

MEETING DATE: August 13, 2015

TITLE: Authorization to Execute Contract with WSB and Associates, Inc to Conduct Stream Data Statistical Analysis

RESOLUTION NUMBER: 15-067

PREPARED BY: Kelly Dooley and Yvette Christianson

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REVIEWED BY: Administrator Counsel Program Mgr. (Name): Craig Dawson
 Board Committee Engineer Other:

WORKSHOP ACTION:

<input checked="" type="checkbox"/> Advance to Board mtg. Consent Agenda.	<input type="checkbox"/> Advance to Board meeting for discussion prior to action.
<input type="checkbox"/> Refer to a future workshop (date): _____	<input type="checkbox"/> Refer to taskforce or committee (date): _____
<input type="checkbox"/> Return to staff for additional work.	<input type="checkbox"/> No further action requested.
<input type="checkbox"/> Other (specify):	

PURPOSE or ACTION REQUESTED:

Authorize to execute contract with WSB and Associates, Inc to conduct the stream data statistical analysis with the total cost not to exceed \$9,268.

PROJECT/PROGRAM LOCATION:

District Wide.

PROJECT TIMELINE:

See WSB and Associates' Scope of Work

- Organize and pre-screen observed data September 4, 2015
- Monthly statistical analysis September 18, 2015
- Meeting to review results September 21, 2015
- Draft report September 28, 2015
- Receive comments from staff October 5, 2015
- Final report October 12, 2015

PROJECT/PROGRAM COST:

Fund name and number: Research and Monitoring Department: Water Quality Program (500-5001-4320)
Current budget: Contracted Services = \$64,200
Requested amount of funding: \$9,268
Is a budget amendment requested? No.
Is additional staff requested? No.

PAST BOARD ACTIONS:

April 25, 2013 Resolution 13-046: Authorization to Award Contract to HDR for Conducting Statistical Analysis on Lake Water Quality Data

January 23, 2014 Resolution 14-010: Authorization to Award Contract to HDR for Conducting Statistical Analysis – Part II on Lake Water Quality Data

SUMMARY:

Stream monitoring has occurred in the Minnehaha Creek Watershed District (MCWD) since 1968, with significant expansions in the District’s monitoring program occurring in 1997. The Water Quality Program currently monitors 10 sites on Minnehaha Creek and 38 stream sites in the upper watershed. In order to be able to focus additional monitoring efforts in our subwatershed for the Ecosystem Evaluation (E-Grade) Program, yet still be responsive with the routinely monitored stream sites throughout the watershed (e.g., 2017 Comprehensive Water Resource Management Plan), the Water Quality Program will be re-evaluating the number of stream locations currently being monitored.

In February 2015, staff requested a scope of work from Dr. Lorin Hatch, Senior Scientist, at HDR Inc. to perform stream statistical analysis. This analysis would assess the number of monitoring locations on selected streams and make recommendations for anchor sites that best represent the health of the stream. The results of this analysis may allow a reduction of the routinely monitored stream sites, which would allow for reallocation of staff time and MCWD resources to the rotating E-Grade subwatersheds. At the beginning of July, Dr. Lorin Hatch began working at WSB and Associates, Inc., as its Senior Scientist. Consequently, staff requested an updated stream statistical analysis scope of work from WSB to be performed by Dr. Hatch.

Staff has \$64,200 in 2015 Water Quality Program budget designated for contracted services. Staff plans to use those funds to support the WSB and Associates’ scope of work for stream data statistical analysis for a cost of \$9,268.

RESOLUTION

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WHEREAS, The Water Quality Program monitors 10 sites on Minnehaha Creek and 38 stream sites in the upper watershed, and

WHEREAS, In order to focus monitoring efforts in our rotating subwatershed for Ecosystem Evaluation (E-Grade) Program, yet still be responsive with our routinely monitored stream site throughout the watershed, the Water Quality Program will be re-evaluating the stream locations currently being monitored, and

WHEREAS, This analysis would assess the number of monitoring locations on selected streams and make recommendations for anchor sites that best represent the health of the stream; and

WHEREAS, This analysis may suggest a reduction of the core monitoring sites and allow for reallocation of staff's time and resources to the rotating E-Grade subwatersheds; and

WHEREAS, Dr. Lorin Hatch, while working at HDR Engineering, provided MCWD with sound data and recommendation on the lake data statistical analysis work in 2013 and 2014; therefore, was once again requested to provide a quote to perform work on MCWD streams; and

WHEREAS, In July 2015, Dr. Hatch began working with WSB and Associates, Inc; and

WHEREAS, Staff subsequently has worked with Dr. Hatch of WSB and Associates, and received a scope of work for the stream data statistical analysis for the total of \$9,268; and

NOW, THEREFORE, BE IT RESOLVED that the Minnehaha Creek Watershed District Board of Managers authorize the District Administrator execute contract with WSB and Associates, Inc for conducting stream data statistical analysis for the total cost not to exceed \$9,268.

Resolution Number 15-067 was moved by _____, seconded by _____.
Motion to adopt the resolution ___ ayes, ___ nays, ___ abstentions. Date: _____

Secretary Date: _____



July 16, 2015

Ms. Kelly Dooley and Ms. Yvette Christianson
Water Quality Program
Minnehaha Creek Watershed District
15320 Minnetonka Blvd.
Minnetonka, MN 55345

Re: Stream Data Statistical Analysis

Dear Ms. Dooley and Ms. Christianson:

Based on our recent conversations, we have developed a Minnehaha Creek Watershed District (MCWD) Stream Data Statistical Analysis scope of work (SOW) to perform specific statistical analyses of stream locations. We have tried to be very specific in regards to what questions will be evaluated in the SOW because there are many avenues of investigation possible.

SOW Understanding and Approach

A summary of the MCWD stream data for the SOW is presented in Table 1, based on information provided by MCWD. The specific objective is to assess the number of monitoring stations on the selected streams listed below and make recommendations for anchor site(s) that best represent the health of the stream.

- Minnehaha Creek
- Painter Creek
- Long Lake Creek
- Classen Creek

Note that MS Excel software is useful for manipulating data, but is strongly not recommended for statistical analysis. There has been much criticism by statistical experts regarding the statistics algorithms utilized in MS Excel, and MS Excel statistical analyses do not provide probability values (i.e. p-values) necessary for certain statistical comparisons. SPSS statistical software is widely used by statistical experts and will be used for this SOW (<http://www-01.ibm.com/software/analytics/spss/products/statistics/>).

Table 1. Select MCWD Stream Monitoring Stations and Monitoring Years

Site Code	Site Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CCL01	Classen Lake Creek (Bayside Rd.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CCL04	Classen Lake Creek (Watertown Rd.)				X			X	X	X	X	X	X	X	X	X
CLO01	Long Lake Creek (Lake Outlet)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CLO03	Long Lake Creek (Brown and Fox St.)				X	X	X	X	X	X	X	X	X	X	X	X
CMH02	Minnehaha Creek (W. 34th St.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CMH03	Minnehaha Creek (Browndale Ave. Dam)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CMH04	Minnehaha Creek (W. 56th St.)			X			X	X			X	X	X	X	X	X
CMH05	Minnehaha Creek (Chicago Ave. S.)	X	X	X	X	X	X	X								
CMH06	Minnehaha Creek (Hiawatha Ave. train bridge)			X	X		X	X	X	X	X	X	X	X	X	X
CMH07	Minnehaha Creek (Grays Bay Tailwater)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CMH08	Minnehaha Creek (Bridge St.)			X												
CMH11	Minnehaha Creek (Excelsior Blvd.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CMH12	Minnehaha Creek (Upton Ave. S.)	X	X	X	X	X	X	X								
CMH15	Minnehaha Creek (Xerxes)								X	X	X	X	X	X	X	X
CMH17	Minnehaha Creek (32nd Ave. S.)	X	X	X	X	X	X	X								
CMH18	Minnehaha Creek (28th)								X	X	X	X	X	X	X	X
CMH19	Minnehaha Creek (I-494 ramp)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CMH24	Minnehaha Creek (21ST/Minnehaha Pkwy)								X	X	X	X	X			
CPA01	Painter Creek (West Branch Rd.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CPA03	Painter Creek (Deborah Dr. at CR 6)		X	X	X	X	X	X	X	X	X	X	X	X	X	X
CPA04	Painter Creek (CR 26)			X	X	X	X	X	X	X	X	X	X	X	X	X
CPA05	Painter Creek (CR 110)				X		X	X	X	X	X	X	X	X	X	X
CPA06	Painter Creek (Painter Creek Dr.)						X	X	X	X	X	X	X	X	X	X

Scope of Work

We propose to evaluate select Water Quality Program stream data (**Table 1**) as follows:

Task 1: Data Cleanup, Meetings, and Reporting.

WSB will organize and pre-screen the data to identify potential problems and limitations. Examples include selecting methods to account for duplicate values, limits of detection values (e.g. “< 0.02 mg/L”), and outliers. Once these methods are determined and the “cleaned-up” data set is accepted by MCWD, the data will be uploaded into SPSS. MCWD has provided stream data to WSB, but additional data may be needed and requested. The data under this task will include measurements of water temperature (TEMP), dissolved oxygen concentration (DO), specific conductivity (COND), pH, (PH), soluble reactive phosphorus (SRP), total phosphorus (TP), and total suspended solids (TSS). The data range for consideration by stream location is as follows:

- Painter Creek: 2005-2014 available data for CPA01, 03, 04, 05, and 06;
- Classen Creek: 2006-2014 available data for CCL01 and CCL04;
- Long Lake Creek: 2005-2014 available data for CLO01 and CLO03;
- Minnehaha Creek: 2000-2014 available data for CMH02, CMH03, CMH04, CMH05, CMH06, CMH07, CMH11, CMH12, CMH15, CMH17, CMH18, CMH19 and CMH24.

This task will also consist of a meeting with MCWD staff at the MCWD office after completion of Task 2. The meeting will be used to share results and finalize a draft report outline. A draft report will be prepared for MCWD staff review; after a period of one week MCWD will submit one set of comments to WSB for preparation of the final report.

Task 1 Deliverables

- Data Set (electronic form, to be e-mailed)
- Team Meeting (at MCWD offices)
- Draft Report (electronic form, to be e-mailed)
- Final Report (electronic form, to be e-mailed)

Task 2: Perform Water Quality Analyses on a Monthly Time Scale.

The purpose of this task is to assess the number of monitoring stations on selected streams and make recommendations for anchor site(s) that best represent the health of the stream. Our approach is to determine if there are any statistically-significant differences between stations on the same stream for water quality parameters (TEMP, DO, COND, PH, SRP, TP, and TSS) using a monthly time scale:

- Painter Creek: 2005-2014 available data for CPA03 vs. CPA04, CPA04 vs. CPA06, CPA06 vs. CPA01, and CPA01 vs. CPA05;
- Classen Creek: 2006-2014 available data for CCL01 vs. CCL04;
- Long Lake Creek: 2005-2014 available data for CLO01 vs. CLO03;
- Minnehaha Creek: 2005-2014 available data for CMH07 vs. CMH19; CMH02 vs. CMH11; CMH03 vs. CMH04 vs. CMH12/15; and, 2007-2014 available data for CMH24 vs. CMH18 vs. CMH06.

Monthly mean values will be calculated for each water quality parameter and appropriate statistical comparisons performed (e.g. parametric vs. non-parametric, ANOVA analyses).

Task 2 Deliverables

- Print-outs of Task 2 results, to be shared at Task 1 team meeting

WSB Team

Dr. Lorin K. Hatch will perform all statistical analyses for the SOW. He serves as the Senior Water Quality Specialist for WSB's Minneapolis office. He has a Ph.D. in ecology and over 25 years of experience in water quality and aquatic ecosystem management. Dr. Hatch has worked primarily with sediment and chemical generation, transport, and fate in lakes, streams, watersheds, and estuaries on multiple spatial and temporal scales. His work has ranged from pristine to highly-impacted ecosystems across the country. He is an adjunct professor at the

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University of Minnesota in both the Water Resources Science and the Conservation Biology graduate programs, and has led a graduate seminar in statistical analysis.

Dr. Hatch served as the MCWD's first water quality specialist, whose services included developing and managing a water quantity/quality monitoring program for MCWD. This program included nearly 50 stream sites and nearly 60 lake sites (including 27 locations on Lake Minnetonka). The program was brought in-house and included the purchase of nearly all necessary field equipment. The program also involved the supervision of two field technicians. Parameters monitored ranged from physical/chemical to biological (e.g. bacteria, phytoplankton, zooplankton). Dr. Hatch wrote the water quality monitoring manual for MCWD and oversaw the MCWD's water quantity/quality modeling efforts. He conducted numerous studies with collaborators that included the St. Croix Watershed Research Station (Minnesota Science Museum) and the University of Minnesota. Other duties included the updating of technologies for monitoring at MCWD sites (e.g., new weather station on Lake Minnetonka, network of 10 precipitation gauges throughout MCWD, pressure transducer to stormwater sampler communications, cell phone communication of remote autosamplers to MCWD office).

We have broken out the tasks by junior and senior staff. The following timeline assumes notification to proceed by August 28, 2015. Junior WSB staff will be billed at a rate of \$94; Dr. Hatch will be billed at a rate of \$153.

- Task 1 Total: \$4,306
- Task 2 Total: \$4,962

Each task will be billed out separately upon completion of the task. As the SOW evolves, alterations to the scope will be discussed with MCWD, if necessary. The timeline assumes that the SOW notice to proceed is given to WSB by August 28, 2015. If you require additional information, please contact me at 763-762-2829 or lhatch@wsbeng.com.

Sincerely,

WSB & Associates, Inc.



Lorin K. Hatch, Ph.D.
Senior Scientist

Schedule

Task	Anticipated Date	Deliverable	Junior Staff Hours	Senior Staff Hours	Cost
Task 1 - Data Cleanup, Meetings, and Reporting: <i>Data</i>	9/4/15	Dataset	10	4	\$1,552
Task 2 - Monthly Analysis	9/18/15	None	30	14	\$4,962
Task 1 - Data Cleanup, Meetings, and Reporting: <i>Meeting</i>	9/21/15	Team Meeting, Task 2 Results	0	2	\$306
Task 1 - Data Cleanup, Meetings, and Reporting: <i>Reporting</i>	9/28/15	Draft Report	0	12	\$1,836
Task 1 - Data Cleanup, Meetings, and Reporting: <i>Comments from MCWD</i>	10/5/15	None	0	0	\$0
Task 1 - Data Cleanup, Meetings, and Reporting: <i>Reporting</i>	10/12/15	Final Report	0	4	\$612
		Task 1 Total	10	22	\$4,306
		Task 2 Total	30	14	\$4,962