Environment and Natural Resources Trust Fund
2009 Phase 2 Request for Proposals (RFP)

LCCMR ID: 057-B2

Project Title: Side Inlet Controls Research and Demonstration Project

Total Project Budget: $ $435,000

Proposed Project Time Period for the Funding Requested: July 2009 - December 2011

Other Non-State Funds: $ $0.00

Priority: B2. Reduce Peak Water Flows

First Name: Joel **Last Name:** Peterson

Sponsoring Organization: Board of Water and Soil Resources (BWSR)

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Region: Statewide

County Name:

City / Township:

Summary: Determine effects of side inlets on peak flows and water quality, research effectiveness and design optimization of 4 different methods of side inlet controls, and construct 12 demonstration projects statewide.

Main Proposal: 1008-2-002-proposal-2009_main_proposal_side_inlet_30SEP08.doc

Project Budget: 1008-2-002-budget-RFP_2009_Project Budget_side_inlet.xls

Qualifications: 1008-2-002-qualifications-RFP_2009_Project Budget_side_inlet.xls

Map:

Letter of Resolution: 1008-2-002-resolution-LCCMR Support Letter.doc

MAIN PROPOSAL

PROJECT TITLE: Side Inlet Controls Research and Demonstration Project

I. PROJECT STATEMENT

In artificially drained agricultural land, drainage ditches convey runoff water and tile drainage to receiving bodies of water. As impairments to water bodies in agricultural watersheds are being diagnosed and TMDL plans are developed, it is increasingly important to understand the role that agricultural drainage plays in those impairments and to develop Best Management Practices (BMPs) that mitigate negative effects while limiting impacts to crops. Side inlets to agricultural drainage ditches serve as surface runoff outlets on agricultural land adjacent to drainage ditches. Research is desperately needed to quantify the impact of these widely used inlets on peak flow rates, sediment loading to receiving waters, nutrient delivery, and streambank erosion.

Failures of side inlets and associated erosion can have profound negative effects on receiving waters, including: increased downstream sediment transport, reduced ditch conveyance capacity, increased downstream nutrient loading, and potential loss of production land as failures move upslope. One BMP that shows considerable promise to reduce peak water flows, improve water quality in receiving waters, and reduce streambank erosion in agricultural ditches is side inlet controls. There are many design variations of side inlet controls and research is lacking to determine the effectiveness of different designs (e.g., sloping conduit, standpipe inlet, gravel inlet, tile coil and weir) or their cumulative effects if implemented on a watershed-scale.

The goals of this project are to: 1) evaluate the effectiveness of side inlet controls at **reducing peak water flows**, **improving surface water quality**, and **reducing streambank erosion** in drainage ditches through modeling and testing; 2) demonstrate the effectiveness and provide design guidance of side inlet controls through **implementation of demonstration projects**; and 3) provide **outreach and education**. Understanding the effects of emerging BMPs and providing design guidance are crucial to meeting water quality goals.

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Modeling the Effects of Side Inlet Controls **Budget: $ 210,000**

The first component of this proposed project is to conduct a modeling study to: a) better understand the cumulative effects of side inlets; and b) to determine the effects of installing side inlet controls at a watershed scale on peak flow rates and sediment and nutrient delivery.

Modeling is the most effective means of determining the effect that side inlets have on peak flow rates and water quality on a watershed-basis. Although monitoring the impact of side inlets at watershed scales has the potential to provide very useful information, it is cost prohibitive for the several different designs to be explored within this proposed project.

Deliverables	Completion Date
1. Effects of uncontrolled side inlets on peak water flows, sediment delivery, and nutrient contribution to agricultural ditches, communicated via scientific/technical and extension based outlets	April 2010
2. Effects of side inlet **controls** on peak water flows, sediment delivery, and nutrient contribution to agricultural ditches communicated via scientific/technical and extension based outlets	May, 2011

Result 2: Plot-Scale Experimentation at Lamberton, MN **Budget: $ 145,000**

Current understanding of different side inlet control design is poor and the effectiveness of those designs has not been studied. We propose to construct experimental side inlet controls at the University of Minnesota Southwest Research and Outreach Center at Lamberton, MN.

We propose to test five (5) types of side inlet controls: 1) sloping conduit (control); 2) standpipe inlet; 3) high-density tile coil; 4) rock inlet; 5) weir. Part of this research will focus on optimizing the design for the different variants. Results from the plot-scale experiments will be critical to the modeling component for calibration and watershed scale evaluation.

Deliverables **Completion Date**

1. Constructed experimental testing facility at the Southwest Research and Outreach Center – November, 2009

2. Conduct side inlet control experiments – September, 2010

3. Analyze results from experiments and develop and refine algorithms for modeling – January, 2011

4. Use the experimental facility as a component of the broader extension-based outreach the University conducts – ongoing

Result 3: Demonstration Projects – Hawk Creek Watershed **Budget: $ 20,000**

The third component of this project is to implement several side inlets at sites in the Hawk Creek Watershed. Hawk Creek and Beaver Creek are **impaired for turbidity and fecal coliform**. A less rigorous monitoring regimen will be prescribed for the demonstration projects than for the experimental component of the project. Two workshops will be conducted at the sites to educate drainage authorities, engineers, and other professionals interested in innovative BMPs.

Deliverables **Completion Date**

1. Identify project locations and cooperators – March, 2010

2. Construct Demonstration Projects – Spring or Fall, 2010

3. Outreach and Education workshops – Fall 2010 or Spring 2011

Result 4: Demonstration Projects – Statewide **Budget: $ 60,000**

The final project component is construction of demonstration projects at an additional 8 locations throughout Minnesota. BWSR personnel will work to identify willing and suitable local partners, similar to the Hawk Creek Watershed Project. The same monitoring protocol as prescribed in Result 3 will be followed. Workshops will be conducted at 3 sites to educate drainage authorities, engineers, and other professionals interested in innovative BMPs.

Deliverables **Completion Date**

1. Identify project locations and local partners – April 2010

2. Construct Demonstration Projects – Fall, 2010 (potentially Spring 2011 before planting)

3. Outreach and Education workshops – Fall 2011

III. PROJECT STRATEGY AND TIMELINE

A. Project Partners

1) University of Minnesota, Department of Biosystems and Bioproducts Engineering

The University of Minnesota will be responsible for conducting the modeling and experimental research at the Southwest Research and Outreach Center at Lamberton (Dr. Bruce Wilson, Dr. Gary Sands, Dr. John Nieber, and Dr. Jeff Strock).

2) Hawk Creek Watershed

The Hawk Creek Watershed Project will be involved in selecting, implementation, and monitoring of demonstration projects (Darrel Schindler, Dean Dambroten)

B. Project Impact - This project will have impact in the extensive agricultural areas of the state served by drainage ditches. The results of the research will be used by engineers, planners, and other natural resources professionals to determine impacts of existing side inlets, the potential benefits of implementing this BMP, and design guidance to professionals for implementation.

C. Time - This will be a three (3) year project. Year 1 will be spent conducting the first part of the modeling component and planning the field experiments at Lamberton. Year 2 will be spent conducting the field experiments at Lamberton, finding suitable demonstration sites, implementing demonstrations, monitoring, analyzing data and developing and refining algorithms for gravel inlets, tile coil inlets and other inlets tested. Year 3 will be spent constructing the demonstration projects, monitoring and finishing the modeling component of the project.

Project Budget

INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)

IV. TOTAL PROJECT REQUEST BUDGET (Through December 2011)

BUDGET ITEM *(See list of Eligible & Non-Eligible Costs, p. 17)*	**AMOUNT**	**% FTE**
Personnel:	$ -	%
Contracts:		
University of Minnesota, Department of Biosystems and Bioproducts Engineering	$ 325,000	
Hawk Creek Watershed Project	$ 5,000	
Other local partner personnel	$ 15,000	
Contracts to construct demonstration projects	$ 30,000	
Contract to construct experiment facility at Lamberton	$ 15,000	
Equipment/Tools: Pump(s) for water supply and sediment feeder at Lamberton	$ 10,000	
Instrumentation for Lamberton	$ 25,000	
Instrumentation at demonstration projects	$ 10,000	
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$ 435,000	

V. OTHER FUNDS

SOURCE OF FUNDS	**AMOUNT**	**Status**
Other Non-State $ Being Leveraged During Project Period: *What additional non-state cash $ will be spent on the project during the funding period? For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*		*Secured or Pending*
Other State $ Being Spent During Project Period: *What additional state cash $ (e.g. bonding, other grants) will be spent on the project during the funding period? For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*	$ -	*Secured or Pending*
In-kind Services During Project Period: Hawk Creek Watershed Project, 1:1 labor match to LCCMR funding	$ 5,000	
1:1 Match with other local partners (Result 4)	$ 15,000	
University of Minnesota faculty time	$ 40,000	
BWSR personnel time (Joel Peterson, 15% FTE, Al Kean 2% FTE)	$ 68,600	
TOTAL	$ 128,600	

MANAGER QUALIFICATIONS AND ORGANIZATION

Manager Qualifications:

Dr. Joel Peterson is a registered professional engineer in the State of Minnesota and has worked in academia, private consulting and in the public sector for over 10 years. At the BWSR he is the lead technical and administrative engineer in the drainage area. His areas of responsibility include leading the interagency Drainage Management Team, providing technical assistance to drainage authorities, leading the writing of the update of the update of the Minnesota Public Drainage Manual. Dr. Peterson is also an Adjunct Assistant Professor at the University of Minnesota in the Department of Biosystems and Bioproducts Engineering.

As a consulting engineer, Dr. Peterson served as a project engineer and project manager on water resources projects. These projects included rain garden design, regional infiltration basin design, stream restoration design, channel embankment protection, and modeling studies. Construction costs of these projects ranged from $10,000 to multi-million dollar projects. Dr. Peterson also worked for the US Army Corps of Engineers on ecosystem restoration projects and served as Water and Sanitation project manager for the Corps in Baghdad, Iraq from August through December 2003.

During graduate school and as a Visiting Assistant Professor focused on hydrologic modeling and erosion mechanics and taught junior level water resources engineering.

Dr. Peterson received his BS, MS, and PhD degrees from the University of Minnesota, The Pennsylvania State University, and Purdue University, respectively, in Agricultural Engineering with emphasis in Water Resources Engineering.

Organization Description:

The mission of the Board of Water and Soil Resources is to assist local governments to manage and conserve their irreplaceable water and soil resources.

Minnesota Statutes 103B.101 directs the BWSR to facilitate communication and coordination among state agencies and between state and local units of government to make the expertise and resources of the state agencies involved in water and soil resources management available to local units of government. This includes engineering assistance for conservation on private lands.

The BWSR facilitates the stakeholder Drainage Work Group and interagency Drainage Management Team and thus is acutely aware of drainage policy and research in Minnesota. The BWSR is leading the update of the Minnesota Public Drainage Manual, which will include chapters on engineering and Best Management Practices (BMPs).