**Affiliation:** MN DNR - Ecological and Water Resources Division

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**Website:** <https://www.dnr.state.mn.us/ewr/index.html>

**Funding Source:**

**Fiscal Year:**

**Legal Citation:** M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 03c

**Appropriation Amount:** \$1,125,000

**Amount Spent:** \$1,125,000

**Amount Remaining:** -

### Sound bite of Project Outcomes and Results

The Groundwater Atlas provides foundational, science-based, information for use and management of Minnesota groundwaters. The atlas is valuable to government, industry, and for research. The grant supported work on thirteen atlases and publication of county groundwater atlases (County Atlas Part B) for Cass and Becker counties.

### Overall Project Outcome and Results

The Groundwater Atlas provides foundational, science-based, information for use and management of Minnesota groundwaters. The atlas is valuable to government, industry, and research. During the period of the grant, county groundwater atlases (County Atlas Part B) were published for Cass and Becker counties. Mapping activities also continued through the end of the grant in Aitkin, Dodge, Houston, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena counties, with publication of completed groundwater atlases for Hubbard, Wadena, Dodge, and Houston expected in 2024.

Groundwater sampling is a key element in the completion of an atlas. Sampling efforts necessarily slowed during the pandemic. However, collection of core samples for the Steele, Aitkin, and Otter Tail County Groundwater Atlases as well

as carbon-14 sampling for Kandiyohi, Nobles, Rock, and Steele counties was completed. Letter reports with all sampling results were provided to well owners for all wells sampled as part of this grant. DNR Groundwater Atlas staff completed field work for the geophysical investigation of Pennington, Red Lake, and Polk counties as part of the atlas process.

As part of the atlas development process, DNR staff conduct reviews of draft County Geologic Atlases (Part A) prepared by the MGS. During the grant this included DNR reviews for components of Dakota, Lac Qui Parle, Lake, Lincoln, Otter Tail, Pipestone, Scott, and Traverse County Geologic Atlases.

Dissemination and outreach activities continued throughout the grant period including presentations, news releases, GovDelivery list serve (6,000 recipients) notifications, and virtual meetings with county staff and county boards, seminars, and presentations.

### **Project Results Use and Dissemination**

Dissemination activities focused on notification of sampling activities and publication of atlases through news releases and GovDelivery, participation in seminars, presentations, and field trips to a diverse set of stakeholders and resources managers including county SWCDs, county boards, the Clean Water Council, BWSR, MPCA, the Legislative Conference of Minnesota Counties, LCCMR events, and others. Dissemination also included workshops with counties, publication of summary articles, updated website and many personal contacts with users of the atlas. Completed atlas products have been posted to the website noted above, and include PDF products as well as all of the related GIS data.



## Environment and Natural Resources Trust Fund

M.L. 2020 Approved Final Report

### General Information

**Date:** December 11, 2024

**ID Number:** 2020-009

**Staff Lead:** Noah Fribley

**Project Title:** County Groundwater Atlas

**Project Budget:** \$1,125,000

### Project Manager Information

**Name:** Vanessa Baratta-Person

**Organization:** MN DNR - Ecological and Water Resources Division

**Office Telephone:** (651) 259-5685

**Email:** [vanessa.baratta@state.mn.us](mailto:vanessa.baratta@state.mn.us)

**Web Address:** <https://www.dnr.state.mn.us/ewr/index.html>

### Project Reporting

**Final Report Approved:** November 27, 2024

**Reporting Status:** Project Completed

**Date of Last Action:** November 27, 2024

**Project Completion:** June 30, 2024

### Legal Information

**Legal Citation:** M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 03c

**Appropriation Language:** \$1,125,000 the second year is from the trust fund to the commissioner of natural resources to continue producing county geologic atlases to inform management of surface water and groundwater resources for drinking water and other purposes. This appropriation is for Part B, to characterize the potential water yields of aquifers and the aquifers' sensitivity to contamination.

**Appropriation End Date:** June 30, 2024

## Narrative

**Project Summary:** This project supports continuing development of the County Groundwater Atlases. The goal is to provide this valuable water and resource management “information infrastructure” to every county in Minnesota.

**Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

Groundwater is one of the most valuable, often overlooked, and misunderstood natural resources. Our state is placing more demands on our groundwater every year. The challenge to balance wise-use and protection will only increase over time. Minnesota’s healthy environment, growing economy, and vibrant quality of life requires informed use, management and planning related to all the state’s natural resources, including groundwater. Industry, researchers, state and local governments and others need comprehensive and accurate information about those resources to do their jobs on behalf of all Minnesotans. The Groundwater Atlas is one important tool for professional planners, resource managers, researchers and citizens to help make these critical informed judgments.

**What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.**

To address this pressing need, our goal is a Groundwater Atlas for all Minnesota counties as soon as possible. This appropriation will support atlas work on four or more counties depending upon completion of the Part A Atlas by the MGS and when they are provided to DNR. This appropriation may include work on Dodge, Hubbard, Olmsted, and Wadena.

The atlas is a critical tool for a broad range of resource managers. It provides comprehensive geologic and groundwater mapping, pollution sensitivity and recharge potential of aquifers, water chemistry of major aquifers, age-dating of groundwater, groundwater flow direction of key aquifers, information about surface water-groundwater interaction and associated data for planners, managers, scientists and citizens statewide for a wide variety of projects such as: water supply planning, land use decisions, resource development, resource protection, transportation planning, agricultural water supply, groundwater research/studies, Environmental Impact Statements and more.

**What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state’s natural resources?**

The atlases provide very specific and foundational natural resource data and information to a wide variety of resource managers for maintaining long-term stable water supplies for growing economies, and help protect ecological systems that rely on groundwater. Groundwater Atlases also provide information and training for future resource managers, researchers and citizens who in the decades ahead, will be grappling with the many challenges of balancing use and preservation of their groundwater resources.

## Project Location

**What is the best scale for describing where your work will take place?**

Statewide

**What is the best scale to describe the area impacted by your work?**

Statewide

**When will the work impact occur?**

During the Project and In the Future

## Activities and Milestones

### Activity 1: Groundwater & surface water sampling and analysis

**Activity Budget:** \$283,978

**Activity Description:**

The DNR will analyze Geologic Atlas data (from the Minnesota Geological Survey), prepare a sampling plan for up to 100 wells in each of up to four counties and selected surface water bodies, compile field chemistry; and analyze groundwater samples for natural chemistry and age-dating isotopes.

Project design and data collection for counties in southeast Minnesota may include specialty mapping of the karst groundwater conditions, including dye tracing to help understand complex groundwater flow conditions in this area of vulnerable natural resources. Mapping in northeast Minnesota may also require specialized sampling and analysis techniques.

**Activity Milestones:**

Description	Approximate Completion Date
Complete water sampling in 2 counties	June 30, 2022
Complete water sampling in 2 counties	June 30, 2023

### Activity 2: Groundwater Atlas preparation and publication

**Activity Budget:** \$781,022

**Activity Description:**

The activity includes preparing, writing and publishing atlas following data collection. The activity includes analyzing collected data (geology, water chemistry, water usage, other), preparing groundwater flow direction maps and groundwater cross sections, pollution sensitivity maps, preparing and publishing reports (hardcopy and web). This activity includes providing GIS data layers for use in decision-support systems, such as county land use planning, and county environmental programs. The assembled GIS layers and electronic files also make the information usable for local, regional, and state decision makers, scientists, industry and citizens.

**Activity Milestones:**

Description	Approximate Completion Date
Preparation and publication of up to 1-2 complete County Groundwater Atlases	October 31, 2022
Preparation and publication of up to 1-2 complete County Groundwater Atlases	October 31, 2023

### Activity 3: Atlas Stakeholder Workshop & Dissemination Activities

**Activity Budget:** \$60,000

**Activity Description:**

To introduce local resource professionals to the atlas when complete, for this activity DNR will provide hands-on workshops and potentially field trips in cooperation with county staff. Workshops include real-life exercises that demonstrate some of the critical and creative ways to use the groundwater atlas to manage resources. DNR will conduct other dissemination activities as detailed in that section of this work plan.

**Activity Milestones:**

<b>Description</b>	<b>Approximate Completion Date</b>
Completion of 1-2 Groundwater Atlas Workshops and other dissemination activities for completed Atlases	December 31, 2022
Completion of 1-2 Groundwater Atlas Workshops and other dissemination activities for completed Atlases	December 31, 2023

## Dissemination

**Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.**

At the completion of a Groundwater Atlas for a county, DNR provides direct personal notification to county partners of the availability of the atlas. DNR also notifies LCCMR staff and approximately 4,000 email recipients (listserv: <http://www.dnr.state.mn.us/emailupdates>) who have signed up to receive such notifications. DNR uses official news releases that are picked up by media outlets across the state, and targeted news releases to county media. Additional dissemination outlets include articles or updates in newsletters for organizations such as the Legislative Water Commission, Association of Minnesota County's, the Minnesota Ground Water Association, internal DNR agency news releases, and presentations at technical and local conferences across Minnesota.

Each completed atlas is printed in paper format and distributed to the county, libraries, state agencies, and other organizations. County representatives are provided with up to 200 paper (hard) copies of the final atlas to distribute to local stakeholders at no charge. Project data, including water chemistry data and GIS data are available on the DNR web site. Water chemistry data are also incorporated into the interagency EquiS database that can be used by all state government entities. PDF versions of the complete report are posted to the DNR web site: [https://www.dnr.state.mn.us/waters/groundwater\\_section/mapping/status.html](https://www.dnr.state.mn.us/waters/groundwater_section/mapping/status.html).

Following the publication of each atlas, a local workshop is held to introduce the report contents and train users in its application. County representatives host the workshop, inviting interested parties. Real-life exercises based on the specific groundwater resources of the county are used to walk stakeholders through the use of the comprehensive information provided in the CGA for their county. Following dissemination and the local workshop, DNR staff are available to the counties and others to answer questions and assist in the continued application and use of the atlas.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) is acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines.

## Long-Term Implementation and Funding

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?**

The DNR provides training and support to atlas users, through workshops, field trips, user guides, conference and media presentations and importantly, ongoing support to individual county and local resource managers on specific projects and challenges. Additionally, DNR uses data from each newly completed atlas to update state-wide atlas products like the Groundwater Provinces Maps, Pollution Sensitivity of the Bedrock Surface (HG-01) & Near Surface Materials (HG-02), spring shed mapping and the extensive chemistry database. With ongoing funding from DNR, atlas groundwater professional staff will continue to provide atlas-related support as needed after each county atlas is completed.

## Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
County Geologic Atlases - Part B	M.L. 2015, Chp. 76, Sec. 2, Subd. 03b	\$2,000,000
County Geologic Atlases - Part B, Mapping Aquifer Hydrology	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03o	\$2,400,000





## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount	\$ Amount Spent	\$ Amount Remaining
<b>Personnel</b>										
Hydrogeologist Supervisor		Project Manager/Senior Technical			20%	0.5	X	\$86,454	-	-
Research Scientist/Hydrogeologist		Chief Author/Senior Technical			20%	1	X	\$140,000	-	-
Hydrogeologist 3		Hydrogeologist/Lead Author			20%	1	X	\$125,000	-	-
Hydrogeologist 2		Hydrogeologist/Author			20%	1	X	\$114,000	-	-
Hydrogeologist 2		Hydrogeologist/Author			20%	0.5	X	\$57,000	-	-
Hydrogeologist 2		Hydrogeologist/Author			20%	0.5	X	\$57,000	-	-
Hydrogeologist 2/Engineer		Hydrogeologist/Author			20%	0.5	X	\$57,000	-	-
Hydrogeologist 1		Hydrogeologist/Fieldwork Lead			20%	0.5		\$43,976	-	-
Information Officer 2		Technical Editor			20%	0.5	X	\$45,000	-	-
Research Analyst Senior		Lead GIS			20%	0.5	X	\$48,000	-	-
							<b>Sub Total</b>	<b>\$773,430</b>	<b>\$773,430</b>	-
<b>Contracts and Services</b>										
Minnesota Department of Agriculture Chemistry Laboratory	Professional or Technical Service Contract	MDA Laboratory provides comprehensive chemical analysis of approximately 110 groundwater samples from each county included in the atlas schedule. With this funding, groundwater from four counties would be analyzed by the MDA for approximately 440 samples analyzed, at a total cost of approximately \$142,000.		X		1		\$152,627	\$152,627	-
University of Minnesota Chemistry Laboratory	Professional or Technical Service Contract	UM Chemistry Laboratory provides Carbon-14 analysis of groundwater samples collected for each county to understand groundwater residence time and groundwater-surface water connections. Analytical costs are		X		0.1		-	-	-

		approximately \$7,000 per county, or \$28,000 for four counties.								
University of Waterloo	Professional or Technical Service Contract	The University of Waterloo provides unique laboratory analytical service that are not readily available from other vendors for tritium and stable isotopes in groundwater. Cost per county for tritium and stable isotope analysis is approximately \$16,500, or a total cost for four counties of approximately \$66,000		X		0.2		\$75,780	\$75,780	-
							<b>Sub Total</b>	<b>\$228,407</b>	<b>\$228,407</b>	-
<b>Equipment, Tools, and Supplies</b>										
	Tools and Supplies	Supplies, including expendable water sampling supplies (Approx. 440 samples total. \$30/sample: high volume microfilters; valves and tubing for each well sampled, titration supplies (est \$12,500). Shipping costs for water samples to laboratories (est \$1,000).	Disposable supplies used for approximately 110 samples in each of the four counties sampled as part of this proposal.					\$19,728	\$19,728	-
	Equipment	Non-capital equipment including: water sampling and measurement tools and field analytical meters and equipment (est \$7,500 total for replacement multiple, individual meters: Trimble, Hack water quality meters, Rugged Pro field probes and titrate system).	Necessary equipment and instruments for groundwater sampling.					\$8,937	\$8,937	-
							<b>Sub Total</b>	<b>\$28,665</b>	<b>\$28,665</b>	-
<b>Capital Expenditures</b>										
							<b>Sub Total</b>	-	-	-
<b>Acquisitions and Stewardship</b>										
							<b>Sub Total</b>	-	-	-
<b>Travel In Minnesota</b>										

	Miles/ Meals/ Lodging	In-state vehicle mileage (est \$13,500) and travel expenses (est \$13,478), primarily for water sampling and field data collection in up to four counties. All travel per DNR travel policy.	Groundwater sampling in up to four counties.					\$30,111	\$30,111	-	
								<b>Sub Total</b>	<b>\$30,111</b>	<b>\$30,111</b>	-
<b>Travel Outside Minnesota</b>											
								<b>Sub Total</b>	-	-	-
<b>Printing and Publication</b>											
	Printing	Each Groundwater Atlas includes printing (off-set and digital) of approximately 200 copies: 1) One 40-60 page bound report with up to 40 color figures, maps and tables 2) Three to four, full color map plates that are each approximately 24-inches by 36-inches in size. Some Atlases require a second, figures only, bound report. Printing costs also includes preparing 1,000 post cards for each county and postage to mail to citizens to obtain permission for water well sampling. Total anticipated per county printing costs estimated to be \$9,000. Printing costs for four (4) county atlas estimated to be \$36,000.	Post cards are used to request permission from well owners to collect samples from their wells. Approximately 200 copies of the Groundwater Atlas are printed in hard copy for each county and for for distribution to stakeholders and resource managers. Postage costs are included for post cards and sending copies of the atlas to stakeholders.					\$16,341	\$16,341	-	
								<b>Sub Total</b>	<b>\$16,341</b>	<b>\$16,341</b>	-
<b>Other Expenses</b>											
		*Direct and Necessary expenses: HR Support (~\$9,962), Safety Support (~\$1,803), Financial Support (~\$10,061), Communication Support (~\$1,388), IT Support (~\$23,695),	*Direct and Necessary Expenses includes all Department Support Services.					\$48,046	\$48,046	-	

		and Planning Support (~\$1,138) necessary to accomplish funded programs/projects.								
							<b>Sub Total</b>	<b>\$48,046</b>	<b>\$48,046</b>	<b>-</b>
							<b>Grand Total</b>	<b>\$1,125,000</b>	<b>\$1,125,000</b>	<b>-</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Personnel - Hydrogeologist Supervisor		Project Manager/Senior Technical	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
Personnel - Research Scientist/Hydrogeologist		Chief Author/Senior Technical	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
Personnel - Hydrogeologist 3		Hydrogeologist/Lead Author	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
Personnel - Hydrogeologist 2		Hydrogeologist/Author	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
Personnel - Hydrogeologist 2		Hydrogeologist/Author	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
Personnel - Hydrogeologist 2		Hydrogeologist/Author	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work.

			Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
<b>Personnel</b> - Hydrogeologist 2/Engineer		Hydrogeologist/Author	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
<b>Personnel</b> - Information Officer 2		Technical Editor	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
<b>Personnel</b> - Research Analyst Senior		Lead GIS	<b>Classified</b> : Because the atlas program represents a longer-term project (decades) to complete an atlas for each county, most staff paid for with ENRTF funds are in classified positions hired specifically to accelerate the completion of the atlas work. Staff in these positions generally did not have and currently do not have other assignments. The positions will be canceled and the approved complement of the agency reduced accordingly once the appropriation has been spent.
<b>Contracts and Services</b> - Minnesota Department of Agriculture Chemistry Laboratory	Professional or Technical Service Contract	MDA Laboratory provides comprehensive chemical analysis of approximately 110 groundwater samples from each county included in the atlas schedule. With this funding, groundwater from four counties would be analyzed by the MDA for approximately 440 samples analyzed, at a total cost of approximately \$142,000.	As a State Agency, the MDA is given preference for this contract.
<b>Contracts and Services</b> - University of Minnesota Chemistry Laboratory	Professional or Technical Service Contract	UM Chemistry Laboratory provides Carbon-14 analysis of groundwater samples collected for each county to understand groundwater residence time and groundwater-surface water connections. Analytical costs are approximately	This is unique laboratory analytical work not readily available from other contractors, and as a state entity, the University of Minnesota Laboratory is given preference for this work.

		\$7,000 per county, or \$28,000 for four counties.	
<b>Contracts and Services - University of Waterloo</b>	Professional or Technical Service Contract	The University of Waterloo provides unique laboratory analytical service that are not readily available from other vendors for tritium and stable isotopes in groundwater. Cost per county for tritium and stable isotope analysis is approximately \$16,500, or a total cost for four counties of approximately \$66,000	This is unique laboratory analytical work not readily available from other contractors.

## Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount	\$ Amount Spent	\$ Amount Remaining
<b>State</b>						
Cash	DNR General Funds appropriated by the legislature, and distributed by the commissioner of the DNR.	DNR General Funds to support salaries for atlas staff (3 FTE) and related support resources for the project period to support completion of groundwater atlases.	Secured	\$1,200,000	\$162,000	\$1,038,000
			<b>State Sub Total</b>	<b>\$1,200,000</b>	<b>\$162,000</b>	<b>\$1,038,000</b>
<b>Non-State</b>						
In-Kind	In-Kind county/local government assistance through staff, resources, facilities and goods.	County/local government assistance to arrange water sampling access, arrange and sponsor local training workshops, field trips and training. Approximately \$4,000/county for up to four counties.	Pending	\$16,000	-	\$16,000
			<b>Non State Sub Total</b>	<b>\$16,000</b>	<b>-</b>	<b>\$16,000</b>
			<b>Funds Total</b>	<b>\$1,216,000</b>	<b>\$162,000</b>	<b>\$1,054,000</b>



## Attachments

### Required Attachments

#### *Visual Component*

File: [b577e711-ad7.pdf](#)

#### *Alternate Text for Visual Component*

The Minnesota map shows the status of groundwater atlases for each county as of July 2021. Counties are colored according to their status as either, 1) not yet started, 2) complete/anticipated completion, or as 3) 2020-009 counties. This appropriation includes work on portions of a groundwater atlas for the four counties shown as 2020-009 counties: Dodge, Hubbard, Olmsted and Wadena...

### Supplemental Attachments

#### *Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other*

Title	File
2020-009 Background Check Certification	<a href="#">0e1f35f7-412.pdf</a>
Becker County Report	<a href="#">2508740d-107.pdf</a>
Becker County Chemistry Plate 7	<a href="#">93339a3a-1df.pdf</a>
Becker County Plate 8	<a href="#">5d3a47a0-ad2.pdf</a>
Becker County Plate 9	<a href="#">18297608-65d.pdf</a>
Cass County Groundwater Atlas	<a href="#">a85cfdcf-c3d.pdf</a>
Cass County Groundwater Atlas	<a href="#">b67f6876-03b.pdf</a>
Cass County Chemistry Plate 7	<a href="#">5313570c-e33.pdf</a>
Cass County Plate 8	<a href="#">09ae16b3-76e.pdf</a>
Cass Workshop Presentation	<a href="#">13885cdd-a8a.pdf</a>
Winona Workshop Presentation	<a href="#">ee412896-514.pdf</a>
Hennepin Presentation	<a href="#">d3ecd8f8-d5a.pdf</a>
Kanabec Workshop Presentation	<a href="#">d7d37f4d-d30.pdf</a>

### Difference between Proposal and Work Plan

#### *Describe changes from Proposal to Work Plan Stage*

DNR added more detailed activities and milestones per LCCMR staff recommendations. The activities and milestones had to be revised to account for overlapping appropriations (2020-009, 2021-071) resulting from the legislative process in 2020/2021. The dissemination section was added and small updates were made to the text of other sections. We selected state-wide work and impacts from new drop downs because our plans call for work across the state and we update statewide coverages (near surface and bedrock sensitivity and water table) every time a new county atlas is completed. No changes to budget or scope were made. Added the Background Certification form (8/2/2021).

## Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

**Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?**

N/A

**Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?**

Yes, I understand the Commissioner's Plan applies.

**Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?**

No

**Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?**

N/A

**Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?**

N/A

**Does your project include original, hypothesis-driven research?**

Yes

**Does the organization have a fiscal agent for this project?**

No

## Work Plan Amendments

Amendment ID	Request Type	Changes made on the following pages	Explanation & justification for Amendment Request (word limit 75)	Date Submitted	Approved	Date of LCCMR Action
1	Amendment Request	<ul style="list-style-type: none"> <li>Budget - Capital, Equipment, Tools, and Supplies</li> <li>Budget - Printing and Publication</li> </ul>	Cost of supplies increased dramatically since this budget was prepared three years ago, and supply chain issues required us to order larger volumes of sample bottles, filters and gloves than needed or we risked not getting supplies in time. Smaller orders were not available. We will be able to use the extra supplies in the future. On the other hand, printing costs have been less than budgeted, so we will shift from printing to supplies.	October 3, 2022	Yes	October 17, 2022
2	Amendment Request	<ul style="list-style-type: none"> <li>Budget - Capital, Equipment, Tools, and Supplies</li> <li>Budget - Travel and Conferences</li> <li>Budget - Printing and Publication</li> </ul>	Cost of supplies, equipment and travel continued to increase since this budget was prepared more than three years ago, and supply chain issues required us to continue to order larger volumes of sample bottles, filters and other essentials or we risked not getting supplies in time. Smaller orders were not available. We will be able to use the extra supplies in the future. On the other hand, printing costs have been less than budgeted.	April 10, 2023	Yes	April 26, 2023
3	Project Manager	<p>Previous Manager: Paul Putzier (paul.putzier@state.mn.us)</p> <p>New Manager: Vanessa Baratta-Person (vanessa.baratta@state.mn.us)</p>	Current Project Manager is retiring.	September 1, 2023	Yes	September 7, 2023
4	Amendment Request	<ul style="list-style-type: none"> <li>Budget</li> <li>Project Collaborators - Project Manager Info</li> <li>Budget - Personnel</li> <li>Budget - Professional / Technical Contracts</li> </ul>	Adjustments were made to the budget to shift funds from U of M lab and printing sections to cover higher costs in other labs and categories. Carbon-14 analysis was shifted from the U of M lab to MDA and Waterloo causing overages	October 9, 2023	Yes	January 19, 2024

		<ul style="list-style-type: none"><li>• Budget - Capital, Equipment, Tools, and Supplies</li><li>• Budget - Travel and Conferences</li><li>• Budget - Printing and Publication</li><li>• Budget - Other</li></ul>	in those categories and no use of money from U of M. Remaining money was shifted to payroll to use up the last of the fund.			
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# Status Update Reporting

## Final Status Update August 14, 2024

**Date Submitted:** June 24, 2024

**Date Approved:** October 15, 2024

### Overall Update

All funds for this grant were utilized by the end of the April 2024 assessment period and all of the activities and milestones have been completed. The summaries presented in each of the activities sections of this update represent an overview of the accomplishments during the entire grant usage.

### Activity 1

This grant supported the collection of core samples for the Steele, Aitkin, and Otter Tail County Groundwater Atlases. The sampling for these three counties amounted to a total of 400 samples (4 standard counties) because Otter Tail County was so large it was sampled as if it were two counties. Carbon-14 sampling was also completed for Kandiyohi, Nobles, Rock, and Steele counties. Sampling for Ultra Low Tritium was completed in four counties to understand value of next generation of groundwater age dating analysis. Geophysical investigations were also completed for Pennington, Red Lake, and Polk counties.

This activity was previously marked complete.

*(This activity marked as complete as of this status update)*

### Activity 2

This grant supported the publication of both Cass and Becker County Groundwater Atlas. It also supported continued work on atlases for Aitkin, Dodge, Houston, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena counties. DNR staff conducted reviews of multiple draft components of Geologic Atlases (Part A) prepared by the MGS. These reviews included components of Dakota, Lac Qui Parle, Lake, Lincoln, Otter Tail, Pipestone, Scott, and Traverse County Geologic Atlases.

This activity was previously marked complete.

*(This activity marked as complete as of this status update)*

### Activity 3

Workshops were delayed when this appropriation was first awarded due to Covid-19 restrictions on in-person meetings. Once in person meeting resumed, this grant supported workshops for the completed groundwater atlases in Cass, Winona, Hennepin, and Kanabec counties. Additional requests for information and presentations were provided to both county and state agency staff.

This activity was previously marked complete.

*(This activity marked as complete as of this status update)*

### Dissemination

In addition to completing workshops and communications with our county partners for Winona, Cass, Hennepin, and Kanabec, atlas staff: participated/presented in a field trip for DNR leadership, worked the DNR State Fair Information Booth to discuss groundwater issues and the atlas work funded by LCCMR, fielded data requests from Blue Earth County staff, MPCA and Houston Engineering, updated the Groundwater Atlas webpages to make our work more accessible to end users, and participated with Minnesota Water Well Association on questions about the extent of the Mount Simon Aquifer.

Atlas staff also published news releases and updates via GovDelivery (over 7,000 people on the list-serve) for work in Winona, Hennepin, Kanabec, and Otter Tail counties. As well as presented two papers at International Karst Conference, presented to Geological Society of Minnesota and Environmental Engineering class at University of St. Thomas. DNR Atlas staff hosted an important meeting with approximately twenty-five professionals from a wide variety of partners to discuss opportunities and approaches to completing groundwater atlases in northeastern Minnesota counties. The hydrogeologic terrain is unique in this part of the state and work is starting on groundwater atlases.

# Status Update Reporting

## Status Update April 1, 2024

**Date Submitted:** June 24, 2024

**Date Approved:** October 15, 2024

### Overall Update

All activities associated with this appropriation were completed as of the last update in October 2023, the remainder of the appropriation was used during this assessment period. Work associated with the publication of Isanti and Hubbard County Groundwater atlases was partially supported with the remainder of the payroll dollars since the last update. This remaining funding also supported work on increasing our staffing after multiple retirements and departures from the group in the last year. Increasing our staff allows our group to continue providing information and training for future resource managers, researchers and citizens who in the decades ahead, will be grappling with the many challenges of balancing use and preservation of their groundwater resources.

### Activity 1

This activity was previously marked complete.

*(This activity marked as complete as of this status update)*

### Activity 2

This activity was previously marked complete.

*(This activity marked as complete as of this status update)*

### Activity 3

This activity was previously marked complete.

*(This activity marked as complete as of this status update)*

### Dissemination

Since the last update this grant supported presentations to internal DNR staff about the County Groundwater Atlas program as well as partially supported the development of a collaborative presentation with the Minnesota Geological Survey given at the Minnesota Groundwater Association fall conference titled "The County Atlas Program: Evolution of Geologic and Groundwater Atlases as Tools for Water Resource Management".

# Status Update Reporting

## Status Update October 1, 2023

**Date Submitted:** October 9, 2023

**Date Approved:** January 19, 2024

### Overall Update

Work associated with the publication of Becker County atlas was completed. Work also included continued preparation of several draft atlases, final preparations for the spring 2023 sampling season, and part of the groundwater sampling in Otter Tail and St Louis counties.

For activity 1, planning continued for fall 2023 sampling in St. Louis County. Work related to Activity 2 was largely conducted using funding from the original grant (2020-009) in early 2023, switching more to the new grant (2021-071) in late spring of 2023 as the atlas projects progressed. Mapping, data analysis and reporting activities continued in Aitkin, Dodge, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena (Activity 2).

DNR completed three successful in-person county workshops and presentations in Cass County that were partially funded by this grant: 1) Stakeholder workshop, 2) presentation to the County Board of Commissioners and 3) a working meeting with county SWCD staff. DNR was also invited to hold a follow-up workshop for Hennepin County Energy & Environment department. The hybrid presentation partially funded by this grant included over 100 county staff online and 30 in person. (Activity 3 and Dissemination).

### Activity 1

Approximately 200 wells and 20 lakes were sampled in Otter Tail County with partial funding from this grant. Otter Tail sampling, the equivalent of two counties was completed by approximately June 30, 2023. As part of this activity, planning continued for fall 2023 sampling in St. Louis County, also the equivalent of two counties. Each county will include double the typical number of samples collected because the counties are very large.

Follow-up C14 sampling from approximately ten wells was completed in Aitkin County and one well in Fillmore County. Since this budget was prepared the analysis for the Carbon-14 samples has been shifted from the U of M laboratory to the University of Waterloo and Minnesota Department of Agriculture labs because of staffing changes at the U of M. *(This activity marked as complete as of this status update)*

### Activity 2

Becker County Groundwater Atlas was published in 2023. This grant provided partial funding for publication. Work continued on Aitkin, Dodge, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena counties. DNR staff conducted reviews of multiple draft components of Geologic Atlases (Part A) prepared by the MGS. These reviews included portions of the reports for Pipestone, Dakota, and Lincoln counties. *(This activity marked as complete as of this status update)*

### Activity 3

All workshops and dissemination activities planned for this grant have been completed. *(This activity marked as complete as of this status update)*

### Dissemination

DNR completed three successful in-person county workshops and presentations in Cass County that were partially funded by this grant: 1) Stakeholder workshop, 2) presentation to the County Board of Commissioners and 3) a working meeting with county SWCD staff. DNR was also invited to hold a follow-up workshop for Hennepin County Energy &



Environment department. The hybrid presentation partially funded by this grant included over 100 county staff online and 30 in person. (Activity 3 and Dissemination). All grant funding available for dissemination activities was expended by the end of June 2023. No additional activities took place under this grant after that.

# Status Update Reporting

## Status Update April 1, 2023

**Date Submitted:** April 10, 2023

**Date Approved:** April 26, 2023

### Overall Update

The update covers non-fieldwork season (winter). Work included finalizing several groundwater atlases and preparing for the 2023 sampling season.

Planning began for the 2023 sampling (Activity 1). Approximately 200 wells will be sampled in Otter Tail and St. Louis counties, double the typical number because of the very large size of the counties.

DNR held an important meeting with approximately twenty-five professionals from a variety of organizations and backgrounds to discuss approaches for completing groundwater atlases in northeastern Minnesota counties (St. Louis, Cook and Lake) where the hydrogeologic terrain is unique.

Technical difficulties related to corrupted GIS data files continued to be addressed in late 2022 for Cass, Becker, and Isanti. The Cass County Groundwater Atlas was published in early 2023 (Activity 2). The expectation is for publication of Becker and Isanti in early 2023.

Mapping, data analysis and reporting activities continued in Aitkin, Becker, Cass, Dodge, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena (Activity 2).

DNR completed three successful in-person, in county workshops presenting the results of groundwater atlases to stakeholders for Hennepin, Winona and Kanabec counties (Activity 3).

Dissemination activities (Activity 3) included the three workshops, county board presentation, technical presentations, news releases, and GovDelivery notifications.

### Activity 1

Milestone 1 completed.

Sampling took place for Aitkin County. Sample results from analytical laboratories have been received. Processing and analysis have started. Groundwater sampling for C-14 was completed in four counties: Kandiyohi, Nobles, Rock and Steele. Sampling for Ultra Low Tritium (ULT) was also completed in four counties to understand value of next generation of groundwater age dating analysis. Groundwater chemistry results were sent to well owners with an explanation. Geophysical sampling completed in Polk and Red Lake counties.

Milestone 2 underway.

Planning began for the 2023 season. Approximately 200 wells will be sampled in each Otter Tail and St. Louis counties. Otter Tail sampling, the equivalent of two counties will be completed by approximately June 30, 2023, depending on weather and access in early spring. Lingering snow may delay sampling in this northerly county. Plans are to complete sampling in St. Louis County, also the equivalent of two counties, in fall 2023. Each county will include double the typical number of samples collected because the counties are very large.

Follow-up C14 sampling from approximately ten wells is planned in Aitkin County and one well in Fillmore County. The sampling is planned for summer 2023 following receipt of tritium results.

## **Activity 2**

Milestone 1 completed. Technical difficulties from corrupted GIS files were addressed in 2022 for Cass, Becker, and Isanti. The Cass County Groundwater Atlas was published in 2023. Publication for Becker and Isanti is in mid-2023. Development of Print on Demand (POD) application, updating the atlas report template, and overhauling our webpages and metadata.

POD reduces printing and administrative costs to store and sell hardcopies. The report template was updated reflecting comments from stakeholders increasing understanding and responding to changes in technical elements like reporting tritium results. Approximately 230 metadata pages were archived to streamline our web presence and the GIS page was updated.

Milestone 2 is underway. Includes analyzing collected data, groundwater flow maps and cross sections, pollution sensitivity maps, and publishing atlases. The assembled GIS layers and electronic files are useful for local, regional, and state decision makers, industry, planners, and citizens.

Work continued on Aitkin, Becker, Dodge, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena counties. Publication of Becker and Isanti in mid-2023, followed by Houston, Wadena and Hubbard in 2023.

DNR staff conducted reviews of draft Geologic Atlases (Part A) prepared by the MGS. This included reviews of Dakota, Lincoln, Lake and Lac Qui Parle counties.

## **Activity 3**

Milestone 1 complete. The Winona County workshop was November 17, 2022. Planning started for in-person workshops for Hennepin and Kanabec counties. Atlas staff worked county staff to find dates, times and venues to hold workshops. As always, we invite the LCCMR members and staff to attend.

Additionally, atlas staff were contacted by local resource managers and citizens for data reports, to answer questions about groundwater resources in their counties.

Milestone 2 complete. Workshops for Hennepin and Kanabec counties were held on February 10, 2023 and March 16, 2023. Atlas staff presented to the Kanabec Board of Commissioners February 20. Allison Holland, Kanabec County Commissioner, sent appreciation for the update:

“Thank you for your presentation to our board in Kanabec County. I appreciate the information you shared, and am even more grateful for the work your team did on the atlas. Our County Engineer pointed me to it within the first month or so in my new role last year when I was approached by a constituent about a concern for our drinking water. Your work enabled me to easily provide evidence-based reassurance. Thank you for taking the time to share with my (mostly new) colleagues about this very useful resource.”

## **Dissemination**

In addition to planning for and hosting workshops with county partners in Winona County (November 16, 2022), Hennepin County (February 10, 2023) and Kanabec County (March 16, 2023), atlas staff presented to the Kanabec Board of Commissioners (February 20, 2023). Planning started for a Cass County workshop and presentation to the county board both scheduled for May 16, 2023.

Atlas staff published news releases and updates via GovDelivery (over 7,000 people on the list-serve) for work in Winona, Hennepin, Kanabec and Otter Tail counties, presented two papers at International Karst Conference, presented to Geological Society of Minnesota and Environmental Engineering class at University of St. Thomas.

DNR Atlas staff hosted an important meeting with approximately twenty-five professionals from a wide variety of organizations (US Forest Service, USGS, NRRI, MGS, DNR Lands and Minerals) and backgrounds to discuss opportunities and approaches to completing groundwater atlases in northeastern Minnesota counties (St. Louis, Cook and Lake). The hydrogeologic terrain is unique in this part of the state and work is starting on groundwater atlases.

Atlas staff also continued to participate with MGWA and others on questions about the extent of the Mount Simon Aquifer based on work of MGS and DNR atlas

# Status Update Reporting

## Status Update October 1, 2022

**Date Submitted:** October 3, 2022

**Date Approved:** October 17, 2022

### Overall Update

Comprehensive groundwater sampling completed for Aitkin County. Sampling for C-14 completed in Kandiyohi, Nobles, Rock and Steele counties. Recent policy decisions under consideration at the University of Minnesota limiting mapping and scientific work on tribal lands has delayed work in several counties that are currently underway, creating scheduling challenges for atlas work. We expect the University to clarify its policy by the end of 2022 so work can resume. Sampling for Ultra Low Tritium was completed in four counties to understand value of next generation of analysis.

No new groundwater atlases (Part B) were published during the period. Technical difficulties related to corrupted data files delayed the planned publication (early 2022) of Cass, Becker, and Isanti. The expectation is for publication in late 2022 or early 2023.

Completed geophysical investigations of Pennington, Red Lake, and Polk, with planning for investigations in Douglas and Grant. Equipment failures may move geophysical surveys for Douglas and Grant to 2023.

Planning continued for in-person workshops to present completed atlases for the Hennepin, Winona and Kanabec County. Mapping and reporting activities continued in Aitkin, Becker, Cass, Dodge, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena.

Dissemination activities continued including presentations, news releases, GovDelivery notifications.

### Activity 1

Milestone 1. Comprehensive groundwater sampling took place for Aitkin County. Groundwater sampling for C-14 was completed in four counties: Kandiyohi, Nobles, Rock and Steele. Sampling for Ultra Low Tritium was completed in four counties to understand value of next generation of groundwater age dating analysis. Groundwater chemistry results were sent to well owners with a letter of explanation. Recent policy considerations at the University of Minnesota limiting mapping (Part A Atlas) on tribal lands has delayed work in counties that are currently underway and where groundwater sampling is planned. We expect the University to clarify its policy by the end of 2022 so work can resume and allow us meet milestones for June 30, 2023.

Completed geophysical investigations (“sampling”) of Pennington, Red Lake, and Polk, with planning for investigations in Douglas and Grant as part of the atlas process. Equipment failures will likely move geophysical surveys for Douglas and Grant to 2023 if equipment cannot be repaired in October 2022.

In southeastern counties, three traces and spring chemistry analysis were completed. The results of two traces completed in 2021 were added to the MGTD and reporting was completed.

### Activity 2

Milestone 1. No new groundwater atlases (Part B) were published during the period. Technical difficulties related to corrupted data files received in the Part A GIS files for several counties delayed the planned publication (early 2022) of Cass, Becker, and Isanti. Having repaired the damaged GIS files, the expectation is for publication of these three atlases in late 2022 or early 2023.

This activity includes preparing, writing, all GIS activity and publishing atlases following data collection. The activity includes analyzing collected data (geology, water chemistry, water usage, other), preparing groundwater flow direction maps and groundwater cross sections, pollution sensitivity maps, preparing and publishing reports (hardcopy and web). These activities continued for Aitkin, Becker, Cass, Dodge, Hubbard, Isanti, Kandiyohi, Nobles, Olmsted, Rock, Steele, and Wadena counties.

Also as part of this activity and the atlas development process, DNR staff conducts reviews of draft County Geologic Atlases (Part A) prepared by the MGS. During the review period this included reviews for aspects of (bedrock, quaternary, cross sections, etc.) Lake, Lincoln, Otter Tail, Pipestone, Scott, and Traverse.

### **Activity 3**

Milestone 1. Planning continued for in-person workshops to present completed atlases for the Hennepin, Winona and Kanabec counties. Atlas staff have been in contact with county staff to find dates, times and venues to hold workshops. The Winona County workshop is scheduled for November 17, 2022. As always, we invite the LCCMR members and staff to attend. The expectation is to complete the other workshops in early 2023 (by the end of March if county schedules allow).

Additionally, atlas staff have been contacted by local resource managers and citizens for data reports, to answer questions about groundwater resources in their counties.

### **Dissemination**

In addition to planning for workshops and communications with our county partners for Winona, Hennepin and Kanabec, atlas staff have: participated/presented in a field trip for DNR leadership, worked the DNR State Fair Information Booth to discuss groundwater issues and the atlas work funded by LCCMR, fielded data requests from Blue Earth County staff, MPCA and Houston Engineering, published news releases and sent updates via GovDelivery for Aitkin County work, updated the Groundwater Atlas webpages to make our work more accessible to end users, presented on the monthly DNR Field Hydrologists call, participated with Minnesota Water Well Association on questions about the extent of the Mount Simon Aquifer.

# Status Update Reporting

## Status Update April 1, 2022

**Date Submitted:** April 22, 2022

**Date Approved:** June 7, 2022

### Overall Update

Groundwater atlas activities funded by this grant during the reporting period were for expenses only, and no salary budget was used. Expenses covered laboratory analytical services for Steele County groundwater and surface water samples, printing expenses associated with publication of the Hennepin County Groundwater Atlas, acquisition of updated field sampling equipment, sampling supplies for future counties, and travel for Steele County sampling and geophysical surveys in Pennington County. Planning is underway for stakeholder workshops in Hennepin and Winona counties. We will begin to use this grant for salaried activities in late FY22 and FY23 per the approved Work Plan.

### Activity 1

Groundwater and surface water sampling and laboratory analysis was completed in Steele County. Plans are underway to complete groundwater sampling and analysis in Aitkin County before the end of June 2022. Geophysical surveys were also completed in Pennington County.

### Activity 2

All activity of preparing, writing, and publishing atlases following data collection for the reporting period was carried out under another ENRTF grant (Legal Citation: M.L. 2019, First Special Session, Chapter 4, Article 2, Subd. 03o) as labor expenses. We will begin to use this grant for salaried activities, including Activity 2 - Groundwater Atlas preparation and publication, in late FY22 and FY23 per the approved Work Plan.

### Activity 3

Due to continuing restrictions for in person meetings, and the request by counties to until the meetings could be attended in person, no workshops were completed. Planning with county staff has started on two workshops in late FY22 and early FY23 - for Hennepin County and Winona County atlases. We will begin to use this grant for salaried activities, including Activity 3: Atlas Stakeholder Workshop & Dissemination Activities, in late FY22 and FY23 per the approved Work Plan.

### Dissemination

There is some overlap for dissemination activities under the three active ENRTF grants for groundwater atlas work. All dissemination activities for the reporting period were completed under the ML2019 grant. A select list of those activities was included in the March 2022 Update for that project. Beginning in July 2022 dissemination activities will be completed under this grant and reported in future updates.