



**Minnesota Pollution
Control Agency**

520 Lafayette Road North
St. Paul, MN 55155-4194

Clean Water Partnership Project Work Plan

Doc Type: Contract

MPCA Use Only	
Swift #:	
CR #:	

Project Title: WFDMR Targeting and Prioritizing Endeavor

1. Project Summary:

Organization: Heron Lake Watershed District
Contractor contact name: Jan Voit
Title: District Administrator
Address: PO Box 345
 Heron Lake, MN 56137
Phone: 507-793-2462
Fax: 507-793-2253
E-mail: jan.voit@mysmbs.com

Subcontractor(s)/Partner(s):

Organization: Houston Engineering, Inc.
Type of organization: Engineering firm
Project manager: Larry Kramka
Address: 6901 East Fish Lake Road, Suite 140
 Maple Grove, MN 55369-5400
Phone: 763-493-6672
Fax: 763-493-5572
E-mail: lkramka@houstongeng.com

MPCA contact(s):

MPCA project manager: Katherine Pekarek-Scott
Title: Environmental Specialist 3
Address: 1601 East Highway 12, Suite 1
 Willmar, MN 56201
Phone: 320-441-6973
Fax: 320-214-3787
E-mail: Katherine.pekarek-scott@state.mn.us

Major watershed(s):

Major watershed/HUC Code: 07100001, 07100002
Latitude/Longitude for project: 95°31'20.362"W 43°50'21.53"N
County: Jackson, Nobles, Murray, Cottonwood, Pipestone, Lyon, and Martin

Project start/End dates: June 15, 2015/June 30, 2018

**Project Funding Type
(check one):**

CWP Resource Investigation

CWP Implementation

Grant Amount:
\$21,955.00

Proposed Cash Match
Funds: \$21,955.00

Proposed Inkind Match
Funds: \$5,210.00

Proposed Loan Funds:
\$0.00

Total project cost:
\$49,120.00

2. Statement of Problems, Opportunities, and Existing Conditions

The West Fork Des Moines River (WFDNR) watershed is part of the Western Corn Belt Plains and Northern Glaciated Plains ecoregions. The watershed extends across seven counties: Murray, Cottonwood, Jackson, and Nobles and small portions of Pipestone, Lyon, and Martin. It covers an area of 1,333 square miles. Its principal source is Lake Shetek. The river flows from the Lake Shetek outlet near Currie in a southeasterly direction for 94 miles to the Minnesota/Iowa border and eventually enters the Mississippi River at Keokuk, Iowa.

The Heron Lake watershed, a WFDNR subwatershed, has an established watershed district. The Heron Lake Watershed District (HLWD) was formed in 1970 to protect and improve the water resources within its boundaries by supporting watershed residents through the use of education and financial programs. The HLWD covers 472 square miles. The managers and staff work with landowners to install Best Management Practices (BMPs) and provide education opportunities to improve water quality.

Lake Shetek, Talcot Lake, and the Graham Lakes have campgrounds and are highly used for summer recreation, as well as fishing and ice fishing. The Fulda Lakes are used for summer recreation, fishing, and ice fishing. The WFDNR is used for fishing, hunting, and canoeing in the summer and snowmobiling and ice fishing in the winter. The Des Moines River is a designated state water trail. North Heron Lake and South Heron Lake were once a nationally recognized migratory waterfowl habitat with over 700,000 staging canvasbacks, 50,000 nesting Franklin's gulls, and large numbers of other birds. North and South Heron Lake are partially designated as feeding and resting areas for waterfowl by the Department of Natural Resources (DNR). The DNR and US Fish and Wildlife Service have significant investment in acquisition and development of Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA) for habitat improvement within the Heron Lake watershed. These investments continue to occur due to the significance of this shallow lake region to migratory waterfowl.

Information about water quality comes from water sampling done by HLWD, other local government entities, Minnesota Pollution Control Agency (MPCA) Surface Water Assessments, and the MPCA's Watershed Restoration and Protection Strategies (WRAPS) stream monitoring efforts. The WFDNR and Heron Lake Total Maximum Daily Load (TMDL) Study approved in December 2008 encompassed 32 impairments on a basin-wide scale in the WFDNR watershed. The primary constituents of concern are sediment, phosphorus, and bacteria. Waters that are in poor condition are labeled "impaired" and are the focus of improvement efforts by the HLWD and other local government entities within the WFDNR watershed. Projects are currently implemented based upon location to impaired waters and landowner willingness. A list of impaired waters in the WFDNR Watershed can be found in **Table 1**.

Locating the sources of sediment, phosphorus, and bacteria is integral to reducing the effect they have on a water body. The completion of the WFDNR Targeting and Prioritizing Endeavor will result in a set of data that is the most cost-effective for the implementation of BMPs for all identified priority resources. The results will be expressed as the maximum reduction of a water quality contaminant (e.g. sediment, phosphorus, bacteria) at a priority resource (e.g. an impaired stream) for a given level of investment. This optimized BMP cost-effectiveness will then serve as the measuring component for project specific evaluation of BMPs. This project will include measuring water quality benefits from both existing conservation efforts and future targeted opportunities to implement BMPs. It will also provide an estimate of the likely reduction that can be achieved through implementation of suitable practices at priority resources.

The extended data products are derived by using advanced Geographic Information Systems (GIS) and engineering methods, developed by Houston Engineering, Inc. (HEI) and applied to the hydrologically corrected Digital Elevation Model (DEM). The outcome of this project will be GIS datasets, summary maps, and a technical memorandum describing the suitability for BMP placement, effect of implementation on priority resources, and the measurable cost-effectiveness of pursuing opportunities to

implement BMPs. All of these methods are complimentary to implementation, restoration, and protection strategies identified within the WRAPS process and will aid local civic engagement efforts.

Table 1: Impaired waters in the WFDNR watershed

Reach Description	ID	Impaired Use	Impairment Cause	TMDL Status
Des Moines River: Windom Dam to Jackson Dam	07100001-501	AqLife	Ammonia (Un-ionized), Dissolved Oxygen	Required
		AqRec AqLife	Fecal Coliform, Turbidity	Approved
Lake Shetek Inlet: Headwaters to Lk Shetek	07100001-502	AqRec	Fecal Coliform	Approved
Beaver Creek: CD 20 to Des Moines R	07100001-503	AqRec AqLife	Fecal Coliform, Turbidity	Approved
County Ditch 20: Headwaters to Beaver Cr	07100001-504	AqRec	Fecal Coliform	Approved
Jack Creek, North Branch: Headwaters to Jack Cr	07100001-505	AqLife	Turbidity	Approved
Elk Creek: Headwaters to Okabena Cr	07100001-507	AqRec AqLife	Fecal Coliform, Turbidity	Approved
Lower Lake Sarah Outlet : First Unnamed cr on Lk Sarah outlet str to Lk Shetek inlet	07100001-508	AqRec	Fecal Coliform	Approved
Jack Creek: JD 26 to Heron Lk	07100001-509	AqRec AqLife	Fecal Coliform, Turbidity	Approved
Okabena Creek: Unnamed cr to T102 R38W S6, north line	07100001-512	LimUse	Escherichia coli	Required
Upper Lake Sarah Outlet: Lk Sarah to Unnamed cr	07100001-513	AqRec	Fecal Coliform	Approved
Unnamed creek: Unnamed cr to Unnamed cr	07100001-517	AqRec	Fecal Coliform	Approved
Unnamed creek: Unnamed cr to Lk Shetek	07100001-519	AqRec	Fecal Coliform	Approved
Des Moines River: Heron Lk outlet to Windom Dam	07100001-524	AqLife	Turbidity	Approved
Heron Lake Outlet: Heron Lk (32-0057-01) to Des Moines R	07100001-527	AqLife	Turbidity, pH	Approved
Division Creek: Okabena Cr to Heron Lk (32-0057-06)	07100001-529	AqLife	Turbidity	Approved
Des Moines River: Lime Cr to Heron Lk outlet	07100001-533	AqRec AqLife	Fecal Coliform, Turbidity	Approved
Lime Creek: Lime Lk to Des Moines R	07100001-535	AqRec AqLife	Fecal Coliform, Turbidity	Approved
Des Moines River: Jackson Dam to JD 66	07100001-541	AqLife	Turbidity	Approved
Des Moines River: Lk Shetek to Beaver Cr	07100001-545	AqLife	Turbidity	Approved
Des Moines River: Beaver Cr to Lime Cr	07100001-546	AqRec AqLife	Fecal Coliform, Turbidity	Approved
Unnamed creek: String Lk to Des Moines R	07100001-551	AqLife	Turbidity	Required
Okabena Creek: Elk Cr to Division Cr	07100001-602	AqRec AqLife	Fecal Coliform, Turbidity	Approved
Des Moines River: JD 66 to MN/IA border	07100002-501	AqRec AqLife	Fecal Coliform, Turbidity	Approved
Judicial Ditch 56: Unnamed cr to Des Moines R	07100002-505	AqLife	Turbidity	Required
Talcot	17-0060-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Flaherty	32-0045-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Heron: North Marsh	32-0057-01	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Heron: Duck	32-0057-02	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Heron: North Heron	32-0057-05	AqRec	Nutrient/Eutrophication Biological Indicators	Approved
Heron: South Heron	32-0057-07	AqRec	Nutrient/Eutrophication Biological Indicators	Approved
Yankton	42-0047-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
First Fulda	51-0021-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Lime	51-0024-00	AqRec	Nutrient/Eutrophication	Required

			Biological Indicators	
Bloody	51-0040-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Shetek	51-0046-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Sarah	51-0063-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
Currant	51-0082-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
East Graham	53-0020-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required
West Graham	53-0021-00	AqRec	Nutrient/Eutrophication Biological Indicators	Required

3. Goals, Objectives, Tasks, and Subtasks

Goal: Through the WFDNR Targeting and Prioritizing Endeavor, the HLWD will build upon the terrain analysis products developed by Southwest Prairie Technical Service Area 5 (SWPTSA 5) and extend the data products to include BMP suitability, BMP effectiveness, and BMP value datasets. The outcome of this project will be GIS datasets, summary maps, and a technical memorandum describing the suitability for BMP placement, effect of implementation on priority resources, and the measurable cost-effectiveness of pursuing opportunities to implement BMPs. All of these methods are complimentary to implementation, restoration, and protection strategies identified within the WRAPS process and will aid local civic engagement efforts.

Objective 1: Generate Enhanced Water Quality Products

Task A: Generate Travel Time Grids to Priority Resources

- Compile datasets developed by SWPTSA 5 project, utilizing raw Lidar data, flow direction and accumulation digital elevation models (DEM), RUSLE, NASS 2011 and most recent CDL.
 - raw_dem – raw lidar data
 - fdr_total – flow direction grid from the filled dem
 - fac_total – flow accumulation grid from the filled dem
 - fdr_surf – flow direction grid with non-contributing areas omitted
 - fac_surf – flow accumulation grid with the non-contributing areas omitted
 - hyd_dem – hydro conditioned dem
 - RUSLE_kw – RUSLE kw factor
 - RUSLE_r – RUSLE R factor
 - RUSLE_c – RUSLE C factor
 - RUSLE_p – RUSLE P factor
 - RUSLE_m – RUSLE M factor
 - NASS 2011 and Most Recent CDL
- Prepare data for additional GIS post processing
- Calculate raster cell to cell travel times
- Calculate runoff volume
- Calculate accumulated travel times upstream and downstream
- Compile travel time statistics

Responsible Party: Houston Engineering, Inc.

Task B: Estimate Total Nitrogen (TN), Total Phosphorus (TP), Sediment, and Hydrologic Loading

- GIS post processing of previously prepared data
- Utilize SSURGO data layers to estimate TN, TP, sediment, and hydrologic loading
- Calculate raster cell mass sediment mobilization
- Calculate accumulated sediment and adjust for calibration factor
- Calculate accumulated sediment at catchment outlet
- Calculate TN and TP, with calibration factor leaving the landscape
- Compile statistics

Responsible Party: Houston Engineering, Inc.

Objective 1 Timeline: September 2015 – December 2015

Objective 1 Cost: \$5,462.50

Objective 1 Deliverables: Enhanced Water Quality Data Products: TN, TP, sediment, and Hydrologic Loading

Objective 2: Develop Targeted Implementation Plan

Identify locations on the landscape that are suitable for BMP and conservation practices and generate an

implementation plan that provides calculated implementation cost estimates and the estimated benefits as reductions in TP, TN, and mass sediment.

Task A: Priority Area Identification

- HLWD and consultant will identify specific priority resources for targeted implementation, based on local knowledge and identified impairments, or locally significant resources
- Perform GIS analysis of the hydrologically corrected DEM, SSURGO soils, and the 2011 National Land Cover Dataset (NLCD) to identify locations on the landscape that are suitable for BMP and conservation practices.
- Identified candidate locations will be reviewed to develop a targeted implementation plan that "measures" costs and improvements in TP, TN, and sediment that would result from implementing the BMPs.

Responsible Party: Houston Engineering, Inc. and HLWD

Task B: Data Verification

- HEI will develop a field verification strategy and approach for HLWD staff
- Site check to visually verify land use, practice suitability, and any potential additional physical parameters identified in verification strategy
- Compile site verification data

Responsible Party: Houston Engineering, Inc. and HLWD

Task C: BMP Truthing

- Use site verification information to adjust BMP recommendations
- Complete final BMP recommendations

Responsible Party: Houston Engineering, Inc.

Objective 2 Timeline: September 2015 – July 2016

Objective 2 Cost: \$10,206.00

Objective 2 Deliverables: Enhanced Water Quality Data Products: BMP Suitability and Benefits; Targeted implementation plan

Objective 3: Knowledge and Technology Transfer

Assure that data is understood and useable by HLWD staff and provide enhanced public outreach to deliver improved conservation practice adoption by landowners.

Task A: Develop Final Reports

- Draft technical memorandums that document the enhanced data parameters, the approaches to development of the data, and identifying the appropriate use for planning and implementation of conservation practice recommendations.
- Compiled data that can be used for education and outreach in tabular, map, and other visual formats.
- Identify potential funding sources for implementation of practices

Responsible Party: Houston Engineering, Inc. and HLWD

Task B: Conduct Training Workshops

- Develop training materials for workshop that includes overview of the process, introduction to the data, and specific outcomes and use of the data by landowners and practitioners
- Develop approach to solicit feedback
- Conduct two educational workshops for HLWD staff and select stakeholders/agency technical staff within the targeted priority resource areas
- Compile feedback and discussion from the workshops for use by the HLWD.

Responsible Party: Houston Engineering, Inc. and HLWD

Task C: Refine Data Products and Training

- Conduct debrief session with HLWD staff and HEI after workshops
- Compile a list of lessons learned
- Identify and implement any necessary revisions to the workshop materials and final reports based on the feedback from the debrief sessions

Responsible Party: Houston Engineering, Inc. and HLWD

Objective 3 Timeline: October 2015 – August 2017

Objective 3 Cost: \$31,126.50

Objective 3 Deliverables: Final Report, Two Workshops, all Enhanced Water Quality Data

- Enhanced Water Quality Data will be delivered as an ArcGIS file geodatabase and will contain all GIS data outputs generated during this project. This includes an extensive list of GIS data all set to the extent of the project watershed, and re-packaging the SWPTSA 5 data into a standardized format applicable to HLWD, all of which will be available for continued use. Data includes:

Data Name	Description
catchment	Individual hydrologic catchment boundaries
adj_catchment	Adjoint hydrologic catchment boundaries
cti	Compound topographic index
spi	Stream power index
spi_ranks	rank of the spi file
Sed_mass	Sediment mass leaving the landscape adjusted by calibration factor (tons/acre/year)
overland_sdr	Delivery ratio of sediment to the flow line
Sed_mass_fl	Sediment mass delivered to the catchment outlet (tons/acre/year)
Sed_mass_fl_acc	Sediment mass delivered to the catchment outlet and accumulated to the catchment outlet (tons/year)
TP_mass	TP mass leaving the landscape (lbs/acre/year)
TP_mass_fl	TP mass delivered to the catchment outlet (lbs/acre/year)
TP_mass_fl_acc	TP mass delivered to the catchment outlet and accumulated to the catchment outlet (lbs/year)
TN_mass	TN mass leaving the landscape (lbs/acre/year)
TN_mass_fl	TN mass delivered to the catchment outlet (lbs/acre/year)
TN_mass_fl_acc	TN mass delivered to the catchment outlet and accumulated to the catchment outlet (lbs/year)
PeakQ_2yr	Peak flow from upstream contributing drainage area for 2 yr event
PeakQ_10yr	Peak flow from upstream contributing drainage area for 10 yr event
table_scaled_load	Lookup table to scale yields based on HSPF/SWAT/etc models
Sed_mass_rank	Rank of sediment leaving the landscape
TP_mass_rank	Rank of phosphorus leaving the landscape
TN_mass_rank	Rank of nitrogen leaving the landscape
Sed_mass_fl_rank	Rank of sediment reaching the flow line
TP_mass_fl_rank	Rank of phosphorus reaching the flow line
TN_mass_fl_rank	Rank of nitrogen reaching the flow line
table_r_catchment	Ranking catchment table (sed, TP, TN, WQI), ranking based on 1WIP boundary
table_r_p_res_catchment	Ranking catchment table (sed, TP, TN, WQI), ranking based on priority resource boundaries
usr_rank_weight	Option user weighting for ranking
WQI_mass_rank	Rank of WQI leaving the landscape
WQI_mass_fl_rank	Rank of WQI reaching the flow line
biofiltration	Locations suitable for biofiltration practices.
filtration	Locations suitable for filtration practices.
infiltration	Locations suitable for infiltration practices.

Data Name	Description
protection	Locations suitable for protection practices.
sourcreduction	Locations suitable for Source Reduction practices.
storage	Locations suitable for Storage practices.

Objective 4: Project Coordination

Task A: Grant Reporting

- Complete and submit reports in accordance with work plan requirements. Semi-annual reports will be due February 1 and August 1 during each year of the grant, electronically, in the format specified by the MPCA. A final report will be due within 30 days following the end of this grant agreement, electronically, in the format specified by the MPCA.
- Complete and submit reimbursement requests in accordance with work plan requirements.
- Assure work plan requirements are met.

Responsible Party: HLWD

Objective 4 Timeline: September 2015 – December 2017

Objective 4 Cost: \$2,325.00

Objective 4 Deliverables: Reports and reimbursement requests

4. Measurable Outcomes

The outcome of the WFDNR Targeting and Prioritizing Endeavor will be GIS datasets, summary maps, and a technical memorandum describing the suitability for BMP placement, the effect of targeted implementation on priority resources, and the measurable cost-effectiveness to implement BMPs. Decision-makers will be provided with more detailed data than ever before, allowing for targeting implementation efforts and ultimately making better use of tax payer dollars. This will position the HLWD and other local government entities to leverage the the results of the WFDNR Targeting and Prioritizing Endeavor for more concise and effective grant applications. And most importantly, provide better information for more effective outreach to potential landowners.

- A prioritized implementation plan, with estimated costs, and calculated reductions measured at priority resources
- A better equipped HLWD staff to engage local landowners in selection and implementation of conservation practices that improve water quality at the priority resource
- Improved outreach and education
- Improved local government coordination of priorities and resource allocation

5. Gantt charts (See attached spreadsheet)

6. Project Budget (See attached spreadsheet)