Minnehaha Creek Watershed District ***REQUEST FOR BOARD ACTION***

MEETING DATE: October 8, 2015

TITLE: Authorization to Execute Contract with Wenck Associates to Conduct Wetland Soils Analysis

RESOLUTION NUMBER: 15-083

PREPARED BY: Kelly Dooley and Yvette Christianson, Water Quality Managers

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

WORKSHOP ACTION:

☒ Advance to Board mtg. Consent Agenda.	☐ Advance to Board meeting for discussion prior to action.
☐ Refer to a future workshop (date):_____	☐ Refer to taskforce or committee (date):_____
☐ Return to staff for additional work.	☐ No further action requested.
☐ Other (specify):	

PURPOSE or ACTION REQUESTED:
Authorization to execute contract with Wenck Associates to Conduct Wetland Soils Analysis for the E-Grade Program. The total cost of the soils analysis is not to exceed $11,750

PROJECT/PROGRAM LOCATION:
The wetlands within Six Mile Marsh, Schutz Lake and Minnehaha Creek subwatersheds

PROJECT TIMELINE:
The wetland soil analysis will be conducted from November through December 2015

PROJECT/PROGRAM COST:
Fund name and number: Research and Monitoring Department: Water Quality Program (500-5001-4320)
2015 budget: $82,000
Requested amount of funding: $11,750
Is a budget amendment requested? No
Is additional staff requested? No

PAST BOARD ACTIONS:
None

SUMMARY:

The E-Grade program is being developed to promote greater understanding of the overall health of the waterbodies as well as the watershed itself. Under this program, waterbodies and other ecological features (e.g.; wetlands) will be evaluated for their performance of ecosystem functions.

For wetlands, in particular the ecosystem function of nutrient cycling, there are four components the E-Grade Program plans to assess: vegetation, land use, connectivity to other waterbodies, and soils. Wetland soils assess a wetland's ability to cycle phosphorus and improve water quality; however, can be expensive to analyze. Due to the analysis cost, wetland soils were not originally included as a nutrient cycling metric. After much discussion among ourselves and with the Technical Advisory Committee, MCWD and Wenck Associates believe it is an important component to measure.

In Six Mile Marsh, Schutz Lake and lower Minnehaha Creek subwatersheds, there is little to no wetland soils data. In order to fulfill this component, approximately 50 wetlands will be surveyed in across the three subwatersheds by Wenck Associates in 2015. Two sediment cores will be collected at each site and analyzed following the Environmental Protection Agency's National Wetland Condition Assessment protocol (Attachment 1). The sediment cores will be analyzed by two laboratories that Wenck Associates has contracted with: University of Wisconsin-Stout and University of Minnesota Soils Testing Laboratory. The laboratory at University of Wisconsin-Stout will extract the iron, aluminum, manganese, phosphorus fractions from the soil cores, then the University of Minnesota Soils Testing Laboratory will analyze the extractions. The cores will be analyzed to measure a wetland's ability to adsorb and release phosphorus (Attachment 1). The wetland sediment cores will be analyzed in autumn of 2015.

The Research and Monitoring Department's Water Quality Program 2015 budget has available funds under "contracted services" to support the wetland soils analysis. Both the 2015 budget and work plan were approved by the MCWD Board of Managers. The wetland soil analysis is not to exceed $11,750.00 (Attachment 2).

RESOLUTION

RESOLUTION NUMBER: 15-083

TITLE: Authorization to Execute Contract with Wenck Associates to Conduct Wetland Soils Analysis

WHEREAS, As part of the E-Grade Program, evaluation of Minnehaha Creek Watershed District wetlands was identified to be performed to assess the function of nutrient cycling; and

WHEREAS, For the development of E-Grade, approximately 50 wetlands will be sampled throughout Minnehaha Creek, Six Mile Creek, and Schutz Creek subwatersheds;

WHEREAS, Sediment cores will be taken at each site and analyzed to determine the wetland's soils ability to cycle phosphorus; and

WHEREAS, Wenck provides a unique mix of limnologists, ecologists, wetland ecologists, and engineers with an extensive background in watershed management to develop the ecosystem watershed evaluation; and

WHEREAS, Wenck Associates has unique knowledge of the hydrologic and hydraulic behavior of the Minnehaha Creek watershed and the organizational goals of the MCWD, as well as its work to date in developing the concept of the ecosystem evaluation program, which together make Wenck Associates uniquely qualified; and

WHEREAS, MCWD's Research and Monitoring staff recommends the approval of executing an agreement with Wenck Associates to conduct wetland soils analysis on selected wetlands in Minnehaha Creek, Six Mile Creek, and Schutz Creek subwatersheds; and

NOW, THEREFORE, BE IT RESOLVED, that the Minnehaha Creek Watershed District Board of Managers; hereby authorizes the District Administrator to execute an agreement with Wenck Associates to conduct wetland soils analysis that is not to exceed $11,750.00.

Resolution Number 15-083 was moved by Manager _____ seconded by Manager _____
Motion to adopt the resolution ___ ayes, ___ nays, ___abstentions. Date: _____.

_____ Date:_____
Secretary

Attachment 1

Technical Memo

WENCK ASSOCIATES

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To: Kelly Dooley, Minnehaha Creek Watershed District
Yvette Christianson, Minnehaha Creek Watershed District

From: Brian Beck, Wenck Associates, Inc.
Joe Bischoff, Wenck Associates, Inc.

Copy: Wes Boll, Wenck Associates

Date: 9/22/2015

Subject: E-Grade Wetland Soil Sampling Methodology and Parameters

Objectives

The primary objectives of soil sampling are to assess wetland soil's capacity adsorb phosphorus and to assess the possibility for sediment phosphorus release during periods of anoxia. These objectives can be answered using well-established analytical techniques used to describe phosphorus cycling in wetlands and lakes. The results from the sampling will not only be used to compare among wetlands within the Minnehaha Creek watershed, but other studies which have used similar methods to assess phosphorus cycling in wetlands. Ultimately, the results from this sampling effort will help assess wetlands net positive or negative impacts on water quality.

Site Selection

Generally, two areas will be selected for sampling in each wetland, continuously inundated areas (open water) and seasonally inundated areas. The goal of sampling these two areas in the wetland is to assess geochemistry in areas that continually are interacting with surface water (i.e. continuously inundated areas) to assess possible phosphorus release during anoxic periods and assess phosphorus adsorption capacity in areas that experience intermittent flushing (i.e. seasonally inundated areas). One sample will be collected in each area.

Although spatial variability does exist within wetlands, the goal of this study is not to characterize the heterogeneity of any particular wetland. The goal of this study is to assess how the geochemistry among a variety of wetlands may impact water quality conditions. For this reason, only one sample will be collected from seasonally and permanently inundated areas.

Sampling Methods

The NWCA and other publications (Reddy, 2008) provide a variety of soil sampling methodologies. For example, the NWCA recommends that samples be collected every 8 cm from 0 to 60 cm, while Reddy et. al. (2008) generically recommends that soil sections of 5, 10, or 15 cm be collected. When sampling soils and sediments, the top 10 cm is generally accepted as the section of sediment that interacts with the overlying water column. My recommendation is to consistently sample the top 10 cm of sediment at each site.

Although the top 10 cm should be consistently sampled, the tools used to collect samples may vary among wetlands. Since each wetland will have different saturation, density, and consistency conditions, it may not be possible to sample each wetland using the same tool. For example, a wetland with very loosely consolidated sediment may need to be sampled with a sediment corer while other types of wetlands may need to be sampled with a shovel or soil auger. Equipment selection will be left to professional judgement of the scientist conducting the soil sampling.

The NWCA field manual recommends that surface vegetation be removed prior to sediment sampling. This is recommended for the E-grade sampling program since it would be difficult to collect soil samples that include overlying vegetation cover.

Parameters Analyzed

Literature sources were reviewed to determine if there are common soil chemistry parameters that could be used for the E-grade wetland monitoring program. One program that has investigated soil chemistry in the past is the EPA's NWCA. Table 1 contains the entire list of soil parameters that were routinely measured for the NWCA program.

Table 1. Soil parameters that were measured for the NWCA program.

Method	SSL Method	Analyte
PSDA, <2mm, air dry	3A1a1a	Clay, Silt, Sand
Calcium carbonate equivalent, <2mm	4E1a1a1a1	CaCO3
Calcium carbonate equivalent, <20mm	4E1a1a1a2	CaCO3
Total Carbon, Nitrogen and Sulfur	4H2a1-3	C, N, S
pH	4C1a2a1a-b1, 4C1a2a2a-b1	1:1 H20, 1:2 0.01 M CaCl2
Cation exchange capacity	4B1a1b1-4	CEC, $Ca2^{+}$, K^{+}, Mg^{2-}, Na^{+}
Ammonium Oxalate Extraction	4G2a1a1-5	Al, Fe, Mn, P, Si
Electrical Conductivity	4F1a1a1a1	EC
Dithionite-Citrate Extraction	4G1a1-3a-b1	Al, Fe, Mn
Olsen Phosphorus	4D5a1a-b1	P
Mehlich Phosphorus	4D6a1a-b1	P
Trace Elements	4H1a1a1a1-20	Ag, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, P, Pb, Sb, Se, Sn, Sr, VW, Zn
Bulk Density	3B1a3B1b, 3B1c3B1d	Db_{fi}, Db_{od}, Db_{33}

Of these parameters, the ammonium oxalate extraction and analysis appears to be a widely used method for measuring aluminum and iron in wetland sediments (Reddy, 1995; Richardson, 1985). Furthermore, the ammonium oxalate extractable metals method has been used to investigate wetland's phosphorus sorption capacity (Reddy, 1995), which may be a useful metric to assess a wetland's ability to improve water quality. For these reasons, the ammonium oxalate iron, aluminum, and phosphorus extraction method will be used to analyze each wetlands ability to act as a sink for soluble phosphorus.

In addition to phosphorus sorption, anoxic release of phosphorus will be taken into consideration using Psenner and Puckso (1988) method. This method will allow us to determine the amount of redox sensitive phosphorus that is available during anoxic periods.

Parameter Costs

The ammonium oxalate metal and phosphorus extraction method would be conducted by the University of Wisconsin Stout, while the analysis of the extract would be performed by the University of Minnesota Soil testing lab. Costs for each lab is listed in Table 2.

The phosphorus fractionation extractions and analysis will both be performed by the University of Wisconsin Stout (Table 3).

Table 2. Ammonium oxalate extraction and analysis costs.

Analysis Step	Laboratory	Cost	Unit
Extraction	UW Stout	$10.00	per site
Shipping to U of M	N/A	$20.00	per batch
Equipment Setup	U of M Soils	$108.00	per batch
Mn, Fe, Al, and P Analysis	U of M Soils	$57.50	per site
Per Sample Cost		$67.50	Total
Per Batch Cost		$128.00	Total

Table 3. Phosphorus fractionation of iron bound, labile organic, and loosely bound phosphorus.

Analysis Step	Laboratory	Cost	Unit
Psenner Extraction and analysis	UW Stout	$100.00	per site
Per Sample Cost		$100.00	Total

Table 4. Total costs per wetland for soil analytical methods

Analysis	Sites Sampled	Cost	Samples Per Wetland	Total Cost Per wetland
Psenner Extraction	Continuously Inundated areas	$100 per sample	1	$100
Ammonium Oxalate Extraction	Seasonally and continuously inundated areas	$67.50 per sample	2	$135
.Per Wetland Cost				$235[1]

[1] Per batch costs were not taken into account since they will be relatively small.

References

Reddy, K.R., O.A. Diaz, L.J. Scinto, and Agami. 1995. Phosphorus dynamics in selected wetlands and streams of the Lake Okeechobee Basin. Ecol. Eng. 5:183-208.

Reddy, K.R., DeLaune, R.D. 2008. Biogeochemistry of Wetlands: Science and Applications.

Attachment 2

Technical Memo

WENCK ASSOCIATES

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To: Kelly Dooley, Minnehaha Creek Watershed District
Yvette Christiansen, Minnehaha Creek Watershed District

From: Joe Bischoff, Wenck Associates, Inc.

Date: September 22, 2015

Subject: Soil and Sediment Chemistry Costs

The purpose of this memo is to outline the costs required to collected wetland sediment and lake sediment samples to support the E-Grade Ecosystem Evaluation Program.

Wetland Sediments

The purpose of collecting wetland sediments is to develop indicators of biogeochemical processes in support of the nutrient cycling ecosystem service. Approximately 50 wetlands will be sampled by the end of the season (Table 1). Assuming that 2 cores will be taken per site, analytical costs will be $11,750. The sampling and analytical approach is outlined in the Wenck Technical Memorandum entitled E-Grade Wetland Soil Sampling Methodology and Parameters (September 22, 2015).

Table 1. Wetlands sampled in the test subwatersheds.

Watershed	Total Wetlands Surveyed (through 8/31/2015)	Additional Planned Wetlands to Survey
Six Mile	22	6
Schutz	7	0
Lower Minnehaha Creek	11	4
TOTALS	**40**	**10**

Lake Sediments

The purpose of collecting lake sediments is to develop indicators of biogeochemical processes in support of the nutrient cycling ecosystem service. Data was compiled for the lakes in the test subwatershed and only 13 of the 36 lakes currently have sediment chemistry and phosphorus release data. Because there is no existing index for lake sediment health and this needs to be developed, we are not recommending collecting additional lake sediments at this time. Rather, we intend to utilize the existing sediment database to develop the sediment health index concept. If the approach looks reasonable, lake sediment data could be collected later to fill out the database. Lake sediment analyses would cost between $6,000 to $7,000 per lake for a total around $150,000.

Table 2. Available lake sediment data.

Lake	Most Recent Sediment Coring
Carl Krey	--
Church	--
East Auburn	2012 (Wenck)
Kelser's Pond	--
Marsh	2012 (Wenck)
North Lundsten	2012 (Wenck)
Parley	2012 (Wenck)
Piersons	--
South Lundsten	2012 (Wenck)
Steiger	--
Stone	2012 (Wenck)
Sunny	--
Turbid	2012 (Wenck)
Wassermann	2012 (Wenck)
West Auburn	--
Zumbra	2012 (Wenck)
Schutz	--
Bass	--
Brownie	--
Calhoun	Barr
Cedar	--
Cemetery	--
Grass	--
Harriet	Barr
Harvey	--
Hiawatha	--
Lake of the Isles	--
Legion	--
Milner Pond	--
Mother	--
Nokomis	Barr
Norby's Pond	--
Pamela Pond	--
Powderhorn	Barr
Taft	--
Twin	--