Environment and Natural Resources Trust Fund
2014 Request for Proposals (RFP)

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Project Title:

Small-scale Groundwater sustainability assessment

Category: B. Water Resources

Total Project Budget: $ 118,214

Proposed Project Time Period for the Funding Requested: 2 Years, July 2014 - June 2016

Other Non-State Funds: $ 0

Summary:

We propose the development of a simple tool for assessment of groundwater sustainability. The proposal includes and educational component. The tool is intended for local use in rural Minnesota.

Name: Otto Strack

Sponsoring Organization: U of MN

Address: Dept of Civil Engineering, 500 Pillsbury Drive SE
Minneapolis MN 55455

Telephone Number: (715) 673-4392

Email strac001@umn.edu

Web Address

Location

Region: Statewide

County Name: Statewide

City / Township:

MP: 0613-2-133-proposa
Budget: 0613-2-133-bud
Qual: 0613-2-133-qualifi
Map: 0613-2-133-map-m
Resolution:
List:

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base	
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency	
Capacity	Readiness	Leverage	Employment	TOTAL

Environment and Natural Resources Trust Fund (ENRTF)
2014 Main Proposal
Project Title: SMALL-SCALE GROUNDWATER SUSTAINABILITY ASSESSMENT

I. PROJECT STATEMENT

Water shortages have become an increasing concern for the community. Many of the presentations at the one of the largest groundwater flow conferences in the world, the MODFLOW and More conference (held at Golden, Colorado, June 2-5, 2013), addressed this issue. A featured presentations of the conference by William H. Schlesinger (Cary Institute of Ecosystem Studies), stressed the need for groundwater professionals to educate legislators and officials in the importance of maintaining groundwater sustainability.
We do not intend to address groundwater issues in the Twin Cities Metropolitan Area (White Bear Lake, for example); these problems are being addressed already. Our proposal focuses instead on the need to ensure groundwater sustainability in rural areas of Minnesota, where no studies exist, and where neither the methodology, nor the expertise is available for responsible administrators to make informed decisions. We intend to provide a very simple and easy to use tool for sustainability assessment on a local scale, following the lead of the State of MIchigan, where a website exists as a first step in providing education as well as a simple tool for impact assessment of wells (see www.miwwat.org for further information).
Overall Goal of the project
The overall goal of the project is to assure groundwater sustainability in rural Minnesota, i.e., the long-term balance between accumulation of groundwater, due to infiltration for example, and decrease, e.g., due to pumping.
Outcomes

1. A simple groundwater modeling tool that can be used to verify that the sustainability of groundwater in a certain area is ensured.
2. An educational tool that explains basics of groundwater sustainability as appliied to a local rural scale, available on the internet.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: Development of the groundwater modeling tool. **Budget: $ 75,000**

The groundwater modeling tool will be written in Python, an open-source programming language. The principle of the tool is that accumulation minus withdrawal of water, over an area chosen by the user, will be zero over a target period, e.g., 2 years in the future. The end of the target period will move forward in time; sustainability will be maintained over a period of two years in the future.
The tool will include the following:

1. Infiltration rates as they vary over time. The infiltration rates must be updated as data become available. The predictions of the model will thus change over time, so that timely corrective measures can be taken and adjusted.
2. Pumping wells that can be placed where needed, with variable pumping schedules; these too can be adjusted as needed.
3. A tool that computes the cumulative discharge over the chosen boundary over the two-year period in the future. The user can make adjustments in pumping schedules so that there is no net loss over the chosen domain. Note that the adjustments need not be implemented immediately, they can become effective any time within the target period.

Three sites will be chosen for testing the model and data will be collected so that the model can be tested in year 2. The model will be adjusted as needed in view of its performance given the available data for the three test sites.

Activity 2: Development of a website with a forum, a program manual and an educational tool. **Budget: $ 25,000**

An educational tool will be written and be made available on the University website, specific to the project. The tool will contain the following.

1. A brief description of the principles of groundwater sustainability.

2. A forum where questions can be posed and answered in the form of discussions. The principal investigators and their students will monitor the questions and answers, and will provide additional comments, references, and answers where needed.
3. An educational tool where the user can select pre-programmed questions, attempt an answer, and obtain the proper answer when desired.

Activity 3: Short courses and lectures. **Budget: $ 18,214**

Short courses and lectures will be scheduled for the second year of the project, when the first version of the modeling tool is ready. The short courses will be scheduled according to demand. Interested parties can sign up for the short courses on the web site; a course will be scheduled whenever the number of applicants reaches a set minimum, e.g., 10.

Outcome	Completion Date
Activity 1, part 1: Groundwater modeling tool, version 1	May 1, 2015
Activity 1, part 2: Testing of the groundwater modeling tool.	December 31, 2015
Activity 1, part 3: Adjustment of the model according to the results of part 2.	July 1, 2016
Activity 2: Development of the website	July 1, 2016
Activity 3: Short courses and lectures	July 1, 2016

III. PROJECT STRATEGY

A. Project Team/Partners

The project team consists of Professors Barnes and Strack. Professor Strack will be primarily responsible for the development of the mathematical framework to be implemented in the computer model. Both Professors will supervise the graduate student(s) responsible for the implementation of the mathematical framework. Professor Barnes will be responsible for the design of the website. Both professors and the students will participate in the teaching of short courses and lectures.

B. Timeline Requirements

The timelines are defined by the nature of the project; the development of the modeling tool necessarily precedes the testing of the tool and model adjustment. The development of the modeling tool and the design of the website will begin at the starting date of the project. Both modeling tool and website will be updated continuously until the end of the project. Activity 1, part 2 will begin May 1, 2015 and activity 1, part 3 on December 31, 2015. Activity 2 will begin on July 1, 2015 and activity 3 on July 1, 2016.

C. Long-Term Strategy and Future Funding Needs

The long-term vision is that both the tool and the website remain in use as needed, without further investment. The educational needs will remain in the future, but the University of Minnesota, in its role as a Land-Grant Institution, will provide this service free of charge within the State, provided that travel costs are covered by the inviting unit.

2014 Detailed Project Budget

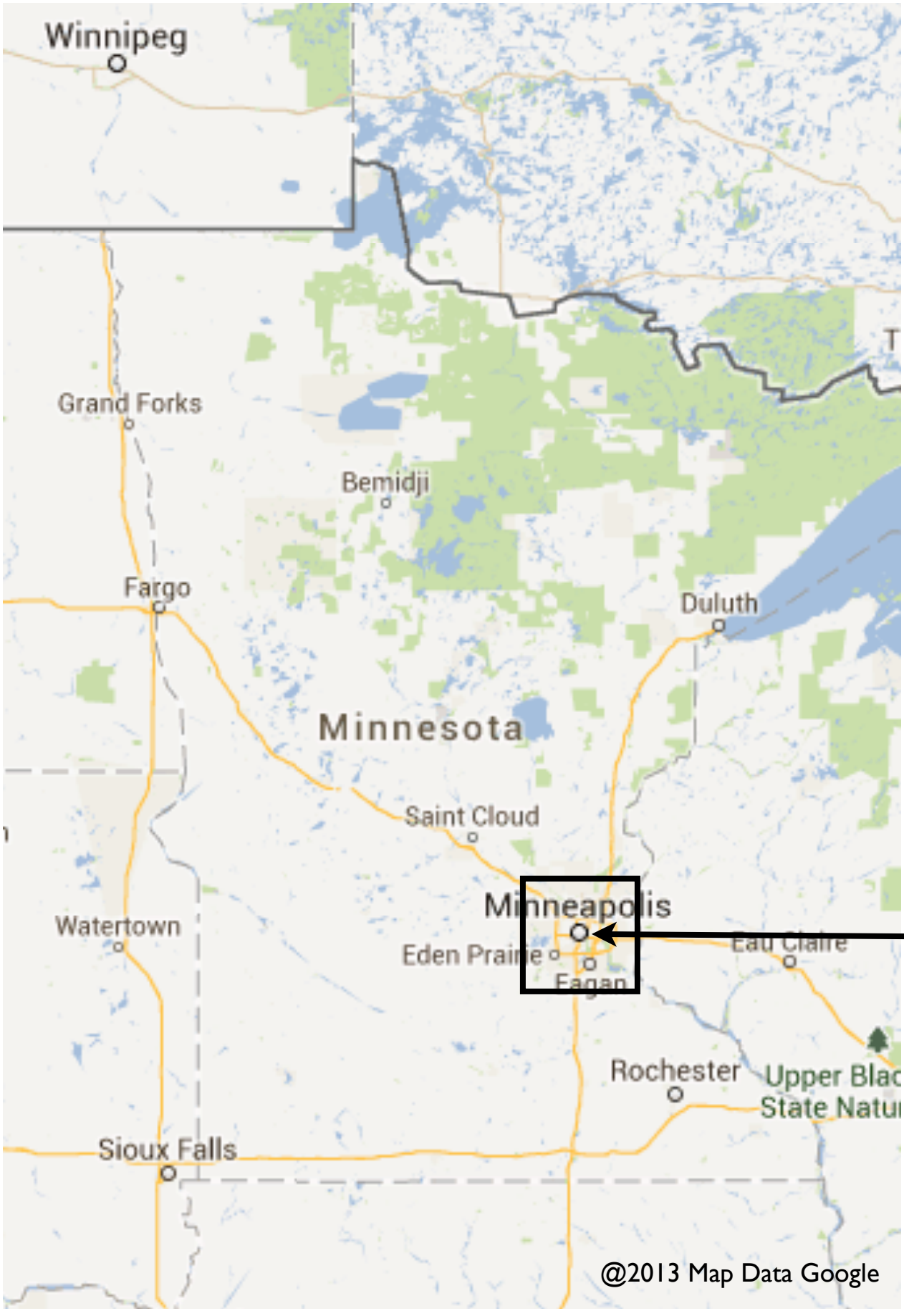
Project Title: SMALL-SCALE GROUNDWATER SUSTAINABILITY ASSESSMENT

IV. TOTAL ENRTF REQUEST BUDGET 2 years

BUDGET ITEM	AMOUNT
Personnel:	$ -
Two (2) co-principle investigator, 5% of full-time over the two (2) years of the project salary: $19,895 (75%); fringe benefits: $6,685 (25%).	$ 26,579
One (1) graduate student, 50% of full-time over the two (2) years of the project. salary: $47,311 (57%); fringe benefits: $35,323 (43%).	$ 82,634
Contracts:	N/A
Equipment/Tools/Supplies:	N/A
Acquisition (Fee Title or Permanent Easements):	N/A
Travel:	
Year 1 - Travel to participating cities/towns for consultation and data collection	$ 2,500
Year 2 - Travel to participating cities/towns for testing and training. Travel to additional counties, cities, and towns for demonstrations and training.	$ 5,000
Additional Budget Items:	
Short course: Open training short course at the University of Minnesota	$ 2,500
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 119,213

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ Being Applied to Project During Project Period:	N/A	
Other State $ Being Applied to Project During Project Period:	N/A	
In-kind Services During Project Period:	N/A	
Remaining $ from Current ENRTF Appropriation (if applicable):	N/A	
Funding History:	N/A	



The study area covers rural Minnesota, not including the Metropolitan area

Twin Cities Metropolitan Area is not included in the study

Project Manager Qualifications & Organization Description

Biographical sketch

Dr. Strack received his PhD from the Technical University of Delft in 1973. He joined the Department of Civil Engineering of the University of Minnesota in 1974, where he is currently a Professor. Dr. Strack is the original developer of the Analytic Element Method, which is now the second most popular method in groundwater modeling. He is the author of the textbook Groundwater Mechanics, Prentice-Hall, 1989 (732 pp.) and the textbook Applied Groundwater Mechanics which is currently under review (330 pp). He has authored numerous papers, is the third recipient of the Lifetime Achievement Award, granted by the Minnesota Groundwater Association, and is a Correspondent (foreign member) of the Royal Dutch Academy of Sciences. Professor Strack has taught groundwater flow for over 40 years and has nearly 40 years of experience as a consultant. He is the author of the computer programs MLAEM and SLAEM.

Duties and responsibilities of the project manager

The project manager will bear the full responsibility for the quality of the final products and for their suitability for the goals specified in the proposal. The project manager is responsible for the design of the mathematical model used for the tool to be produced, and for overseeing its implementation in an open source computer language. The project manager will meet with the participants (students and Professor Barnes) several times a week, will schedule a meeting once a week where all participants in the project will report on the progress. The weekly groundwater seminars, organized at the Department of Civil Engineering, University of Minnesota, will serve as a platform for discussions regarding the project; members of the professional groundwater community regularly participate in these meetings, and will be asked for their professional opinion regarding the suitability of the tools for use by practicing engineers and officials.