# elm creek
## Watershed Management Commission

**ADMINISTRATIVE OFFICE**
3235 Fernbrook Lane
Plymouth, MN 55447
PH: 763.553.1144
email: judie@jass.biz
www.elmcreekwatershed.org

**TECHNICAL OFFICE**
Barr Engineering
4300 Market Point Drive, Suite 200
Minneapolis, MN 55435
PH: 612.834.1060
Email: jherbert@barr.com

February 5, 2020

Representatives
Elm Creek Watershed Management
Commission Hennepin County, MN

*The meeting packet for this meeting may be found on the Commission's website:*
http://www.elmcreekwatershed.org/minutes--meeting-packets.html

Dear Representatives:

A **regular meeting** of the Elm Creek Watershed Management Commission will be held on **Wednesday, February 12, 2020, at 11:30 a.m.** in the Mayor's Conference Room at Maple Grove City Hall, 12800 Arbor Lakes Parkway, Maple Grove, MN.

Nominations for officers for the coming year will be accepted at this meeting. Elections will occur at the March 11, 2020 meeting.

Please email me at judie@jass.biz to confirm whether you or your Alternate will be attending the regular meeting.

Thank you.

Regards,

Judie A. Anderson
Administrator
JAA:tim
Encls: Meeting Packet
cc: Alternates, TAC Members, City Clerks, Jim Herbert, Kris Guentzel, MPCA, James Kujawa, Brian Vlach, Met Council, Diane Spector, DNR, BWSR, Official Newspaper

Z:\Elm Creek\Meetings\Meetings 2020\02 Notice_reg meeting.docx

# elm creek
# Watershed Management Commission

ADMINISTRATIVE OFFICE
3235 Fernbrook Lane
Plymouth, MN 55447
PH: 763.553.1144
email: judie@jass.biz
www.elmcreekwatershed.org

TECHNICAL OFFICE
Barr Engineering
4300 Market Point Drive, Suite 200
Minneapolis, MN 55435
PH: 612.834.1060
email: jherbert@barr.com
email surface water solutions@outlook.com

**AGENDA**
**Regular Meeting**
**February 12, 2020**

*The meeting packet may be found on the Commission's website:* http://elmcreekwatershed.org/minutes--meeting-packets.html

**1.** Call Regular Meeting to Order.
- a. Approve Agenda.*

**2.** Consent Agenda.
- a. Minutes last Meeting.*
- b. Treasurer's Report and Claims.*

**3.** Open Forum.

**4.** Action Items.
- a. Nomination of Officers. *Currently:*
  - 1) Doug Baines, Dayton, Chair.
  - 2) Liz Weir, Medina, Vice Chair.
  - 3) Bill Walraven, Champlin, Secretary.
  - 4) Fred Moore, Plymouth, Treasurer.
- b. Project Reviews – *see Staff Report.**
- c. Accept 2019 Work Plan in Review.*
- d. Accept Fish Lake Final Report.* *Report is included in mailed meeting packets; report and appendices are uploaded to the website.*
- e. Salt Symposium Sponsorship.*

**5.** Old Business.

**6.** New Business.
- a. 2020 Subwatershed Assessment Applications.*
  - 1) Weaver Lake.
  - 2) South Fork Rush Creek.

**7.** Communications. *(Also see Staff Report.*)*
- a. Manufactured Treatment Devices (MTDs).* *Barr memo is included in mailed meeting packets; memo and attachments are uploaded to the website.*

**8.** Education.
- a. WMWA – next meeting is scheduled for February 11, 2020, at Plymouth Creek Center.
- b. Smart Salting Workshop.*

**9.** Grant Opportunities and Updates.

*(over)*

*in meeting packet
**available at meeting or on website

**10.** Project Reviews.

| Item No. | A | E | I\|RPFI RP\|D | AR | Project No. | Project Name |
|---|---|---|---|---|---|---|
| | | | | | W Denotes wetland project | |
| ag | | | | AR | 2013-046 | Woods of Medina, Medina. |
| ah. | | | | AR | 2014-015 | Rogers Drive Extension, Rogers. |
| a. | A | | | | 2015-004 | Kinghorn Outlet A, Rogers. |
| ai. | | | | AR | 2015-030 | Kiddiegarten Child Care Center, Maple Grove. |
| aj. | | | | AR | 2016-002 | The Markets at Rush Creek, Maple Grove. |
| ak. | | | | AR | 2016-005W | Ravinia Wetland Bank Plan, Corcoran. |
| b. | A | | | | 2016-040 | Kinghorn 4th Addition, Rogers. |
| c. | | | | | 2016-047 | Hy-Vee North, Maple Grove. |
| al. | | | | AR | 2017-014 | Laurel Creek, Rogers. |
| am. | | | R | AR | 2017-017 | Mary Queen of Peace Catholic Church, Rogers. |
| an. | | | | AR | 2017-029 | Brayburn Trails, Dayton. |
| d. | | | | | 2017-039 | Rush Creek Apartments, Maple Grove. |
| e. | | | | | 2017-050W | Ernie Mayers Wetland/floodplain violation, Corcoran. |
| ao. | | | | AR | 2018-018 | Summers Edge Phase II, Plymouth. |
| f. | | | | | 2018-020 | North 101 Storage, Rogers. |
| ap. | | | | AR | 2018-026 | Windrose, Maple Grove. |
| aq, | | | | AR | 2018-028 | Tricare Third Addition, Maple Grove. |
| ar. | | | | AR | 2018-044 | OSI Phase II, Medina. |
| g. | | | | | 2018-046 | Graco, Rogers |
| as. | | | | AR | 2018-048 | Faithbrook Church Phase 2, Dayton. |
| h. | | E | | | 2019-001 | Fernbrook View Apartments, Maple Grove. |
| at. | | | | | 2019-002 | Parkside Villas, Champlin. |
| au. | | | | | 2019-021 | Brenly Meadows, Rogers. |
| av. | | | | | 2019-022 | Comlink Midwest, Corcoran. |
| aw. | | | | | 2019-023 | 99th Avenue Apartments, Maple Grove. |
| i. | | | | | 2019-024 | Boston Scientific, Maple Grove. |
| j. | | | | | 2019-026 | Interstate Power Systems, Rogers. |
| ax. | | | | | 2019-027 | Havenwood at Maple Grove. |
| k. | | | | | 2019-028 | Howell Meadows, Maple Grove. |
| l. | | | | | 2019-029 | South Prominence, Maple Grove. |
| m. | | | | | 2019-030 | Rolling Hills Acres, Corcoran. |
| n. | A | E | | | 2019-031 | Hassan Sand and Gravel Expansion, Rogers. |
| o. | A | E | | | 2019-032 | OSI Expansion, Medina. |
| p. | | E | | | 2020-001 | Outlot 1, Markets at Rush Creek, Maple Grove. |
| q. | | | | | 2020-002 | Project 100, Maple Grove. |
| r. | | E | | | 2020-003 | Palisades at Nottingham Second Addn., Maple Grove. |
| s. | | | | | 2020-004 | Elm Road Area Project, Maple Grove. |

= Action item E = Enclosure provided I = Informational update will be provided at meeting RPFI - removed pending further information
R = Will be removed RP= Information will be provided in revised meeting packet….. D = Project is denied AR awaiting recordation

**11.** Other Business.



*in meeting packet
**available at meeting or on website

# elm creek
# Watershed Management Commission

**ADMINISTRATIVE OFFICE**
3235 Fernbrook Lane
Plymouth, MN 55447
PH: 763.553.1144
email: judie@jass.biz
www.elmcreekwatershed.org

**TECHNICAL OFFICE**
Barr Engineering
4300 Market Point Drive, Suite 200
Minneapolis, MN 55435
PH: 612.834.1060
Email: jherbert@barr.com

**Technical Advisory Committee** *(page 1)*
**and Regular Meeting** *(beginning on page 2)*
**Minutes – January 8, 2020**

**I.** A meeting of the **Technical Advisory Committee (TAC)** for the Elm Creek Watershed Management Commission was convened at 10:01 a.m., Wednesday, January 8, 2020, in the Mayor's Conference Room, Maple Grove City Hall, 12800 Arbor Lakes Parkway, Maple Grove, MN.

In attendance: Kevin Mattson, Corcoran; Nico Cantarero, Wenck Associates, Dayton; Derek Asche, Maple Grove; Kaci Fisher, Hakanson Anderson, Medina; Ben Scharenbroich, Plymouth; Kris Guentzel, and Kirsten Barta, Hennepin County Dept. of Environment and Energy (HCEE); Jim Herbert and Jeff Weiss, Barr Engineering; James Kujawa, Surface Water Solutions; Brian Vlach, Three Rivers Park District (TRPD); and Judie Anderson, JASS.

Not represented: Champlin and Rogers.

Also present: Ken Guenthner, Corcoran; Doug Baines, Dayton; Liz Weir, Medina; and Fred Moore and Catherine Cesnik, Plymouth.

**A.** Asche was named **Chair** and Scharenbroich **Vice Chair** of the Technical Advisory Committee by acclamation.

**B.** Motion by Scharenbroich, second by Fischer to approve the **agenda.*** *Motion carried unanimously.*

**C.** Motion by Scharenbroich, second by Mattson to approve the **minutes*** of the December 11, 2019 Technical Advisory Committee meeting. *Motion carried unanimously.*

**II. Rules of the Commission**.

Included in the meeting packet was a redlined version of the most recent Rules of the Commission* adopted in 1993. They have been reviewed and redlined by the Commission's attorney, Joel Jamnik, and the Administrator. Most of the edits were to bring the document into conformance with the most current State Statute language and to better align the activities of the Commission described therein with the current practices of the organization. The members reviewed the document page by page and their comments will be inserted into the draft document.

**III. Member Assessments.**

Staff returned to this meeting with the member assessment spreadsheet* containing additional information. Updates show the annual fluctuations in (1) Consumer Price Indices (CPIs), (2) Tax Capacity/Market Value, and (3) total member assessments, along with the focus of each budget/reason for assessment increases. This information was also provided in graph format.*

**IV.** The next meeting of the TAC is tentatively scheduled for 10:00 a.m., Wednesday, February 12, 2020, prior to the regular meeting. The meeting of the Technical Advisory Committee was adjourned at 11:29 a.m.

**I.** A regular meeting of the Elm Creek Watershed Management Commission was called to order at 11:36 a.m., Wednesday, January 8, 2020, in the Mayor's Conference Room, Maple Grove City Hall, 12800 Arbor Lakes Parkway, Maple Grove, MN, by Chairman Doug Baines.

Present were: Bill Walraven, Champlin; Ken Guenthner, Corcoran; Doug Baines, Dayton; Joe Trainor, Maple Grove; Elizabeth Weir, Medina; Fred Moore, Plymouth; Kris Guentzel, and Kirsten Barta, Hennepin County Dept. of Environment and Energy (HCEE); Brian Vlach, Three Rivers Park District (TRPD); Jim Herbert and Jeff Weiss, Barr Engineering; James Kujawa, Surface Water Solutions; and Judie Anderson, JASS.

Not represented: Rogers.

Also present: Kevin Mattson, Corcoran; Nico Cantarero, Wenck Associates, Dayton; Derek Asche and Mark Lahtinen, Maple Grove; Kaci Fisher, Hakanson-Anderson, Medina; and Catherine Cesnik and Ben Scharenbroich, Plymouth.

**A.** Motion by Weir, second by Walraven to approve the **agenda.*** *Motion carried unanimously.*

**B.** Motion by Weir, second by Guenthner to approve the **minutes*** of the December 11, 2019, regular meeting. *Motion carried unanimously.*

**C.** Motion by Moore, second by Walraven to approve the January **Treasurer's Report** and **Claims*** totaling $101,264.73. *Motion carried unanimously.*

**II. Open Forum.**

**A.** Baines presented Moore with a **certificate of appreciation** for his many years of service to the Commission as the representative from Plymouth.

**B.** **Weiss announced that he has resigned** from Barr Engineering in order to take a position at the Department of Natural Resources (DNR). This will be his last meeting as a Technical Advisor to the Commission.

The members extended their good wishes to both of these gentlemen.

**III. Action Items.**

**A.** Motion by Weir, second by Walraven to approve the following **appointments for 2020**:

**1.** Official newspaper, Osseo-Maple Grove Press.

**2.** Official depositories, US Bank and the 4M Fund.

**3.** Deputy Treasurer, Judie Anderson.

**4.** Auditor, Johnson & Company, Ltd.

*Motion carried unanimously.*

**B.** **Project Reviews.**

**1.** 2015-004 Kinghorn Outlot A, Rogers.

**2.** 2016-040 Kinghorn 4th Addition, Rogers.

**3.** 2018-020 North 101 Storage, Rogers.

Staff noted that these projects have been dormant for many months. At this time Staff are seeking to have the applications denied due to lack of activity. However, since the representative from the City of Rogers is not present at this meeting, Staff are requesting the Commission to table action on these projects pending input from the City. Motion by Guenthner, second by Weir to table action on these projects per Staff's request. *Motion carried unanimously.*

**IV. Old Business.**

**A.** Barta reminded the members that **Subwatershed Assessment (SWA) applications** are due January 15, 2020 and should be emailed to her attention.

**B. Current SWA status:** the Fish Lake SWA draft report is available now, the Diamond Lake SWA is in progress, the North Fork Rush Creek SWA is done, and the Weaver Lake SWA is under consideration.

**V. New Business.**

Members of the **Technical Advisory Committee** recapped their meeting held prior to this meeting. The committee reviewed and commented on revisions to the Commission's Rules.* They also received an updated member assessment spreadsheet* showing annual fluctuations in (1) Consumer Price Index (CPI), (2) Tax Capacity/Market Value, and (3) total member assessments, along with the focus of each budget/reason for assessment increases.

**VI. Communications.**

Included in the meeting packet is a copy of a letter* from the Minnesota Campaign Finance Board reminding the Commissioners that they are required as public officials to complete and return a **Statement of Economic Interest*** by January 27, 2020. These documents were previously emailed to the Commissioners so that they could be returned electronically.

**VII. Education and Public Outreach.** The next meeting of the West Metro Water Alliance (**WMWA)** is scheduled for 8:30 a.m., Tuesday, January 14, 2020, at Plymouth City Hall. Please check for the location of the meeting room due to building remodeling.)

**VIII. Grant Opportunities and Project Updates.**

**IX. Other Business.**

**A.** The **projects** listed on the following page are discussed in the January Staff Report.

**B. Adjournment.** There being no further business, the meeting was adjourned at 12:01 p.m.

Respectfully submitted,

Judie A. Anderson
Recording Secretary
JAA:tim

Z:\Elm Creek\Meetings\Meetings 2020\January 8 2020 Regular and TAC meeting minutes.docx.

| Item No. | | | | | Project No. | Project Name |
|---|---|---|---|---|---|---|
| | | | | | W Denotes wetland project | |
| ag | | | | AR | 2013-046 | Woods of Medina, Medina. |
| ah. | | | | AR | 2014-015 | Rogers Drive Extension, Rogers. |
| a. | | | | | 2015-004 | Kinghorn Outlet A, Rogers. |
| ai. | | | | AR | 2015-030 | Kiddiegarten Child Care Center, Maple Grove. |
| aj. | | | | AR | 2016-002 | The Markets at Rush Creek, Maple Grove. |
| ak. | | | | AR | 2016-005W | Ravinia Wetland Bank Plan, Corcoran. |
| b. | | | | | 2016-040 | Kinghorn 4th Addition, Rogers. |
| c. | | | | | 2016-047 | Hy-Vee North, Maple Grove. |
| al. | | | | AR | 2017-014 | Laurel Creek, Rogers. |
| am. | | | | AR | 2017-017 | Mary Queen of Peace Catholic Church, Rogers. |
| an. | | | | AR | 2017-029 | Brayburn Trails, Dayton. |
| d. | | | | | 2017-039 | Rush Creek Apartments, Maple Grove. |
| e. | | E | | | 2017-050W | Ernie Mayers Wetland/floodplain violation, Corcoran. |
| ao. | | | | AR | 2018-018 | Summers Edge Phase II, Plymouth. |
| f. | | | | | 2018-020 | North 101 Storage, Rogers. |
| ap. | | | | AR | 2018-026 | Windrose, Maple Grove. |
| aq. | | | | AR | 2018-028 | Tricare Third Addition, Maple Grove. |
| ar. | | | | AR | 2018-044 | OSI Phase II, Medina. |
| g. | | | | | 2018-046 | Graco, Rogers |
| as. | | | | AR | 2018-048 | Faithbrook Church Phase 2, Dayton. |
| h. | | | | | 2019-001 | Fernbrook View apartments, Maple Grove. |
| at. | | | | | 2019-002 | Parkside Villas, Champlin. |
| au. | | | | | 2019-021 | Brenly Meadows, Rogers. |
| av. | | | | | 2019-022 | Comlink Midwest, Corcoran. |
| aw. | | | | | 2019-023 | 99th Avenue Apartments, Maple Grove. |
| i. | | | | | 2019-024 | Boston Scientific, Maple Grove. |
| j. | | | | | 2019-026 | Interstate Power Systems, Rogers. |
| ax. | | | | | 2019-027 | Havenwood at Maple Grove. |
| k. | | | | | 2019-028 | Howell Meadows, Maple Grove. |
| l. | | | | | 2019-029 | South Prominence, Maple Grove. |
| m. | | E | | | 2019-030 | Rolling Hills Acres, Corcoran. |
| n. | | | | | 2019-031 | Hassan Sand and Gravel Expansion, Rogers. |
| o. | | | | | 2019-032 | OSI Expansion, Medina. |

A= Action item E = Enclosure provided I = Informational update will be provided at meeting RPFI - removed pending further information
R = Will be removed RP= Information will be provided in revised meeting packet….. D = Project is denied AR awaiting recordation

# Elm Creek Watershed Management Commission Treasurer's Report

| | | 2019 Budget | Jan 2020 | Feb 2020 | 2019 Budget YTD |
|---|---|---|---|---|---|
| **EXPENSES** | | | | | |
| Administrative | | 90,000 | 9,671.44 | 10,484.05 | 106,455.83 |
| Watershed-wide TMDL Admin | | 1,500 | | | 0.00 |
| Grant Writing | | 4,000 | | | 0.00 |
| Website | | 5,000 | 65.00 | 81.25 | 1,153.80 |
| Legal | | 2,000 | | 31.00 | 1,881.20 |
| Audit | | 5,000 | | | 4,500.00 |
| Insurance | | 3,900 | | 200.00 | 2,661.00 |
| Miscellaneous/Contingency | | 1,000 | | | 0.00 |
| Project Reviews | HCEE | 97,400 | | 10,659.56 | 70,473.04 |
| Project Reviews | Consult | 15,000 | 972.00 | | 20,388.50 |
| Other Technical | Barr | | | 847.00 | |
| Project Reviews | Admin | 15,000 | 112.70 | 580.81 | 9,122.68 |
| WCA-Technical | HCEE | 18,200 | | 327.00 | 3,710.36 |
| WCA | Legal | 500 | | | 31.00 |
| WCA | Admin | 2,000 | 32.00 | | 424.45 |
| Floodplain Mapping HCEE | Technical | 46,386 | | (2,283.66) | (5,436.36) |
| Floodplain Mapping Barr | | | | 532.50 | 532.50 |
| Stream Monitoring USGS | | 41,000 | | | 20,840.00 |
| Stream Monitoring TRPD | | 6,875 | 6,875.00 | | 6,875.00 |
| TMDL Follow-up - TRPD | | 2,500 | | | 0.00 |
| Rain Gauge | | 250 | 16.39 | 28.43 | 207.83 |
| Rain Gauge Network | | 100 | | | 0.00 |
| Lakes Monitoring - CAMP | | 760 | | | 0.00 |
| Lakes Monitoring - TRPD | | | | | |
| Sentinel Lakes | | 8,100 | 8,100.00 | | 8,100.00 |
| Additional Lake | | 1,500 | | | 0.00 |
| Aquatic Vegetation Surveys | | 325 | 325.00 | | 325.00 |
| Wetland Monitoring (WHEP) | | 4,000 | | 4,000.00 | 4,000.00 |
| Education | | 4,000 | 87.40 | 20.47 | 2,513.63 |
| WMWA General Activities | | 5,000 | | | 3,000.00 |
| WMWA Educators/Watershed Prep | | 4,500 | | | 2,000.00 |
| WMWA Special Projects | | 2,000 | | | 2,000.00 |
| Rain Garden Workshops | | 2,000 | | | 2,000.00 |
| Education Grants | | 1,000 | | | 0.00 |
| Macroinvertebrate Monitoring-River Watch | | 3,000 | | 3,000.00 | 3,000.00 |
| Projects ineligible for ad valorem-See Note 1 | | - | | | 0.00 |
| Studies / Project ID / SWA | | 35,000 | 299.30 | | 4,860.13 |
| Plan Amendments | | 2,000 | | | 1,396.20 |
| *Transfer to (from) Encumbered Funds (see below)* | | | | | 0.00 |
| *Transfer to (from) Capital Projects (see CIP Tr* | | *490,000* | *74,246.00* | *1,710.19* | 352,687.16 |
| *Transfer to (from) Cash Sureties (see below)* | | | *462.50* | *586.00* | 5,580.97 |
| *Transfer to (from) Grants (see below)* | | | - | - | 199,092.00 |
| *To Fund Balance* | | | | | 0.00 |
| **TOTAL - Month** | | | **101,264.73** | **30,804.60** | **834,375.92** |
| **TOTAL Paid in 2019, incl late 2018 Expenses** | | **920,796.00** | **913,004.22** | **943,808.82** | **2019 Paid** |

Note 1: $50,000 2019 Budget Projects ineligible for ad valorum re-assigned to General Fund effective May 8, 2019

| | | | | 2019 Activity | |
|---|---|---|---|---|---|

# Elm Creek Watershed Management Commission Treasurer's Report

| | | 2019 Budget | Jan 2020 | Feb 2020 | 2019 Budget YTD |
|---|---|---|---|---|---|
| **INCOME** | | | | | |
| *From Fund Balance* | | | | | |
| Project Review Fee | | 80,000 | 13,400.00 | | 59,274.20 |
| Return Project Fee | | | | | 0.00 |
| Water Monitoring - TRPD Co-op Agmt 2018 | | | | | |
| Water Monitoring - TRPD Co-op Agmt | | 5,000 | | | 0.00 |
| WCA Fees | | 9,000 | | | 900.00 |
| Return WCA Fee | | | | | 0.00 |
| Reimbursement for WCA Expense | | | | | 654.81 |
| WCA Escrow Earned | | | | | 0.00 |
| Member Dues | | 230,400 | 211,670.38 | | 442,070.38 |
| Interest/Dividends Earned | | 3,000 | 1,465.02 | | 27,871.76 |
| *Transfer to (from) Capital Projects (see CIP Tr* | | 490,000 | *3,870.36* | | 458,031.53 |
| *Transfer to (from) Cash Sureties (see below)* | | | | | |
| *Transfer to (from) Grants (see below)* | | | *19,713.04* | | 24,741.04 |
| Misc Income | | | | | 0.00 |
| **Total - Month** | | | **250,118.80** | **0.00** | **1,013,543.72** |
| **TOTAL Rec'd 2019, incl late 2018 Income** | | **817,400.00** | **1,022,683.40** | **1,022,683.40** | **2019 Received** |
| **CASH SUMMARY** | | **Balance Fwd** | | | |
| Checking | | 0.00 | | | |
| 4M Fund | | 1,303,038.87 | 1,412,718.05 | | |
| **Cash on Hand** | | | **1,412,718.05** | | |
| **CASH SURETIES HELD** | | **Balance Fwd** | | | **Activity 2019** |
| WCA Escrows Received | | 30,000.00 | | | 1,000.00 |
| WCA Escrow Reduced | | 0.00 | 462.50 | 586.00 | 19,505.53 |
| **Total Cash Sureties Held** | | **30,000.00** | **12,080.47** | **11,494.47** | |
| **RESTRICTED / ENCUMBERED FUNDS** | | **Balance Fwd** | | | |
| *Restricted for CIPs* | | 732,761 | | | |
| *Restricted for Closed Project Funds* | | 1,222 | | | |
| *Enc. Studies / Project Identification / SWA* | | 175,297 | | | |
| *Projects Ineligible for ad valorum* | | | | | |
| **Total Restricted / Encumbered Funds** | | **909,280** | **909,280.00** | **909,280.00** | |
| | | | | | |
| | | | | **2019 Activity** | |

# Elm Creek Watershed Management Commission Treasurer's Report

| | | | Jan 2020 | Feb 2020 | 2019 Budget YTD |
|---|---|---|---|---|---|
| **GRANTS** | | | | | |
| **Fish Lake CWLA** | | | | | |
| Revenue | | | | | - |
| Expense | | | | | 199,092.00 |
| Balance | | | - | - | (199,092.00) |
| **Fish Lake Alum Trmt Phase 2** | | | | | |
| Revenue | | | 19,713.04 | | 19,713.04 |
| Expense | | | | | - |
| Balance | | | **19,713.04** | - | 19,713.04 |
| **Rush Creek SWA** | | | | | |
| Revenue | | | | | 5,028.00 |
| Expense | | | | | - |
| Balance | | | | | 5,028.00 |
| **BWSR Watershed-based Funding** | | | | | |
| Revenue | | | | | - |
| Expense | | | | | - |
| Balance | | | | | - |
| **TOTAL GRANTS** | | | | | |
| **Revenue** | | | 19,713.04 | - | **24,741.04** |
| **Expense** | | | - | - | **199,092.00** |
| **Balance** | | | **19,713.04** | **-** | **(174,350.96)** |

| **Claims Presented** | | General Ledger Account No | Jan 2020 | Feb 2020 | TOTAL |
|---|---|---|---|---|---|
| Campbell Knutson - Legal | | 521000 | | 31.00 | **31.00** |
| Connexus - Rain Gauge | | 551100 | | 28.43 | **28.43** |
| Barr Engineering | | 578050 | | | **1,965.50** |
| Floodplain Mapping | | 580440 | | 532.50 | |
| Other Technical | | 578050 | | 847.00 | |
| Ravinia Wetland Mitigation | | 240201 | | 586.00 | |
| City of Plymouth - EC Reach D Addn'l Pmt | | 563014 | | 1,710.19 | **1,710.19** |
| Hennepin County Treasurer | | | | | **15,702.90** |
| HCEE - Tech Svcs Project Reviews | | 578000 | | 10,659.56 | |
| HCEE - Tech Svcs WCA | | 579500 | | 327.00 | |
| HCEE - Floodplain Mapping Credit | | 580440 | | -2,283.66 | |
| HCEE - River Watch | | 553000 | | 3,000.00 | |
| HCEE - WHEP | | 579800 | | 4,000.00 | |
| League of MN Cities | | | | | **200.00** |
| LMC - Workers' Comp Insurance | | 513000 | | 200.00 | |
| JASS | | | | | **11,166.58** |
| Administration | | 511000 | | 8,110.42 | |
| TAC Support | | 511000 | | 1,208.83 | |
| Annual Report | | 511000 | | 1,164.80 | |
| Website | | 581000 | | 81.25 | |
| Project Reviews | | 578100 | | 580.81 | |
| Education | | 590000 | | 20.47 | |
| **TOTAL CLAIMS** | | | | | **30,804.60** |

**Elm Creek Watershed Management Commission**
**2019 Treasurer's Report - Capital Improvement Project Tracking**

| CIPs | | Amount | %age | TOTAL 2016 | TOTAL 2017 | TOTAL 2018 | JAN 2019 | FEB 2019 | MAR 2019 | APR 2019 | MAY 2019 | JUN 2019 | JUL 2019 | AUG 2019 | SEP 2019 | OCT 2019 | NOV 2019 | DEC 2019 | 2019 GJEs | TOTAL 2019 | TOTAL ALL YEARS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014-01 Medina Tower Drive | | 68,750 | 52.380 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | (37.13) | (15.52) | 6.56 | | | | | | | | | | | | | | - | 68,870.35 |
| | Expense | | | - | - | - | | | | | | | | | | | | | | - | 1,989.80 |
| | Payment to City | | | | | | | | | | 66,760.20 | | | | | | | | | 66,760.20 | 66,760.20 |
| | To Closed Project Account | | | | | | | | | | | | | | | | | | (120.35) | (120.35) | 120.35 |
| | Balance | | | (37.13) | (15.52) | 6.56 | | | | | (66,760.20) | | | | | | | | (120.35) | (66,880.55) | (0.00) |
| 2016-01 Fox Creek Phase 2 Bank Stabil | | 80,312.00 | 16.296 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | 80,353.26 | (98.25) | | | | | | | (772.06) | | | | | 56.43 | 21.20 | (694.43) | 79,560.58 |
| | Expense | | | 106.32 | - | - | | | | | | | | | | | | | | - | 106.32 |
| | Balance | | | (106.32) | 80,353.26 | (98.25) | | | | | - | | (772.06) | - | - | - | - | 56.43 | 21.20 | (694.43) | 79,454.26 |
| 2016-04 Rush Creek Main Stem Restora | | 75,000.00 | 15.219 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | 75,042.75 | (91.75) | | | | | | | (721.02) | | | | | 52.71 | | (668.31) | 74,282.69 |
| | Expense | | | 106.32 | - | - | | | | | | | | | | | | | | - | 106.32 |
| | Payment to City | | | | | | | | | | | | | | | | | | 74,176.37 | 74,176.37 | 74,176.37 |
| | Balance | | | (106.32) | 75,042.75 | (91.75) | | | | | - | | (721.02) | - | - | - | - | 52.71 | (74,176.37) | (74,844.68) | - |
| 2016-05 Fish Lake Alum Trmt Phase 1 | | 75,000.00 | 15.219 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | 75,042.75 | (91.75) | | | | | | | (721.02) | | | | | 52.71 | 19.79 | (648.52) | 74,302.48 |
| | Expense | | | 106.32 | - | - | | | | | | | | | | | | | | - | 106.32 |
| | Balance | | | (106.32) | 75,042.75 | (91.75) | | | | | - | | (721.02) | - | - | - | - | 52.71 | 19.79 | (648.52) | 74,196.16 |
| 2017-01 Fox Creek Phase 3 Streambant | | 112,500.00 | 25.714 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | - | 112,347.11 | | | | | | | 84.46 | | | | | (101.19) | 27.56 | 10.83 | 112,357.94 |
| | Expense | | | - | 135.85 | - | | | | | | | | | | | | | | - | 135.85 |
| | Balance | | | - | (135.85) | 112,347.11 | | | | | - | | 84.46 | - | - | - | - | (101.19) | 27.56 | 10.83 | 112,222.09 |
| 2017-03 Mill Pond Fishery & Habitat Res | | 250,000.00 | 57.143 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | - | 249,663.63 | | | | | | | 187.69 | | | | | (224.86) | 61.25 | 24.08 | 249,687.71 |
| | Expense | | | - | 135.86 | - | | | | | | | | | | | | | | - | 135.86 |
| | Balance | | | - | (135.86) | 249,663.63 | | | | | - | | 187.69 | - | - | - | - | (224.86) | 61.25 | 24.08 | 249,551.85 |
| 2017-04 Rain Garden at Independence A | | 75,000.00 | 17.143 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | - | 74,899.52 | | | | | | | 56.30 | | | | | (67.46) | 18.38 | 7.22 | 74,906.74 |
| | Expense | | | - | 135.85 | - | | | | | | | | | | | | | | - | 135.85 |
| | Balance | | | - | (135.85) | 74,899.52 | | | | | - | | 56.30 | - | - | - | - | (67.46) | 18.38 | 7.22 | 74,770.89 |
| 2018-01 Rush Creek Ph 3 Main Stem St | | 75,000.00 | 16.216 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | - | - | | | | | | | 38,404.58 | | | | 24.58 | 35,560.96 | 603.59 | 74,593.71 | 74,593.71 |
| | Expense | | | - | - | 115.18 | | | | | | | | | | | | | | - | 115.18 |
| | Balance | | | - | - | (115.18) | | | | | - | | 38,404.58 | - | - | - | 24.58 | 35,560.96 | 603.59 | 74,593.71 | 74,478.53 |
| 2018-02 Elm Creek Reach D Stream Re | | 212,500.00 | 45.946 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | - | - | | | | | | | 108,814.55 | | | | 69.63 | 100,757.52 | 1,710.19 | 211,351.89 | 211,351.89 |
| | Expense | | | - | - | 115.18 | | | | | | | | | | | | | | - | 115.18 |
| | Payment to City | | | | | | | | | | | | | | | | | 209,456.89 | 1,779.82 | 211,236.71 | 211,236.71 |
| | Balance | | | - | - | (115.18) | | | | | - | | 108,814.55 | - | - | - | 69.63 | (108,699.37) | (69.63) | 115.18 | (0.00) |
| 2018-03 Elm Creek Phase III Stream Re | | 100,000.00 | 21.622 | | | | | | | | | | | | | | | | | | |
| | Revenue | | | - | - | - | | | | | | | 51,207.69 | | | | 32.77 | 47,416.08 | 804.81 | 99,461.35 | 99,461.35 |
| | Expense | | | - | - | 115.18 | | | | | | | | | | | | | | - | 115.18 |
| | Balance | | | - | - | (115.18) | | | | | - | | 51,207.69 | - | - | - | 32.77 | 47,416.08 | 804.81 | 99,461.35 | 99,346.17 |

**Elm Creek Watershed Management Commission**
**2019 Treasurer's Report - Capital Improvement Project Tracking**

| CIPs | Amount | %age | TOTAL 2016 | TOTAL 2017 | TOTAL 2018 | JAN 2019 | FEB 2019 | MAR 2019 | APR 2019 | MAY 2019 | JUN 2019 | JUL 2019 | AUG 2019 | SEP 2019 | OCT 2019 | NOV 2019 | DEC 2019 | 2019 GJEs | TOTAL 2019 | TOTAL ALL YEARS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2018-04 Downs Road Trail Raiin Garder | 75,000.00 | 16.216 | | | | | | | | | | | | | | | | | | |
| Revenue | | | - | - | - | | | | | | | 38,404.58 | | | | 24.58 | 35,560.96 | 603.59 | **74,593.71** | **74,593.71** |
| Expense | | | - | - | **115.18** | | | | | | | | | | | | | | **-** | **115.18** |
| Balance | | | - | - | **(115.18)** | | | | | - | | 38,404.58 | - | - | - | 24.58 | 35,560.96 | 603.59 | **74,593.71** | **74,478.53** |
| 2019-01 Rush Creek Main Stem Ph 3 | 25,000.00 | | | | | | | | | | | | | | | | | | | |
| Revenue | | | - | - | - | | | | | | | | | | | | | | - | - |
| Expense | | | - | - | - | | | | | | | | | 102.77 | | | | | **102.77** | **102.77** |
| Balance | | | - | - | - | | | | | - | | - | - | (102.77) | - | - | - | - | **(102.77)** | **(102.77)** |
| 2019-02 Ranchview Wetland Restoratio | 125,000.00 | | | | | | | | | | | | | | | | | | | |
| Revenue | | | - | - | - | | | | | | | | | | | | | | - | - |
| Expense | | | - | - | - | | | | | | | | | 102.78 | | | | | **102.78** | **102.78** |
| Balance | | | - | - | - | | | | | - | | - | | (102.78) | - | - | - | - | **(102.78)** | **(102.78)** |
| 2019-04 Hickory Drive Stormwater Impr | 76,823.00 | | | | | | | | | | | | | | | | | | | |
| Revenue | | | - | - | - | | | | | | | | | | | | | | - | - |
| Expense | | | - | - | - | | | | | | | | | 102.78 | | | | | **102.78** | **102.78** |
| Balance | | | - | - | - | | | | | - | | - | | (102.78) | - | - | - | - | **(102.78)** | **(102.78)** |
| 2019-05 Downtown Regional Stormwate | 26,477.00 | | | | | | | | | | | | | | | | | | | |
| Revenue | | | - | - | - | | | | | | | | | | | | | | - | - |
| Expense | | | - | - | - | | | | | | | | | 102.77 | | | | | **102.77** | **102.77** |
| Balance | | | - | - | - | | | | | - | | - | | (102.77) | - | - | - | - | **(102.77)** | **(102.77)** |
| 2019-06 Elm Creek Restore Ph IV | 150,000.00 | | | | | | | | | | | | | | | | | | | |
| Revenue | | | - | - | - | | | | | | | | | | | | | | - | - |
| Expense | | | - | - | - | | | | | | | | | 102.78 | | | | | **102.78** | **102.78** |
| Balance | | | - | - | - | | | | | - | | - | | (102.78) | - | - | - | - | **(102.78)** | **(102.78)** |
| **TOTAL CIP** | | | | | | | | | | | | | | | | | | | | |
| **Revenue** | | | **249,795.17** | **494,329.63** | **436,392.95** | **-** | **-** | **-** | **-** | **-** | **-** | **196,541.17** | **-** | **-** | **-** | **151.56** | **219,063.86** | **3,870.36** | **419,626.95** | **1,731,714.83** |
| **Expense** | | | **812.59** | **407.56** | **570.54** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **513.88** | **-** | **-** | **-** | **-** | **513.88** | **8,532.35** |
| **Payments** | | | **245,276.36** | **1,836.48** | **322,859.09** | **-** | **-** | **-** | **-** | **66,760.20** | **-** | **-** | **-** | **-** | **-** | **-** | **209,456.89** | **75,956.19** | **352,173.28** | **922,145.21** |
| **Balance** | | | **3,706.22** | **492,085.59** | **111,741.60** | **-** | **-** | **-** | **-** | **(66,760.20)** | **-** | **196,541.17** | **-** | **(513.88)** | **-** | **151.56** | **9,606.97** | **(72,206.18)** | **66,819.44** | **799,695.20** |
| **CLOSED PROJECT FUND** | | | | | | | | | | | | | | | | | | | | |
| 2014-02 Champlin Mill Pond Dam | | | | | **82.31** | | | | | | | | | | | | | | | **82.31** |
| 2015-01 Plymouth Elm Creek Restoration | | | | | **1,139.41** | | | | | | | | | | | | | | | **1,139.41** |
| 2014-01 Medina Tower Drive | | | | | | | | | | | | | | | | | | | **120.35** | **120.35** |
| **Balance Closed Project Fund** | | | | | | | | | | | | | | | | | | | | **1,342.07** |
| **TOTAL CIP & Closed Project Fund** | | | | | | | | | | | | | | | | | | | | **801,037.27** |
| **COMPLETED PROJECTS $0 BALANCE** | | | | | | | | | | | | | | | | | | | | |
| 2016-02 Miss River Shore Repair/Stabilization | | | | | **COMPLETE** | | | | | | | | | | | | | | | |
| 2016-03 EC Dam at Mill Pond | | | | | **COMPLETE** | | | | | | | | | | | | | | | |

**CAMPBELL KNUTSON**
***Professional Association***
**Attorneys at Law**
**Federal Tax I.D. #41-1562130**
**Grand Oak Office Center I**
**860 Blue Gentian Road, Suite 290**
**Eagan, Minnesota 55121**
**(651) 452-5000**


January 31, 2020
Account # 1448G

Elm Creek Watershed Management Commission
c/o Judie A. Anderson, Exec. Secty.
3235 Fernbrook Lane
Plymouth MN 55447

SUMMARY STATEMENT

| PREVIOUS BALANCE | FEES | EXPENSES | CREDITS | PAYMENTS | BALANCE |
|---|---|---|---|---|---|
| 1448-0000 RE: GENERAL MATTERS | | | | | |
| | SERVICES RENDERED TO DATE: | | | | |
| 186.00 | 31.00 | 0.00 | 0.00 | -186.00 | $31.00 |

Amounts due over 30 days will be subject to a finance charge of .5% per month (or an annual rate of 6%). Minimum charge - 50 cents.

**CAMPBELL KNUTSON**
***Professional Association***
**Attorneys at Law**
**Federal Tax I.D. #41-1562130**
**Grand Oak Office Center I**
**860 Blue Gentian Road, Suite 290**
**Eagan, Minnesota 55121**
**(651) 452-5000**


January 31, 2020
Account # 1448-0000G
220

Elm Creek Watershed Management Commission
c/o Judie A. Anderson, Exec. Secty.
3235 Fernbrook Lane
Plymouth MN 55447

RE: GENERAL MATTERS
SERVICES RENDERED TO DATE:

| | | | HOURS | |
|---|---|---|---|---|
| 01/02/2020 | JJJ | Emails Judie re: minutes/minutes book language for policy. | 0.20 | 31.00 |
| | | AMOUNT DUE | 0.20 | 31.00 |
| | | TOTAL CURRENT WORK | | 31.00 |
| | | PREVIOUS BALANCE | | $186.00 |
| 12/30/2019 | | Payment - thank you | | -186.00 |
| | | TOTAL AMOUNT DUE | | $31.00 |

Amounts due over 30 days will be subject to a finance charge of
.5% per month (or an annual rate of 6%). Minimum charge - 50 cents.

CONNEXUS® ENERGY
Your Community Energy Partner

**Account Number:** item 02b
**481113-238425**
ELM CREEK WATERSHED MGMT ORG

# Monthly Statement

**Service Address**
ELM CREEK RD
DAYTON MN

| Total Amount Due | Due Date |
|---|---|
| **$28.43** | **February 13, 2020** |

## Billing Summary

**Billing Date:** Jan 17, 2020

| | |
|---|---|
| Previous Balance | $16.39 |
| Payments - Thank You! | $16.39 |
| **Balance Forward** | **$0.00** |
| **New Charges** | **$28.43** |
| **Total Amount Due** | **$28.43** |

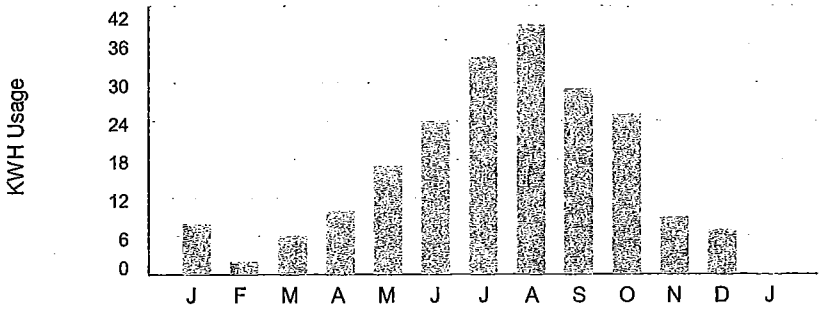
Payment must be received on or before February 13, 2020

## Message Center

**No rate increase in 2020**
Budgeting for the coming year? The budget for your 2020 electric bill should stay the same. For the third year in a row, Connexus Energy members will not see a rate increase. In addition, the more energy-efficient you are, the more control you will have over your monthly bill.

## Energy Comparison

Previous Months' Usage  Current Month's Usage




## How to contact us

Member Services / Moving - 763-323-2650
Outages and Emergencies - 763-323-2660
Hearing/Speech Impaired Call - 711 or 800-627-3529
Email: info@connexusenergy.com
www.connexusenergy.com
Gopher State One Call - 811
**14601 Ramsey Boulevard, Ramsey, MN 55303**

▼ *Please detach at perforation and return this portion with a check or money order made payable to Connexus Energy* ▼

TRA3-D-007496/007180 AGXTWJ S1-ET-M1-C00002 1

CONNEXUS® ENERGY
Your Community Energy Partner

| | |
|---|---|
| **Account Number:** | **481113-238425** |
| **Total Amount Due** | **$28.43** |
| Payment Due By | February 13, 2020 |

007496 1 AB 0.409 003498/007496/007180 027 02 AGXTWJ
ELM CREEK WATERSHED MGMT ORG
3235 FERNBROOK LN N
PLYMOUTH MN 55447-5325

**Connexus Energy**
PO Box 1808
Minneapolis, MN 55480-1808

00002843 00048111130238425 000000 00000 00000000000 0000000

item 02b

# INVOICE

**Barr Engineering Co.**
**4300 MarketPointe Drive, Suite 200**
**Minneapolis, MN 55435**
**Phone: 952-832-2600; Fax: 952-832-2601**
**FEIN #: 41-0905995 Inc: 1966**

Ms. Judie Anderson
Elm Creek Watershed Management
10801 Wayzata Boulevard
Minnetonka, MN 55305

January 22, 2020
Invoice No: 23271759.00 - 2

**Total this Invoice $532.50**

**Regarding: Elm Creek Floodplain Mapping**

This invoice is for professional services, which include the following:

- Initial set up of HEC-HMS hydrology modeling approach
- HEC-HMS hydrology modeling of watershed

| Project Budget | Previously Billed | Current Invoice | Total Billed | Total Remaining | Total Billed % |
|---|---|---|---|---|---|
| $90,945.00 | $1,441.00 | $532.50 | $1,973.50 | $88,971.50 | 2% |

**Professional Services from November 30, 2019 to December 31, 2019**

Job: 100 Meetings
**Labor Charges**

| | Hours | Rate | Amount | |
|---|---|---|---|---|
| Engineer / Scientist / Specialist III | | | | |
| Waln, Joseph | .80 | 150.00 | 120.00 | |
| Weiss, Jeffrey | 1.00 | 135.00 | 135.00 | |
| Support Personnel II | | | | |
| Nypan, Nyssa | .50 | 95.00 | 47.50 | |
| | 2.30 | | 302.50 | |
| **Subtotal Labor** | | | | **302.50** |
| | | | **Job Subtotal** | **$302.50** |

Job: 400 Hydrologic Analysis
**Labor Charges**

| | Hours | Rate | Amount | |
|---|---|---|---|---|
| Engineer / Scientist / Specialist III | | | | |
| Waln, Joseph | .90 | 150.00 | 135.00 | |
| Engineer / Scientist / Specialist II | | | | |
| Vecchi, Anthony | 1.00 | 95.00 | 95.00 | |
| | 1.90 | | 230.00 | |
| **Subtotal Labor** | | | | **230.00** |
| | | | **Job Subtotal** | **$230.00** |
| | | | **Total this Invoice** | **$532.50** |

| | Current | Prior | Total | Received | A/R Balance |
|---|---|---|---|---|---|
| **Invoiced to Date** | **532.50** | **1,441.00** | **1,973.50** | **0.00** | **1,973.50** |

**Outstanding Invoices**

| Invoice | Date | Balance |
|---|---|---|
| 1 | 12/20/2019 | 1,441.00 |
| **Total** | | **1,441.00** |

Thank you in advance for your prompt processing of this invoice. If you have any questions, please contact Heather Hlavaty, your Barr project manager at 952.842.3613 or email at hhlavaty@barr.com.

PLEASE REMIT TO ABOVE ADDRESS and INCLUDE INVOICE NUMBER ON CHECK.
Terms: Due upon receipt. 1 1/2% per month after 30 days. Please refer to the contract if other terms apply.

item 02b

# INVOICE

**Barr Engineering Co.**
**4300 MarketPointe Drive, Suite 200**
**Minneapolis, MN 55435**
**Phone: 952-832-2600; Fax: 952-832-2601**
**FEIN #: 41-0905995 Inc: 1966**

Ms. Judie Anderson
Elm Creek Watershed Management
JASS-Watershed Administrators
3235 Fernbrook Lane
Plymouth, MN 55447

January 15, 2020
Invoice No: 23270F55.03 - 106

**Total this Invoice $847.00**

**Regarding: Development Reviews**

This invoice is for professional services related to Elm Creek Watershed Management Commission project reviews, which included the following tasks:

**Task 001 – Commission Meetings**

- Prepare for and attend December TAC and Commission Meetings

**Professional Services from November 30, 2019 to December 27, 2019**

| | | |
|---|---|---|
| Job: | JOB3 | Project Review |
| Task: | 001 | Commission meetings |

**Labor Charges**

| | Hours | Rate | Amount | |
|---|---|---|---|---|
| Engineer / Scientist / Specialist III | | | | |
| Weiss, Jeffrey | 5.50 | 135.00 | 742.50 | |
| Support Personnel II | | | | |
| Nypan, Nyssa | 1.10 | 95.00 | 104.50 | |
| | 6.60 | | 847.00 | |
| **Subtotal Labor** | | | | **847.00** |
| | | **Task Subtotal** | | **$847.00** |
| | | **Job Subtotal** | | **$847.00** |
| | | **Total this Invoice** | | **$847.00** |

Thank you in advance for your prompt processing of this invoice. If you have any questions, please contact your Barr Project Manager, Jeff Weiss Phone: 952-832-2706 or E-Mail: jweiss@barr.com.

PLEASE REMIT TO ABOVE ADDRESS and INCLUDE INVOICE NUMBER ON CHECK.
Terms: Due upon receipt. 1 1/2% per month after 30 days. Please refer to the contract if other terms apply.

item 02b

# INVOICE

**Barr Engineering Co.**
**4300 MarketPointe Drive, Suite 200**
**Minneapolis, MN 55435**
**Phone: 952-832-2600; Fax: 952-832-2601**
**FEIN #: 41-0905995 Inc: 1966**

Ms. Judie Anderson
Elm Creek Watershed Management
JASS-Watershed Administrators
3235 Fernbrook Lane
Plymouth, MN 55447

January 15, 2020
Invoice No: 23270F55.05 - 17

**Total this Invoice $586.00**

**Regarding: Elm Creek Wetland Mitigation Monitoring**

This invoice is for professional services related to Elm Creek Wetland Mitigation Monitoring project, which included the following tasks:

**Job 001 – Ravinia Wetland Mitigation**
Task 003 –2019 Monitoring and Report
- Data management and reporting

**Professional Services from November 30, 2019 to December 27, 2019**

| | | |
|---|---|---|
| Job: | 001 | Ravinia Wetland Mitigation |
| Task: | 003 | 2019 Monitoring and Report |

**Labor Charges**

| | Hours | Rate | Amount | |
|---|---|---|---|---|
| Engineer / Scientist / Specialist II | | | | |
| Burgner, Brian | 3.00 | 105.00 | 315.00 | |
| Engineer / Scientist / Specialist I | | | | |
| Shalley, Matthew | 2.00 | 85.00 | 170.00 | |
| Support Personnel II | | | | |
| Huffman, Yvonne | .20 | 95.00 | 19.00 | |
| Lawless, Peter | .30 | 115.00 | 34.50 | |
| Nypan, Nyssa | .50 | 95.00 | 47.50 | |
| | 6.00 | | 586.00 | |
| **Subtotal Labor** | | | | **586.00** |
| | | **Task Subtotal** | | **$586.00** |
| | | **Job Subtotal** | | **$586.00** |
| | | **Total this Invoice** | | **$586.00** |

| | Current | Prior | Total | Received | A/R Balance |
|---|---|---|---|---|---|
| **Invoiced to Date** | **586.00** | **18,257.25** | **18,843.25** | **18,257.25** | **586.00** |

Thank you in advance for your prompt processing of this invoice. If you have any questions, please contact your Barr Project Manager, Jeff Weiss, Phone: 952-832-2706 or E-Mail: jweiss@barr.com.

PLEASE REMIT TO ABOVE ADDRESS and INCLUDE INVOICE NUMBER ON CHECK.
Terms: Due upon receipt. 1 1/2% per month after 30 days. Please refer to the contract if other terms apply.

item 02b

**Hennepin County**
Public Works

**Department of Environment and Energy**
701 Fourth Avenue South, Suite 700
Minneapolis, Minnesota 55415-1842

612-348-3777, Phone
612-348-8532, Fax
hennepin.us/environment

| Bill To: |
|---|
| **Elm Creek Watershed Management Commission**<br>**3235 Fernbrook Lane**<br>**Plymouth, MN 55447** |

# Invoice

| Date |
|---|
| 1/21/20 |

| Contract |
|---|
| A199745 |

| Description | County Contribution/Refund | Total Amount |
|---|---|---|
| 4th quarter 2019 invoice (October 1 – December 31, 2019) | | |
| • Site Plan Review & Meeting Attendance (137 hrs.) | | $8,876.36 |
| • WCA (5 hrs.) | | $327.00 |
| • Conservation Promotion (60 hrs.) | $1,783.20 | $1,783.20 |
| Volunteer Monitoring/Education Programs – 3 RiverWatch and 5 WHEP sites<br>$3,000.– $4,000.– | $1,000 | $7,000 |
| **Subtotal:** | | **$17,986.56** |
| • Elm Creek Floodplain Mapping (paid by ECWMC, to be reimbursed through offsets to other services): $21,483.37<br>o Reimbursed via Q3 invoice: $19,199.68<br>o **Reimbursed this invoice:**<br>o Balance remaining to reimburse: $0.00 | **$2,283.66** | |
| • 2019 Payments and other credits to-date | | $59,915.12 |
| • Accrued 2019 costs to-date | | $75,618.02 |
| | **AMOUNT DUE** | **$15,702.90** |

Make check payable to: Hennepin County Treasurer

Remit to: Hennepin County Accounts Receivable
300 South 6th Street

City of Plymouth

*Adding Quality to Life*

December 4, 2019

Judie Anderson, JASS
Elm Creek Watershed Management Commission
3235 Fernbrook Lane North
Plymouth, MN 55447

SUBJECT: Elm Creek Stream Restoration Project
City Project No. 18011

Dear Ms. Anderson,

Enclosed/attached you will find as-builts and payment documentation totaling $679,093.67 to date for the design and construction of the Elm Creek Stream Restoration Project in Plymouth. Per the "Cooperative Agreement for 2018-02 Elm Creek Stream Restoration Project Reach D" between the City of Plymouth and the Elm Creek Watershed Management Commission, the City is requesting reimbursement of up to $212,500 (less Commission expenses) for this project.

The City is grateful for the partnership with the Elm Creek Watershed Management Commission on water quality improvements and protections.

Sincerely,

Ben Scharenbroich

Ben Scharenbroich
Interim Water Resources Manager

enc

| | |
|---|---|
| Tax Levy Received to-date | $209,572.07 |
| Less Commission Expenses | 115.18 |
| BALANCE PAID 12/11/2019 | $209,456.89 |

This balance will be paid per this request and additional funds will be disbursed as they are received from the County for this project.

files have been reviewed
OK to pay less EC
expenses. ja

**Tax Levy Rec'd 12/27/2019 $69.63**
**Paid to City 1/8/2020**

**Final 2019 Tax Levy Rec'd 1/27/2020**
**$ 1,710.19 Paid to City 2/12/2020**

**Total Paid to City - $211,236.71**

item 02b

LEAGUE OF MINNESOTA CITIES

CONNECTING & INNOVATING
SINCE 1913

# Invoice



**Member Name and Address**
Elm Creek Watershed
Management Commission
3235 Fernbrook Lane North
Plymouth, MN 55447-5325

**Invoice Date**
01/27/2020

**Agent**
Arthur J Gallagher Risk Management Services Inc
3600 American Blvd W Ste 500
Bloomington, MN 55431-4502
(952)358-7500

**Account Number:** 10002653
**Account Type** Workers' Compensation Coverage Premium
**Current Balance:** $ 200.00
**Minimum Due:** $ 200.00
**Due Date:** 02/22/2020

**Summary of activity since last Billing Invoice**

See reverse side and attachments for additional information

| Date | Activity | Account Balance | Minimum Due |
|---|---|---|---|
| | Previous Invoice Balance | 200.00 | |
| | Payments Received | -200.00 | |
| | Total of Transactions and Fees shown on reverse or attached | 200.00 | |
| | Current Balance | $ 200.00 | $ 200.00 |

**Detach and return this Payment Coupon with your payment**

| Account Number | Invoice Date | Due Date | Current Balance | Minimum Due |
|---|---|---|---|---|
| 10002653 | 01/27/2020 | 02/22/2020 | $ 200.00 | 200.00 |

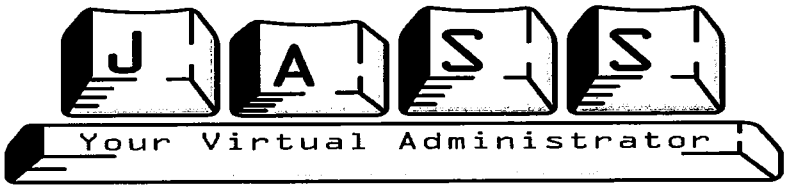
**Amount Enclosed**
$ _____

**Member Name** Elm Creek Watershed Management Commission

**BILLING INVOICE - Return stub with payment - make checks payable to:**

Mail payment 7 days before Due Date to ensure timely receipt

League of MN Cities Insurance Trust WC
c/o Berkley Risk Administrators Company
222 South Ninth Street, Suite 2700
P.O.Box 581517
Minneapolis, MN 55458-1517




**3235 Fernbrook Lane**
**Plymouth MN 55447**

**Elm Creek Watershed Management Commission**
**3235 Fernbrook Lane**
**Plymouth, MN 55447**

6-Feb-20

| | | | | Total by Project Area |
|---|---|---|---|---|
| Administrative | 1.42 | 60.00 | 85.20 | |
| Administrative | 69.35 | 65.00 | 4,507.75 | |
| Admin - Offsite | 1.68 | 70.00 | 117.60 | |
| Office Support | 10.00 | 200.00 | 2,000.00 | |
| Storage Unit | 1.00 | 134.42 | 134.42 | |
| Data Processing/File Mgmt | 0.25 | 60.00 | 15.00 | |
| File Management | | 60.00 | 0.00 | |
| Archiving | 11.34 | 60.00 | 680.40 | |
| Admin - Reimbursable Expense | 570.05 | 1.00 | 570.05 | 8,110.420 |
| Admin - TAC support | 2.17 | 60.00 | 130.20 | |
| Admin - TAC support | 10.83 | 65.00 | 703.95 | |
| Admin - TAC support offsite | 2.50 | 70.00 | 175.00 | |
| TAC Support - Reimbursable Expense | 199.68 | 1.00 | 199.68 | 1,208.830 |
| Website | | 60.00 | 0.00 | |
| Website | 1.25 | 65.00 | 81.25 | |
| Website - Reimbursable Expense | | 1.00 | 0.00 | |
| Web Domain, hosting | | 1.00 | 0.00 | 81.250 |
| Annual Reporting/Work Plans | | 60.00 | 0.00 | |
| Annual Reporting/Work Plans | 17.92 | 65.00 | 1,164.80 | |
| Annual Reporting - Reimbursable Expense | | 1.00 | 0.00 | 1,164.800 |
| Project Reviews - Secre | | 60.00 | 0.00 | |
| Project Reviews - Admin | 6.33 | 65.00 | 411.45 | |
| Project Reviews - Admin offiste | | 70.00 | 0.00 | |
| Project Reviews - Admin - File Mgmt | | 55.00 | 0.00 | |
| Project Reviews - Reimbursable Expense | 169.36 | 1.00 | 169.36 | 580.810 |
| Education - Secretarial | | 60.00 | 0.00 | |
| Education - Admin | | 65.00 | 0.00 | |
| Education - Admin Offsite | | 70.00 | 0.00 | |
| Education - Reimbursable Expense | 20.47 | 1.00 | 20.47 | 20.470 |
| | | **Invoice Total** | | **11,166.580** |

# elm creek
# Watershed Management Commission

ADMINISTRATIVE OFFICE
3235 Fernbrook Lane
Plymouth, MN 55447
PH: 763.553.1144
email: judie@jass.biz
www.elmcreekwatershed.org

TECHNICAL OFFICE
Barr Engineering
4300 Market Point Drive, Suite 200
Minneapolis, MN 55435
PH: **612.834.1060**
email: jherbert**@barr.com**
email: surfacewatersolutions@outlook.com

**STAFF REPORT**
**February 6, 2020**

**a. 2015-004 Kinghorn Outlot A, Rogers.** This is a 31-acre site located between the Clam and Fed Ex sites on the west side of Brockton Road and I-94. Two warehouse buildings with associated parking and loading facilities are proposed. In June 2015 the Commission approved this project with three conditions. Revisions have yet to meet the Commission's approval conditions. This project was extended by the City of Rogers in 2019. *Because of the lack of activity, Staff recommends that this project be denied.*

**b. 2016-040 Kinghorn 4th Addition, Rogers.** This is a 13.7-acre parcel located in the northwest corner of the intersection of Brockton Lane and Rogers Drive. An industrial warehouse with 8.8 acres of new impervious area is proposed. The plan includes the use of a NURP pond and a biofiltration basin to meet Commission requirements for rates, water quality and abstraction. The adjacent site is likely to be developed in the near future and some of the stormwater features were oversized to accommodate this future development. In November 2016 the Commission approved the project with six conditions. Three conditions remain outstanding and are expected to be addressed during final design: 4) an O&M Plan for the pond and biofiltration basin must be completed and recorded on the final plat; 5) modification of the storm sewer system to maximize the area draining to the NURP pond; and 6) receipt and review of wetland-related documentation if wetlands are present. Staff has discussed the project with the City and been in contact with the project engineer to receive an update. *Because of the lack of activity, Staff recommends that this project be denied.*

**c. 2016-047 Hy-Vee North Maple Grove**. The applicant is proposing to disturb 13 acres of a 20.4-acre site located at the northeast corner of Maple Grove Parkway and 99th Avenue for the purpose of constructing a grocery store, fuel station, convenience store and parking facilities. In findings dated January 10, 2017, Staff recommended approval of this project subject to three conditions. The Commission approved Staff's recommendations at their January 11, 2017 meeting with the additional requirement that the Commission receive and comment on a WCA impact notice. (Also see Project 2019-023 99th Avenue Apartments. That project is part of this PUD and had the same requirements prior to approval.) Updated grading plans from the applicant have been requested by the City of Maple Grove. This item will be updated when the revised plans are provided for Staff review.

**d. 2017-039 Rush Creek Apartments, Maple Grove.** This project is located in the southwest quadrant of the intersection of Bass Lake Road (CSAH 10) and Troy Lane (CSAH 101). The project area is 8.2 acres in size and includes two phases of construction. Phase I is 236 apartment units located on 6.0 acres; Phase II is a future 76-unit apartment building located on 2.2 acres in Outlot C of this development. The Commission will review this project for conformance to Rules D, E and I. Findings with no recommendations dated November 15, 2017, were provided to the applicant and the City. The applicant requested and was granted an extensionof the deadline per MN statute 15.99 to December 31, 2019. A new layout and project application were submitted to Maple Grove in January 2019 and the project is still considered active by the City. Staff extended the deadline on this project to December 31, 2020.

**e. 2017-050W Ernie Mayers Wetland/floodplain violation, Corcoran.** The City of Corcoran contacted the Commission in December 2017 concerning drainage complaints on Mayers' property. Technical Evaluation Panels (TEPs) were held in 2017 and 2018 to assess the nature and extent of the violations and a restoration order was issued to Mayers. On October 30, 2018, an appeal of the restoration order was received by BWSR. BWSR issued an order of abeyance (stay) on the appeal until April 1, 2019. An application for a replacement plan was received from Mayers on January 29, 2019. It addresses the wetland fill (4:1 replacement request) and drain tile (disable existing tile) impacts, but requests additional time to submit an application to address the ditch (WCA jurisdiction) and floodplain (Commission jurisdiction) impacts. A TEP was held February 28, 2019 to address the replacement plan and provide guidance to the LGU. The City of Corcoran assumed WCA LGU responsibilites for this project March 1, 2019. Corcoran and BWSR have extended the decision process until July 30, 2019. An updated replacement plan was received by the City of Corcoran on July 24, 2019. A TEP was held on August 13 to discuss the plan. Corcoran extended the deadline for their decision to November 21, 2019. A new no-loss and replacement plan was received by the LGU on November 14, 2019. The TEP recommended and the LGU denied the application. *Mayers appealed the decision. A TEP was held on January 30, 2020 to discuss possible resolutions to the appeal. As of this update, no solution has been obtained.*

**f. 2018-020 North 101 Storage, Rogers.** This is an existing 3-acre lot in the northwest corner of Highway 101 and CR144. The current land use is a combination of mini-storage units and outdoor storage. The site is proposed for complete demolition and construction of seven new mini-storage buildings. At their July meeting the Commission approved Staff findings dated July 9, 2018, pending four items relating to abstration requirements and the infiltration system. *The applicant requested and was granted an extension to December 31, 2020, provided the review process with the City of Rogers does not expire.*

**g. 2018-046 Graco Expansion, Rogers.** This project is the expansion of an existing building. The site is located in an area that has regional ponding provided for rate control purposes, but needs to account for water quality and abstraction requirements on site prior to discharging offsite as part of the improvements. The Commission granted conditional approval at their October meeting. Conditions of approval were to submit a SWPPP plan meeting requirements, clarify maintenance responsibilities for the iron enhanced sand filter, and a letter from the City of Rogers stating their intentions to provide the water quality deficit in an upcoming project. Staff confirmed several minor plan revisions remain in conformance with the original approval. This item will remain on the Staff report until such time as the water quality deficit has been made up.

**h. 2019-001 Fernbrook View Apartments, Maple Grove**. This is a 4.85-acre rural residential lot located at the northeast intersection of CSAH 81 and Fernbrook Lane. The applicant proposes to construct a 2-story, 42-unit apartment building. This project was approved at the February 2019 Commission meeting with the following conditions: 1) the applicant pursue utilizing water from the NURP pond for irrigation needs for this property; 2) long term operation and maintenance on the stormwater basin must be addressed: 3) mean average pond depth must meet the Commission standard: 4) pond filter bench details must be provided. With the exception of the O&M plans, these condtions have been met by the applicant. This project was approved by the Commission's technical advisor per the updated project review dated February 5, 2020. This item will be moved to the Final Recording section of this report.

**i. 2019-024 Boston Scientific Weaver Lake Road, Building 2 East Addition, Maple Grove.** Boston Scientific is building an addition on the east side of Building 2 to provide more production and office space for their existing facility. The project includes moving the existing service drive and site utilities on the east side of Building 2 to the east within the BS property to create space for the building addition. About 1.9 acres of the

site will be disturbed and 1.06 acres of impervious surface will be added. This project was reviewed for compliance to Rules D, E, F, and I. Based on Staff findings dated September 11, 2019, at their September 11, 2019 meeting the Commission approved the project contingent upon: 1) a site plan that provides the irrigation areas to be irrigated by the new system and 2) an operation and maintenance plan for the irrigation system approved by the City and the Commission and recorded on the land title. *The applicant and their engineer are pursuing overall stormwater management alternatives for this project and potential future projects. Updates will be provided to the Commission when the applicant resolves how they would like to proceed.*

**j. 2019-026 Interstate Power Systems, Rogers.** This project consists of constructing a 1.06-acre building to house a semi-truck mechanical shop and 6.06 acres of parking and driveways. The total new imprevious area will be approximately 7.11 acres. Stormwater management is being proposed by multiple detention ponds. The project was reviewed for conformance with Rules D, E, G, and I. At their November 2019 meeting the Commission approved this project per Staff's findings dated November 6, 2019 contingent upon LGU approval of WCA wetland impacts/replacement plans. *WCA replacement plans were approved by the LGU on January 21, 2020. This item will be removed from the report.*

**k. 2019-028 Howell Meadows, Maple Grove.** This is a 5.3-acre site located east of Brockton Lane (CR 101) at 64th Avenue. It is a remnant piece of property surrounded by the Fieldstone development on the north, south and east with the City of Corcoran and the Ravinia Development across Brockton Lane to the west. The site is proposed to be subdivided into ten residential lots. The project will create a total of 1.505 acres of new impervious areas. This site plan triggered the Commission's review for conformance to Rules D, E and I. At their November 2019 meeting the Commission approved this project per Staff's findings dated November 6, 2019 contingent upon LGU approval of WCA wetland impacts/replacement plans. *No new information has been received.*

**l. 2019-029 South Prominence, Maple Grove.** This is a 12-acre site located on the north side of Fieldstone Boulevard near 63rd Avenue. It consists of two large lot residential parcels proposed to be developed into 21 residential lots. This a remnant piece of property surrounded by the Fieldstone development on the north, south and west sides and the Prominence Woods project (2005-024) on the east side. The site includes a four (4) lot area that is already platted (the Prominence Woods development), two areas that will be ghost-platted into eight (8) lots in the future and this site plan, which is 13 lots. The project will create a total of 2.5 acres of new impervious areas on the ghost-platted and South Prominence parcels. This site plan triggered the Commission's review for conformance to Rules D, E and I. At their November 2019 meeting the Commission aproved this project per Staff's findings dated November 13, 2019 conditioned upon: (1) LGU approval of WCA wetland impacts/replacement plans; (2) Iron-enhanced filter basin details being provided with the plan and approved by the City and the Commission; and (3) City approval of the discharge increase to the north. *The WCA replacement plan and increased discharge to the north of this site have been approved by the City of Maple Grove. Updated grading and erosion control plans received February 5, 2020 include IEF details. This item will be removed from the report.*

**m. 2019-030 Rolling Hills Acres, Corcoran.** This is a 40.8-acre rural agriculture parcel located a mile north of Highway 55 on the east side of Rolling Hills Road. There is an existing home site in the far southwest corner of the parcel. The project proposes to subdivide the property into 4 large single-family lots ranging from 6.9 acres to 12.7 acres in size. The project will create approximately 0.5 acres of new impervious area. There are wetlands and floodplains on this site. The site plan triggers the Commission's review for conformance to Rules E, I, and F. Because there are no grading or floodplain impacts proposed, Staff approved this project contingent upon: 1) A planting plan of native vegetation being developed for the wetland buffer areas that are

not in permanent vegetation at this time. 2) A permanent vegetation cover plan being developed to control erosion and sedimentation on this site. *No new information has been received.*

**n. 2019-031 Hassan Sand and Gravel Expansion, Rogers.** The applicant is proposing to open a new mining operation just north and west of their existing site on CR 144 and Willandale Road. The Crow River runs along the northerly boundary of this property. Approximately 38 acres of the land will be mined in phases over the next 5-10 years (depending on demand). The site plans propose to stay out of the bluff and setback zones along the river. During the mining operations runoff will be directed north into a sediment pond. From there the water runs approximately one-half mile north on a flat grade before entering the Crow River. The site plan triggers the Commission's Rules E), F, D, and I. *In their findings dated January 17, 2020, Staff recommends approval with two conditions.*

**o. 2019-032 OSI Expansion, Medina.** This an existing business located in the northwest corner of Highway 55 and Arrowhead Drive. They are proposing to build an addition on the south side of their building and add parking to the north side of the site. This will create an additional 3.6 acres of new impervious area. This project triggers the Commission's review for Rules E, D, I and F. *In their findings dated February 4, 2020, Staff recommends approval contingent upon receipt of O& M plans on the stormwater facilities that meet the Commission's requirements.*

**p. 2020-001 Outlot L, Markets at Rush Creek, Maple Grove**. Outlot L is a 1.55-acre lot located in The Markets at Rush Creek (Hy-Vee South) PUD development. This project is just west of the Hy-Vee gas station and south of CR10. A 12,000 sq. ft. multi-tenant building and its associated parking is proposed for this site. Stormwater management for this lot is part of the regional stormwater system approved by the Commission for project 2016-002. Commission rules require compliance for stormwater management (Rule D) and erosion and sediment controls (Rule E). OLn January 23, 2020, Staff administratively approved this project contingent upon receipt of a dated and signed plan set of the final development stage plans.

***q. 2020-002 Project 100, Maple Grove**. Ryan Companies is proposing to develop 100.6 acres of agricultural land into a mixed-use development consisting of office, medical, hospital, multi-family residential and senior living facilities. This site is situated between I-610 to the north, I-94 to the west and the Maple Grove Hospital to the east. The applicant is looking for approval of a regional stormwater management system to address the Commission's present-day requirements throughout the timeline for all the phases of this development. Additionally, they are requesting grading and erosion control approvals for Phase I of the development. Phase I consists of mass grading approximately 35 acres in the southeast portion of the site. This will accommodate street and utilities, 383 parking stalls for the existing hospital and future building in this area. The Commission will be reviewing the current plan set for conformance with Rules D and I and Phase I site plans for conformance with Rule E. The site plans were still under review by the technical advisor at the time of the Staff Report update. If available, additional updates will be provided to the Commission at their meeting.*

***r. 2020-003 Palisades at Nottingham Second Addition, Maple Grove.** This is a 4.05 acre in-fill project in the Nottingham development section of Maple Grove. It is located at the 73rd Place/Xene Lane Cul-de-sac about ¼ mile northeast of the intersection of Nottingham Parkway at Bass Lake Road. Nine new single-family residential lots are proposed creating 28,440 SF of new impervious areas. This review will be for compliance to the Commission's Rules D, E and I. Site plans do not meet the Commission's requirements at this time. If available, additional updates will be provided to the Commission at their meeting.*

***s. 2020-004 Elm Road Area Project, Maple Grove.** This is approximately 53 acres consisting of nine large residential parcels proposed to be developed into 106 single-family residential lots. It is located*

*along Elm Road near the border of Plymouth. Site plans were received too late to be reviewed for this meeting. This project will most likely be reviewed at the Commission's March meeting.*

**FINAL RECORDINGS OR OTHER DOCUMENTATION ARE DUE ON THE FOLLOWING PROJECTS**: *(Staff reached out to the cities for updates on these projects on October 2, 2019.)*

**ag. 2013-046 Woods of Medina. Medina**. In January 2015 the Commission approved this project with two conditions. This project remained active throughout this period with the final plat recently approved by the City. No significant changes were made to the original plans. The two conditions were 1) compliance to the WCA requirements and 2) final approval and recording of the O & M plans. The WCA condition has been met with only the O&M plan condition remaining. *On October 2, 2019 Dusty Finke reported that the City has approved the final plat. The applicant is trying to begin construction in fall 2019. The City has also received confirmation of their wetland credit purchase and is awaiting their signature on the Maintenance Agreement.*

**ah. 2014-015 Rogers Drive Extension, Rogers.** This project involves improvements along Rogers Drive from Vevea Lane to Brockton Lane. The project is located east of I-94, south of the Cabela development. The total project area is 8.0 acres; proposed impervious surfaces total 5.6 acres. Site plans received July 1, 2014 met the requirements of the Commission with the exception of the nutrient control. The Commission approved the site plan contingent upon the City deferring 4.6 lbs. of phosphorus for treatment in future ponding opportunities as the easterly corridor of Rogers Drive develops. 2.3 lbs. will be accounted for in the Kinghorn Spec. Building site plan, with 2.3 lbs. still outstanding. This item will remain on the report until the total deferral is accounted for.

**ai. 2015-030 Kiddiegarten Child Care Center, Maple Grove.** Approved December 9, 2015. If the City does not take over the operation and maintenance of the underground system and the sump catch basins, an O&M agreement for the underground trench/pond system must be approved by the Commission and the City and recorded with the title. On February 5, 2019 Derek Asche contacted the owner requesting a copy of the recorded maintenance agreement. No update was available on July 2, 2019.

**aj. 2016-002 The Markets at Rush Creek, Maple Grove.** This is a proposal to develop 40 acres of a 123-acre PUD located in the southwest quadrant of the intersection of CSAH 101 and CSAH 10. In 2016 the Commission granted Staff authority to administratively approve the project and report any updates. Updated plans with some minor layout revisions were reviewed by Staff and administratively approved on July 24, 2018, contingent upon the Operation Manager requesting a copy of the recorded maintenance agreement. No update was available on July 2, 2019.

**ak. 2016-005W Ravinia Wetland Replacement Plan, Corcoran.** In December 2016 the Commission approved Staff's recommendations on this wetland replacement plan. Final wetland impacts are 1.22 acres. Wetland credits created on site will be 4.01 acres. Excess credits of 0.75 acres are proposed to be used on Lennar's Laurel Creek development in Rogers (2017-014). All approval contingencies have been met and construction is completed.. Vegetation planting and management took place throughout 2017. Barr Engineering is providing monitoring to ensure the replacement meets the performance standards of the approved plans. Their first annual report was submitted to the US Army Corps of Engineers on February 7, 2019. Kevin Mattson indicated on October 2, 2019 that no further updates are available.

**al. 2017-014 Laurel Creek, Rogers.** In June 2017 the Commission approved this project with four conditions. All contingency items have been provided with the exception of the O&M agreement which is being negotiated by the City as to whether the City or the HOA will be responsible for the operation and maintenance of the stormwater management facility. On August 31, 2017, Andrew Simmons responded that the O&M agreement is still being negotiated.

**am. 2017-017 Mary Queen of Peace Catholic Church, Rogers.** In June 2017 the Commission granted Staff approval authority pending satisfactory compliance with Staff's findings. All items from the findings have been completed with the exception of the O&M agreement for the stormwater facilities. On June 7, 2018 Andrew Simmons reported that the Church is in the process of revising the stormwater management plan for the site to include water reuse instead of a bio-

filtration pond. The Commission should receive a revised application in the near future. There are also underlying utility easement issues with this project that are holding up the final recording of the plat against which to record the maintenance agreement. *The Commission received the recorded O&M agreement on January 27, 2020. This item will be removed from the report.*

**an. 2017-029 Brayburn Trails, Dayton.** At their August 2017 meeting the Commission approved Staff's findings dated August 2, 2017 with five conditions. All of the conditions have been met except for the final recordings of the O&M agreements and easements. On March 7, 2018, the City reported: final plat approval has not been granted, easements will be recorded as plats are approved. Ponds will be maintained by the City of Dayton. An agreement, and additional easement, will be required for a water re-use system within one of the ponds (between the City and HOA). This system is not part of the first addition – the timing of said improvements/agreement is unknown. Construction was expected to start in 2018.

On February 7, 2019, Jason Quisberg provided the following information: The 1st Addition was scaled back from what was proposed; associated construction activity is significantly completed. Extension of trunk utilities through Sundance Golf Course are complete. The proposed 2nd Addition is under review. Improvements to 117th Avenue (East French Lake Road to Fernbrook Lane) will be part of the work done with the 2nd Addition. Construction is anticipated to start this spring. Pond easements are being recorded with the platting process for each addition (those [that are] part of the 1st Addition are in place). The water re-use system is not part of the 2nd Addition (will be with future addition).

**ao. 2018-018 Summers Edge Phase III, Plymouth.** The Commission approved Staff's recommendations at their June 13, 2018 meeting, subject to receipt of final easements over the wetland buffers within 90 days of final platting in a format acceptable to the Commission. *On October 2, 2019 Ben Scharenbroich provided a signed copy of the final plat. This item will be removed from the report.*

**ap. 2018-026 Windrose, Maple Grove.** The Commission approved Staff's finding and recommendations dated July 20, 2018. Final plan approval is contingent upon verification of the wetland approvals by the City of Maple Grove and the approval and recording of the operation and maintenance plan on the filter basins. On February 5, 2019 Derek Asche reported that the City will receive the agreement for the filter basins with the grading permit application.

**aq. 2018-028 Tricare Third Addition, Maple Grove** In their findings dated August 7, 2018, Staff recommended approval contingent on approval and recordation of the O&M plan on the filter basins. The Commission further recommended that the City consider an oil/debris type of separator in the parking lot manhole. Derek Asche contacted the project manager on February 5, 2019. It is a condition of the grading permit that the maintenance agreement is provided. No update was available on July 2, 2019.

**ar. 2018-044 OSI Phase II, Medina.** Staff findings dated October 9, 2018 were approved by the Commission at their October meeting contingent upon receipt of an approved stormwater system O&M plan being recorded on the property title. On October 2, 2019 Dusty Finke reported that the City is still awaiting final plat for this project.

**as. 2018-048 Faithbrook Church, Phase 2, Dayton.** This is an application for review of an expansion of an existing church located northeast of the intersection of Fernbrook Lane and Elm Creek Road. The Commission approved this project at their November meeting conditioned upon receipt of a SWPPP meeting NPDES requirements and the City accepting maintenance responsibility or recording a modified O&M plan for the stormwater features on the site in a form acceptable to the Commission. On February 7, 2019, Jason Quisberg reported that this project has gone idle; it is believed to be due to funding needs of the applicant. It was expected activity would resume in Spring 2019.

**at. 2019-002 Parkside Villas, Champlin.** This is two adjacent rural parcels totaling 13.9 acres that are proposed to be split into 56 single-family residential lots. It is located on the east side of Goose Lake Road just south of its intersection with Elm Road (CR 202). The review is for compliance with Commission's Rules D and E. At their February 2019 meeting the Commissioners approved Staff's findings dated January 29, 2019, contingent on 1) a long term O&M agreement on the stormwater basin and irrigation system being provided and recorded on the property title and 2) the applicant working with the City and Three Rivers Park District to safely outlet the pond water below the trail system adjacent to the proerty line.

**au. 2019-021 Brenly Meadows, Rogers.** This is a 38-unit townhome project proposed on 6.9 acres north of 129th Avenue about 1/3 mile west of Main Street. It triggered the Commissions review for Rules D, and E. This item was approved by the Commission at their August 2019 meeting, contingent upon O & M plan requirements for the stormwater pond and irrigation system.

**av. 2019-022 Comlink Midwest (CML Holdings LLC), Corcoran.** This is an existing 16.5-acre lot located in the southeast quadrant of County Roads 19 and 10 in Burschville. The present land use is about 13 acres of cropland and 3.5 acres of wetland/farmstead/meadow. The applicant proposes to construct three new commercial/ industrial buildings with adjacent parking and storage areas, creating approximately 5.5 acres of new impervious area. The Commission approved site plans per Staff's recommendations dated August 6, 2019 which were contingent upon an Operation and Maintenance agreement being approved by the City and the Commission and recorded on the property title. *Kevin Mattson indicated on October 2, 2019 that no updates are available.*

**aw. 2019-023 99th Avenue Apartements, Maple Grove.** This is part of a 20.4-acre PUD proposed on the Hy-Vee North property located at the southeast corner of Maple Grove Parkway and MNDOT Highway 610. The site is proposed to be divided into two parcels. The west parcel will be approximately 12.0 acres and be used for the Hy-Vee development. This apartment project comprises the eastern 8.42 acres. The Hy-Vee development was reviewed and approved by the Commission under project 2016-047 and is considered active by the City of Maple Grove. This apartment project was part of the overall stormwater management plan and PUD factored into the Commission's approval but was not proposed for construction at that time. A stormwater facility along the ROW of Highway 610 was approved as part of a shared facility to manage stormwater from both projects. The PUD will create 12.25 acres of new impervious surface (about 60% impervious cover). The apartment site plans trigger the Commissions review for Rules D, E, and I. At their September 11, 2019 meeting the Commisison approved Staff's findings dated September 4, 2019, wherein they recommended approval of the project contingent upon: 1) a City and Commission approved stormwater system operation and maintenance plan being recorded on the property title, and 2) restrictive covenants outlining the buffer installation, management, and performance standards being received and recorded on the property title. The covenants may allow a signage structure per the location and dimensions (4'x10') provided for on the site plan.

**ax. 2019-027 Havenwood at Maple Grove.** This is a 5.6-acre site located at the northwestern intersection of Bass Lake Road (CR10) and Troy Lane (CR101). The site is proposed to be subdivided into two lots. The southerly lot will be 4.5-acres with a 150-unit senior living facility. The remaining outlot (~1.3 acres) is anticipated to be a daycare facility. In their findings dated October 17, 2019, Staff recommended approval contingent upon the irrigation pond and system having an operation and maintenance plan approved by the City and Commission and recorded on the title for this property. A copy of the recorded document must be provided to the Commission.

## BUFFER REVIEW

Buffer review has been completed for Corcoran, Rogers, and Medina. Those parcels found to be non-compliant were sent to the state for enforcement and the landowners notified by US Mail of that action. Hennepin staff will work with those residents that are subject to enforcement actions at the request of BWSR, but will otherwise await findings. *In 2020, another one-third of the County will be reviewed for buffer violations. This will include Dayton, Plymouth, Maple Grove, and Champlin. Owners of parcels found to be newly out of compliance will be notified and given a chance to take corrective action before being referred to BWSR for enforcement.*

## RUSH CREEK SWA IMPLEMENTATION

*Staff will provide an update at the meeting.*

## SUBWATERSHED ASSESSMENT APPLICATIONS

The 2019 Subwatershed Assessment Cost Share Application and Criteria were included in the October meeting packet. Completed applications were due to Kirsten Barta by **January 15, 2020**.

## ELM CREEK FLOODPLAIN MAPPING PROJECT

Heather Hlavaty at Barr Engineering provided the following update:

**Work conducted over the last month:**

1. Subwatershed delineation and determination of hydrologic parameters
2. Preparation of HEC-HMS hydrology model
3. Documentation of model assumptions and identification of preliminary survey needs
4. Calibration of the HEC-HMS model

**Work that is anticipated to occur over the month:**

1. HEC-HMS hydrology model QAQC
2. Draft HEC-HMS hydrology submission to the DNR
3. Receive review comments from the DNR on the draft HEC-HMS model submittal
4. Begin development of HEC-RAS hydraulics model
5. Identify additional survey needs

**Data/input we are waiting on from others:** Nothing at this time

**Budget spent through 1/24/2020:** $12,425.00 (86% remaining)

## MANUFACTURED TREATMENT DEVICES (MTDS)

Below is a summary of the Manufactured Treatment Device meeting that Jim Herbert, Jim Kujawa, and Kris Guentzel attended at the MPCA office.

On January 29, 2020, MPCA staff hosted a meeting with city, county, and watershed organization staff (along with engineering firms supporting them) to discuss Manufactured Treatment Devices (MTDs) and find how organizations are approaching their use in permitting programs and whether the agency should explore incorporating them into the MN Stormwater Manual. This discussion was initiated by the Basset Creek WMC following a letter they drafted to MPCA last summer asking for guidance on how to approach providing credit for the devices to permit applicants. Discussion was led by staff from Bassett Creek WMC, Capital Region WD, Riley Purgatory Bluff WD, and Middle St. Croix WD who had either encountered the use of these devices by permit applicants or had been involved in implementation of the devices through retrofit projects.

As the name implies, MTDs are devices that are factory-assembled and installed as a stormwater treatment device, typically downstream from either a pretreatment chamber (sump or baffle) or another stormwater practice (wet pond or dry basin) that helps to settle out solids and slow down and force water into the treatment device. These have generally been sited in small drainage areas 0.1-5 acres (but usually less than 1 acre) with a large percentage of impervious surface (75-90%) and where soils won't allow for infiltration.

Approaches among watershed organizations have varied, but have generally centered around using out-of-state testing programs (notably the Technology Assessment Protocol – Ecology (TAPE) from the State of Washington's Department of Ecology) to establish a 50% TP efficiency permit credit. Any additional benefits above 50% requested by the applicant have been followed by requests for either additional field or lab testing results, additional continuous water quality modeling, or 1-2 years of project inflow/outflow monitoring results at the site to provide due diligence that the proposed additional benefit could be achieved. The group agreed that the efforts provided by these watershed organizations have been critical for understanding the benefit and practicality of these practices but that it's inefficient for so many organizations to be researching these devices and developing credit systems in parallel.

Lastly, significant discussion centered around the necessity for maintenance of these devices, the difficulty in completing that maintenance (or ensuring the applicant completes it), and for the concern that current testing protocols (and therefore the standards coming from those protocols) don't consider long-term maintenance. This validates the need for improved standards and for developing a database of completed projects the group can track and assess long-term.

Action items following the meeting are:

- For MPCA staff to reach out to individuals working on the Stormwater Testing and Evaluation for Projects and Practices (STEPP) program, which is looking to establish a common framework for evaluating stormwater practices across the US, MTDS included. MPCA staff will determine whether input from a MN work group to STEPP would be beneficial
- If input to the STEPP program is beneficial, MPCA staff will convene a workgroup with participants in the Jan. 29 meeting plus additional city staff to develop objectives and needs for the STEPP program for practitioners in MN.
- The group agreed it should begin cataloging sites where MTDs have been implemented, especially in areas where public entities can compile detailed monitoring data and track operations and maintenance activities
- MPCA staff will reach out to Seth Brown during his visit to MN in March for a lecture at the St. Anthony Falls Lab to see if he would give our work group a presentation on STEPP and how the work group can provide assistance
- If beneficial, MPCA may also ask participating organizations to add their signature to a letter of support for STEPP. It's believed this will help them get the federal funding they need to operate. It will likely be 3-5 years until we see deliverables from STEPP, even if funding is imminent.

Included in the meeting packet is a technical memo prepared by Barr Engineering for the Bassett Creek WMO. It provides a detailed description of MTDs and how the BCWMO could approach them in their permitting program.

# elm creek
## Watershed Management Commission

**ADMINISTRATIVE OFFICE**
**3235 Fernbrook Lane**
**Plymouth, MN 55447**
**PH: 763.553.1144**
**E-mail: judie@jass.biz**

**TECHNICAL OFFICE**
**Hennepin County Public Works**
**Department of Environment and Energy**
**701 Fourth Ave. South, Suite 700**
**Minneapolis, MN 55415**
**PH: 612.348.7338**
**E-mail: james.kujawa@hennepin.us**


# Fernbrook View Apartments
## *Maple Grove, Project #2019-001*

**Project Overview:** This is a 4.85 acres rural residential lot located at the NE intersection of CSAH 81 at Fernbrook Lane in Maple Grove. The applicant proposes to construct a 2 story, 42-unit apartment building. This review will for compliance to the Commission's 3rd Generation STWMP Rules and Standards, Rule D (stormwater management), Rule E (erosion and sediment controls), and Rule I (buffer strips)

**Applicant:** Arrow Companies, Steve Fischer, 7365 Kirkwood Court, #335, Maple Grove, MN 55369. Phone: 763-424-6355. Email: sfischer@arrowcos.com

**Agent/Engineer:** Loucks Associates, Zach Webber, 7200 Hemlock Lane, #300, Maple Grove, MN 55369. Phone: 763-496-6753. Email: zwebber@loucksinc.com

**Exhibits**:

1) ECWMC Request for Plan Review and Approval dated November 13, 2018, received January 10, 2019.
2) Site Plans. Latest revision date of January 4, 2019.
    a. Sheet C1-1, Existing Conditions
    b. Sheet C1-2, Demolition Plan
    c. Sheet C2-1, Site Plan
    d. Sheet C3-1, Grading Plan
    e. Sheet C3-2, SWPPP Plan
    f. Sheet C3-3, SWPPP Notes
    g. Sheet C4-1, Sanitary Sewer & Watermain Plans
    h. Sheet C4-2, Storm Sewer Plans
    i. Sheets C8-1 to C8-3, Details
    j. Sheet L1-1, Landscape Plan.
3) Architectural Site Plans, Latest revision date of January 3, 2019.
    a. Architecture Site Plan Sheet A1.1
    b. Architecture Sidewalk and Roof Plan A1.2
4) Fernbrook View Apartments Stormwater Management Plan dated November 13, 2018, revised January 4, 2019.
5) Correspondence from Loucks Associates to the City of Maple Grove regarding Fernbrook View Apartments response to City Comments, dated January 4, 2019.
6) Correspondence from Loucks Associates dated January 22, 2020 to the ECWMC regarding response to ECWMC comments from January 24, 2019.

**Findings**;

1) A complete set of plans was received January 10, 2019. The initial decision period per MN Statute 15.99 is March 11, 2019.
2) Current land use is rural residential, 4.85-acre parcel area. Approximately 0.34 acres is hard surface, 2.6 acres cropland, 0.90 acres wetland and 1.0-acre grass/woodland.
3) Proposed land use is multifamily residential (PUD). 1.84 acres will be impervious, 0.92 acres will remain wetland and 2.09 acres will be grass/landscaped.
4) This site drains directly into a small unnamed creek in the southeast corner of the property. This creek flows southeast for approximately 1,900 feet where it goes under the CSAH 81/I-610 ROW for about 900 feet. From there it flows about 1300 feet in the ditch between the 610 ROW and RR ROW before entering Elm Creek on the south side of the I-610 ROW.

Stormwater Management

5) Two permanent BMP's are proposed on site for stormwater management.
    a. A NURP/Filtration basin is proposed to treat 3.35 acres for abstraction, flow rates, total phosphorus and total suspended solids
    b. A soil amendment/filtration trench is proposed to treat 0.25 acres of impervious areas for phosphorus and suspended solids.
6) No information is provided on the long-term operation and maintenance of the pond and filter trenches. If the City of Maple Grove does not provide this service, the applicant is required to provide an O&M agreement for review and approval by the City and Watershed. The approved agreement must be recorded on the property title.
7) Although it is not required to meet the ECWMC conditions, the City of Maple Grove requested a filter trench for additional treatment from the roof and surface water along the west site of the building. The soil amendment/filtration trench next to the building does not appear to meet standards for this BMP. Assumed rate controls and water quality benefits will be minimized by this BMP due to;
    a. the slope of the trench (~2.6%). Ponding will only occur for approximately the last 50 feet on this trench.
    b. the void ratio of the amended soil mix (30-35%). 100% ratio appears to be used for storage availability in HydroCAD.
    c. an actual exfiltration rate will be limited by the ponding capability.
    d. Assumes the trench depth at 1.5'. Details show 1.0'
8) Abstraction requirements will be 7,365 cubic feet (1.1" of runoff on 1.84 acres of new impervious area). Actual abstraction provided will be 7,588 cubic feet.
9) Water quality analysis;
    a. Post-development TP and TSS will be equal to or less than pre-development load. This will meet the Commission's standards.

Stormwater Summary

| Condition | TP Load* (lbs/yr) | TSS Load** (lbs/yr) | Abstraction (cu. ft.) | Filtration (cu. ft.) | Annual Volume** (ac. ft.) |
|---|---|---|---|---|---|
| Pre-development (baseline) | **4.9** | **601** | **N/A** | **N/A** | **4.06** |
| Post-development without BMPs | **8.3** | **817** | **N/A** | **7,365** | **5.51** |
| Post-development with BMPs | **3.8** | **146** | **N/A** | **7,588** | **5.20** |
| **Net Change** | **-1.1** | **-455** | **N/A** | **-223** | **+1.14** |

*based on NURP and staff analysis
** based on MIDS

10) Rate Controls will meet the Commission requirements. (note, these may change slightly based on item 7 above)

| | 2-yr (cfs) | 10-yr (cfs) | 100-yr (cfs) |
|---|---|---|---|
| **Pre-Development Rates** | **5.9** | **14.0** | **31.8** |
| **Post-Development Rates** | **4.7** | **13.3** | **26.1** |

Wetland Buffers

11) The on-site wetland will not be impacted. Buffers will be established around this wetland to meet the Commission's standard widths of 10' minimum and 25' average.

Erosion and Sediment Controls

12) Erosion and sediment control plans meet the Commission's requirements.

**Decision**: This project was approved at the February 2019 ECWMC meeting with the following conditions: 1) the applicant pursue utilizing water from the NURP pond for irrigation needs for this property; 2) long term operation and maintenance on the stormwater basin must be addressed: 3) mean average pond depth must meet the Commission standard: 4) pond filter bench details must be provided.
Except for the O&M plan, these conditions have been met and this project is hereby approved contingent upon final receipt of an approved and recorded O&M plan on the stormwater facilities within 90 days after the final plat is recorded on this site.

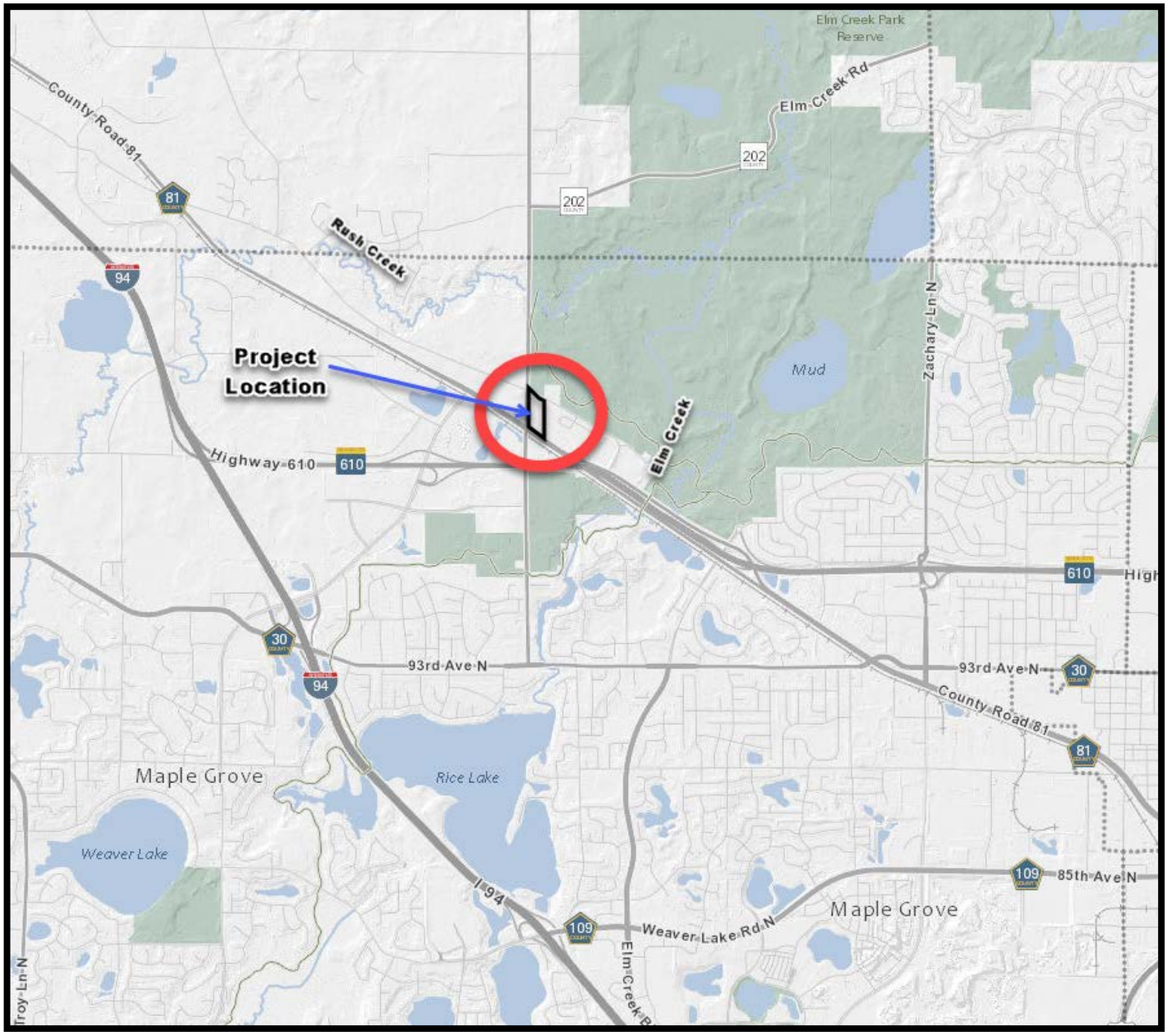
Advisor to the Commission

Surface Water Solutions

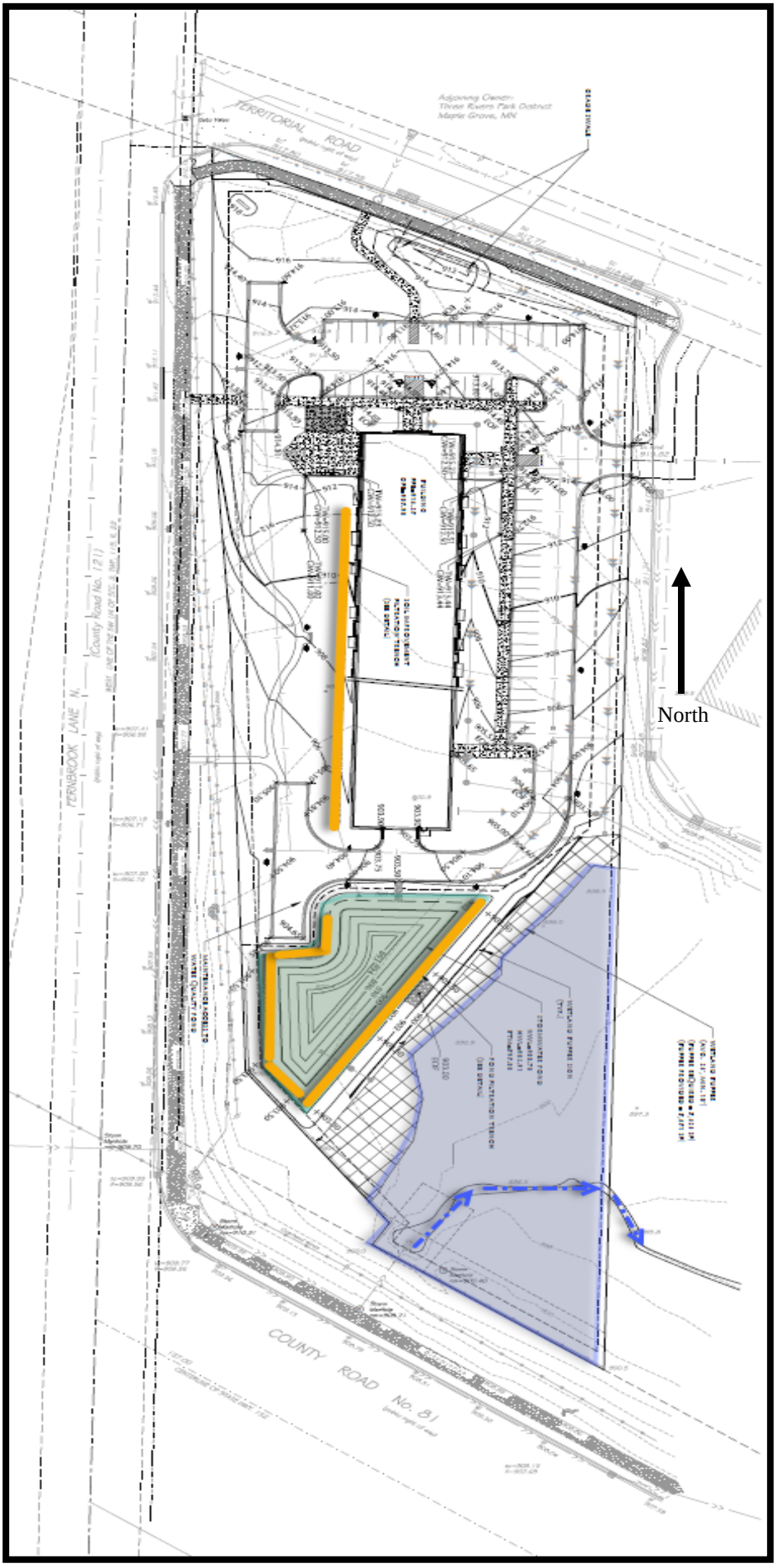
February 5, 2020
Date

Fernbrook View Apartments
Maple Grove project 2019-001
February 5, 2020

**LOCATION MAP**



Fernbrook View Apartments
Maple Grove project 2019-001
February 5, 2020



# elm creek
## Watershed Management Commission

**ADMINISTRATIVE OFFICE**
**3235 Fernbrook Lane**
**Plymouth, MN 55447**
**PH: 763.553.1144**
**E-mail: judie@jass.biz**

**TECHNICAL OFFICE**
**Barr Engineering**
**4300 MarketPointe Drive**
**Minneapolis, MN 55435**
**952-832-2600**
**E-mail: surfacewatersolutions@outlook.com**

# Hassan Sand & Gravel Expansion
# Zachman Property, Rogers
# *Project #2019-031*

**Project Overview:** Hassan Sand and Gravel is proposing to open a new mining operation just north and west of their existing site on CR 144 and Willandale Road. The new site has CR 144 along the south boarder and the Crow River along the northerly boundary. Approximately 38 acres of the land will be mined in phases over the next 20 to 30 years (depending on demand). The site plans propose to stay out of the bluff and setback zones along the Crow River. During the mining operations runoff will be directed west into an onsite sediment pond. From there the water runs approximately ½ mile north on a flat grade before it enters the Crow River. The site plan triggers the Commission's rules E (erosion control) and F (floodplain).

**Applicant:** Hassan Sand & Gravel, Inc., Attn. Kevin Scherber, 13530 Willandale Road, Rogers, MN 55374. Email; Kevin@hassansand.com. Phone: 763-4282393.

**Engineer:** Otto Associates, Attn. Paul Otto, 9 West Division Street, Buffalo, MN 55313. Phone: 763-682-3522. Email; paul@ottoassociates.com

**Exhibits**:

1) Elm Creek Watershed Management Commission Request for Plan Review and Approval received November 14, 2019 with application fee of $9,400.00.
2) Hassan Sand and Gravel Mining Plan dated December 27, 2019.
    a. Sheet 1 of 5, Mining Plan, Map A, Existing Conditions
    b. Sheet 2 of 5, Mining Plan, Map B, Proposed Conditions
    c. Sheet 3 of 5, Stormwater Pollution Plan
    d. Sheet 4 of 5, Stormwater Pollution Plan Narrative
    e. Sheet 5 of 5, Mining Plan, Map C, Restoration Plan
3) Mining Plan Permit Narrative to the City of Rogers, dated October11, 2019.
4) Hassan Sand & Gravel Zachman Property Wetland Delineation by Bopray Environmental, dated October 19, 2018
    a. Notice of Application from LGU (Rogers) dated October 19, 2019.
    b. Notice of Decision Approval from LGU (Rogers) dated November 9, 2019.

**Findings**;

1) A complete application was received November 14, 2019. The initial 60-day decision period per MN Statute 15.99 expired January 13, 2020. Staff extended the deadline 30 days to February 13, 2020.

2) This is an existing 124 acres parcel north of CR 144 along the Crow River. The area that is being considered for mining is approximately 38 acres located in the southeasterly section of the property.
3) The Commission rules require review for Erosion and Sediment Controls (Rule E) and Floodplains (Rule F).
4) The projected timeline on this mining operation will be dependent upon the local demand for sand and gravel. The applicants best estimate for the length the mine will operate is between 20 and 30 years.
5) Existing conditions consist of approximately;
    a. 40 acres of farmed cropland,
    b. 0.30 acres on two wetland areas (wetland A is ~0.28 acres, wetland B is along the west edge of the proposed mining area and was not fully delineate) and
    c. 7.4 acres of woodland area that runs along the Crow River.
6) Proposed conditions during the mining operation;
    a. Will not disturb wetlands A or B or the woodland/bluff areas along the Crow River.
    b. Approximately 38 acres will be mined for sand and gravel.
        i. One large sediment pond is proposed on site. All runoff from the mining activities will be directed toward the sediment pond.
        ii. No water from the mining areas will be directed toward the river. It will be shaped to route the water into the sediment pond.
        iii. The sediment pond will outlet via a Faircloth Skimmer into wetland B.
        iv. Flowage patterns out of wetland B will remain the same before, during and after the mining activities. This water meanders and ponds in natural depressional areas west then north before reaching the Crow River ~1/2 mile away.
        v. Mining will not occur below the existing water table on site which is projected at 972.0.
7) Proposed restoration conditions after mining activity (20-30 years anticipated).
    a. Final slopes will be established so water will flow to the north, away from the river bluff areas.
        i. Based on the highly erosive nature of the existing bluff soils along the Crow river, this is desirable for shoreline stability.
        ii. Disturbed areas will be seeded and mulched.
        iii. Soils imported for restoration will be compacted to 100% of maximum density in lifts of 8-10". Any fill depths >8' must sit for at least 6 months for soil consolidation.

<u>Grading and Erosion Control Standards and Recommendations</u>;

8) Erosion and sediment controls during mining activities will meet the Commissions standards. They will consist of;
    a. Site containment of runoff water
    b. No water from the mining areas will be directed toward the river or on-site wetlands. It will be routed into the sediment pond before entering wetland B.

c. The sediment pond meets MPCA/SWPPP design requirements for construction activities.
    i. The pond will outlet via a Faircloth Skimmer into wetland B.
    ii. The area draining to the sediment pond is approximately 35 acres. The pond is designed to accept up to approximately 43 acres of area.
d. Buffer and setbacks from the Crow River.
    i. All bluff and buffer areas are identified and a 30' setback from the top of the bluff and 50' undisturbed area from the OHWL of the river are provided.

9) Erosion and sediment controls after mining activities (restoration plan) will generally meet the Commission standards. Because the amount of material being mined and the restoration efforts will vary based on demand, we recommend periodic updates be provided to the City of Rogers and Commission (5 year minimum?) on the mining and restoration progress and on the existing BMP's effectiveness to control any off-site effects.
    a. The current restoration plan consists of;
        i. Final slopes will be established so water will flow to the south, away from the river bluff areas.
        ii. A minimum of 3" of topsoil will be placed on all disturbed areas
        iii. Disturbed areas will be seeded and mulched.
        iv. Soils imported for restoration will be compacted to 100% of maximum density in lifts of 8-10". Any fill depths >8' must sit for at least 6 months for soil consolidation.
        v. Restoration plans make general statements that the site will comply with MPCA BMP's and construction activities as outlined in the MPCA General NPDES Permit requirements and the contractor shall control all erosion and siltation until the site is adequately vegetated.

<u>Floodplain Standards</u>

10) There is a backwater area of the Crow River that winds its way back into this site. The 100-year BFE for the floodplain is 973.0.
    a. Some minor filling into the floodplain will occur on a portion of the new access road and sediment pond berm.
    b. The minor filling will be offset by a hydrologic connection (Faircloth Skimmer pipe) and excavation in the sediment pond.
    c. Restoration plans provide for floodplain areas and volumes below 973.0 in excess of the existing floodplain.

<u>Wetlands</u>

11) A wetland delineation determined there are two wetland basins on this site.

a. Wetland A is ~0.28 acres and is a depressional area in the SE corner of the site.
    i. There is a drainage area of 8.0 acres currently flowing into this wetland.
    ii. During mining operations approximately 6.4 acres of the drainage area to this wetland will be cut off. Only about 1.6 acres will remain draining into this basin from this property.
    iii. This will impact the hydrology to this wetland during the mining operations.
    iv. The restoration plan will re-establish the watershed area draining to the wetland. It provides approximately a 10.0-acre drainage area to the wetland.
b. Wetland B is along the west edge of the proposed mining area and was not fully delineate.
c. No fill is proposed for either wetland.
d. The decrease in the drainage area to wetland A during the mining operation could constitute an impact to this wetland.
e. The City of Rogers is the LGU in charge of administering the Wetland Conservation Act on this site. We recommend the city consults with the WCA Technical Evaluation Panel to determine if there are impacts to Wetland A during the mining operations.

Buffers

12) Although technically not a requirement by the watershed, the applicant is maintaining a 25' permanent vegetative buffer around wetlands A and B.
13) The mining plan provides for buffer along the Crow River.
    a. Top of bluff areas are identified along the River.
    b. A minimum 30' buffer area above the top of bluff and a minimum 50' area is proposed to remain undisturbed along the river corridor during construction.
    c. No water from the mining site will flow toward the buffer or bluff areas along the river corridor on this site.

Stormwater Management;

14) No stormwater management is proposed or required on this site.
    a. Temporary erosion and sediment controls during construction will occur from the sediment pond being constructed on site.
        i. The sediment pond was designed at a capacity to store 3,600 cubic feet per acre of drainage area. This is consistent with MPCA design criteria.
        ii. The outlet control on the sediment pond is restricted to a 5.1" opening in a 6" pipe on a Faircloth Skimmer device.
    b. At this time, no new impervious areas are proposed after mining is complete. Any increase in impervious area will have to be reviewed by the Commission per their rules at the time they are proposed.
15) Because soil site conditions will change from A hydrologic soils before mining to C or D hydrologic soils after mining, runoff rates will be affected.
    a. We recommend the City establishes a pre-development runoff rate standard for the 2, 10- and 100-year storm event for the existing discharge points from this site. The discharge points would be at Wetland A and at the farmstead driveway.

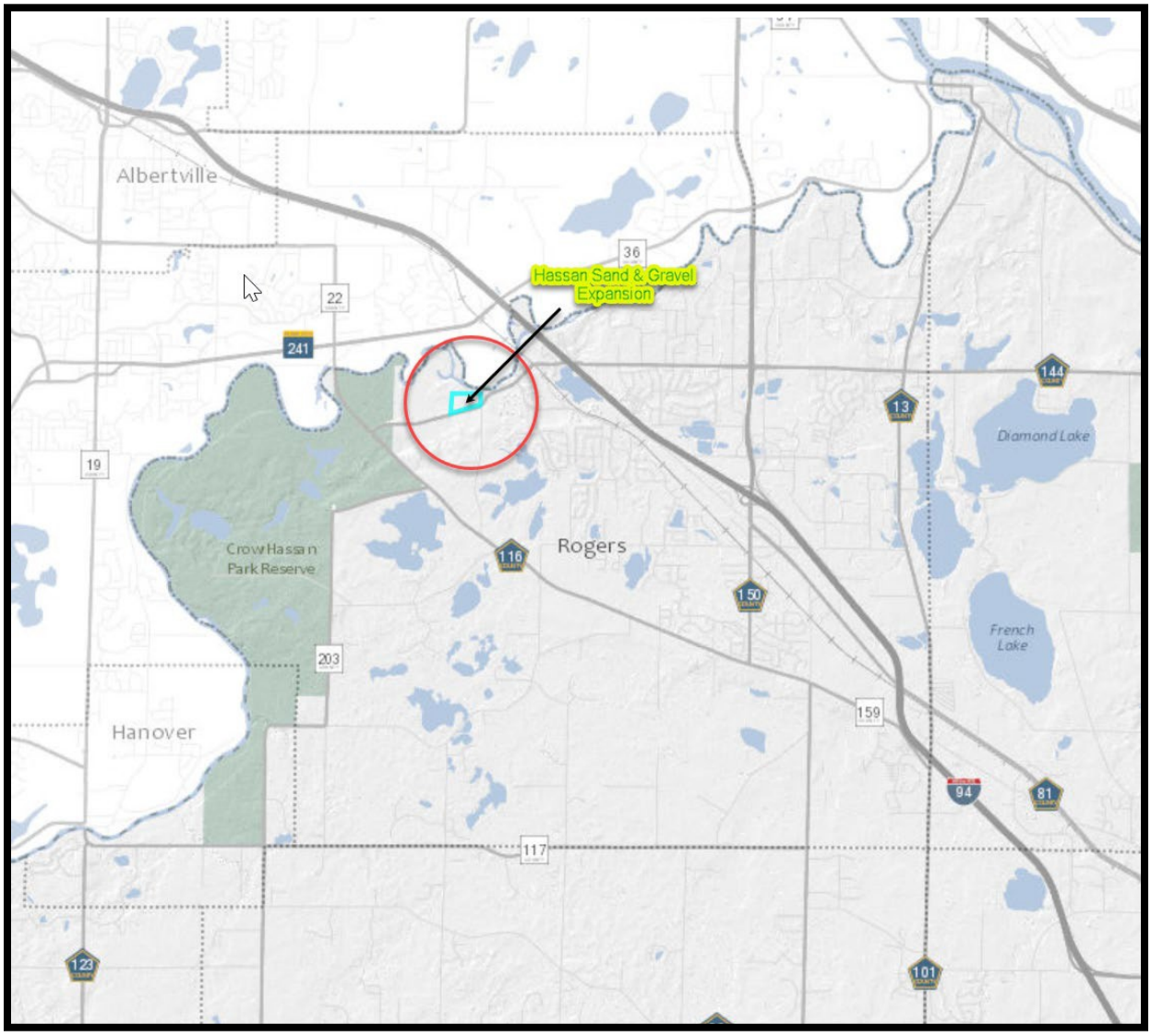
b. We recommend that before final restoration site work begins, the City require site plans that will provide for the two-discharge point to be equal to or less than pre-development flows.

**Recommendation:** Approval, contingent upon;

1) WCA requirements are met.
   - The city consults with the WCA Technical Evaluation Panel to determine if there are impacts to Wetland A during the mining operations.
2) The City establishes a pre-development runoff rate standard for the 2, 10- and 100-year storm event for the existing discharge points from this site.
   - Before final restoration site work begins, the City require site plans that will provide equal to, or less than pre-development flows.

Surface Water Solutions
Advisor to the Commission

January 17, 2020
Date

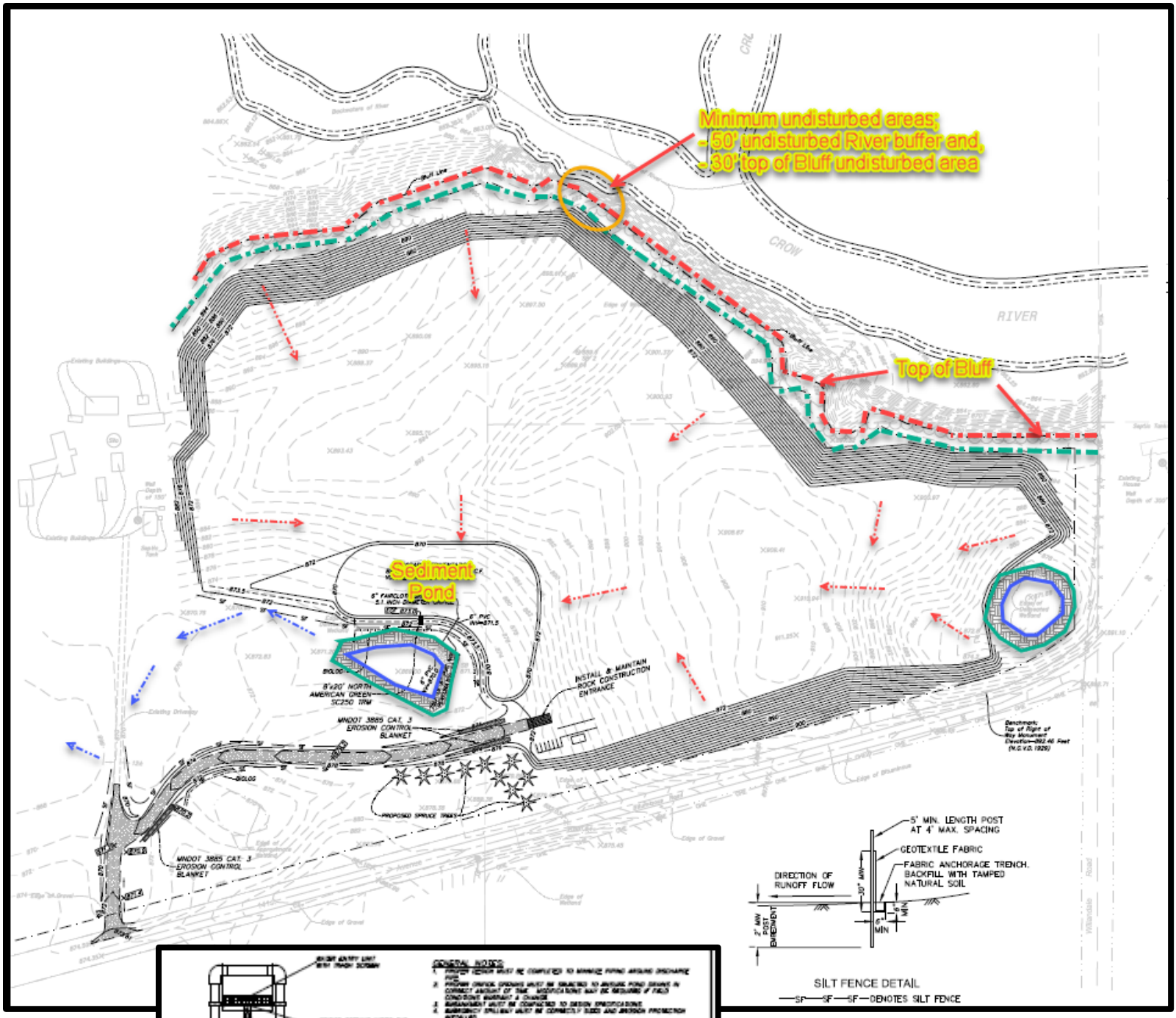


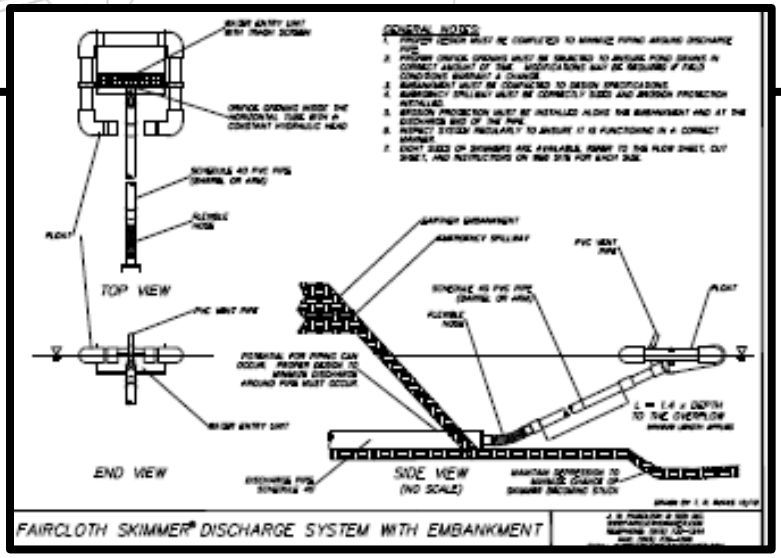
Hassan Sand & Gravel, Zachman Property, Rogers
2019-031
January 17, 2020

## Existing Conditions

Hassan Sand & Gravel, Zachman Property, Rogers
2019-031
January 17, 2020

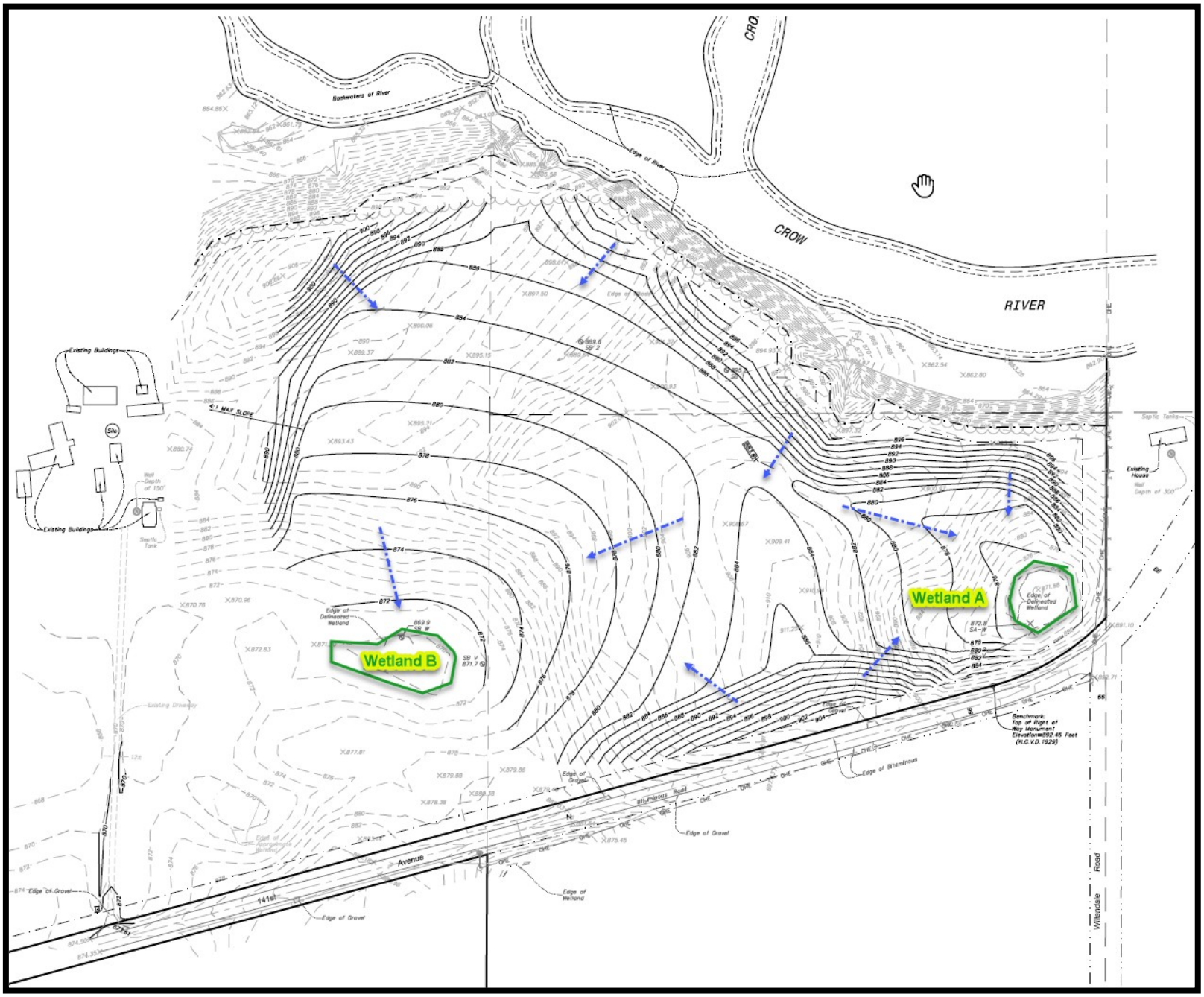
# Mining Plan



Hassan Sand & Gravel, Zachman Property, Rogers
2019-031
January 17, 2020

# Restoration Plan



# elm creek
## Watershed Management Commission

**ADMINISTRATIVE OFFICE**
**3235 Fernbrook Lane**
**Plymouth, MN 55447**
**PH: 763.553.1144**
**E-mail: judie@jass.biz**

**TECHNICAL OFFICE**
**Barr Engineering**
**4300 MarketPointe Drive**
**Minneapolis, MN 55435**
**952-832-2600**
**E-mail: surfacewatersolutions@outlook.com**

# Open Systems International (OSI) Headquarters Addition
## *Medina, Project #2019-032*

**Project Overview:** The OSI site is 50 acres located at the NW intersection of Highway 55 and Arrowhead Drive (across from the Hennepin County PW facility) in Medina. This site plan proposes a 40,240 sq. ft. building addition south of the existing building and a parking lot expansion of 329 spaces. It will disturb approximately 8 acres and create an additional 3.6 acres of new imperious areas. Commission rules require compliance for stormwater management (Rule D), erosion and sediment controls (Rule E), wetland buffers (Rule I) and potential floodplain impacts (Rule F)

**Applicant:** Open Systems International, Inc., attention Michael Kuklok, 4101 Arrowhead Drive, Medina, MN 55340-9649. Phone: 763-404-4337. Email; mkuklok@osii.com

**Agent:** Rehder & Associates, Inc, attention Nicholas Adam, 3440 Federal Drive, Suite 110, Eagan, MN 55122. Phone; 651-337-6729. Email; nadam@rehder.com.

**Exhibits**:

1) A complete ECWMC application received November 29, 2019.
    a. ECWMC Request for Review and Approval dated November 13, 2019
    b. City of Medina authorization dated November 27, 2019
    c. Project review fee, $2,050 for 8 acres of disturbance, commercial/industrial project.
    d. Site plan design submittal via email on November 9, 2019.
2) OSI Stormwater Management Report by Rehder & Associates, dated October 8, 2019, revised December 18, 2019.
3) OSI Stormwater Pollution Prevention Plan Narrative prepared by Rehder & Associates for CoBeck Construction Company. Dated January 21, 2020.
4) OSI response memos from Rehder & Associates to WSB (city engineer) and City of Median Planning Department, both dated Decembers 18, 2019.
5) Combined Site Plans for OSI Inc. Headquarters Addition dated December 18, 2019.
    a. Sheet G0.0, Cover Sheet
    b. Sheets 1 & 2 of 2, Existing Conditions Survey
    c. Sheets A1.0 to A3.1 (5 of 5 sheets) Architectural Plans
    d. Civil Site Plans, updated January 31, 2020
        i. Sheet C0, Title Sheet
        ii. Sheets C1 & C2, Site Demolition Plan
        iii. Sheets C3 & C4, Site Dimension Plan
        iv. Sheets C5 & C6, Grading, Drainage & Erosion Control Plan & SWPPP
        v. Sheets C7 & C8, Utility Plan
        vi. Sheets C9 to C11, Details
        vii. Sheet C12, Wetland Buffer Exhibit, updated January 31, 2020.

e. Sheets L1.0 & L1.1, Landscape Plans
f. Sheet ES, Site Plan Photometrics

6) ECWMC project files for 2009-034 (Initial OSI site plan).

**Findings**;

1) A complete application was received, November 29, 2019. The initial decision period deadline per MN Statute 15.99 is January 30, 2020. Staff extended the review period an additional 30 days to February 29, 2020 to account for ECWMC technical services changes.

Stormwater Management

2) This site drains into two different watersheds. Approximately 15.3 acres drains westerly into the Rush Creek Watershed area. The remaining area (approximately 7.3 acres) drains easterly into the Elm Creek Watershed.
3) For stormwater treatment, site plans propose to utilize the existing stormwater pond and two new biofiltration basins.
    a. The existing stormwater pond was approved by the Commission in 2010 under EC project 2009-034. It was approved as a wet detention pond for a 10.05-acre watershed with 7.89 acres of impervious areas. With this new site plan, there will be 8.87 acres draining into it with 6.49-acres of impervious areas.
        i. The existing wet detention pond water elevations were updated using Atlas 14 runoff. This raised the 100-year elevation to 992.05. The lowest floor elevation on the building is 994.89. This meets the Commission's 2' freeboard standard.
    b. The two new biofiltration basins are proposed to treat for abstraction, water quality and rate controls from the new parking area water.

Abstraction volume;

    c. The total new impervious area for the site is 3.69 acres.
    d. 14,734 cubic feet of abstraction required to meet 1.1" volume for new imperious areas.
    e. Biofiltration basins 1 and 2 provide 19,200 and 8,800 cubic feet of storage respectively between the surface of the basin and the outlet pipe.
    f. Drawdown for both basins will be less than 48 hours.
    g. Pre-treatment for Basin 1 will be two 4-foot sump manholes upstream from the basin. Both manholes will have a SAFL Baffle weirs.
    h. Pre-treatment for Basin 2 will be two 4-foot sump manholes with two SAFL Baffle weirs.

Nutrient and TSS loads.

    i. Commission standards require post development TP and TSS loads to be equal to or less than pre-development.
        i. Per staff analysis, these conditions will be met.

4) An approved long-term operation and maintenance plan for the biofiltration basins on this site must be provided by the landowner. Said O & M agreement must be recorded on the property title with the recorded document provided to the Commission.
5) Drainage easements are proposed over the stormwater basins.

Rate Control Summary (rate controls meet the Commission standards)

| | 2-yr (cfs) | | 10-yr (cfs) | | 100-yr (cfs) | |
|---|---|---|---|---|---|---|
| | East | West | East | West | East | West |
| **Pre-Development Rates** | **11.45** | **8.34** | **22.42** | **16.32** | **48.01** | **34.95** |
| **Post-Development Rates*** | **8.44** | **1.78** | **17.48** | **6.53** | **47.1** | **19.86** |

Water Quality summary (water quality controls meet the Commission standards)

| Condition (based on 17.0 acres) | TP Load (lbs/yr) | TSS Load (lbs/yr) | True Abstraction (cu. ft.) | Filtration (cu. ft.) | Annual Volume (ac. ft.) |
|---|---|---|---|---|---|
| **Pre-development (baseline)** | **12.1**** | **1238** | | | **8.35** |
| **Post-development without BMPs** | **12.0** | **2188** | **0** | **14,734** | **14.73** |
| **Post-development with BMPs** | **8.0** | **1204** | **0** | **28,000** | **14.73** |
| **Net Change** | **-4.1** | **-34** | **0** | **-13,266** | **+6.4*** |

***Based on MIDS Model.**
****Pre-development P concentration for cropland=0.533 mg/l**

Wetland Buffers.

6) The Commission requires 25' average, 10' minimum buffers around all wetland basins (stormwater pond slopes can be considered in the buffer areas). Where any disturbed slope exceeds 6:1, an additional 5' buffer width for each 1' increase in vertical drop is required (i.e. 5:1=30', 4:1=35' etc.). These requirements are met with this addition on the three wetlands affected by this site plan.
    a. The easterly wetland has an average buffer width of at least 25 ft. With a maximum width of 58 ft and a minimum width of 15 ft.
    b. The middle wetland has an average buffer width of 25' with a minimum width of 15'.
    c. The westerly wetland will have an average 35' buffer width that was established with the original site plan in 2010. A 50' buffer width will be established in the new parking lot area on this same wetland.
    d. Wetland buffer monumentation are provided per Commission standards.
    e. Drainage easements cover all wetland and buffer areas.

Floodplain

7) There are two floodplain areas within this project.
    a. On the west site of the site there is an Elm Creek Watershed Upland flood storage area that has a flood elevation established at 981.7. This is also designated by FEMA as a Zone A (no flood elevation determined) and,
    b. In the far southeast corner of the site a small portion of the FEMA floodplain overlay map that comes up to this property. FEMA has this area designated as a Zone A (no flood elevation determined). The Elm Creek Management Plan modeled the 100-year elevation on this basin at 981.2.
8) No floodplain impacts are proposed in the plans received.
9) Drainage easements are proposed over all floodplain areas.

Erosion and sediment control plans

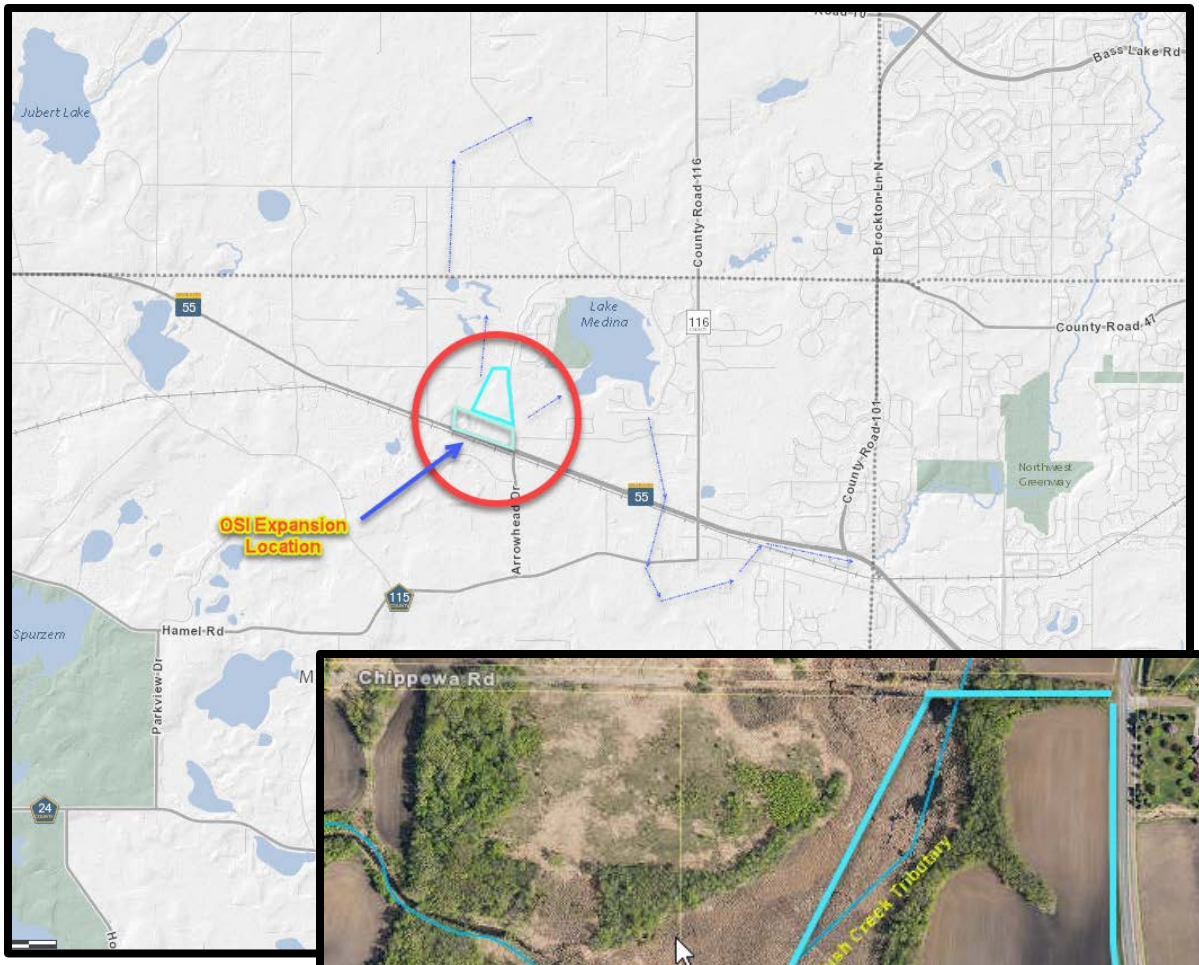
10) SWPPP and erosion control plans meet the Commission's requirements.

**Recommendation**: Approval contingent upon receipt of O& M plans (per item #4) on the biofiltration basins within 90 days after the final plat is filed by the applicant.

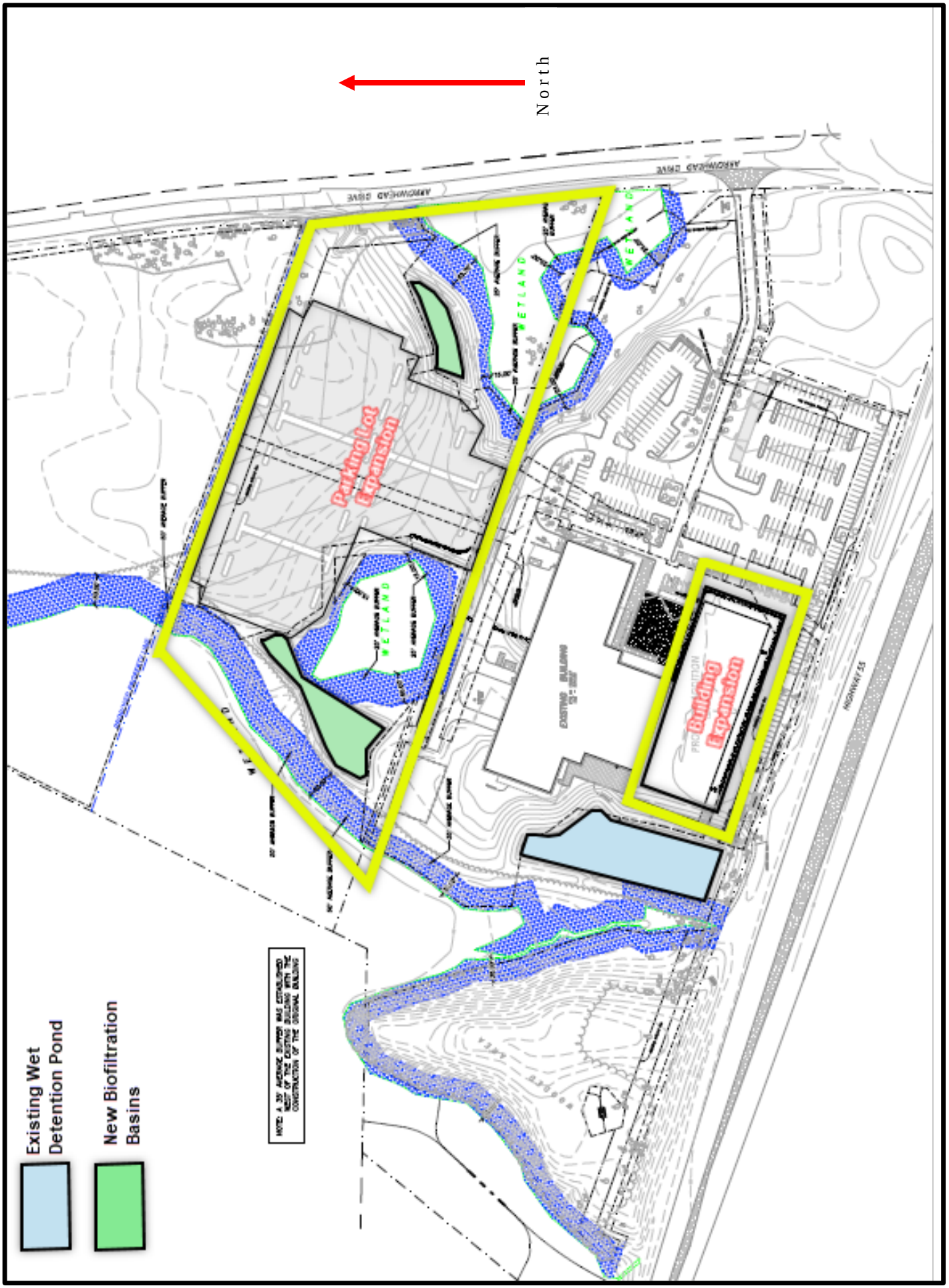
Hennepin County
Department of Environment and Energy
Advisor to the Commission

February 4, 2020
Date

OSI Headquarters Addition (2019-032)
City of Medina
February 4, 2020




OSI Headquarters Addition (2019-032)
City of Medina
February 4, 2020



# elm creek
## Watershed Management Commission

**ADMINISTRATIVE OFFICE**
**3235 Fernbrook Lane**
**Plymouth, MN 55447**
**PH: 763.553.1144**
**E-mail: judie@jass.biz**

**TECHNICAL OFFICE**
**Barr Engineering**
**4300 MarketPointe Drive**
**Minneapolis, MN 55435**
**952-832-2600**
**E-mail: surfacewatersolutions@outlook.com**

# Markets at Rush Creek Outlot L Multi-Tenant
## *Maple Grove, Project #20120-001*

**Project Overview:** Outlot L is a 1.55-acre lot located in The Markets at Rush Creek (Hy-Vee South) PUD development. This project is just west of the Hy-Vee gas station and south of CR10. A 12,000 sq. ft. multi-tenant building and its associated parking is proposed for this site. Stormwater management for this lot is part of the regional stormwater system approved by the Commission for project 2016-002. Commission rules require compliance for stormwater management (Rule D) and erosion and sediment controls (Rule E),

**Applicant:** Hy-Vee Inc., Attn. Jeffery Stein, 5820 Weston Parkway, West Des Moines, Iowa, 50266. Phone: 515-267-2800. Email; jstein@hy-vee.com

**Agent:** Alliant Engineering, Attn. David Nash, 733 Marquette Avenue, Suite 700, Minneapolis, MN 55402-2340. Phone; 612-767-9327. Email; dnash@alliant-inc.com

**Exhibits**:

1) A complete ECWMC application received January 17, 2020.
    a. ECWMC Request for Review and Approval dated January 13, 2020
    b. City of Maple Grove authorization dated January 15, 2020
    c. Project review fee, $550.00 for 1.6 acres of disturbance, commercial/industrial project received January 17, 2020
    d. Site plan design submittal via email on January 10, 2020.
2) Markets at Rush Creek Outlot L Multi-Tenant Development Stage Plan and Final Plat, by Alliant Engineering undated and unsigned.
    a. Sheet 1 of 12, Cover Sheet
    b. Sheet 2 of 12, Existing Conditions
    c. Sheet 3 of 12, Site Plan
    d. Sheet 4 of 12, Erosion Control Plan
    e. Sheet 5 of 12, SWPPP Notes
    f. Sheet 6 of 12, Grading Plan
    g. Sheet 7 of 12, Utility Plan
    h. Sheets 8-10 of 12, Civil Details
    i. Sheet 11 of 12 Landscape Plan and Details
    j. Sheet 12 of 12 Photometric Plan
3) ECWMC project files for 2016-002, Markets at Rush Creek Development Stage PUD.

**Findings**;

1) A complete application was received January 17, 2020. The initial decision period deadline per MN Statute 15.99 is March 17, 2020.

Stormwater Management

2) This lot was designed to drain into regional stormwater treatment system approved by the ECWMC on Project 2016-002 for the Markets at Rush Creek PUD.
    a. Stormwater treatment for Project 2016-002 was designed to meet the Commission's requirements from their 3rd Generation Stormwater Management Plan.
    b. Stormwater from Outlot L was designed for 76% impervious and 24% pervious areas for the regional treatment facilities in the Markets at Rush Creek PUD.
    c. Based on the Outlot L site plan, actual impervious areas will be 74%. Pervious areas will be 26%.
    d. Site plan drainage and impervious areas on the Outlot L are consistent with the approved stormwater management plan for the Markets at Rush Creek.

Floodplain/Wetlands/Buffers/Stream Crossing

3) There are no floodplains, wetlands, wetland buffers or steam crossing within this site area.

Erosion and sediment control plans

4) The proposed SWPPP narrative and erosion control plans meet the requirements of the Commission.
    a. Perimeter silt fence, a rock construction entrance, inlet protections and vegetation restoration are provided during and after site work.

**Decision**: This site is administratively approved pending receipt of a signed, dated Development Stage Plan.

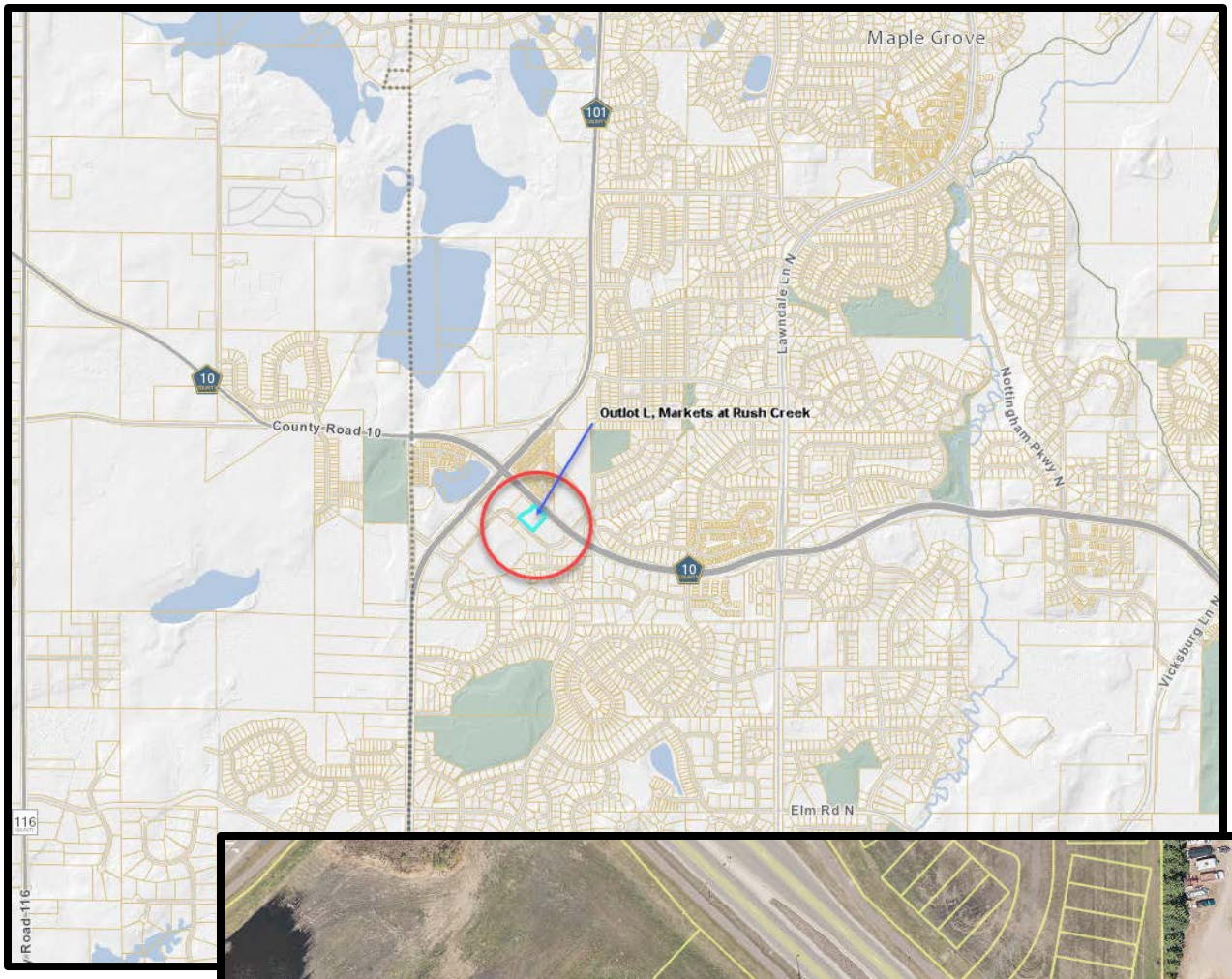
Advisor to the Commission

Surface Water Solutions

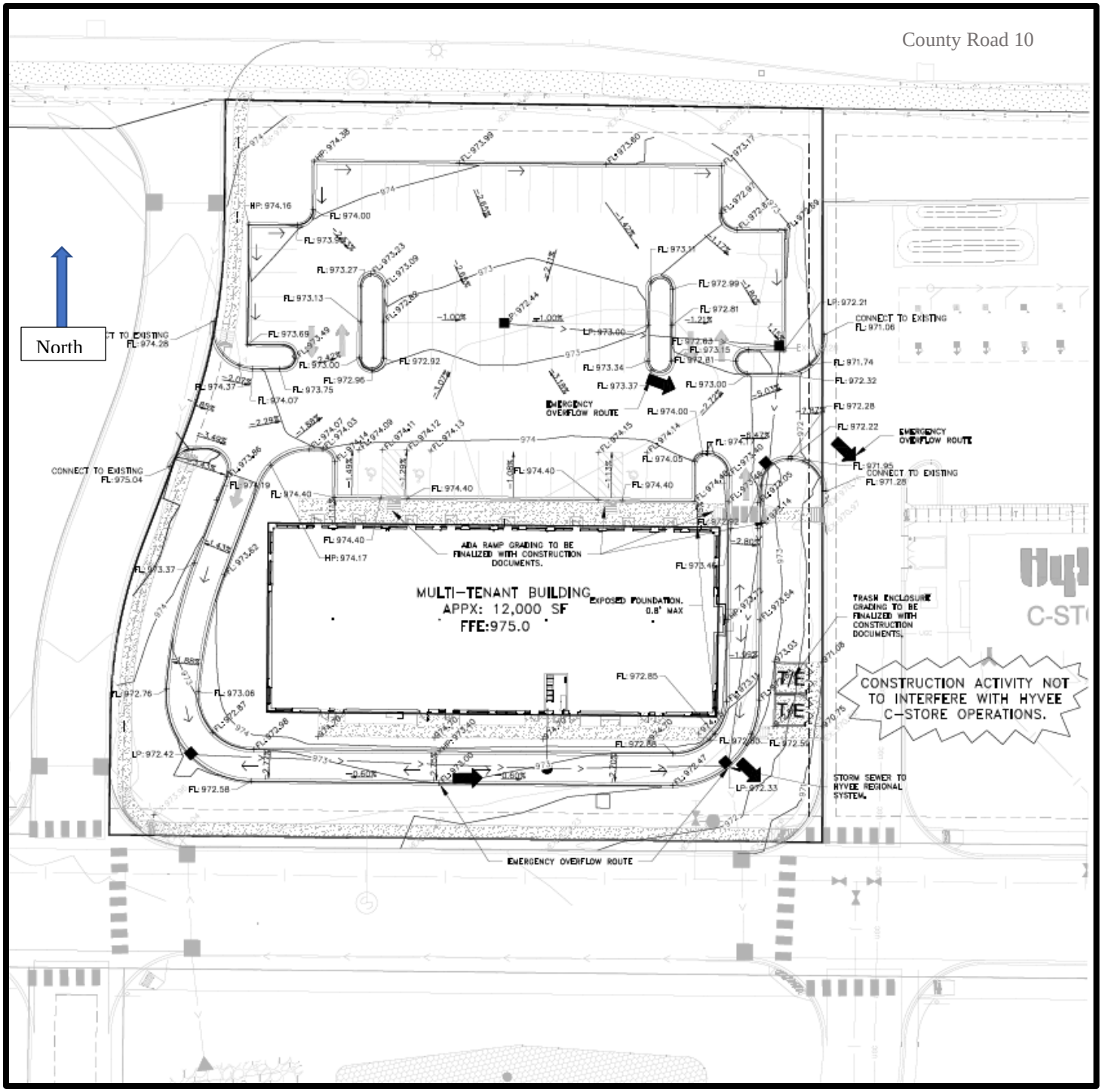
January 23, 2020
Date

The Markets at Rush Creek Outlot L, Multi-Tenant Building
City of Maple Grove Project 2020-001
January 23, 2020

## Location Map




# Outlot L Multi-Tenant Building Grading & Drainage Plan



# elm creek
## Watershed Management Commission

**ADMINISTRATIVE OFFICE**
**3235 Fernbrook Lane**
**Plymouth, MN 55447**
**PH: 763.553.1144**
**E-mail: judie@jass.biz**

**TECHNICAL OFFICE**
**Barr Engineering**
**4300 MarketPointe Drive**
**Minneapolis, MN 55435**
**952-832-2600**
**E-mail: surfacewatersolutions@outlook.com**

# Palisades at Nottingham 2nd Addition
## *Maple Grove, Project #2020-003*

**Project Overview:** This is a 4.05 acre in-fill project in the Nottingham development section of Maple Grove. It is located at the 73rd Place/Xene Lane Cul-de-sac about ¼ mile northeast of the intersection of Nottingham Parkway at Bass Lake Road. Nine (9) new single-family residential lots are proposed creating 28,440 sq. ft. of new impervious areas. This review will be for compliance to the Commissions 3rd Generation Stormwater Management Plan, Appendix C, Rule D (Stormwater Management), Rule E (Erosion and Sediment Controls) and Rule I (Wetland Buffers)

**Applicant:** Zehnder Homes Inc., Attention Eric Zehnder, 14240 23rd Ave. N, Plymouth, MN 55447. Phone; 651-303-5747. Email; ericzehnder@zehnderhomes.com

**Agent:** Landform, Attention Ross Abel, 580 Dodge Ave., Suite 15, Elk River, MN 55330. Phone: 612-638-0251. Email; rabel@landform.net.

**Exhibits**:

1) A complete ECWMC application received January 24, 2020.
    a. ECWMC Request for Review and Approval dated January 6, 2020.
    b. City of Maple Grove authorization for review, dated January 23, 2020
    c. Project review fee, $550.00 for 4.05 acres, residential site development project received January 24, 2020
    d. Site plan design submittal via email on January 23, 2020.
2) Palisades at Nottingham Second Addition Site Plans by Landform Engineering dated March 15, 2018 with last revision date of January 22, 2020.
    a. Sheet C0.1, Title Sheet
    b. Sheet C0.2, Preliminary Plat
    c. Sheet C1.1, Existing Conditions,
    d. Sheet C3.0, Existing Drainage Exhibit
    e. Sheet C3.1, Grading Plan,
    f. Sheets C3.2 & C3.3, SWPP Plan
    g. Sheet C4.1, Utility Plan
    h. Sheets C7.1 & C7.2, Details
    i. Sheets L1l1 & L.12, T-Zone Exhibit and Preservation
    j. Sheet L2.1, Landscape Plan.
    k. Sheets 1 &2 of 2, Palisades at Nottingham Second Addition Plat Sheets.
3) Hydrology Summary and Hydro CAD design information by Landform, dated December 23, 2019, revised January 28, 2010.

**Findings**;

1) A complete application was received January 21, 2020. The initial decision period deadline per MN Statute 15.99 is March 21, 2020.
2) This site drains to the north via existing storm sewer pipe eventually reaching (±4000 feet) Elm Creek just south of Weaver Lake Road.
3) There are no floodplains, or steam crossing within this site area.
4) One wet detention pond with a filter bench is proposed for stormwater management for most of the runoff from this site.
5) The City of Maple Grove operates and maintains stormwater facilities in residential areas. This must be confirmed by the City, or the applicant will be required to provide a recorded O & M agreement between the property owners and the City for said work.

**Stormwater Management (Rule D)**

Abstraction controls

6) There will be 28,440 sq. ft. of new impervious areas on this site. Abstraction volumes must be 2,607 cubic feet or greater to meet the Commission requirements.
7) Filtration in lieu of infiltration is proposed.
8) Site plans were evaluated assuming filtration will be allowed. Soil conditions on site have not been evaluated for their feasibility to infiltrate. The basis to the assumption to filter instead of infiltrate must be provided to eliminate infiltration as an option for abstractions.
9) The following comments were assuming filtration will be allowed;
    a. Water will flow into the filter bench at a 963.4 elevation.
        i. 963.4 filter bench elevation is the same elevation as the outlet to the pond.
        ii. Water will flow into the filter bench and outlet pipe at the same elevation eliminating any filtration effects from the filter bench.
    b. Filter bench drain tile is recommended to meet the following details;
        i. Underdrains constructed with Schedule 40 or SDR smooth wall PVC pipe (or a similar pipe and corresponding ‘n’ value)
        ii. Minimum 3” #57 (3/4-1”) stone around the pipe
        iii. Minimum 2” chocking stone (1/2” minus)
        iv. Minimum 0.5% pipe slope
        v. One underdrain for every 1000 sq. ft. of surface area.
        vi. Include at least 2 observation /cleanouts for each underdrain, one at the upstream end and one at the downstream end. Cleanouts should be at least 4 inches diameter vertical non-perforated schedule 40 PVC pipe, and extend to the surface. Cap cleanouts with a watertight removable cap.
        vii. Avoid filter fabric. (Pipe socks may be needed for underdrains imbedded in sand. If pipe socks are used, then use circular knit fabric)
        viii. Use solid sections of non-perforated PVC piping and watertight joints where the underdrain system passes below berms and makes the connection to OCS 1.
        ix. Provide the locations of the drainpipe and cleanouts on the utility plan.

Water Quality Controls;

10) Pre vs Post development TSS and TP loads were not provided for our review.
    a. Staff MIDS calculations are as follows;
        i. TP-
            1. Pre-existing = 2.065 lbs./year
            2. Post-development = 2.235 lbs./year
        ii. TSS
            1. Pre-existing = 375 lbs./year
            2. Post-development = 163 lbs./year

Rate Controls

11) Pre and post development rate controls do not appear to meet the Commission's requirements for the 2- and 10-year storm events.
    a. Summery information below looks at the total peak flows for Subcatchments 1S, 2S, 3S & 4S before development and Subcatchments 1S, 4S (pre-development) & 1P after development.
    b. For pre-existing conditions, pipe CBMH 119A should be modeled as a pond.

Rate Control Summary

| | **2-yr (cfs)** | **10-yr (cfs)** | **100-yr (cfs)** |
|---|---|---|---|
| **Pre-Development Rates** | **3.86** | **8.47** | **19.64** |
| **Post-Development Rates** | **4.31** | **9.15** | **17.51** |

**Wetland Buffers (Rule I)**

12) The City of Maple Grove is the LGU in charge of administering the Wetland Conservation Act on this site. One wetland is identified along the extreme north edge of the property. It extends between this property and the ROW of the existing public road.
13) On-and off-site wetland buffers extend into this property. The applicant is establishing a 35' buffer around the wetland edge that abuts the development. Buffer monumentation is provided. Wetland buffer establishment meets the Commission requirements per Rule I.

**Erosion and sediment control plans (Rule E)**

14) The erosion control sequencing plan has installation of stormwater infiltration areas as part of the initial erosion and perimeter controls.
    a. Infiltration areas need to be defined.
15) If the permanent pond will be utilized as a temporary sediment pond, a specific sequencing plan must be developed addressing filter bench protections, final cleanout and stabilization.

**Recommendations**: None currently.

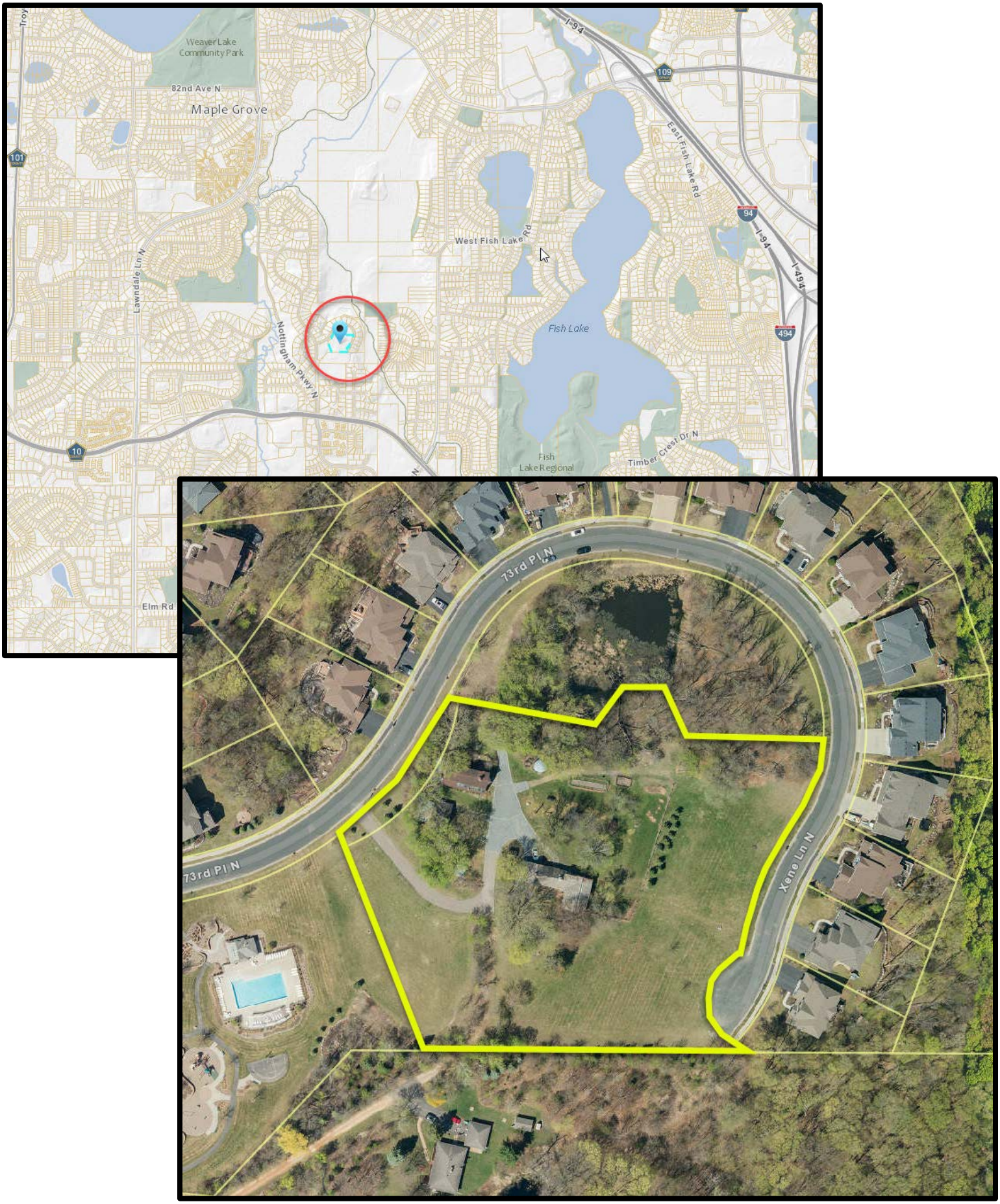
Advisor to the Commission

Surface Water Solutions

January 28, 2020
Date

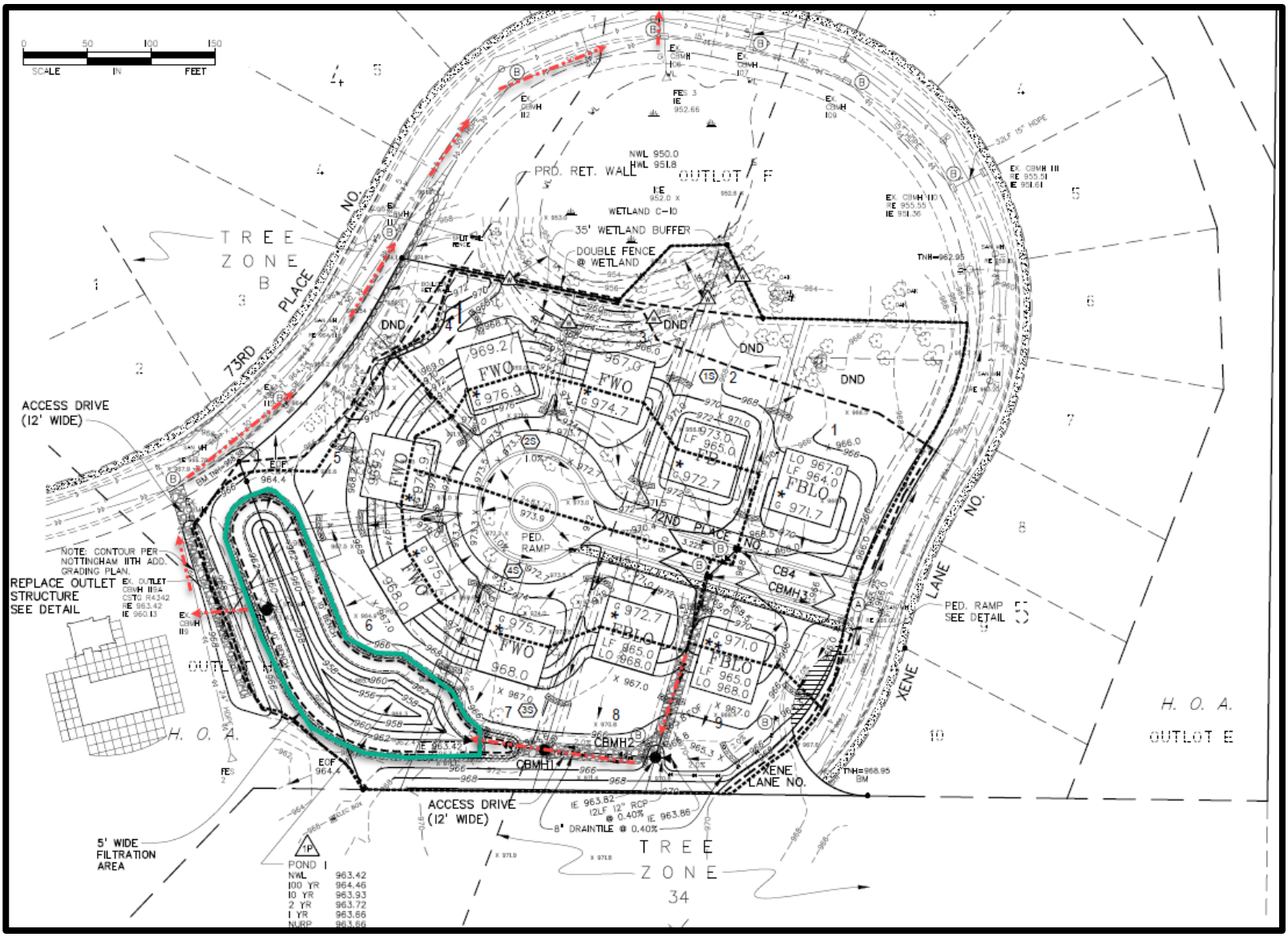
Palisades at Nottingham 2nd Addition
City of Maple Grove Project 2020-003
January 27, 2020

# Location Map



Palisades at Nottingham 2nd Addition
City of Maple Grove Project 2020-003
January 27, 2020

# Grading & Drainage Plan



# elm creek
## Watershed Management Commission

Z:\Elm Creek\Work Plans\2019 Work Plan progress report.doc 02-06-2020

## 2019 WORK PLAN IN REVIEW

Minnesota Rule 8410.0150 requires the Commission to submit to the Board of Water and Soil Resources a financial report, activity report and audit report for the preceding fiscal year. 8410.0150 Subp. 3 outlines the required content of the annual activity report. It includes an assessment of the previous year's annual work plan and development of a projected work plan for the following year.

The Commission's Third Generation Watershed Management Plan identifies issues, priorities and goals for the ten-year period 2015-2024.

1. Continue to review local development/redevelopment plans for conformance with the standards outlined in the Commission's Third Generation Watershed Management Plan. Review the current project review fee schedule for fiscal conformity. *Thirty-two projects, along with two carry-over projects were reviewed by the Commission in 2019. At year-end the Technical Advisory Committee (TAC) was beginning its review of the current project review fee schedule in light of the fact that the Commission, in 2020, would no longer have available to it the services of the staff of the Hennepin County Department of Environment and Energy as their primary technical advisor. The Commission does not have a permit program.*

   *In August 2019 the Commission solicited proposals from interested entities to serve as its technical advisor beginning January 1, 2020. The primary function of this position is to ensure that development plans comply with the Commission's Watershed Management Plan by reviewing submitted site development plans and designs to evaluate drainage, hydrologic and water quality requirements, erosion and sediment controls, shoreland and natural resource preservation issues, and compliance with the Wetland Conservation Act. Four proposals were received and reviewed by the Technical Advisory Committee and the Commission. Barr Engineering was chosen as the Commission's Technical Advisor for the year 2020.*

2. Continue to serve as the local government unit (LGU) for administering the Wetland Conservation Act (WCA) for the City of Corcoran on three projects that were carried over as the City transitioned to becoming its own LGU for WCA. Costs associated with these projects will be billed back to the City. *Effective March 1, 2019, the Commission no longer serves as the LGU for administering the Minnesota WCA for the City of Corcoran per Resolution 2019-01 adopted February 13, 2019.*

3. Continue to partner with the Three Rivers Park District (TRPD) to share in the costs of conducting lake and stream monitoring in the watershed. Under a five-year cooperative agreement approved in 2018 TRPD will be responsible for monitoring three of twelve sampling stations every year for continuous flow and monitor water quality nutrient data upon request from the Commission. TRPD will also be responsible for monitoring four of fifteen lakes in the Elm Creek watershed annually plus other specific lakes that have been approved for monitoring by the Commission. In addition, under the cooperative agreement, the Commission and the Park District will provide financial support to assist the monitoring efforts of the USGS stream gauging station on Elm Creek within the Elm Creek Park Reserve. *In 2019 Three Rivers Park District monitored four stream sites including EC77 (Elm Creek at 77th Avenue); EC81 (Elm Creek at County Road 81); DC (Diamond Creek within the Elm Creek Park Reserve); and RT (Rush*

*Creek at Territorial Road). Continuous flow was collected in open channel morphology that requires the development of a stage-discharge rating curve at each sampling site. TRPD took manual flow measurements at various stream depths to create the rating curves and estimate the flow. No nutrient data was collected in 2019.*

*The Park District also monitored water quality at Diamond, Fish, Rice and Weaver lakes. The water quality samples were collected at the surface for all four lakes and were analyzed for total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll-a. Since Fish and Weaver Lake stratify during the summer, water samples were also collected at the middle (top of hypolimnion) and bottom (1-m from bottom) and were analyzed for total phosphorus and soluble reactive phosphorus.*

*Point intercept aquatic vegetation surveys were conducted on Diamond and Fish Lakes to assess the plant community in 2019.*

*Results of the 2019 monitoring are detailed in the Commission's* 2019 Annual Report.

4. Fund the monitoring of one lake through Metropolitan Council's Citizen Assisted Monitoring Program (CAMP). *The Commission was unable to identify a citizen volunteer; thus, no lakes were monitored under the auspices of CAMP in 2019.*

5. Continue to operate the monitoring station in Champlin in cooperation with the United States Geological Survey (USGS). *During Water/Fiscal Year 2019, USGS continued to operate the stream gage and water-quality monitoring station 05287890, Elm Creek near Champlin. During this period, the county bridge immediately upstream of the gage was removed and replaced so, in addition to routine monitoring, additional work was performed. This included coordinating with construction and utility crews to ensure continuity of gage operation and relocation of water sensor and water-quality intake lines. The bridge replacement also caused physical changes to the stream channel's cross-section that nullified the relationship between stream level (stage) and discharge that is required to compute daily streamflow rates at the station. Consequently, real-time stage data were available, but discharge data were not displayed for most of the year.*

   *Field visits were increased for direct measurements of stage and discharge (11 total, normally 6-9 are made per year) so observations over the range of stage that occurred could be collected to more quickly develop a revised stage-discharge relation (or rating) needed to compute the discharge record since bridge replacement. That record is currently being analyzed. Although the Water Year 2019 discharge record for Elm Creek currently is less certain than other stations in Minnesota due to rating re-development, records from nearby gages in the metro and southern Minnesota suggest that WY2019 could be among the highest annual streamflow on record.*

   *Water-quality samples were collected monthly and during runoff events. A total of 12 monthly samples and 8 flow-weighted composite samples of the increasing flows of runoff were collected. Samples are analyzed for Total Phosphorus, Dissolved Phosphorus, Total Ammonia plus Organic Nitrogen, Dissolved Ammonia Nitrogen, Dissolved Nitrite plus Nitrate Nitrogen, Total Suspended Solids, Volatile Suspended Solids, Oxygen Demand, Dissolved Chloride, Water Temperature, Specific Conductance, pH, and Dissolved Oxygen. Provisional results of these analyses are available online at:*
   https://nwis.waterdata.usgs.gov/mn/nwis/qwdata/?site_no=05287890&agency_cd=USGS&inventory_output=0&rdb_inventory_output=file&begin_date=2018-10-01&end_date=2019-09-30&qw_attributes=0&format=rdb&qw_sample_wide=wide&date_format=YYYY-MM-DD.

6. Promote river stewardship through Hennepin County's RiverWatch program with three sites in 2019. *The three sites monitored by student volunteers were Rush Creek on the west side of 101st Lane (RC-1b) and Rush Creek on the east side of 101st Lane (RC-1a) in Maple Grove; and Elm Creek at Peony Lane behind Wayzata High School in Plymouth (EC-2).*

7. Participate in the MN Wetland Health Evaluation Program (WHEP) with four wetlands in 2019. *Adult volunteers monitored five sites as part of the WHEP program in 2019 – (EC-1) Blundell Restoration, (EC-2) Bulduc Restoration, and (EC-3) Bulduc wetland, all in the City of Rogers; (EC-4) Cedar Hollow, Plymouth; and (EC-5) Northwest Greenway, also in Plymouth.*

8. Complete the review of member communities' local water management plans. Under Rule 8410.0160, subp. 6, local plans were to be approved by the Commission by December 31, 2018. At 2018 year-end the plans for Champlin and Rogers were still under review. *The Commission approved Champlin's Surface Water Management Plan on January 9, 2019. In their letter dated July 8, 2019, Metropolitan Council advised the Commission that Rogers' plan fulfills the requirements for a local water management plan.*

9. Conduct the biennial solicitation of interest proposals for administrative, legal, technical and wetland consultants. *Pursuant to Minnesota Statute 103B.227.subd. 5., a solicitation of interest proposals was published in the January 14, 2019 issue of the* State Register. *Two responses to provide technical support, three responses to provide wetland consultant support, and one response each for legal and administrative support were received. The Commission voted to retain the current consultants for 2019-2020, although, with Hennepin County choosing not to continue as the Technical Advisor, the Commission chose Barr Engineering to continue with these duties in 2020 (see item #1 above).*

10. Continue as a member of the West Metro Water Alliance (WMWA). *Continued to support the WMWA Educator Program and promoted the Watershed PREP program to reach every 4th grade science class in the watershed. Chairman Doug Baines and Plymouth Alternate Commissioner Catherine Cesnik attended the monthly WMWA meetings to represent the Commission.*

11. Co-sponsor Rain Garden Workshops in conjunction with WMWA as part of the Commission's Education and Public Outreach Program. *WMWA sponsored Resilient Yards and Healthy Soils workshops in Champlin on April 4 and Plymouth on May 2, 2019. The workshops were presented by Metro Blooms.*

12. Continue as a member of Blue Thumb and WaterShed Partners and a partner in the NEMO (Nonpoint Education for Municipal Officials) program. *These memberships were renewed in 2019 with Staff regularly attending Blue Thumb and WaterShed Partner meetings.*

13. Continue to work in partnership with the University of Minnesota's agriculture specialist to help build relationships with the agricultural community in the watershed in order to achieve TMDL load reductions. *This is an ongoing activity. BMPs are undertaken as opportunities are identified and grant-funding assistance is available.*

14. Work with the Hennepin County Rural Conservation Specialist. Assist landowners in identifying BMPs for implementation throughout the watershed. *The Rural Conservation Specialist assisted cities as they worked to incorporate the Commission's Recommended Livestock Management Policy into their own ordinances/policies. She assisted landowners to identify BMPs for implementation as part of the Rush Creek Subwatershed Assessment and in other areas of the watershed. She also developed a subwatershed assessment cost share application form and criteria by which applications will be evaluated.*

15. Seek grant funding to assist with the costs associated with projects identified on the Commission's Capital Improvement Program (CIP). Adopt Minor Plan Amendment to support proposed CIPs and CIP updates. *The annual call for CIPs went out to the cities , requesting them to provide updates to the projects already included on the Commission's CIP as well to inform the Commission of new projects that they would like to have considered for inclusion on the CIP. Proposed CIPs and CIP updates were reviewed for inclusion on the Commission's CIP by the Technical Advisory Committee (TAC) and their recommendation forwarded to the Commission. This activity necessitated a Minor Plan Amendment to the Commission's Third Generation Watershed Management Plan to add three new projects, remove one project, and shift the timing or the funding of six existing projects. A public meeting was held on May 8,*

*2019, to hear the proposed amendment, which was adopted by the Commission on that date. (Resolution 2019-02). Additional funding toward CIP projects was received from watershed-based funds provided by the Board of Water and Soil Resources from Clean Water Legacy grant money (also see item 22 below).*

16. Conduct a second alum treatment as part of the Internal Phosphorus Loading Control Project on Fish Lake. *The second alum application for Fish Lake was completed in early August of 2019. There was approximately 95,000 gallons of alum applied to 120 acres of the lake (792 gallons/acre) from August 5 through August 8, 2019. This was similar to the dosage that was applied for the first application (40 g/m$^2$) in 2017. The two alum applications completed the dosage rate of 80 g/m$^2$ that was recommended to achieve the water quality standards for Fish Lake. The in-lake water quality monitoring for 2018 and 2019 indicated the alum treatment was effective at improving water quality conditions for Fish Lake. The in-lake water quality achieved the state water quality standards for phosphorus throughout the entire growing season (May through September) in which the average phosphorus concentrations were 27 µg/L in 2018 and 24 µg/L in 2019. The hypolimnetic phosphorus concentrations were also the lowest recorded since monitoring has occurred, which suggests that the alum was effective at reducing the sediment release of phosphorus during anoxic conditions. A final report has been submitted to the Board of Water and Soil Resources.*

17. Undertake high priority projects identified in the Rush Creek Headwaters Subwatershed Assessment. *In 2017 an Open House was held for property owners living in the Corcoran portion of the Study Area. The folks who attended the Open House shared information about known problems, issues, and observations about conditions in their area. Wenck Associates and the Core Team reviewed this information as they moved forward with the assessment. A final report was published in July 2018, identifying high priority projects, along with their cost-benefit, across the Study Area.*

    *As a follow-up, 200 letters were sent to residents identified in the Rush Creek SWA as having livestock, erosion issues, and those residents who came to the open house and indicated interest in the project. From that mailing, 22 site visits were completed. Of those, two residents opted to utilize resources provided by Commission staff to complete projects on their own.*

    *By mid-2019 four projects were awaiting staff review/cost estimate approvals for contracting; three other projects were not put under contract because residents were happy to pay for them on their own with staff technical assistance and further guidance; three projects were pending cooperation from neighbors (necessary for the project to effectively be completed); and five site visits were pending. Staff will also work with Environmental Health (Hennepin) on a septic project to target failing systems in the area (MPCA approached Staff about this project). Seeking more recent update.*

18. Continue to support City-sponsored projects using the ad valorem funding mechanism. Conduct public hearing for identified projects. *On September 11. 2019 the Commission conducted a public hearing on five improvement projects. (One project was subsequently withdrawn.) The Commission adopted Resolution 2019-03 certifying for payment by Hennepin County of the Commission's share of the cost of four projects totaling $295,138. On October 22, 2019, the Hennepin County Board approved the Commission's request to fund the following projects: (1) Phase 3 of the Rush Creek Main Stem Stream Stabilization project in Maple Grove; (2) Hickory Drive Stormwater Improvement project in Medina; (3) the Downtown Regional Stormwater Pond project in Corcoran; and (4) Phase IV of the Elm Creek Stream Restoration project in Champlin.*

19 Adopt a 2020 operating budget. *At its June 12, 2019 regular meeting, the Elm Creek Watershed Management Commission approved a 2020 operating budget totaling $1,012,505. The budget is based in part on the projected costs found in the Implementation section of the Commission's Third Generation Watershed Management Plan and includes Capital Improvement Projects totaling $448,935. To fund the*

*2020 operating budget the Commission approved an increase in member assessments to $237,300, a 2.99% increase over the 2019 assessments.*

20. Continue to populate and maintain the Commission's website www.elmcreekwatershed.org to provide news to residents, students, developers and other individuals interested in the water resources of the watershed. *Using the tool Weebly, continued to update and enhance the website, adding links to other websites as well as to other useful information.*

21. Publish an annual activity report summarizing the Commission's yearly activities and financial reporting. *The* 2018 Annual Activity Report *was accepted by the Commission on April 10, 2019 and uploaded to the Commission's website by the April 30, 2019 statutory deadline.*

22. Complete Phase IV of the Elm Creek Stream Restoration Project in Champlin. In 2018, under the auspices of the Board of Water and Soil Resources (BWSR) Watershed-Based funding pilot program, the Commission was a recipient of $134,486 to fund this project. Phase IV will also be funded through the ad valorem taxing process (see 18., above.) The Watershed-Based pilot program extends through December 31, 2020. *In December 2019 BWSR met with a group comprised of representatives of each of the groups of stakeholders to try to come to a consensus recommendation on how to fund future projects under this program. For the new biennium, it was decided to allocate the funds based on major watershed divides. Need input from Todd Tuominen here*

    Background: The purpose of Watershed-based Implementation Funding is to supplement existing funding to accelerate clean water activities (practices, projects, and programs) toward advancing Minnesota's water resources goals through prioritized and targeted cost-effective actions with measurable water quality results.

    2018-2019 Biennium: A pilot program to reallocate a portion of the Clean Water Legacy funds from a competitive funding model towards a more systematic Clean Water Funding model was adopted for 2019 in Hennepin County. This was based on *a working group of representatives of the 11 watersheds in the county and subsequent meetings that identified funding options for the $1,018,000 allocated to Hennepin County watersheds for state fiscal years 2018 and 2019. For this pilot program it was a consensus of the partnership to proceed with; 1) setting aside $101,800 (ten percent) for chloride management and 2) allocating the remaining balance ($916,200) to WMO's based on 50% land area and 50% tax base. The Elm Creek allocation was $134,486 which was budgeted to Champlin's Phase IV Elm Creek Restoration Project. (See above.)*

    *2020-2021 Biennium: For the new biennium, BWSR decided to allocate the funds based on major watershed divides. Elm Creek is in the Mississippi West Major Watershed (MWW) which will be allocated $874,153. A partnership must be developed consisting of at least one representative from each watershed district, watershed management organization, soil and water conservation district, county and at least two municipalities within the WMW. The partnership will coordinate development of a watershed-based budget for submittal to BWSR for approval. Funds become available July 1, 2020. Grants from these funds expire December 31, 2023*

23. Continue to update the Special Flood Hazard Areas on the FEMA Floodplain maps located within the watershed into current modeling packages. The Federal Emergency Management Agency (FEMA) awarded the Minnesota Department of Natural Resources (MnDNR) a grant to update the Special Flood Hazard Areas in the Twin Cities HUC8 watershed. Pass-through grants were provided so that WMOs can complete this work. The total budget for this project in Elm Creek is $92,772.45 and does not require a local match. The term of the contract extends into the year 2020. *In 2018, the Commission chose to undertake this work through their technical consultant, Hennepin County Department of Environment and Energy. Because of County personnel changes, the contract for this study was mutually terminated*

*by the DNR and the Commission. In 2019, the Commission chose Barr Engineering to provide these same services at the same contract cost*

24. Support the City of Maple Grove and its partners as they undertake a subwatershed assessment for that portion of Fish Lake within the Elm Creek watershed.

25. Prioritize subwatershed assessment applications received in the first round of SWA Cost Share Applications.

Items not identified in 2019 Work Plan.

26. Minnesota's New Buffer Initiative requires public waters in the state - lakes, rivers and streams - to be surrounded by vegetated buffers 50-feet wide (on average) and public ditches to have 16.5-foot wide buffers as well. Buffers were required to be installed on public waters by November, 2017 and on public drainage systems by November, 2018. *Buffer review was completed for Corcoran, Rogers, and Medina in 2019. Those parcels found to be non-compliant were sent to the state for enforcement, and the landowners notified by US Mail of that action. Hennepin County staff will work with those residents who are subject to enforcement actions at the request of BWSR, but will otherwise await findings.*

# Elm Creek Watershed Management Commission
# Internal Phosphorus Load Control for
# Fish Lake, Hennepin County

Final Report

2017 - 2019

Submitted

To

Minnesota Board of Water & Soil Resources

Submitted

By

elm creek Watershed Management Commission

ThreeRivers PARK DISTRICT

# Fish Lake Alum Treatment
# Final Progress Report
# 2017-2019

Fish Lake (DNR # 27-118-00) is located in the City of Maple Grove in Hennepin County. The lake is 238 acres with a maximum depth of 61 feet. The littoral area (water depth of < 15 feet) represents approximately 38% of the total lake surface area. The lake was listed on the MPCA's 303(d) list as impaired for aquatic recreation use due to excessive nutrients in 2008. Fish Lake was included in the total daily maximum load (TMDL) and watershed restoration and protection strategy (WRAPS) completed by the Elm Creek Watershed Management Commission in 2016. As part of preparation of the TMDL/WRAPS for Fish Lake, sediment cores were collected and analyzed in 2012 by William James at the University of Wisconsin-Stout. The sediment cores were used to measure sediment phosphorus release rates for the estimation of internal loading. The TMDL/WRAPS studies identified internal loading representing approximately 70% of the total phosphorus load affecting surface water quality and recommended an in-lake alum treatment to achieve MPCA water quality standards. The sediment cores were also used to develop the alum dosing options to address the internal phosphorus load. It was recommended to treat with alum at a sediment delivery rate of 80 grams of Al/$m^2$ in areas of the lake 20 feet or deeper. This dosage translated to a liquid alum application rate of 1,583 gallons/acre over 120 acres of the lake surface.

An adaptive management approach was used for the implementation of the Fish Lake Alum treatment. The current scientific literature indicates that multiple smaller doses spread out over a period of years improve the effectiveness of an alum treatment compared to administering the alum in one large dose at a single point in time. The phosphorus binding efficiency and capacity on the alum floc depends on the rapidity of exposure to phosphorus after the alum application. Thus, the application of alum during late summer peak hypolimnetic phosphorus concentrations can promote immediate exposure of the settling alum floc to hypolimnetic soluble phosphorus for rapid binding and higher phosphorus adsorption capacity before deposition on to the sediment surface. It was recommended by William James to conduct two separate alum treatments during periods of peak anoxia with high hypolimnetic phosphorus concentrations at a delivery rate of 40 grams Al/$m^2$ over a three-year time period. This would allow the opportunity to monitor changes in water quality and conduct a comprehensive study to measure alum effectiveness at controlling internal loading. Based on the outcome of the study, the second alum treatment could then be adjusted accordingly in order to maximize potential treatment effectiveness.

HAB Aquatic Solutions was awarded the contract for both alum treatments. The first alum application was completed in mid-September (September 18$^{th}$-September 21$^{st}$) of 2017. The GPS-guided chemical application treatment barge (Figure 1) was pre-programed with bathymetry data that adjusted the target alum dosage rate of 40 grams/$m^2$ based on water depth and travel speed. There was 95,349 gallons of alum applied (22 tanker trucks) to 120 acres of Fish Lake at depths greater than 20 feet (Table 1; Figure 2). The actual treatment area provided by HAB Aquatic Solutions was similar to the 20-foot bathymetric contour (Figure 3). The Fish Lake Area Residents Association (FLARA) scheduled a media event on September 20$^{th}$ with partner representatives from Elm Creek Watershed Commission, City of Maple Grove, Three Rivers Park District and HAB Aquatic Solutions. There were approximately 15 home

owners that attended the media event. The CCX news station featured a story about the alum treatment while conducting interviews with local partners and home owners.


Figure 1: HAB Aquatic Solutions treatment barge used for the Fish Lake alum application in 2017

Table 1: Fish Lake alum treatment application in 2017.

| Date | Hours of Application | Alum Applied (gallons) | Area Applied (acres) | Alum Truck Deliveries |
|---|---|---|---|---|
| 9/18/2017 | 12:35 - 20:25 | 19,800 | 50.2 | 6 |
| 9/19/2017 | 6:55 - 21:00 | 30,668 | 77.8 | 7 |
| 9/20/2017 | 7:40 - 21:35 | 29,385 | 74.3 | 7 |
| 9/21/2017 | 7:35 - 13:05 | 15,496 | 39.1 | 2 |
| Total | | 95,349 | 241.4 | 22 |

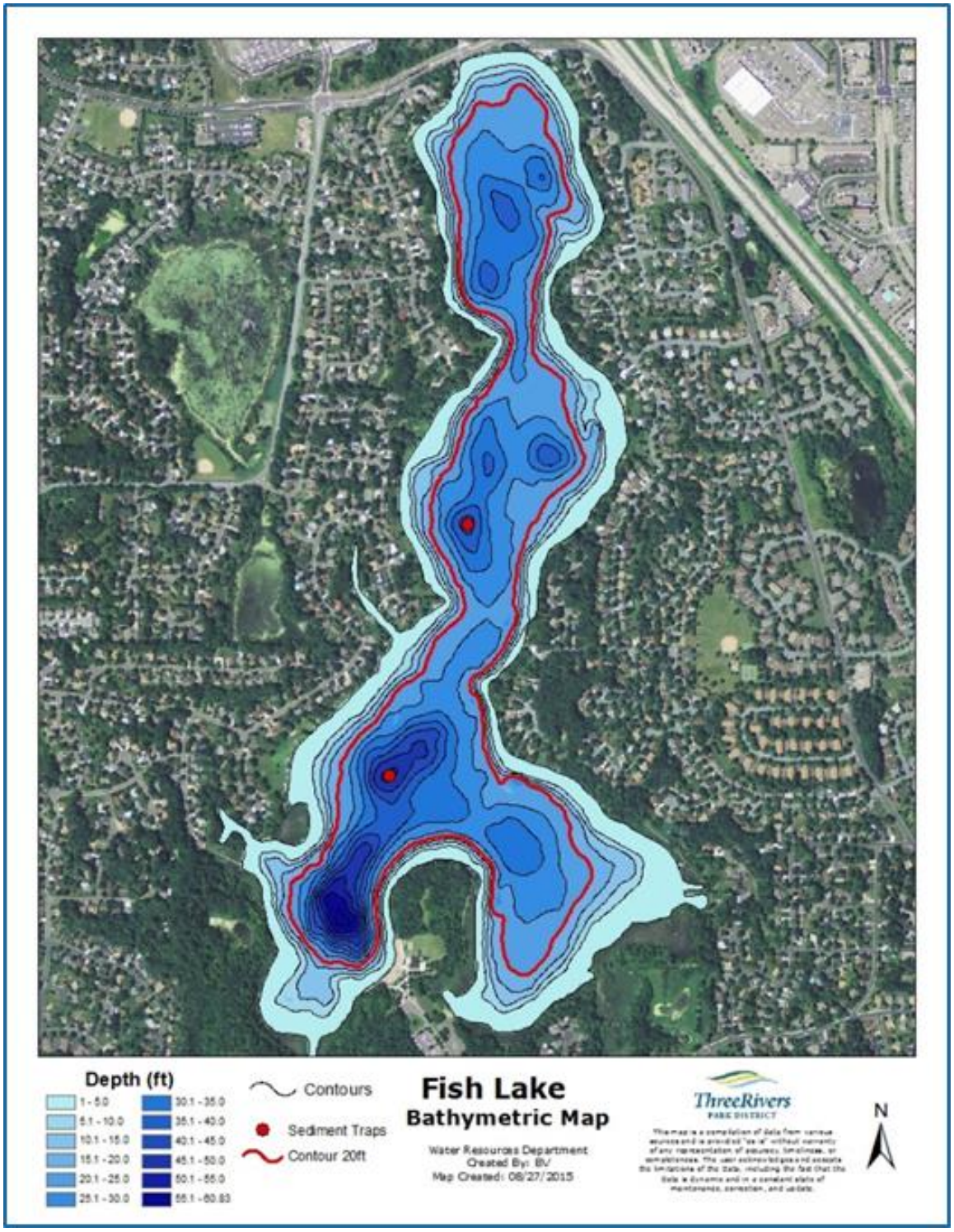



Figure 2: Fish Lake alum proposed treatment area and sediment trap location.

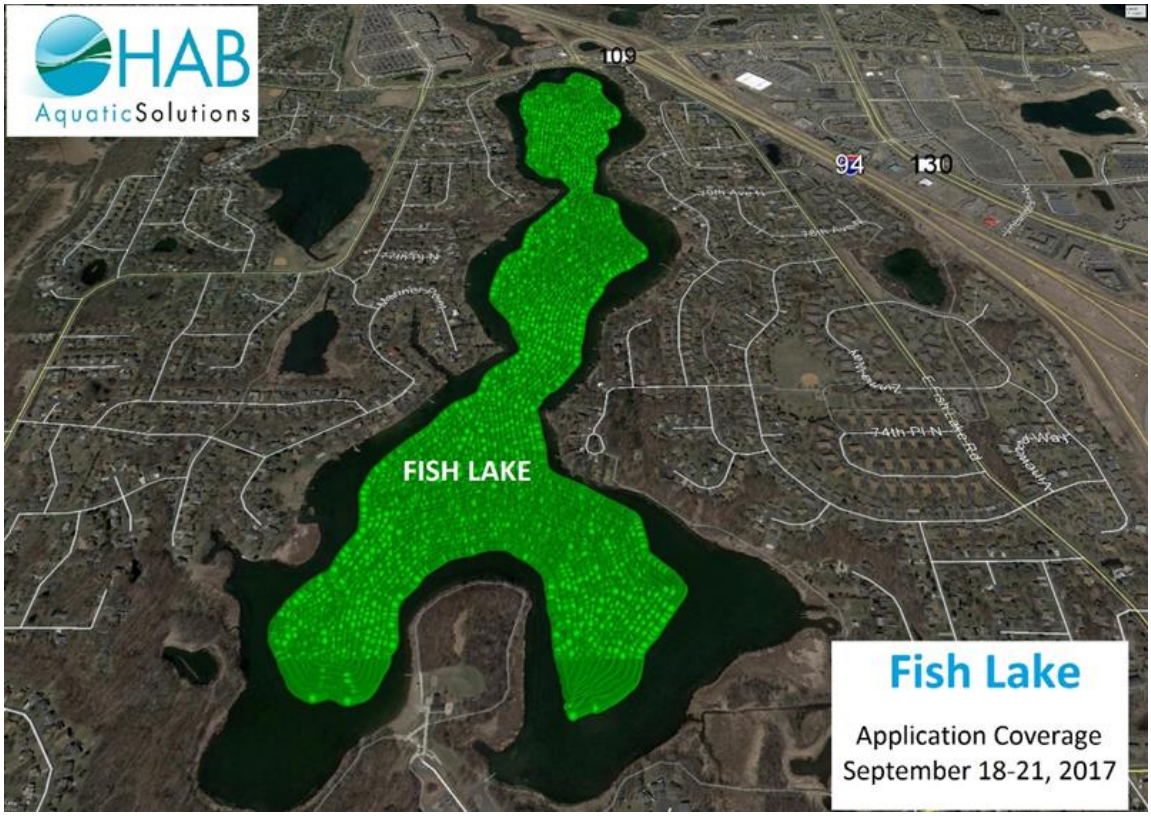



Figure 3: Fish Lake alum application coverage September 18-21, 2017.

Three Rivers Park District and the University of Wisconsin-Stout conducted a two-phased study to determine the effectiveness of the alum application in controlling internal phosphorus load. The specific details of the study proposal are referenced in Appendix A. Phase 1 of the study involved the deployment of sediment traps above the sediment surface in two different locations of Fish Lake (Figure 2) to determine the Al:P binding capacity ratio immediately after the first alum treatment in 2017. Phase 2 of the study involved collection of sediment cores in the same locations as the sediment traps to measure phosphorus sediment flux and the Al:P binding capacity ratio the following summer in 2018. Three Rivers Park District also monitored the change in water quality in response to the alum treatments. Water samples were collected bi-weekly at the surface from May through September in 2018 and 2019. Surface water samples were analyzed for total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll-a. The water clarity/transparency was also measured with a secchi disk. The surface water quality constituents were compared to the MPCA state water quality standards. Water samples were also collected at the top of the hypolimnion and 1-m from the bottom to estimate the change in hypolimnetic phosphorus due to sediment release during anoxic conditions in 2018 and 2019.

The report for the Phase 1 portion of the study are referenced in Appendix B. The sediment traps were collected 1 week after the alum application to allow for the complete settling of the alum floc in 2017. The samples were analyzed for dry mass, total aluminum, aluminum-bound phosphorus,

and the Al:P binding ratio. The sediment trap analysis was compared to the changes in the phosphorus vertical profile before and after the alum application. The results indicated that the alum application was effective at removing phosphorus as the alum floc settled throughout the water column (Figure 4).

- There were significant decreases in hypolimnetic phosphorus, and it was estimated that 33% to 41% of the total phosphorus and 29% to 44% of the soluble reactive phosphorus was bound by the alum floc during deposition through the hypolimnion.

- Aluminum bound phosphorus in the sediment traps accounted for most of the hypolimnetic total phosphorus (60% to 80%) and soluble reactive phosphorus (79% to 88%).

- The Al:P binding ratios in the sediment traps was approximately 20:1 for both stations.

The report for Phase 2 portion of the study are referenced in Appendix C. Sediment samples were collected at the two sediment trap locations the following summer of 2018. This was the first summer following the fall alum treatment in 2017. The phosphorus flux from the sediments was measured under anerobic conditions within the laboratory. The sediments were further analyzed for phosphorus fractionation and total aluminum to determine Al:P binding ratios. The results indicated that there was continual binding of phosphorus on the Alum floc layer between the first alum treatment (September 2017) and August 2018. A summary of the findings from the Phase 2 portion of the project are below.

- The rates of diffusive phosphorus flux under anaerobic conditions were extremely low after late summer 2017 alum treatment.

- The total aluminum was greatest at the surface of the sediments suggesting that the alum floc layer was located primarily on top of the original sediment surface. This alum concentration was similar to concentration measured in the sediment traps during Phase 1 of the study.
- There was considerable phosphorus bound to the Aluminum on the alum floc over time.

- The Al:P ratio declined from 19:1 to 16:1 at station 1 and from 21:1 to 18:1 at station 2 in approximately 1 year. Declining Al:P ratios suggested that binding sites were continuing to be efficiently filled via phosphorus diffusing from underlying sediments.

The study results suggest the application of alum during the late summer stratified period and floc deposition through the phosphorus-rich hypolimnion lead to considerable binding of internal phosphorus loads, a relatively low Al:P ratio, and suppression of hypolimnetic phosphorus accumulation. (Table 2; Figure 4). The goal with the Fish Lake alum treatment was to maintain high phosphorus binding efficiency of the Alum floc by exposing it to high concentrations of hypolimnetic phosphorus immediately after application. The decrease in the hypolimnetic phosphorus concentrations further suggests that the alum application has significantly reduce the internal loading within Fish Lake (Figure 4). Based on the results of the study, William James recommended completing the second alum treatment during a period of summer anoxia when the hypolimnetic phosphorus is at its highest to achieve optimal binding capacity.

Table 2: Area-weighted concentrations of Al, Al-bound P, and the Al:P ratio at station 1 and 2 after the alum application in Fish Lake (September 2017).

| Months After Alum Application | Station 1 | | | Station 2 | | |
|---|---|---|---|---|---|---|
| | Al ($g/m^2$) | Al-bound P ($g/m^2$) | Al:P Ratio | Al ($g/m^2$) | Al-bound P ($g/m^2$) | Al:P Ratio |
| **0.8 Months** | 26.0 | 1.35 | 19.3 | 31.4 | 1.48 | 21.2 |
| **10.8 Months** | 32.4 | 2.07 | 15.7 | 30.6 | 1.71 | 17.9 |

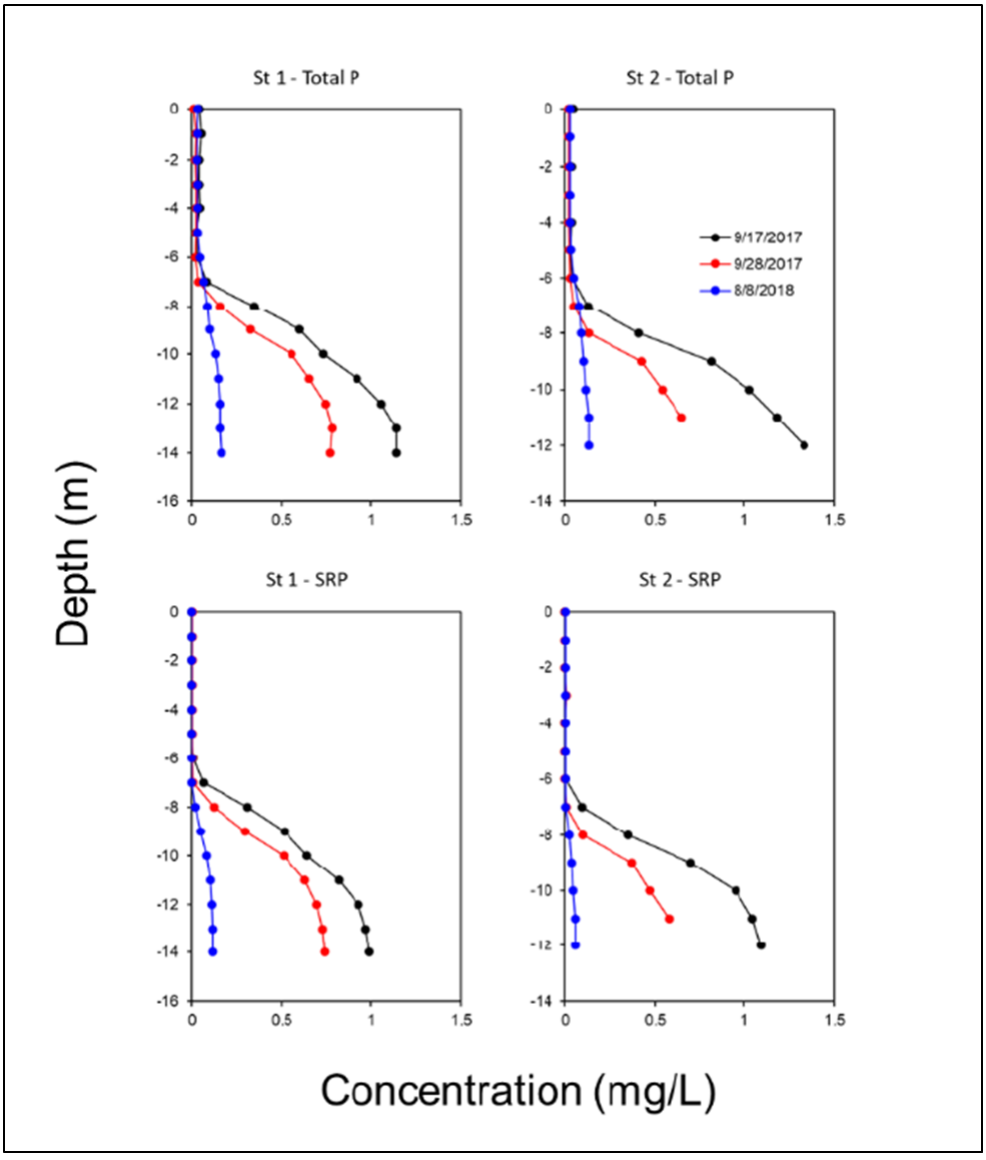



Figure 4: Hypolimnetic vertical variations in total phosphorus and soluble reactive phosphorus concentrations for station 1 and 2 that occurred prior to and after the alum treatment in September of 2017.

The second alum application for Fish Lake was completed in early August of 2019. There was approximately 95,000 gallons of alum applied to 120 acres of the lake (792 gallons/acre) from August 5 through August 8th of 2019 (Table 3; Figure 5). This was similar to the same treatment dosage that was applied for the first application (40 g/m$^2$) in 2017. The two alum applications completed the dosage rate of 80 g/m$^2$ that was recommended to achieve the water quality standards for Fish Lake.

Table 3: Fish Lake Alum Treatment Application in 2019.

| Date | Hours of Application | Alum Applied (gallons) | Area Applied (acres) | Alum Truck Deliveries |
|---|---|---|---|---|
| 8/5/2019 | 15:45 - 20:50 | 10,749 | 28.1 | 3 |
| 8/6/2019 | 7:45 - 21:00 | 28,468 | 70.4 | 6 |
| 8/7/2019 | 7:00 - 8:30 | 29,456 | 74.2 | 7 |
| 8/8/2019 | 6:20 - 16:45 | 26,406 | 67.6 | 6 |
| **Totals** | | 95,079 | 240.3 | 22 |

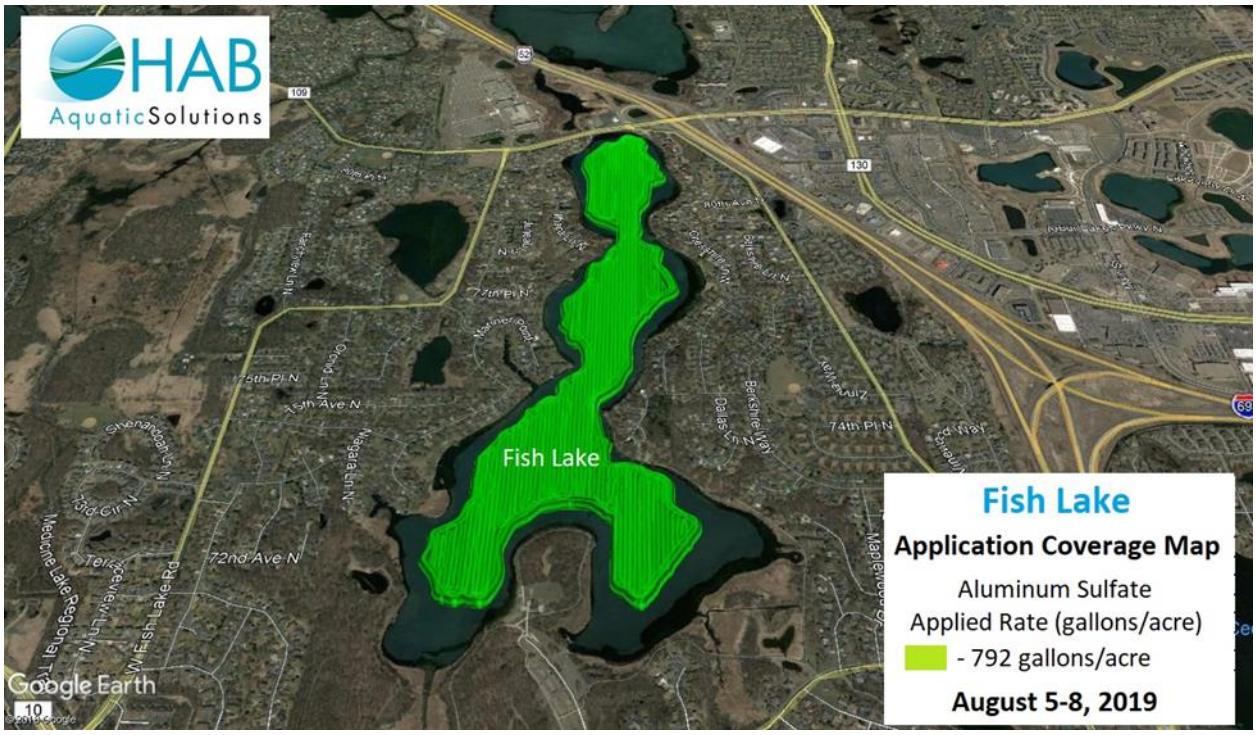



Figure 5: Fish Lake Alum Application Coverage August 5-8, 2019.

The alum treatment effectiveness of achieving the state water quality standards was further confirmed through the in-lake water quality monitoring efforts in 2018 and 2019. The in-lake water quality conditions achieved the state water quality standards for phosphorus throughout the entire growing season (May through September; Figures 6 & 8) in which the average phosphorus concentrations were 27 µg/L in 2018 and 24 µg/L in 2019 (Figure 10). The hypolimnetic phosphorus concentrations were also the lowest recorded since monitoring has occurred. The highest hypolimnetic phosphorus concentrations were approximately 1000 µg/L in 2015 and 2016 prior to the alum treatments. After the alum treatments, the highest hypolimnetic phosphorus concentrations decreased to 300 µg/L in 2018 and 170 µg/L in 2019 (Figures 7 & 9). Despite these low phosphorus concentrations, there were algal blooms observed during the summer of 2018 and 2019. These algal blooms have been observed in other lakes that have recently had alum treatments. William James has observed this phenomenon the first year after an alum treatment for other lakes in Wisconsin, and has indicated that these rare community algal assemblages can temporarily exploit a niche that is created following the treatment. This may account for the temporary algal blooms that were observed in 2018, but doesn't account for the persistence of algal blooms during the summer of 2019. The algal blooms in 2019 are most likely attributed to the significant amount of watershed nutrient loading due to a record amount precipitation in 2019 (43 inches). These algal blooms were not unique to Fish Lake, but were also observed for other lakes within the metro area including those lakes that had alum treatments (i.e. Hyland Lake and Lake Rebecca). Despite these algal blooms, Fish Lake secchi depth transparency still met the state water clarity standards in 2018 and 2019. The extent of these algal blooms will continue to be monitored, but it is anticipated that these algal blooms are temporary assuming the lake continues to meet the state standards for phosphorus concentration.

Water quality monitoring will continue every year to ensure the lake continues to meet the state water quality standards for deep lakes within the Central Hardwoods Forest Ecoregion (TP ≤ 40 µg/L). A condition of the Board of Water and Soil Resources Clean Water Legacy Grant was that Fish Lake will achieve and maintain the state water quality standards for a period of 20 years. It was anticipated that the alum treatment would be effective at achieving this goal assuming average precipitation conditions. There is concern that continuation of above average precipitation conditions similar to 2019 that resulted in an increase in watershed nutrient loading will reduce the alum treatment effectiveness overtime. If the lake begins trending towards degraded/impaired water quality conditions, then sediment samples will be collected to measure existing alum binding capacity and sediment phosphorus release to determine alum effectiveness. Another alum treatment application at lower dosage may be required to ensure that water quality conditions remain in compliance with the state standards.

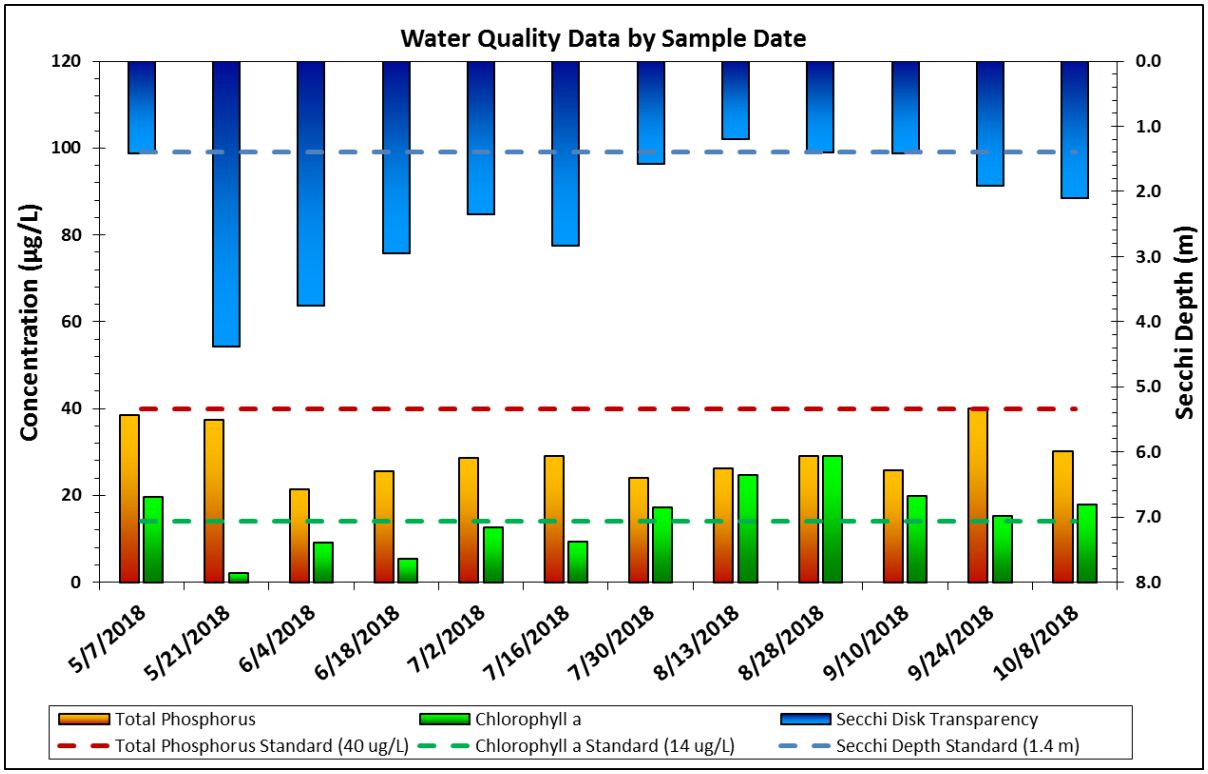



Figure 6: Seasonal changes in water quality (TP, Chl-a, and Secchi) for Fish Lake in 2018.

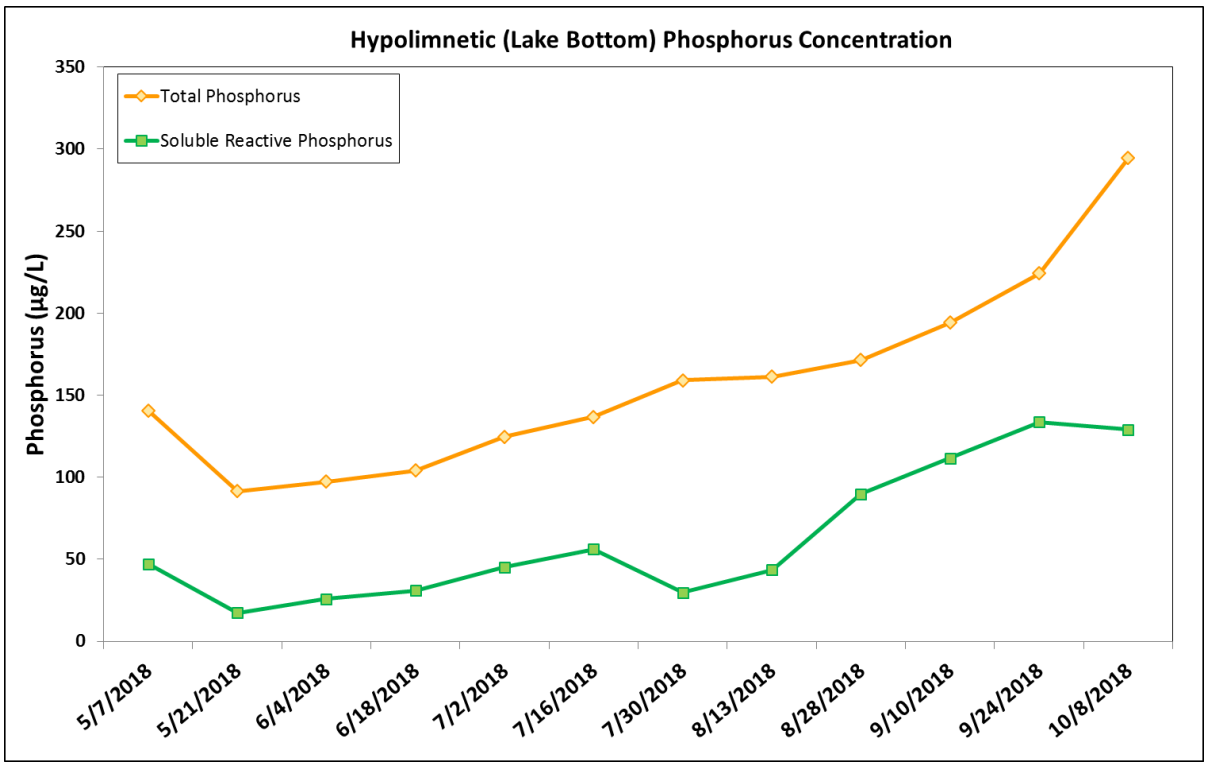



Figure 7: Seasonal changes in hypolimnetic phosphorus concentrations for Fish Lake in 2018.

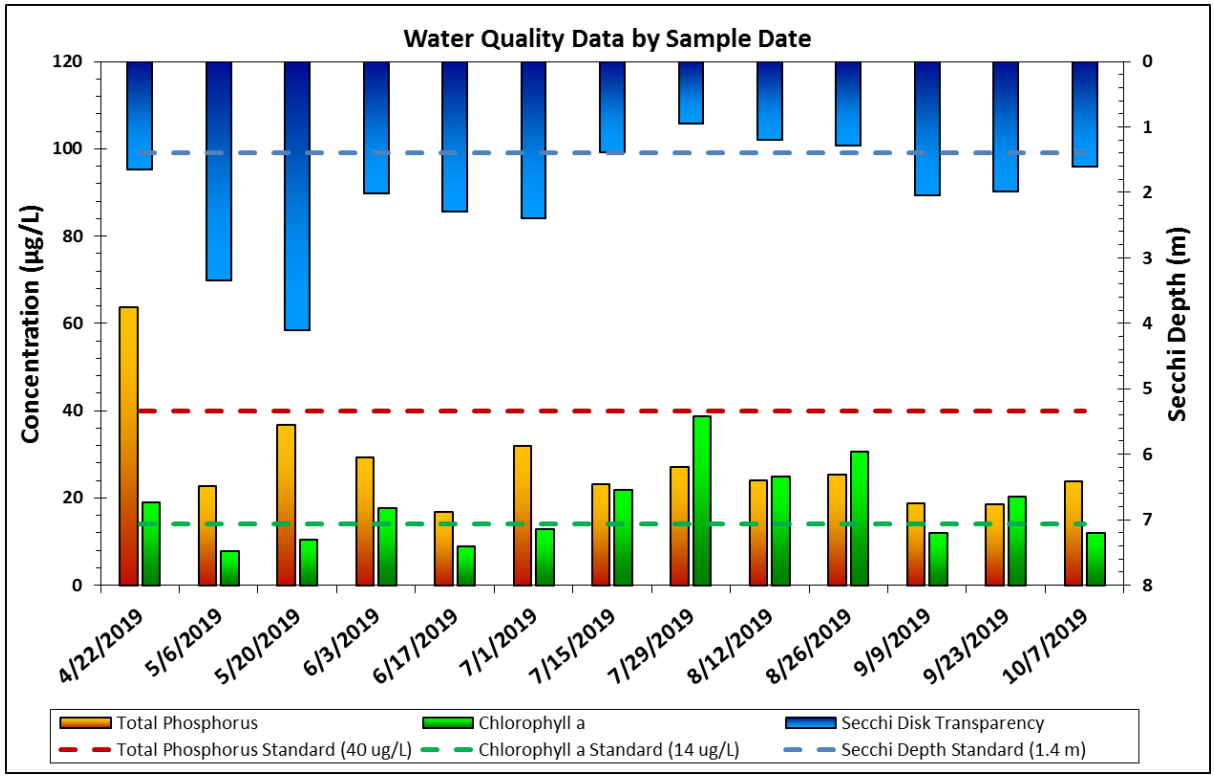



Figure 8: Seasonal changes in water quality (TP, Chl-a, and Secchi) for Fish Lake in 2019.

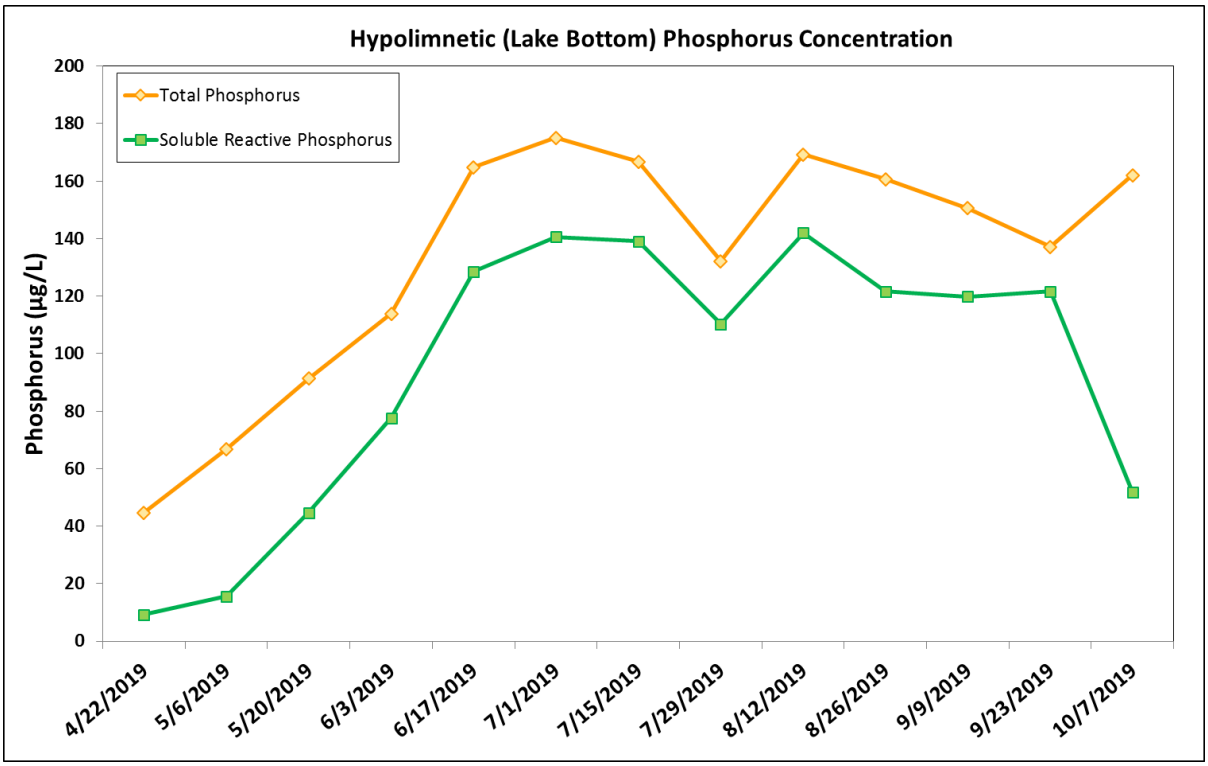



Figure 9: Seasonal changes in hypolimnetic phosphorus concentrations for Fish Lake in 2019.

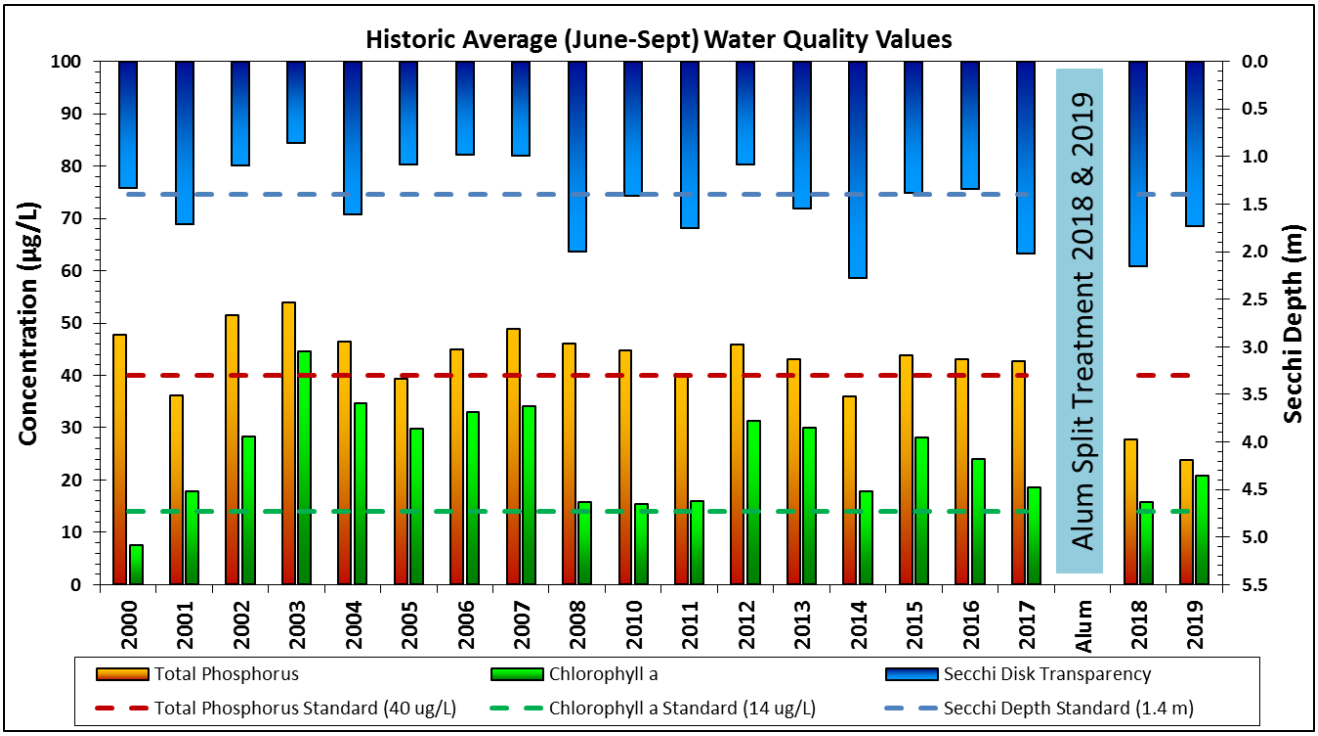



Figure 10: Changes in the annual water quality conditions in response to the Fish Lake alum treatments.

# APPENDIX A

## Effectiveness of Late Summer Aluminum Sulfate Application to Fish Lake, MN

## Research Proposal

item 04d

# Effectiveness of Late Summer Aluminum Sulfate Application to Fish Lake, MN

## PROPOSAL OF RESEARCH

13 August, 2017

University of Wisconsin - Stout
Sustainability Sciences Institute
Center for Limnological Research and Rehabilitation
Menomonie, Wisconsin 54751
715-338-4395
jamesw@uwstout.edu

## 1.0 BACKGROUND.

Application of Al salts has been an effective management strategy for controlling internal P loading in lakes (Cooke et al. 2005, Huser et al. 2016). However, P binding efficiency on the $Al(OH)_3$ floc and overall longevity depends to a large extent on the rapidity of exposure to P after $Al(OH)_3$ formation. de Vicente et al. (2008a) found that Al binding efficiency for P can decrease by up to 75% within a short period of time (< 30 d) if not exposed to P, due to polymerization into a more ordered crystalline structure. Since newly formed Al flocs are generally less dense than surficial sediment, they can typically settle on top rather than sink or mix into sediment after application, resulting in much slower exposure to P via upward diffusion (James 2017). Under this scenario, polymerization leads to greatly decreased Al floc binding efficiency for P and shortened longevity. Thus, application during the late summer peak in hypolimnetic P accumulation can promote immediate exposure of the settling Al floc to soluble P for rapid binding and maintenance of a much higher P adsorption capacity after deposition onto the sediment surface.

## 2.0 PURPOSE.

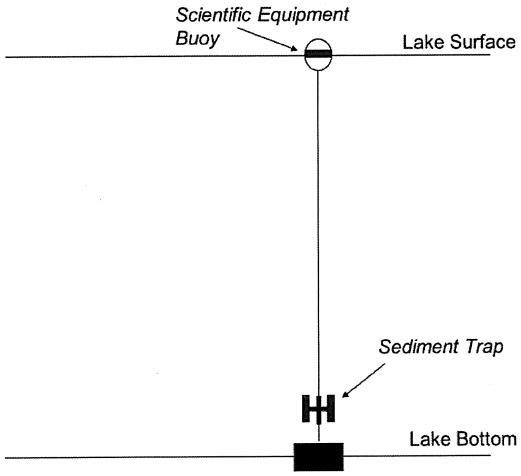
Historically, late summer Al application have typically been avoided due to concerns over unnecessarily filling binding sites with hypolimnetic P rather than sediment mobile P. There is little information on the effectiveness of this application strategy in controlling internal P loading. However, findings over the last decade have suggested rapid exposure to and binding of P is desirable to both reduce polymerization and maintain higher P binding efficiency after deposition. Late summer application of Al to Fish Lake during peak hypolimnetic P accumulation provides an opportunity to examine the extent of P binding onto the Al floc during and after a late summer alum treatment to Fish Lake. The objectives of these investigations are to specifically:

1. determine the Al:P binding ratio of newly-formed $Al(OH)_3$ that has been exposed to peak hypolimnetic P using sediment traps deployed shortly before Al application
2. examine the extent of hypolimnetic P removal as a result of the Al application, and
3. monitor vertical variations total Al, mobile P, and Al-bound P in the sediment column and rates of P release from sediment several months after treatment.

## 3.0 SCOPE OF WORK.

**Task 1.** Al:P binding ratio in the newly-formed Al floc

Sediment traps will be deployed above the sediment surface in the deep south basin and central basin of Fish Lake shortly before the start of Al application. The traps will be secured to a plastic-coated steel cable, anchored with concrete block, and buoyed at the surface.




Traps will be collected ~ 1-2 weeks after application and Al floc deposition. The contents will be analyzed for dry mass, total Al, Al-bound P, and the Al:P binding ratio. Results from this task will be compared with changes in the hypolimnetic SRP vertical profile before and after the Al application (see Task 2) to estimate the mass of hypolimnetic P sequestered by the settling Al floc.

**Task 2.** Changes in the hypolimnetic soluble reactive P (i.e., SRP or ortho-P)

Vertical variations in in situ variables (temperature and dissolved oxygen) and hypolimnetic SRP will be collected at 1-m intervals the 2 sediment trap stations during trap deployment and retrieval. In situ measurements will be collected using a YSI 6600 data sonde calibrated against Winkler titrations. Samples for SRP will be collected using a peristaltic pump and tygon tubing. Water samples will be field-filtered under anoxic conditions using a 60-cc syringe and 0.45 um syringe filter. Filtered samples will be stored on ice and analyzed using standard methods (APHA 2016) within 24 hours. Changes in the mass of SRP as a result of Al application will be calculated in conjunction with *Task 1* to estimate the Al:P binding ratio and Al-bound P sequestered as a result of treatment.

**Task 3.** Rates of diffusive P flux under anaerobic conditions

Intact replicate (duplicates) sediment cores will be collected from the two established stations in Fish Lake for the determination of rates of P release from sediment under controlled laboratory conditions. Sampling will occur during the summer 2018, nearly one year after the initial Al application, to quantify the initial Al treatment effectiveness in controlling anaerobic diffusive P flux. All cores will be carefully drained of overlying water in the laboratory and the upper 10 cm of sediment will be transferred intact to a smaller acrylic core liner (6.5-cm dia and 20-cm ht) using a core remover tool. Surface water collected from each lake will be filtered through a glass fiber filter (Gelman A-E), with 300 mL then siphoned onto the sediment contained in the small acrylic core liner without causing sediment resuspension. They will be placed in a darkened environmental chamber and incubated at a constant temperature to reflect summer conditions. The oxidation-reduction environment in the overlying water will be controlled by gently bubbling air (oxic) or nitrogen (anoxic) through an air stone placed just above the sediment surface in each system. Bubbling action will insure complete mixing of the water column but not disrupt the sediment. For each station, duplicate cores will be subjected to oxic conditions and additional duplicate cores will be subjected to anoxic conditions.

Water samples for soluble reactive P will be collected from the center of each system using an acid-washed syringe and filtered through a 0.45 µm membrane syringe filter. The water volume

removed from each system during sampling will be replaced by addition of filtered lake water preadjusted to the proper oxidation-reduction condition. These volumes are accurately measured for determination of dilution effects. Soluble reactive P is measured colorimetrically using the ascorbic acid method (APHA 2005). Rates of P release from the sediment (mg $m^{-2}$ $d^{-1}$) are calculated as the linear change in mass in the overlying water divided by time (days) and the area (m2) of the incubation core liner. Regression analysis is used to estimate rates over the linear portion of the data.

**Task 4.** Sediment chemistry

Additional sediment cores collected at the two stations in 2018 will be sectioned vertically over the upper 20-cm layer to evaluate variations in sediment physical-textural and chemical characteristics. These cores will be sectioned at 1-cm intervals over the first 6 cm and at 2-cm intervals below that sediment depth.

A known volume of sediment will b dried at 105 °C for determination of moisture content, wet and dry bulk density, and burned at 550 °C for determination of loss-on-ignition organic matter content (Avnimelech et al. 2001, Håkanson and Jansson 2002; Table 2). Phosphorus fractionation will be conducted according to Hieltjes and Lijklema (1980), Psenner and Puckso (1988), and Nürnberg (1988) for the determination of ammonium-chloride-extractable P (loosely-bound P), bicarbonate-dithionite-extractable P (i.e., iron-bound P), and sodium hydroxide-extractable P (i.e., aluminum-bound P). A subsample of the sodium hydroxide extract will be digested with potassium persulfate to determine nonreactive sodium hydroxide-extractable P (Psenner and Puckso 1988). Labile organic P is calculated as the difference between reactive and nonreactive sodium hydroxide-extractable P. Additional sediment will be sent to Pace Analytical Services, Inc. (1800 Elm Street SE, Minneapolis, MN 55414) for analysis of total Al.

Sediment chemistry information will be used to estimate the Al:P binding ratio in the Al floc and the location of the Al floc in relation to the original sediment surface.

**Task 5.** Reporting

A summary report containing figures and tables that Task 1 and 2 will be provided in February, 2018. A comprehensive report that includes Task 3 and 4 will be provided at the end of the study in December, 2018.

item 04d

| Sediment Chemistry Price List | | | | | | | |
|---|---|---|---|---|---|---|---|
| Task | Year | Variable | | Unit | Cost | | |
| | | | | | Each | Quantity | Total |
| **1** | 2017 | Sediment Traps | Field deployment | per hour | $100 | 4 | $400 |
| | | | Total Al | per sample | $55 | 2 | $110 |
| | | | Al-bound P | per sample | $55 | 2 | $110 |
| **2** | 2017 | Water Column | SRP | per sample | $15.50 | 20 | $310 |
| **4** | 2018 | Textural and Physical Characteristics | Moisture Content-Bulk Density | per sediment section | $15 | 16 | $240 |
| | | | Loss-on-ignition Organic Matter | per sediment section | $15 | 16 | $240 |
| **4** | 2018 | Sediment Total Metals | Total Al | per sediment section | $55 | 16 | $880 |
| **4** | 2018 | Sediment Phosphorus Extractions | Biologically-labile Phosphorus | per sediment section | $135 | 16 | $2,160 |
| **3** | 2018 | Sediment Flux or Internal Loading | Incubation for rates of soluble reactive P release | per 10 cm core | $540 | 4 | $2,160 |
| **5** | 2017 | Reporting | | per hour | $100 | 8 | $800 |
| **5** | 2018 | Reporting | | per hour | $100 | 8 | $800 |
| **Total** | 2017 | | | | | | $1,730 |
| **Total** | 2018 | | | | | | $6,480 |

# APPENDIX B

## Effectiveness of a Late Summer Aluminum Sulfate Application in Binding Hypolimnetic Phosphorus in Fish Lake, MN

## Phase 1

## Interim Report

item 04d

# Effectiveness of a Late-Summer Aluminum Sulfate Application in Binding Hypolimnetic Phosphorus in Fish Lake, MN: Phase 1 Interim report

*Sediment trap deployment in Fish Lake, Minnesota*

10 April, 2018

University of Wisconsin - Stout
Sustainability Sciences Institute Discovery Center
Center for Limnological Research and Rehabilitation
Menomonie, Wisconsin 54751
715-338-4395
jamesw@uwstout.edu

## BACKGROUND

Application of Al salts has been an effective management strategy for controlling internal phosphorus (P) loading in lakes (Cooke et al. 2005, Huser et al. 2016). However, P binding efficiency and capacity on the $Al(OH)_3$ floc depend to a large extent on the rapidity of exposure to P after $Al(OH)_3$ formation. Berkowitz et al (2006) and de Vicente et al. (2008a) found that Al binding efficiency for P can decrease by up to 75% within a short period of time (< 30 d) if not exposed to P, due to polymerization into a more ordered crystalline structure and increased tortuosity (diffusive path length). Since newly formed Al flocs are generally less dense than surficial sediment, they can typically settle on top rather than sink or mix into sediment after application, resulting in much slower exposure to P via upward diffusion (James 2017). Under this scenario, polymerization leads to greatly decreased Al floc binding sites for P and shortened longevity. Thus, application during the late summer peak in hypolimnetic P accumulation can promote immediate exposure of the settling Al floc to soluble P for rapid binding and maintenance of a much higher P adsorption capacity after deposition onto the sediment surface.

An alum dosage of at least 80 $g/m^2$ was proposed to control internal P loading in Fish Lake, MN. In addition, the dosage was split into two 40 $g/m^2$ applications: the first application occurred in early fall 2017 (18 September) during peak anoxia and soluble P accumulation in the hypolimnion and the second application to occur in 2019.

## PURPOSE

Historically, late summer Al application have typically been avoided due to concerns over unnecessarily filling binding sites with hypolimnetic P rather than sediment mobile P. There is little information on the effectiveness of this application strategy in controlling internal P loading and improving the overall Al:P binding ratio. However, findings over the last decade have suggested rapid exposure to and binding of P is desirable to both reduce polymerization and maintain higher P binding efficiency after deposition. Late summer application of Al to Fish Lake during peak hypolimnetic P accumulation provides an opportunity to examine the extent of

P binding onto the Al floc during and after a late summer alum treatment to Fish Lake. The objectives of these investigations were to specifically:

1. determine the Al:P binding ratio of newly-formed $Al(OH)_3$ that has been exposed to peak hypolimnetic P from sediment traps deployed shortly before Al application,
2. examine the extent of hypolimnetic P removal as a result of the 40 $g/m^2$ Al application, and,
3. monitor vertical variations total Al, mobile P, and Al-bound P in the sediment column and rates of P release from sediment approximately one year after the first treatment.

This first interim report will address objectives 1 and 2 above.

## METHODS

*Al:P binding ratio in the newly-formed Al floc*

Sediment traps were deployed ~ 2-m above the sediment surface in the deep south basin and central basin of Fish Lake one day before the start of Al application which occurred on 18 September, 2017 (Fig. 1). The traps were secured to a plastic-coated steel cable, anchored with a

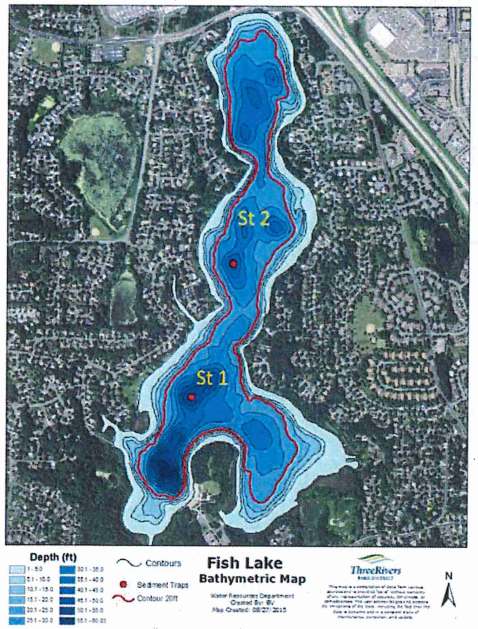



*Fig. 1. Bathymetric map showing station locations for vertical water chemistry profiles and sediment trap deployment.*

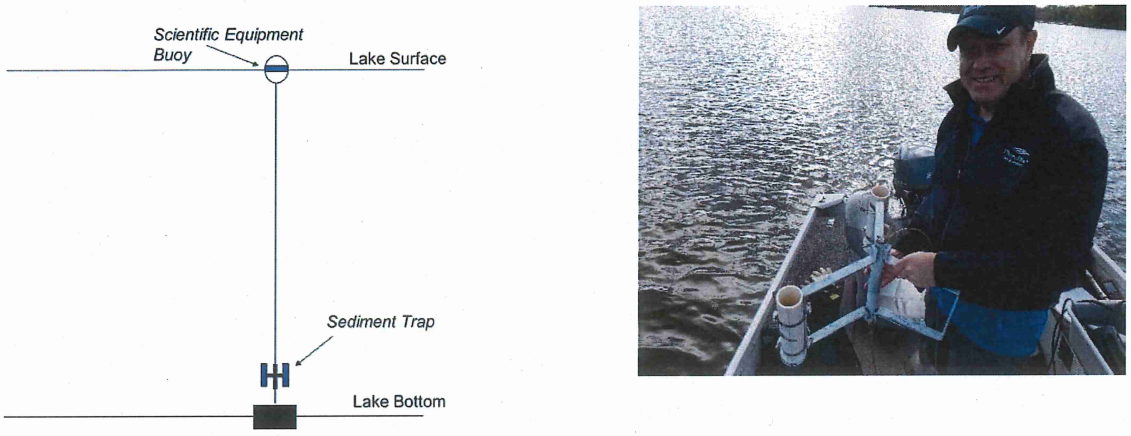



*Fig. 2. Schematic depicting the sediment trap deployment system.*

concrete block and buoyed at the surface (Fig. 2).

Trap contents were emptied on day 11 and day 25 after application and Al floc deposition (Fig. 3). In the laboratory, ~ 90% of the overlying water was decanted and the remaining slurry was

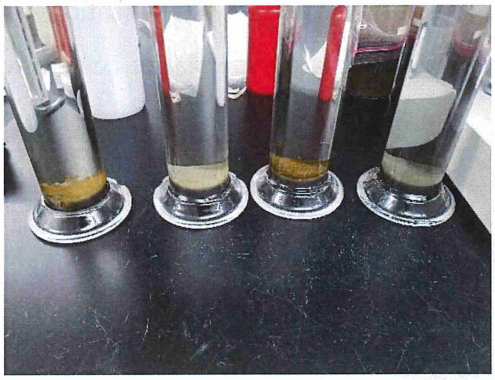


*Fig. 3. Trap material in laboratory settling columns.*

dried at 105 C in a crucible, then weighted to the nearest 1 mg for determination of total dry mass deposition. Dried slurry was then ground with a mortar and pestle for analysis. Phosphorus bound to aluminum (Al) was extracted in a 1 N NaOH solution as modified by Psenner and Puckso (1988). For Al-bound P determination, 25 mL of 1 N NaOH were added to a 50 mL centrifuge tube containing ~ 25 mg of dried sample and gently shaken for 24 h. The sample was

then centrifuged, digested with potassium persulfate, and analyzed for total P using the ascorbic acid method (APHA 2011). Another subsample was sent to the University of Minnesota Research Analytical Laboratory for analysis of total Al using ICP-AES after microwave-assisted acid digestion. Deposition rates (mg/m$^2$ d) were calculated as [concentration (mg/g) · total dry mass (g)] ÷ [trap opening area (m$^2$) · deployment days (d)]. The Al:P ratio was estimated as Al ÷ aluminum-bound P (Al:P binding ratio).

*In situ changes in phosphorus mass during alum application*

Vertical variations in in situ variables (temperature and dissolved oxygen) and hypolimnetic total P and SRP were collected at 1-m intervals at the two sediment trap stations during trap deployment (17 September) and the first retrieval data (28 September). In situ measurements were collected using a YSI 6600 data sonde calibrated against Winkler titrations. Samples for total P and SRP were collected using a peristaltic pump and tygon tubing. Water samples for SRP analysis were field-filtered under anoxic conditions using a 60-cc syringe and 0.45 um syringe filter. Samples were stored on ice and analyzed using the ascorbic acid method (APHA 2011) within 24 hours. Total P was digested with potassium persulfate according to APHA (2011).

Changes in the mass of total P and SRP (g/m$^2$) as a result of Al application were calculated as:

$$\mathrm{P}\ (\mathrm{g}/m^2) = \sum_{z=0}^{bottom} C \cdot I$$

Where C = concentration (mg/L or g/m$^3$) at depth z (m) and I = depth interval (m).

## RESULTS AND INTERPRETATION

One day before Al application (17 September, 2017), both basins were strongly stratified (Fig. 4). Although the hypolimnion was located below ~ 9 m, anoxia extended to near the base of the

epilimnion at ~ the 6-m depth (Fig. 5). Density stratification was still strong ~ 10 days after Al application with anoxic conditions between the lake bottom and ~ 7 m (Fig. 4 and 5).

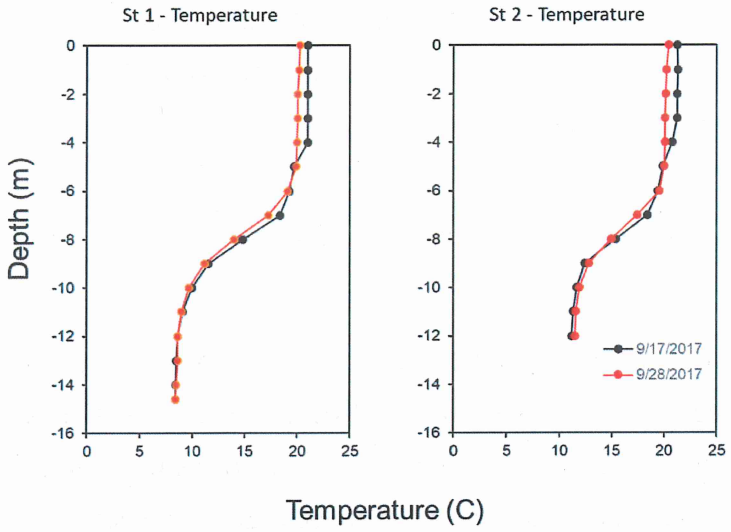



*Fig. 4. Vertical variations in temperature at station 1 and 2 on various dates in 2017.*

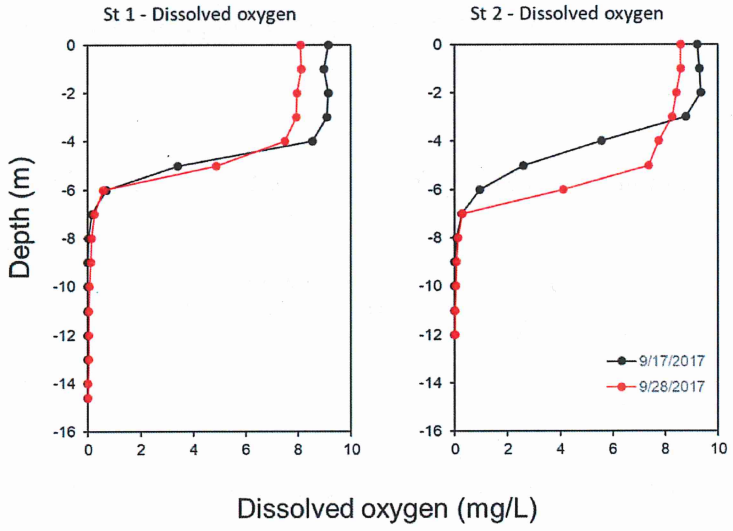



*Fig. 5. Vertical variations in dissolved oxygen at station (St) 1 and 2 on various dates in 2017.*

Total P and SRP concentrations increased with increasing depth between ~ 7 m (i.e., within the metalimnion) and the sediment-water interface at each station one day before alum application

(Fig. 6). In particular, total P exceeded 1 mg/L while SRP was > 0.5 mg/L immediately above the sediment surface on 17 September, 2017. In addition, hypolimnetic SRP accounted for 76% to 91% of the total P.

Alum application during the week of 18-22 September resulted in declines in hypolimnetic P by 28 September (Fig. 6). Additional information collected by Three Rivers Park District indicated that deposition of the Al floc and binding of hypolimnetic P was probably complete by 22 September (Fig. 7). Thus, ~ 33% (St. 1) to 41% (St. 2) of the total P and 29% (St. 1) to 44% (St. 2) of the SRP was bound by the Al floc during deposition through the hypolimnion.

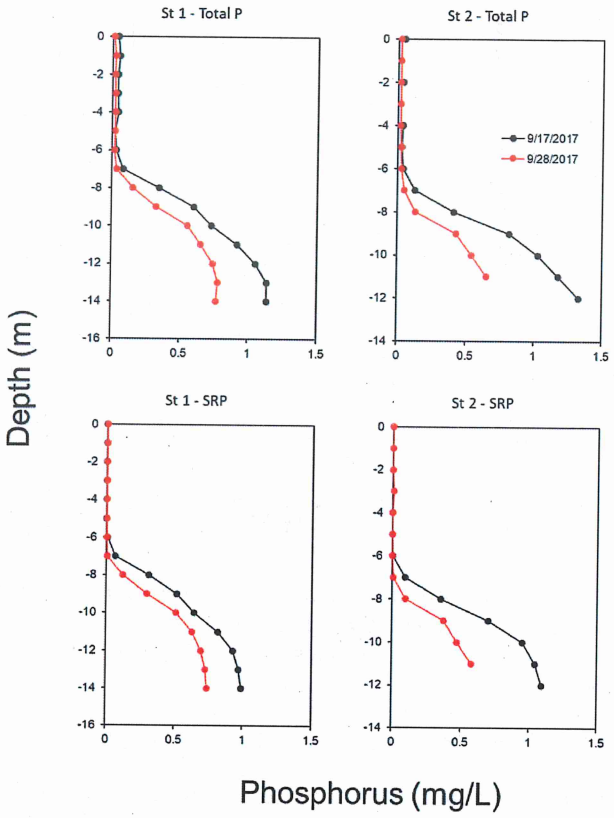



*Fig. 6. Vertical variations in total phosphorus (P) and soluble reactive P (SRP) at station 1 and 2 on various dates in 2017. Samples were analyzed at the University of Wisconsin – Stout.*

P removed from the hypolimnion during Al application ranged between 1.91 g/m$^2$ and 1.61 g/m$^2$ total P and ~ 1.39 g/m$^2$ SRP at station 1 and 2, respectively (Fig. 6). Al-bound P (i.e., 1 N NaOH-extractable P) collected in sediment traps accounted for most of the hypolimnetic SRP (79% to 88%) and ~ 60% to 80% of the hypolimnetic total P (Fig. 8).

The total Al concentration in the traps (17 September to 13 October) was 26.02 g/m$^2$ (± 2.15 SD) at station 1 and 31.36 g/m$^2$ (± 0.20 SD) at station 2 (Fig. 8). Thus, traps accounted for ~ 65% to 78% of the target Al concentration to each basin (i.e., 40 g/m$^2$). Reasons for the differences are not known but could be attributed to incomplete deposition of micro Al flocs at the time of trap retrieval. Very fine $Al(OH)_3$ colloids may have not settled within the 24-d period covered by trap deployment. Independent analysis of Al in sediment cores (scheduled for the summer of 2018)

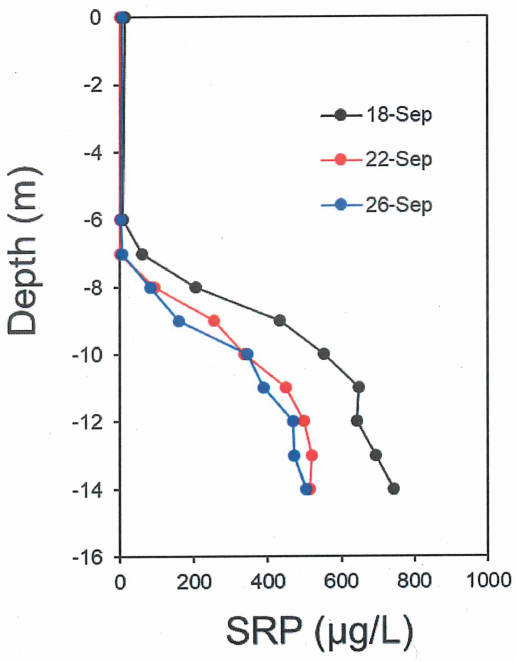



*Fig. 7. Vertical variations in total phosphorus (P) and soluble reactive P (SRP) at station 1 on various dates in 2017. Samples were analyzed at the Three Rivers Park District Laboratory.*

will be used to estimate Al concentration nearly one year after the initial application. The Al:P binding ratio (i.e., stoichiometric mass ratio of Al associated with one part P) in the trap material was ~ 20:1 mass or 23:1 molar at both stations (Fig. 8).

Al:P binding ratios reported in the literature vary widely from ~ 2:1 to > 100:1 molar, depending on time since application. The ratio tends to decline as the Al floc continues to bind P at the sediment interface and can be < 15:1 several years after treatment (Rydin et al. 2000, Reitzel et al. 2005, Huser et al. 2011, Huser 2012). Additions of low Al doses relative to sediment mobile P concentration also tend to result in low Al:P ratios (Lewandowski et al. 2003). Aging of the Al floc in the absence of bound P can result in crystallization and loss of binding efficiency and available binding sites for P (Berkowitz et al. 2006, de Vicente et al. 2008a).

Although data are very limited, Al:P ratios tend to be much higher (> 100:1) for freshly formed amorphous flocs, due to lack of exposure to hypolimnetic P (Dugolpolski et al. 2008). For instance, application of Al to Half Moon Lake, Wisconsin, coincided with an Al:P ratio of ~ 200-300:1 in sediment trap material (James unpublished, James 2017). The high ratio was due to low SRP concentrations in the lake water column during application.

Application of Al during the fall period and floc deposition through the P-rich hypolimnion resulted in considerable binding of internal P loads and a relatively low Al:P ratio of 23:1 molar. Perhaps application of a lower dose relative to hypolimnetic P would have resulted in an even lower Al:P ratio (Huser 2017). De Vicente et al. (2008b) found that freshly formed Al flocs exposed to SRP maintained adsorption capacity for longer periods of time (> 6 months) and

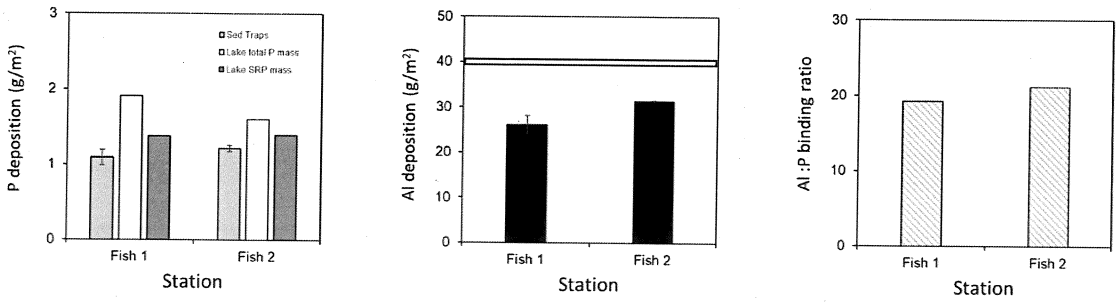



*Fig. 8. A comparison of phosphorus deposition into sediment traps (1 N NaOH extraction) versus loss of total phosphorus (P) and soluble reactive P (SRP) from the water column (left panel), total aluminum (Al) deposition (middle panel), and the Al:P binding ratio (i.e., total Al ÷ NaOH-extractable P) of sediment trap contents at station 1 and 2 in Fish Lake, MN. Horizontal bar in middle panel denotes the target Al dose.*

reduced crystallization. Our goal with the Fish Lake treatment was to maintain high P binding efficiency of the Al floc by exposing it to high concentrations of hypolimnetic SRP immediately after application. Effectiveness of this application strategy will be evaluated in 2018.

## REFERENCES

APHA (American Public Health Association). 20011. Standard methods for the examination of water and wastewater. 22st ed. Washington (DC).

Berkowitz J, Anderson MA, Amrhein C. 2006. Influence of aging on phosphorus sorption to alum floc in lake water. Wat Res 40:911-916.

Cooke GD, Welch EB, Peterson SA, Nichols SA. 2005. Restoration and management of lakes and reservoirs. 3rd ed. Boca Raton (FL): CRC Press.

de Vicente I, Jensen HS, Andersen FØ. 2008a. Factors affecting phosphate adsorption to aluminum in lake water: Implications for lake restoration. Sci Total Environ 389:29-36.

de Vicente I, Huang P, Andersen FØ, Jensen HS. 2008b. Phosphate adsorption by fresh and aged aluminum hydroxide. Consequences for lake restoration. Environ Sci Technol 42:6650-6655.

Dugopolski RA, Rydin E, Brett MT. 2008. Short-term effects of buffered alum treatment on Green Lake sediment phosphorus speciation. Lake Reserv Manage. 24:181-189.

Huser BJ. 2012. Variability in phosphorus binding by aluminum in alum treated lakes explained by lake morphology and aluminum dose. Wat Res 46:4697-4704.

Huser BJ, Egemose S, Harper H, Hupfer M, Jensen H, Pilgrim KM, Reitzel K, Rydin E, Futter M. 2016. Longevity and effectiveness of aluminum addition to reduce sediment phosphorus release and restore lake water quality. Wat Res 97:122-132.

Huser BJ. 2017. Aluminum application to restore water quality in eutrophic lakes: maximizing binding efficiency between aluminum and phosphorus. Lake Reserv Manage 33:143-151.

James WF. 2017. Phosphorus binding dynamics in the aluminum floc layer of Half Moon Lake, Wisconsin. Lake Reserv Manage 33:130-142.

Lewandowski J, Schauser I, Hupfer M. 2003. Long term effects of phosphorus precipitations with alum in hypereutrophic Lake Süsser See (Germany). Wat Res 37:3194-3204.

Psenner R, Puckso R. 1988. Phosphorus fractionation: Advantages and limits of the method for the study of sediment P origins and interactions. Arch Hydrobiol Biel Erg Limnol 30:43-59.

Reitzel K, Hansen J, Jensen HS, Andersen FØ, Hansen KS. 2003. Testing aluminum addition as a tool for lake restoration in shallow eutrophic Lake Sønderby, Denmark. Hydrobiologia 506-509:781-787.

Rydin E, Huser B, Welch EB. 2000. Amount of phosphorus inactivated by alum treatments in Washington Lakes. Limnol Oceanogr 45:226-230.

# APPENDIX C

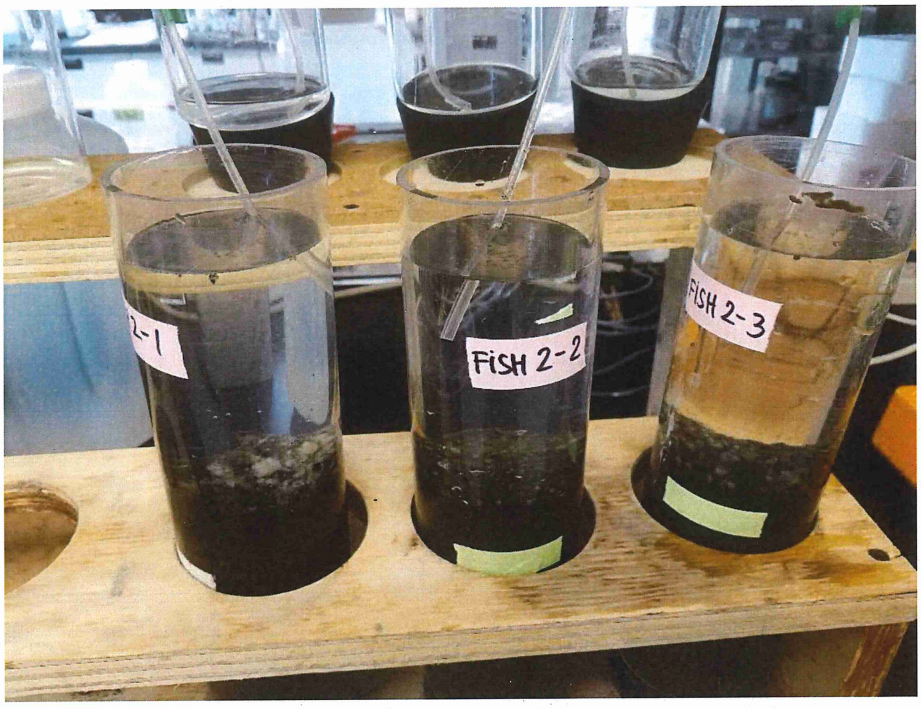
## Effectiveness of a Late Summer Aluminum Sulfate Application in Binding Hypolimnetic Phosphorus in Fish Lake, MN

## Phase 2

## Interim Report

item 04d

# Effectiveness of a Late-Summer Aluminum Sulfate Application in Binding Hypolimnetic Phosphorus in Fish Lake, MN: Phase 2 Interim report




*Sediment phosphorus diffusive flux incubation systems with visible surface alum floc*

20 January, 2019

University of Wisconsin - Stout
Sustainability Sciences Institute Discovery Center
Center for Limnological Research and Rehabilitation
Menomonie, Wisconsin 54751
715-338-4395
jamesw@uwstout.edu

## BACKGROUND

Application of Al salts has been an effective management strategy for controlling internal phosphorus (P) loading in lakes (Cooke et al. 2005, Huser et al. 2016). However, P binding efficiency and capacity on the $Al(OH)_3$ floc depend to a large extent on the rapidity of exposure to P after $Al(OH)_3$ formation. Berkowitz et al (2006) and de Vicente et al. (2008a) found that Al binding efficiency for P can decrease by up to 75% within a short period of time (< 30 d) if not exposed to P, due to polymerization into a more ordered crystalline structure and increased tortuosity (diffusive path length). Since newly formed Al flocs are generally less dense than surficial sediment, they can typically settle on top rather than sink or mix into sediment after application, resulting in much slower exposure to P via upward diffusion (James 2017). Under this scenario, polymerization leads to greatly decreased Al floc binding sites for P and shortened longevity. Thus, application during the late summer peak in hypolimnetic P accumulation can promote immediate exposure of the settling Al floc to soluble P for rapid binding and maintenance of a much higher P adsorption capacity after deposition onto the sediment surface.

An alum dosage of at least 80 $g/m^2$ was proposed to control internal P loading in Fish Lake, MN. In addition, the dosage was split into two 40 $g/m^2$ applications: the first application occurred in early fall 2017 (18 September) during peak anoxia and soluble P accumulation in the hypolimnion and the second application to occur in 2019.

## PURPOSE

Historically, late summer Al application have typically been avoided due to concerns over unnecessarily filling binding sites with hypolimnetic P rather than sediment mobile P. There is little information on the effectiveness of this application strategy in controlling internal P loading and improving the overall Al:P binding ratio. However, findings over the last decade have suggested rapid exposure to and binding of P is desirable to both reduce polymerization and maintain higher P binding efficiency after deposition. Late summer application of Al to Fish Lake during peak hypolimnetic P accumulation provides an opportunity to examine the extent of

P binding onto the Al floc during and after a late summer alum treatment to Fish Lake. The objectives of these investigations were to specifically:

1. determine the Al:P binding ratio of newly-formed $Al(OH)_3$ that has been exposed to peak hypolimnetic P from sediment traps deployed shortly before Al application,
2. examine the extent of hypolimnetic P removal as a result of the 40 $g/m^2$ Al application, and,
3. monitor vertical variations total Al, mobile P, and Al-bound P in the sediment column and rates of P release from sediment approximately one year after the first treatment.

This second interim report will address objectives 2 and 3 above.

## METHODS

*Sediment diffusive phosphorus flux under anaerobic conditions*

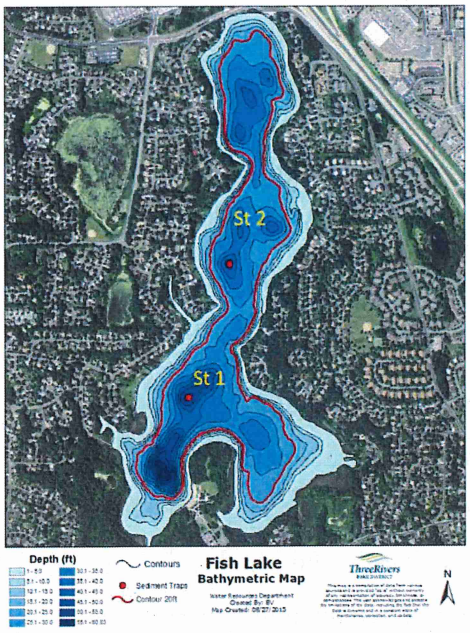



*Fig. 1. Bathymetric map showing station locations for vertical water chemistry profiles and sediment core collection.*

Three intact sediment cores were collected from stations 1 and 2, located in the deep south and central basins, for the determination of rates of diffusive P fux from sediment under controlled laboratory conditions (Fig. 1). Cores were carefully drained of overlying water in the laboratory and the upper 10 cm of sediment was transferred intact to a smaller acrylic core liner (6.5-cm dia and 20-cm ht) using a core remover tool. Surface water collected from each lake was filtered through a glass fiber filter (Gelman A-E), with 300 mL then siphoned onto the sediment contained in the small acrylic core liner without causing sediment resuspension. They were placed in a darkened environmental chamber and incubated at a constant temperature of ~12 °C to reflect summer hypolimnetic conditions. The oxidation-reduction environment in the overlying water was

controlled by gently bubbling nitrogen (anaerobic with 300 ppm $CO_2$ to maintain pH) through an air stone placed just above the sediment surface in each system. Bubbling action insured complete mixing of the water column but did not disrupt the sediment.

Water samples for soluble reactive P were collected from the center of each system using an acid-washed syringe and filtered through a 0.45 µm membrane syringe filter. The water volume removed from each system during sampling was replaced by addition of filtered lake water preadjusted to the proper oxidation-reduction condition. These volumes were accurately measured for determination of dilution effects. Soluble reactive P was measured colorimetrically using the ascorbic acid method (APHA 2011). Rates of diffusive P flux from the sediment ($mg/m^2$ d) were calculated as the linear change in mass in the overlying water divided by time (days) and the area ($m^2$) of the incubation core liner. Regression analysis was used to estimate rates over the linear portion of the data.

*Sediment chemistry*

Additional sediment cores collected at station 1 and 2 for analysis of sediment chemistry were sectioned at 1-cm intervals over the upper 6 cm, and at 2 to 2.5-cm intervals thereafter. Subsamples were dried at 105 °C to a constant weight and burned at 550 °C for determination of moisture content, sediment density, and organic matter content (Håkanson 1977). Phosphorus fractionation were conducted according to Hieltjes and Lijklema (1980), Psenner and Puckso (1988), and Nürnberg (1988) for the determination of ammonium-chloride-extractable P (1 M $NH_4Cl$; loosely-bound P), bicarbonate-dithionite-extractable P (0.11 M BD; iron-bound P), and sodium hydroxide-extractable P (1 N NaOH; aluminum-bound P). Dried and ground subsamples were sent to the University of Minnesota Research Analytical Laboratory for analysis of total Al using ICP-OES after microwave-assisted acid digestion.

*Water chemistry*

Vertical variations in in situ variables (temperature and dissolved oxygen) and total P and SRP were collected at 1-m intervals at the 2 stations on 8 August, 2018. In situ measurements

were collected using a YSI 6600 data sonde calibrated against Winkler titrations. Samples for total P and SRP were collected using a peristaltic pump and tygon tubing. Water samples for SRP analysis were field-filtered under anoxic conditions using a 60-cc syringe and 0.45 um syringe filter. Samples were stored on ice and analyzed using the ascorbic acid method (APHA 2011) within 24 hours. Total P was digested with potassium persulfate according to APHA (2011). Changes in the mass of total P and SRP ($g/m^2$) as a result of Al application were calculated as:

$$\mathrm{P}\ (g/m^2) = \sum_{z=0}^{bottom} C \cdot I$$

Where C = concentration (mg/L or $g/m^3$) at depth z (m) and I = depth interval (m).

## RESULTS AND INTERPRETATION

Rates of diffusive P flux under anaerobic conditions were low ~ 1 year after the late summer 2017 alum treatment at means of ~ 0.7 to 0.8 $mg/m^2$ d (Table 1). Rates varied between 0.22 $mg/m^2$ d and 1.61 $mg/m^2$ d among replicates. While P mass accumulation was relatively low in systems and mean concentrations at the end of the incubation period were only ~ 0.065 mg/L, one replicate from each station exhibited notably higher diffusive P flux at > 1 $mg/m^2$ d compared to the others (Fig. 1). Overall, mean diffusive P flux < 1 $mg/m^2$ d suggested the 40 $g/m^2$ alum treatment in 2017 was effective in suppressing internal P loading in Fish Lake in 2018.

Table 1. Rates of diffusive phosphorus flux under anaerobic conditions measured ~ 10.8 months after 40 $g/m^2$ alum treatment.

| Statistic | Station 1 ($mg/m^2$ d) | Station 2 ($mg/m^2$ d) |
|---|---|---|
| Rep 1 | 0.46 | 0.22 |
| Rep 2 | 1.53 | 1.61 |
| Rep 3 | 0.36 | 0.37 |
| Mean | 0.78 | 0.73 |
| STDERR | 0.38 | 0.44 |

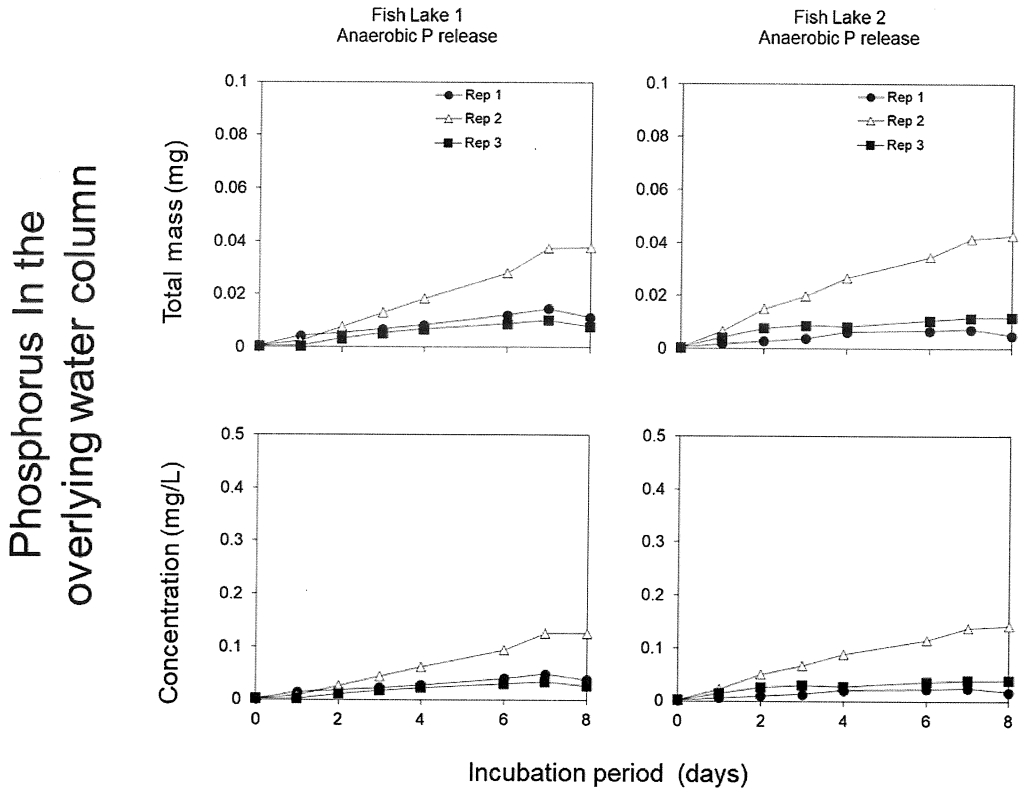



*Fig. 2. Changes in soluble reactive phosphorus mass (upper panels) and concentration (lower panels) in the overlying water column under anaerobic conditions versus time for sediment cores collected in Fish Lake ~ 1 y after alum treatment.*

In the vertical sediment column, total Al was greatest at the surface and declined in concentration over the upper 3 cm to background levels, suggesting the Al floc layer was located

Table 2. Area-weighted concentrations of Al, Al-bound P, and the Al:P ratio at station 1 and 2 shortly after (0.8 months) and nearly 1 year ( 10.8 months) after alum application to Fish Lake (September, 2017).

| Months after Al application | Station 1 Al ($g/m^2$) | Station 1 Al-bound P ($g/m^2$) | Station 1 Al:P ratio | Station 2 Al ($g/m^2$) | Station 2 Al-bound P ($g/m^2$) | Station 2 Al:P ratio |
|---|---|---|---|---|---|---|
| 0.8 months[1] | 26 | 1.35 | 19.3 | 31.4 | 1.48 | 21.2 |
| 10.8 months[2] | 32.4 | 2.07 | 15.7 | 30.6 | 1.71 | 17.9 |

[1]from sediment trap material collected shortly after alum application (James 2017)

[2]from sediment cores collected nearly 1 year after alum application (this study)

on top of the original sediment surface (Fig. 3). Al concentrations exceeded 50 mg/g in the upper 1-cm sediment layer compared to background concentrations < 10 mg/g at sediment depths deeper than 3 to 4 cm. The Al concentration over the upper 3 cm was ~ 30 g/m$^2$ at both stations, similar to the concentration measured in the sediment traps shortly after Al application (Table 2 and James 2018). Aluminum-bound P exhibited concentration maxima at the sediment surface in conjunction with peak sediment Al, indicating considerable P was bound to the Al floc (Fig. 3). Aluminum-bound P concentrations in the Al floc layer (i.e., upper 3 cm) were 2.07 g/m$^2$ at station 1 and 1.71 g/m$^2$ at station 2 (Table 2).

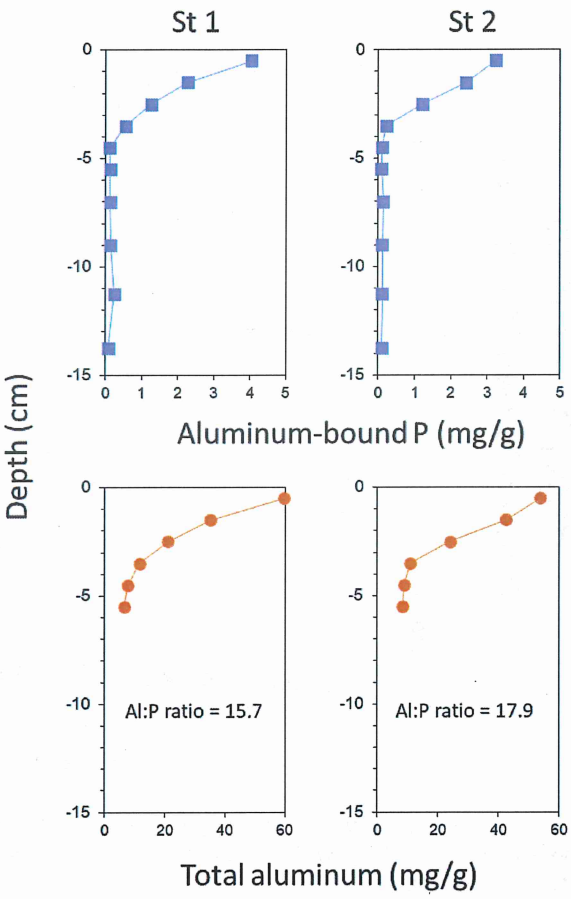



*Fig. 3. Vertical variations in aluminum-bound phosphorus (P, upper panels) and sediment total aluminum (lower panels) concentrations for sediment cores collected at station 1 and 2 in Fish Lake in August 2018 (~ 1 year after 40 g/m$^2$ alum treatment).*

Interestingly, the aluminum-bound P concentration increased in the Al floc layer between September 2017 and August 2018, suggesting continued P binding on the Al floc over time (Table 2, Fig. 4). Aluminum-bound P in August 2018 represented a 53 and 16% increase over concentrations measured in sediment trap material shortly after Al application in September 2017. As a result, the Al:P ratio declined from an initial ~ 19:1 to ~ 16:1 at station 1 and from an initial 21:1 to 18:1 at station 2 in ~ 1 year. Declining Al:P ratios suggested that binding sites were continuing to be efficiently filled via P diffusing from underlying sediments. In addition, low Al:P ratios were directly attributed to application and immediate sequestration of late summer peak P concentrations in the anoxic hypolimnion. In contrast, James (2017) reported a much higher Al:P binding ratio (36:1) in the Al floc of Half Moon Lake ~ 3 years after application. In that research, exposure to and binding

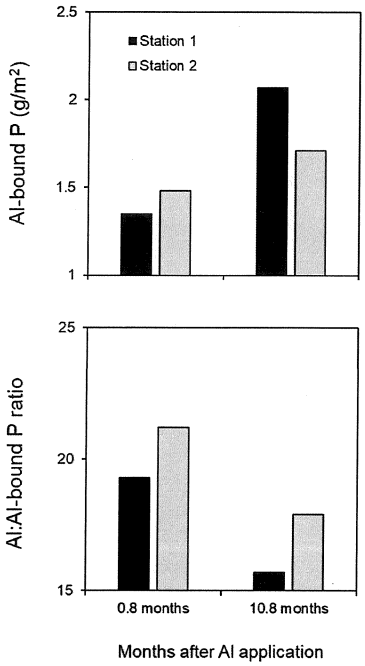



*Fig. 4. Changes in the aluminum-bound phosphorus (Al-bound P) and the Al:Al-bound P ratio as a function of time after initial alum application. Concentrations determined 0.8 months after treatment were derived from sediment trap material while those concentrations measured 10.8 months after treatment came from sediment core material.*

of P by the Al floc occurred via much slower upward diffusion, which probably resulted in $Al(OH)_3$ crystallization, loss of binding sites, and P binding inefficiency.

Al:P binding ratios reported in the literature vary widely from ~ 2:1 to > 100:1 molar, depending on time since application. The ratio tends to decline as the Al floc continues to bind P at the sediment interface and can be < 15:1 several years after treatment (Rydin et al. 2000, Reitzel et al. 2005, Huser et al. 2011, Huser 2012). Additions of low Al doses relative to sediment mobile P concentration also tend to result in low Al:P ratios (Lewandowski et al. 2003, Huser 2017). Aging of the Al floc in the absence of bound P can result in crystallization and loss of binding efficiency and available binding sites for P (Berkowitz et al. 2006, de Vicente et al. 2008a).

Although data are very limited, Al:P ratios tend to be much higher (> 100:1) for freshly formed amorphous flocs, due to lack of exposure to hypolimnetic P (Dugolpolski et al. 2008). For instance, application of Al to Half Moon Lake, Wisconsin, coincided with an Al:P ratio of ~ 200-300:1 in sediment trap material (James unpublished, James 2017). The high ratio was due to low SRP concentrations in the lake water column during application.

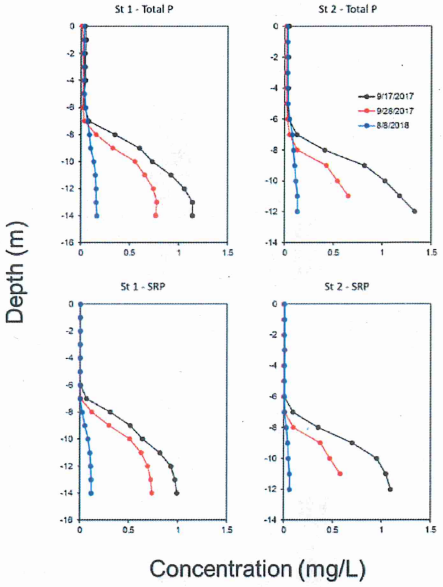



*Fig. 5. Vertical variations in total phosphorus (P) and soluble reactive P (SRP) at station 1 and 2 on various dates in 2017-18. Samples were analyzed at the University of Wisconsin – Stout.*

Total P and, in particular, SRP concentrations were very low in the hypolimnion of Fish Lake in August 2018 compared to the pretreatment period of 17 September 2017 (Fig. 5). Bottom SRP concentrations were < 0.150 mg/L in August 2018 compared to > 1.00 mg/L before Al application in September 2017. Declines in area-weighted total P and SRP were also pronounced nearly 1 year after Al treatment (Fig. 6). For instance, total P declined by ~ 80% while SRP declined by ~ 90-95% in August 2018 from pretreatment peaks in September 2017.

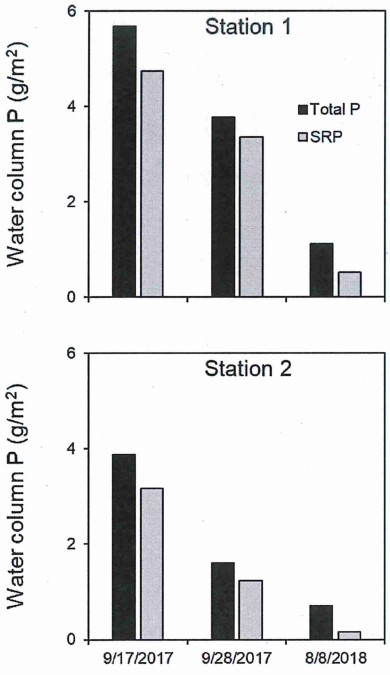



*Fig. 6. Changes in area-weighted water column total phosphorus (P) and soluble reactive P (SRP) before (9/17/17) and after (9/28/17 and 8/8/18) a 40 g/m² alum treatment to Fish Lake.*

These results further suggested that application of alum during the late summer stratified period and floc deposition through the P-rich hypolimnion can lead to considerable binding of internal P loads, a relatively low Al:P ratio, and suppression of hypolimnetic P accumulation. De Vicente et al. (2008b) found that freshly formed Al flocs

exposed to SRP maintained adsorption capacity for longer periods of time (> 6 months) and reduced crystallization. Our goal with the Fish Lake treatment was to maintain high P binding efficiency of the Al floc by exposing it to high concentrations of hypolimnetic SRP immediately after application.

## REFERENCES


APHA (American Public Health Association). 20011. Standard methods for the examination of water and wastewater. 22st ed. Washington (DC).

Berkowitz J, Anderson MA, Amrhein C. 2006. Influence of aging on phosphorus sorption to alum floc in lake water. Wat Res 40:911-916.

Cooke GD, Welch EB, Peterson SA, Nichols SA. 2005. Restoration and management of lakes and reservoirs. 3rd ed. Boca Raton (FL): CRC Press.

de Vicente I, Jensen HS, Andersen FØ. 2008a. Factors affecting phosphate adsorption to aluminum in lake water: Implications for lake restoration. Sci Total Environ 389:29-36.

de Vicente I, Huang P, Andersen FØ, Jensen HS. 2008b. Phosphate adsorption by fresh and aged aluminum hydroxide. Consequences for lake restoration. Environ Sci Technol 42:6650-6655.

Dugopolski RA, Rydin E, Brett MT. 2008. Short-term effects of buffered alum treatment on Green Lake sediment phosphorus speciation. Lake Reserv Manage. 24:181-189.

Huser BJ. 2012. Variability in phosphorus binding by aluminum in alum treated lakes explained by lake morphology and aluminum dose. Wat Res 46:4697-4704.

Huser BJ, Egemose S, Harper H, Hupfer M, Jensen H, Pilgrim KM, Reitzel K, Rydin E, Futter M. 2016. Longevity and effectiveness of aluminum addition to reduce sediment phosphorus release and restore lake water quality. Wat Res 97:122-132.

Huser BJ. 2017. Aluminum application to restore water quality in eutrophic lakes: maximizing binding efficiency between aluminum and phosphorus. Lake Reserv Manage 33:143-151.

James WF. 2017. Phosphorus binding dynamics in the aluminum floc layer of Half Moon Lake, Wisconsin. Lake Reserv Manage 33:130-142.

Lewandowski J, Schauser I, Hupfer M. 2003. Long term effects of phosphorus precipitations with alum in hypereutrophic Lake Süsser See (Germany). Wat Res 37:3194-3204.

Psenner R, Puckso R. 1988. Phosphorus fractionation: Advantages and limits of the method for the study of sediment P origins and interactions. Arch Hydrobiol Biel Erg Limnol 30:43-59.

Reitzel K, Hansen J, Jensen HS, Andersen FØ, Hansen KS. 2003. Testing aluminum addition as a tool for lake restoration in shallow eutrophic Lake Sønderby, Denmark. Hydrobiologia 506-509:781-787.

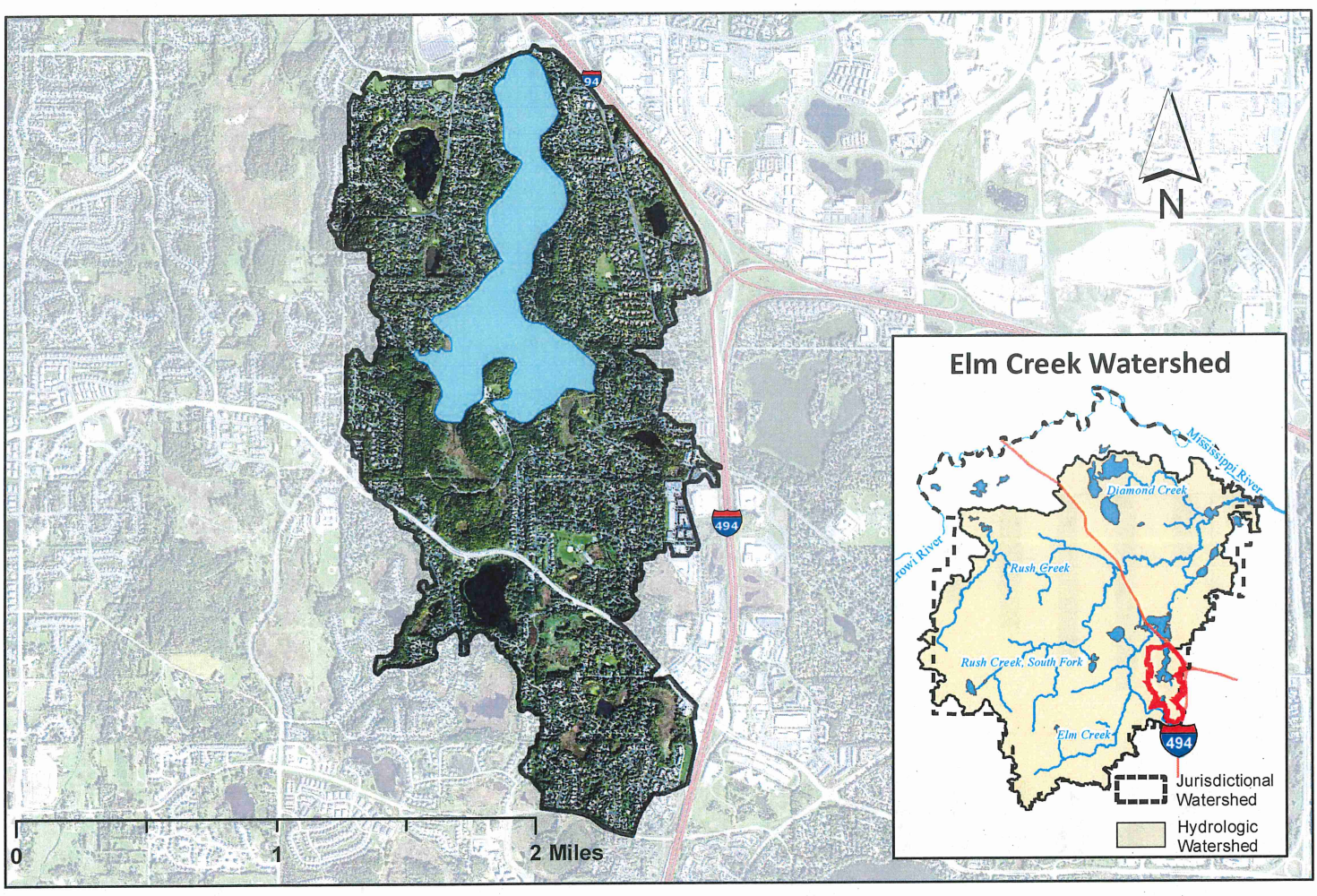
Rydin E, Huser B, Welch EB. 2000. Amount of phosphorus inactivated by alum treatments in Washington Lakes. Limnol Oceanogr 45:226-230.

# APPENDIX D

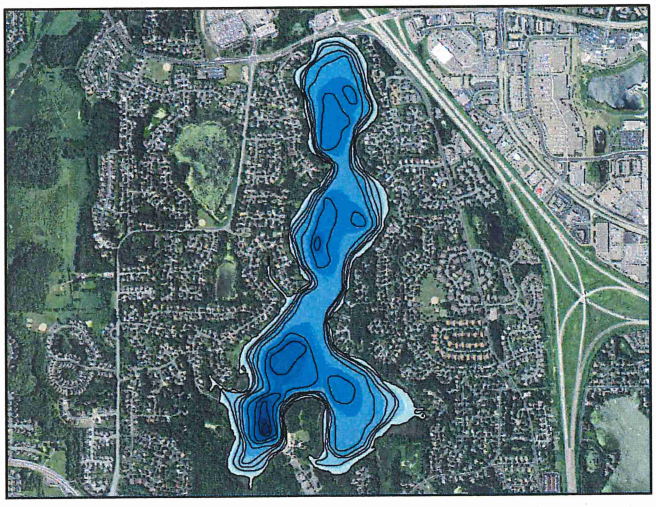
## Fish Lake Water Quality

## Report Card

# Fish Lake Watershed Map




## Fish Lake Bathymetry

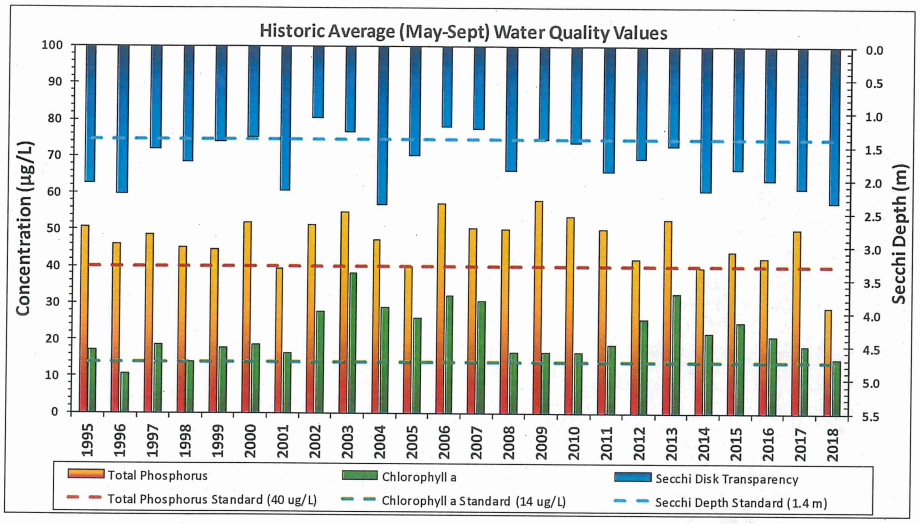


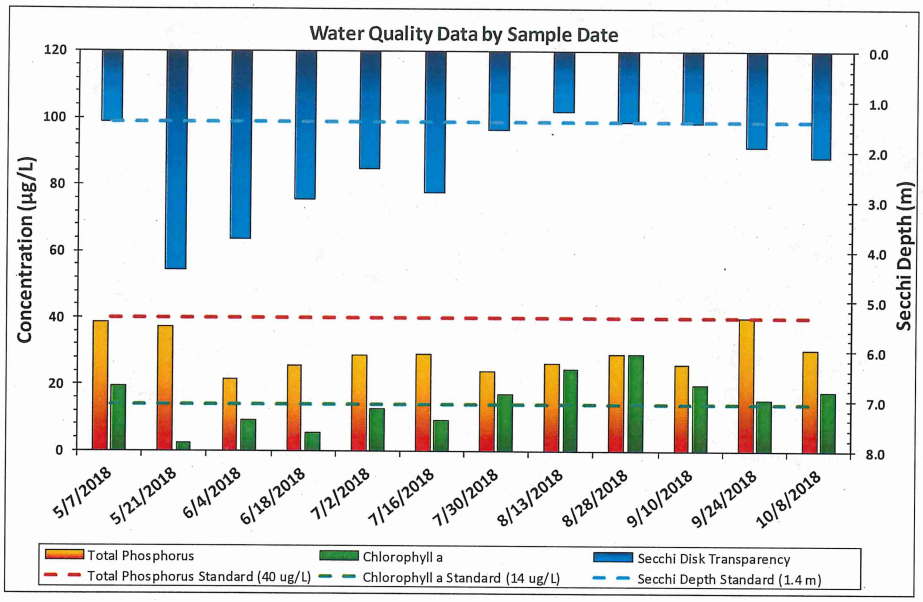
| Lake and Watershed Characteristics | |
|---|---|
| DNR # | 27011800 |
| Watershed Area | 1,611 Acres |
| Lake Area | 232 Acres |
| Percent Littoral Area | 32% |
| Average Depth | 20.5 ft. |
| Maximum Depth | 62 ft. |
| Watershed Area:Lake Area | 6.9:1 |
| Impairment Classification | Excess Nutrients 2008 |
| Classification | Deep Lake |

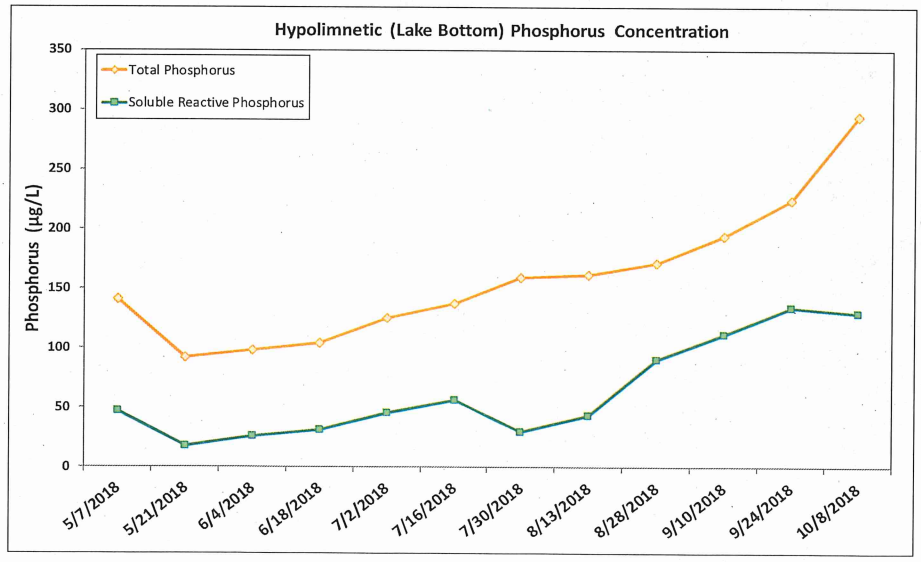
Water Resource Department
Map Created: 11/24/2017
Revised Date: 12/6/2017



ThreeRivers PARK DISTRICT




| Fish Lake Water Quality Report Card | | | | |
|---|---|---|---|---|
| Year | TP | Chl-a | Secchi | Avg Grade |
| 1995 | C | B | C | C+ |
| 1996 | C | B | B | B- |
| 1997 | C | B | C | C+ |
| 1998 | C | B | C | C+ |
| 1999 | C | B | C | C+ |
| 2000 | C | B | C | C+ |
| 2001 | C | B | C | C+ |
| 2002 | C | C | D | C- |
| 2003 | C | C | C | C |
| 2004 | C | C | B | C+ |
| 2005 | C | C | C | C |
| 2006 | C | C | C | C |
| 2007 | C | C | C | C |
| 2008 | C | B | C | C+ |
| 2009 | C | B | C | C+ |
| 2010 | C | B | C | C+ |
| 2011 | C | B | C | C+ |
| 2012 | C | C | C | C |
| 2013 | C | C | C | C |
| 2014 | C | C | C | C |
| 2015 | C | C | C | C |
| 2016 | C | C | C | C |
| 2017 | C | B | C | C+ |
| 2018 | B | B | B | B |
| MPCA Standard | C | B | C | C+ |

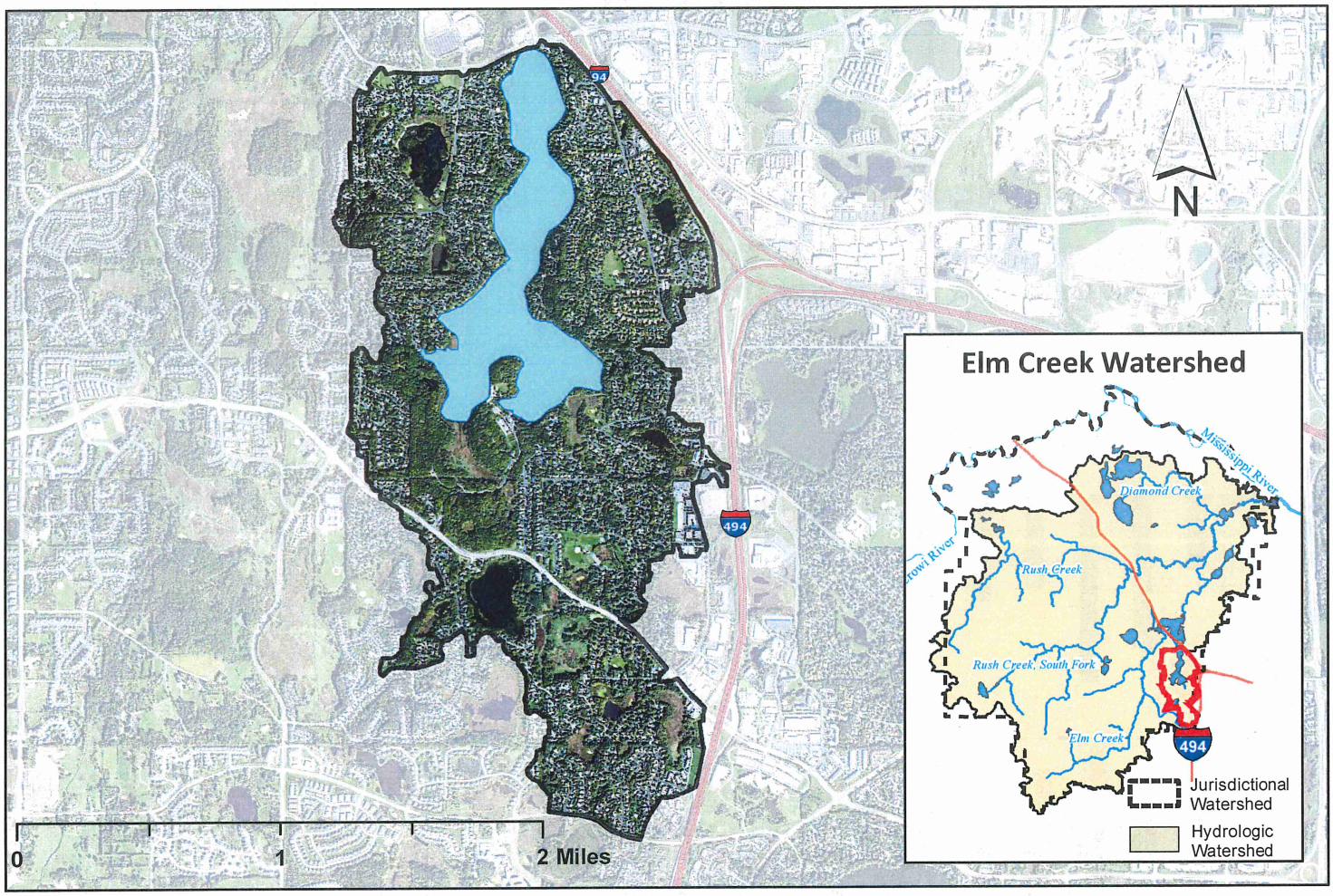
*Met Council Grading System for Lake Water Quality*

ThreeRivers
PARK DISTRICT

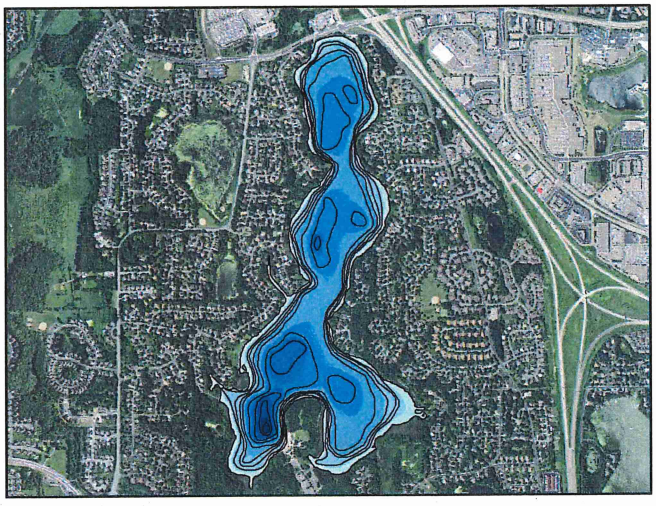
*Division of Water Resources*

*December 2018*

# Fish Lake Watershed Map




## Fish Lake Bathymetry

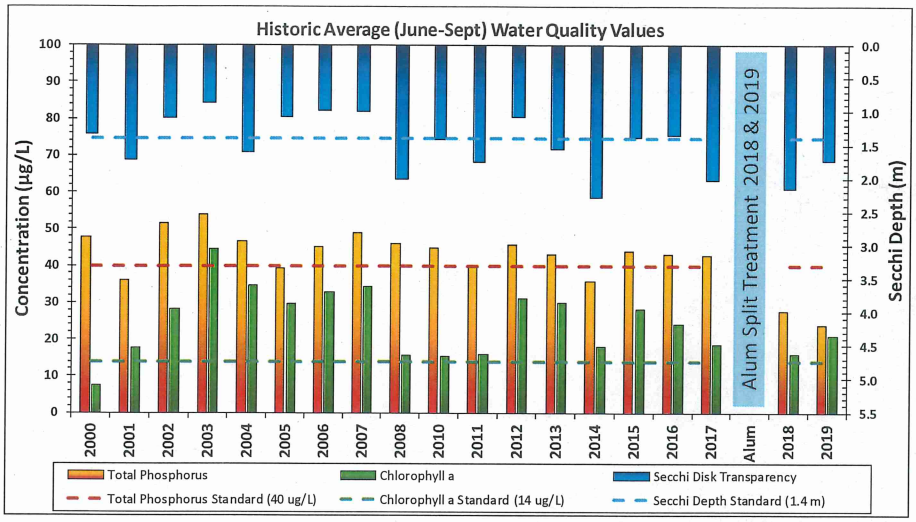


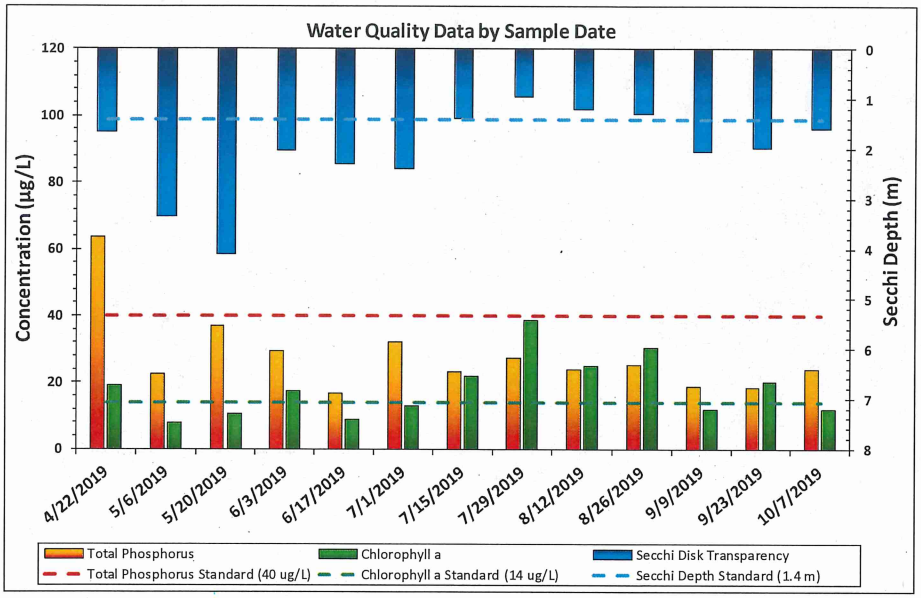
| Lake and Watershed Characteristics | |
|---|---|
| DNR # | 27011800 |
| Watershed Area | 1,611 Acres |
| Lake Area | 232 Acres |
| Percent Littoral Area | 32% |
| Average Depth | 20.5 ft. |
| Maximum Depth | 62 ft. |
| Watershed Area:Lake Area | 6.9:1 |
| Impairment Classification | Excess Nutrients 2008 |
| Classification | Deep Lake |

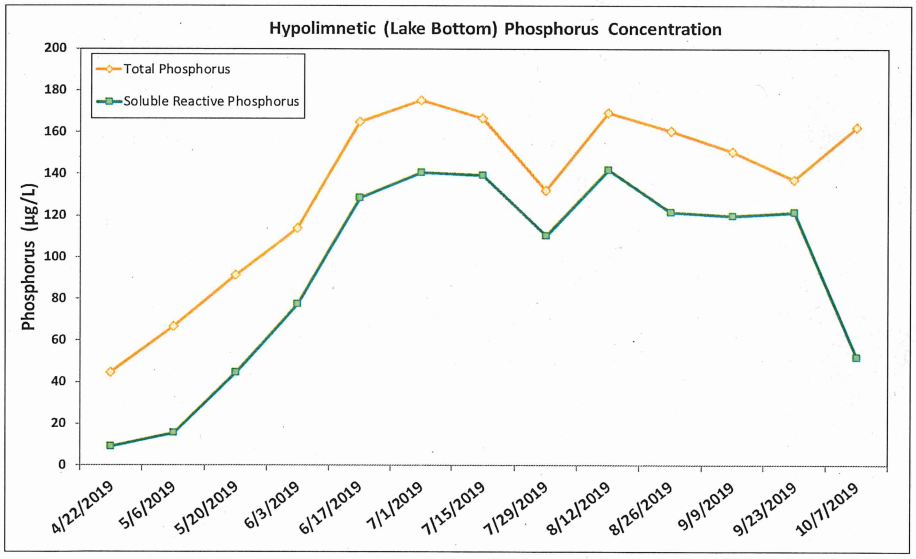
Water Resource Department
Map Created: 11/24/2017
Revised Date: 12/6/2017



ThreeRivers PARK DISTRICT




| Fish Lake Water Quality Report Card | | | | |
|---|---|---|---|---|
| Year | TP | Chl-a | Secchi | Avg Grade |
| 1995 | | | C | C |
| 1996 | | | B | B |
| 1997 | C | C | C | C |
| 1998 | C | B | C | C+ |
| 1999 | C | B | C | C+ |
| 2000 | C | A | C | B- |
| 2001 | C | B | C | C+ |
| 2002 | C | C | D | C- |
| 2003 | C | C | D | C- |
| 2004 | C | C | C | C |
| 2005 | C | C | D | C- |
| 2006 | C | C | D | C- |
| 2007 | C | C | D | C- |
| 2008 | C | B | C | C+ |
| 2009 | C | B | C | C+ |
| 2010 | C | B | C | C+ |
| 2011 | C | B | C | C+ |
| 2012 | C | C | D | C- |
| 2013 | C | C | C | C |
| 2014 | C | B | B | B- |
| 2015 | C | C | C | C |
| 2016 | C | C | C | C |
| 2017 | C | B | C | C+ |
| 2018 | B | B | C | B- |
| 2019 | B | C | C | C+ |
| MPCA Standard | C | B | C | C+ |

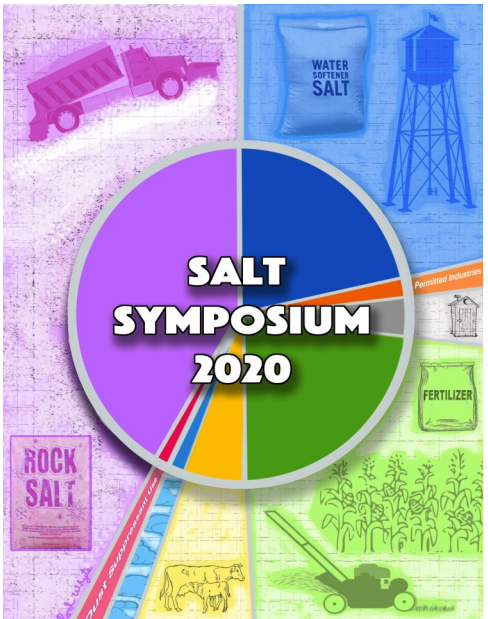
*Met Council Grading System for Lake Water Quality*

*Alum treatments: 2018, 2019*

ThreeRivers
PARK DISTRICT

*Division of Water Resources*

*January 2020*




# SAVE THE DATE!

# Salt Symposium

## AUGUST 5, 2020

**Medina, MN**

A day of chloride research & innovation!

**Winter Maintenance**

The latest research and technology

**New Alternative Sessions**

Water softening, Fertilizers, Dust control, and more!

August 6 – FREE MPCA Smart Salting Certification Trainings

Register now at fortinconsulting.com/salt-symposium


# Sponsor the 2020 SALT SYMPOSIUM

August 5th at the Medina Entertainment Center

## Sponsorship Packages and Benefits

### Platinum Sponsorship - $5,000 donation

- Prominent logo placement on the symposium program, slideshow, and web pages, your materials included in every conference packet, brief podium presentation time, five (5) complimentary attendee registrations, and access to a vendor table or reserved space at the resource tables located in the main room.

### Gold Sponsorship - $2,500 donation

- Prominent logo placement in the symposium program, slideshow, and web pages, two (2) complimentary attendee registrations, and access to a vendor table or reserved space at the resource tables located in the main room.

### Silver Sponsorship - $1,000 donation

- Logo placement in the symposium program, slideshow, and web pages, one (1) complimentary attendee registration, and reserved space provided at the resource tables located in the main room.

### Bronze Sponsorship - $500 donation

- Listing as a Salt Symposium sponsor on the symposium program, slideshow, and web pages, and reserved space at the resource tables located in the main room.

### Specialized Sponsorship - Contact us to start the conversation

- Consider sponsoring refreshments, out-of-town speakers, awards, MPCA Certified Smart Salting trainings, merchandise, and more! Contact Connie Fortin at 763-478-3606 or connie@fortinconsulting.com for details.

PROMOTE YOUR ORGANIZATION. PROTECT THE WATER.

FORTIN CONSULTING, INC.
serving the environment

fci@fortinconsulting.com

763-478-3606

# Sign-up for Salt Symposium Sponsorship

- ☐ Platinum Sponsorship - $5,000 donation
- ☐ Gold Sponsorship - $2,500 donation
- ☐ Silver Sponsorship - $1,000 donation
- ☐ Bronze Sponsorship - $500 donation
- ☐ Special Sponsorship - _____

# Sponsorship Form

Contact Name: _____ Date: _____

Organization/Company: _____

Mailing Address: _____

City: _____ State: _____ Zip code:_____

Phone: _____ Email: _____

☐ Check included by mail ☐ Please send me an invoice

Checks made payable to:
**Fortin Consulting Inc.**

Please send 1) this completed form and 2) your organization's logo to:
**fci@fortinconsulting.com**

To send checks and forms by mail, address the materials to:
**Fortin Consulting, Inc. 215 Hamel Rd, Hamel, MN 55340**

**Sponsorship dollars will be used to reduce registration costs and bring more people into the conversation.**

This event assembles hundreds of professionals from numerous industries, each following the latest developments in salt use and management, road maintenance, agronomy, and more. Your donations help bring more people to the table.

Thank you!

FORTIN CONSULTING, INC.
serving the environment

fci@fortinconsulting.com

763-478-3606

HENNEPIN COUNTY
MINNESOTA

DATE: February 4th, 2020

TO: Elm Creek Watershed Management Organization

FROM: Kirsten Barta, Hennepin County Department of Environment and Energy

RE: Subwatershed Assessment Cost Share Applications

---

In 2020, one SWA application was submitted and another requested to be renewed from 2019. In keeping with policies approved last winter, each SWA is requesting 25% from ECWMC to fund the study. 75% must come from the member city or grant funds said city applies for.

| Subwatershed | Sponsor City | Firm solicited | Total cost estimate | Watershed portion (25%) |
|---|---|---|---|---|
| Weaver Lake | Maple Grove | WSB | $30,000 | $7,500 |
| S Fork Rush Creek | Corcoran | Wenck | $58,800 | $8,820 |
| **TOTAL** | | | | **$16,320** |

Weaver Lake is located in Maple Grove west of I-94 and is surrounded by residential neighborhoods with some park land. The lake is not impaired, but in recent years has been experiencing plant and algae growth issues. Maple Grove anticipates working on this SWA in 2020/21.

South Fork Rush Creek is located predominantly in eastern Corcoran with small portions in Medina and Maple Grove. It forms a confluence with the North Fork of Rush Creek in central Corcoran and flows into Elm Creek in the Elm Creek Park Reserve. The watershed is partially developed with some remaining agricultural land and mix of industrial/residential/commercial properties throughout. Rush Creek is listed as impaired for nutrients and bacteria, though the listing does not call out the individual forks. The City of Corcoran requested this funding in 2019 but is requesting an extension for 2020 to get the 75% matching funds budgeted.

**Hennepin County** Environment and Energy
701 Fourth Ave S., Suite 700, Minneapolis, MN 55415
612-348-3777 | hennepin.us/environment

January 30, 2020

Mr. Derek Asche
City of Maple Grove
12800 Arbor Lakes Parkway
Maple Grove, MN 55369

Re: Proposal to Complete a Subwatershed Assessment for Weaver Lake in Maple Grove

We are pleased to present this proposal to provide professional engineering services to complete a subwatershed assessment for Weaver Lake.

Weaver Lake is one of the most popular water resources in the City of Maple Grove. Weaver Lake Community Park includes a swimming beach, fishing pier, and other amenities that attract numerous visitors and residents each year. While Weaver Lake is not listed as impaired by the State, protection from impairment status is a City goal. A subwatershed assessment will organize existing data collected to date, identify gaps in the data, update watershed modeling, and identify/recommend improvement opportunities for pollutant load reductions.

The Subwatershed Assessment will consist of completing hydrologic and water quality models to verify the existing watershed conditions for Weaver Lake. The following items will be identified as part of the Subwatershed Assessment final report:

- Areas discharging untreated stormwater to Weaver Lake, as well as areas where treatment may be enhanced.
- Improvement options will be developed and evaluated to determine the amount of stormwater treatment benefit.
- Constructability analysis will be completed to ensure improvements provide a feasible/achievable solution.
- Cost-benefit analysis will be completed to help prioritize the projects that will provide the "best bang for the buck" based on initial cost, annual maintenance cost, and overall phosphorus removed annually.

The projected cost to complete the Weaver Lake Subwatershed Assessment is **$30,000**. We are excited to work with you on this project. Please do not hesitate to contact me at 763.231.4861 with any questions.

Sincerely,

WSB

Jake Newhall, PE
Project Manager

alp

701 XENIA AVENUE S | SUITE 300 | MINNEAPOLIS, MN | 55416 | 763.541.4800 | WSBENG.COM

# elm creek
# Watershed Management Commission

## Subwatershed Assessment Cost Share Application

Date: July 16, 2019
Waterbody to be assessed: Weaver Lake
Sponsor City: Maple Grove

Total cost estimate: $20,000
Anticipated City Contribution: $15,000
Anticipated Commission Contribution: $5,000
Firm(s) solicited: TBD

**Background information**

Why is the sponsoring city interested in this SWA? Weaver Lake is one of the most popular water resources in the City of Maple Grove. Weaver Lake Community Park includes parking for 10 vehicles with trailers, picnic tables/grills, swimming beach, fishing pier, playground, and concessions and attracts many visitors each year.

Other supporting documents showing water quality issues? Ex: TMDL, Stressor ID report, etc. Please provide web links While Weaver Lake is not listed as impaired by the State, protection from impairment status is a City goal. Much data has been collected on Weaver and a sub-watershed assessment will organize existing data, identify gaps in the data, update the watershed modeling, and recommend best management practices for implementation.

Any additional local knowledge of issues? Satisfactory water quality has resulted in excessive plant growth. Particularly filamentous algae. Recently the Weaver Lake Conservation Association identified 8 lake issues, of which, 6 were related to plants.

**Implementation**

What implementation support will the sponsoring city provide? Ex: funding, staff time, outreach, submitting a Clean Water Fund app, etc The City of Maple Grove has, and will continue to provide funding, staff time, and outreach toward the improvement and protection of Weaver Lake. In addition, the Weaver Lake Conservation Association is an active group in both funding and implementation of projects to improve and protect Weaver.

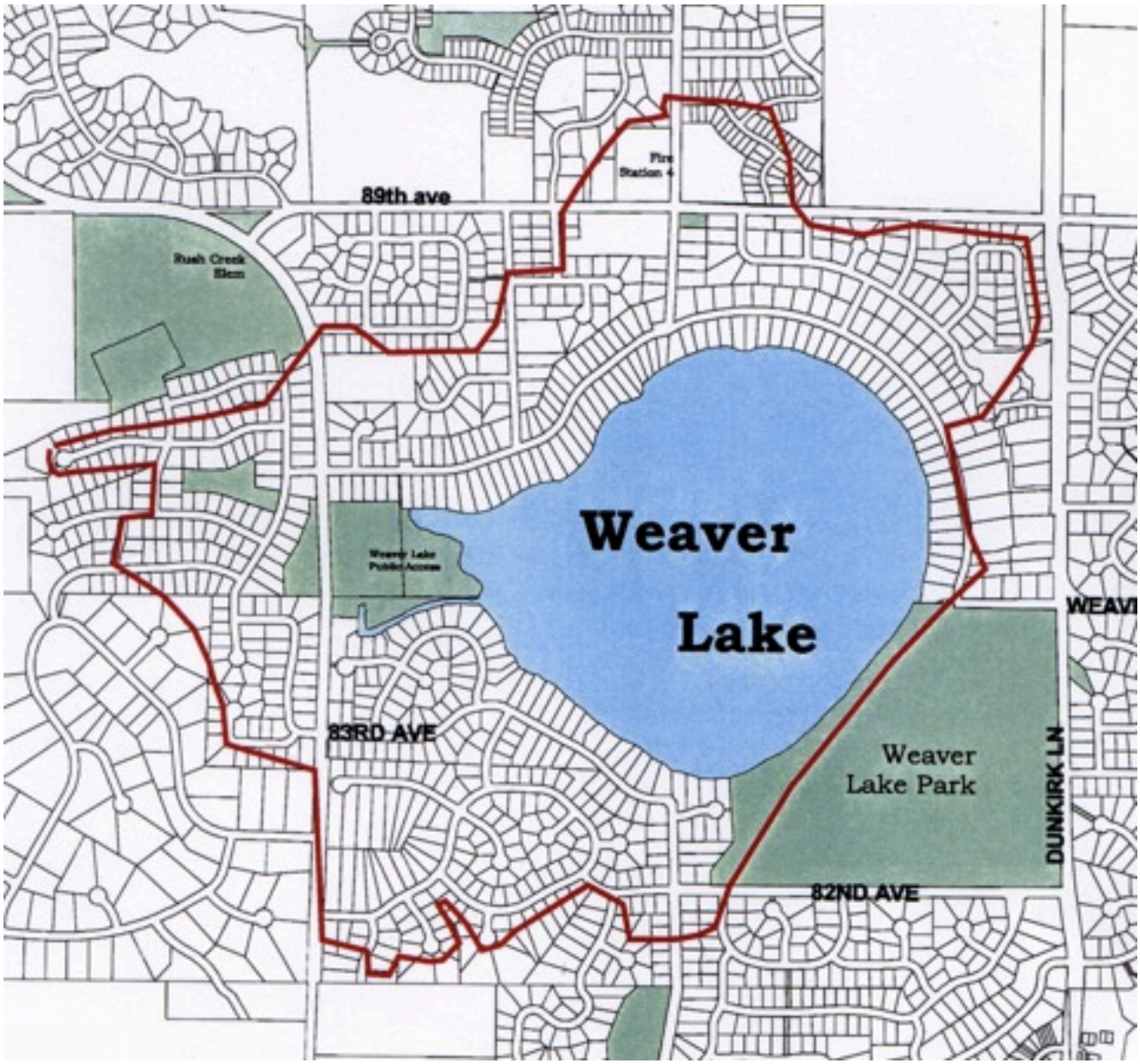
Does the sponsoring city presently have plans to incorporate the SWA information into their planning or other work? Please explain. The sub-watershed assessment will serve organize existing data, identify gaps, update watershed modeling, and will serve as the genesis for projects in the Weaver Lake sub-watershed originating from the Weaver Lake Conservation Association and/or the City of Maple Grove.

**Other information**

Is there anything else the Commission should know about the proposed SWA? No.

**Attachments**

Please attach a map of the proposed project area as well as any cost estimates solicited


89th ave
Rush Creek
Elem
Weaver
Lake
Weaver Lake
Public Access
83RD AVE
Weaver
Lake Park
DUNKIRK LN
82ND AVE

# elm creek
# Watershed Management Commission

## Subwatershed Assessment Cost Share Application

Date: *January 15, 2019*

Waterbody to be assessed: *South Fork Rush Creek SWA*

Sponsor City: *City of Corcoran*

Total cost estimate: *$58,800*

Anticipated City Contribution: *Council approved use of up to $3,000 at January 10th, 2019 meeting towards a South Fork Rush Creek SWA. City staff members would look leverage this commitment with other members in the watershed where the proposed work would take place (Maple Grove and Medina) as well as other available grant options statewide with the support of the commission.*

Anticipated Commission Contribution: *Estimated at $8,820*

Firm(s) solicited: *Preliminary costs were obtained from previous Wenck proposal (July 2018).*

**Background information**

Why is the sponsoring city interested in this SWA?

*The City of Corcoran requests that the Elm Creek Watershed Management Commission consider an application for grant funding for a subwatershed assessment for the South Fork Rush Creek which covers portions of Corcoran, Maple Grove, and Medina (see attached figure).*

*As you are aware, a similar study was recently completed for the Rush Creek Headwaters SWA located in northern and western Corcoran and Rogers. The study provided Corcoran with a road map of potential stormwater BMP's and identified critical locations and associated cost-benefit analysis.*

*Corcoran's current stormwater management program depends heavily on incorporating stormwater improvements as development occurs. The vast majority of the anticipated development area in Corcoran is either located in the South Fork Rush Creek Subwatershed or the Headwaters SWA previously mentioned.*

Other supporting documents showing water quality issues? Ex: TMDL, Stressor ID report, etc. Please provide web links

*The purpose of the South Fork Rush Creek SWA would be to identify high-loading areas and specific best management practices (BMP's) to reduce nutrient loads, bacteria, and volume to the overall watershed system.*

Any additional local knowledge of issues?

*The watershed commissioners have recognized the importance for investment in upstream rural communities such as Corcoran where staff and other resources are not as readily available. In comparison, the cost-benefit ratio for improvement impacts is generally greater prior to development occurring as compared to developed neighbors. Educational and planning assistance, such as SWA's, are essential for communities like Corcoran and go a long way*

*towards moving the bar in terms of the implementation of stormwater management strategies, project, and ultimately impairment reduction outcomes.*

**Implementation**

What implementation support will the sponsoring city provide? Ex: funding, staff time, outreach, submitting a Clean Water Fund app, etc

*As discussed in our Local Plan, Corcoran's successful implementation strategy relies heavily on its ability to identify potential water quality improvement projects and other natural resources protection goals before development occurs so that the work can be incorporated into the development planning and final construction agreements with the developers.*

*City staff are available to host open houses and coordinate additional funding source grant applications with the assistance of the commission's staff to facilitate and improve the overall success of the requests.*

Does the sponsoring city presently have plans to incorporate the SWA information into their planning or other work? Please explain.

*City staff would use the subwatershed assessment in planning for water quality improvement projects throughout the South Fork Rush Creek corridor. SE Corcoran is currently and expected to continue to experience heavy development pressure. Staff anticipates significant opportunities to implement projects in the South Fork Rush creek as a result, thus making time of the essence for the creek to undergo this assessment.*

*The previous Rush Creek Headwaters SWA primarily focused in rural Corcoran which limits develop opportunities. Staff recognize that improvement efforts in this area of the city will rely heavily on the outside assistance of conservation districts, etc. due to the inherent challenges of property rights and limited city resources.*

**Other information**

Is there anything else the Commission should know about the proposed SWA?

*City staff understands there are potential projects under discussion for improvements to the Rush Creek Headwaters system through the help of outside resources. That work is appreciated and the city would like to maintain the positive momentum towards stormwater management in the City of Corcoran.*

**Attachments**

Please attach a map of the proposed project area as well as any cost estimates solicited

# CITY OF CORCORAN

8200 CO RD 116 · Corcoran, MN 55340
763.420.2288
Email: general@ci.corcoran.mn.us Website: www.ci.corcoran.mn.us


August 3, 2018

Dear Jim Kujawa and Elm Creek Watershed Commissioners,

The City of Corcoran requests that the Elm Creek Watershed Management Commission consider an application for grant funding for a subwatershed assessment for the South Fork Rush Creek which covers portions of Corcoran, Maple Grove, and Medina.

As you are aware, a similar study was recently completed for the Rush Creek Headwaters SWA located in northern and western Corcoran and Rogers. The study provided Corcoran with a road map of potential stormwater BMP's and identified critical locations and associated cost-benefit analysis.

One reason for this request is that the Board of Water & Soil Resources (BWSR) has indicated that the funding for the Accelerated Implementation Grant program may be ending in 2019. More importantly, Corcoran's current stormwater management program depends heavily on incorporating stormwater improvements as development occurs. The vast majority of the anticipated development area in Corcoran is either located in the South Fork Rush Creek Subwatershed or the Headwaters SWA previously mentioned.

If the grant is awarded to the Commission, the Commission would be responsible for providing a grant match of 25% of the project cost. We understand that according to the Commission's subwatershed cost share policy, member cities within the subwatershed (i.e. Corcoran, Maple Grove, and Medina) would be responsible for 25% of this match.

Table 1 outlines the estimated project costs by funding source.

| Table 1 | SWA Costs |
|---|---|
| Total Estimated Cost | $58,800 |
| Grant | $47,040 |
| Required Match | $11,760 |
| - Commission Match | $8,820 |
| - City Match | $2,940 * |
| - Corcoran | $1,470 |
| - Maple Grove/Medina | $1,470 |

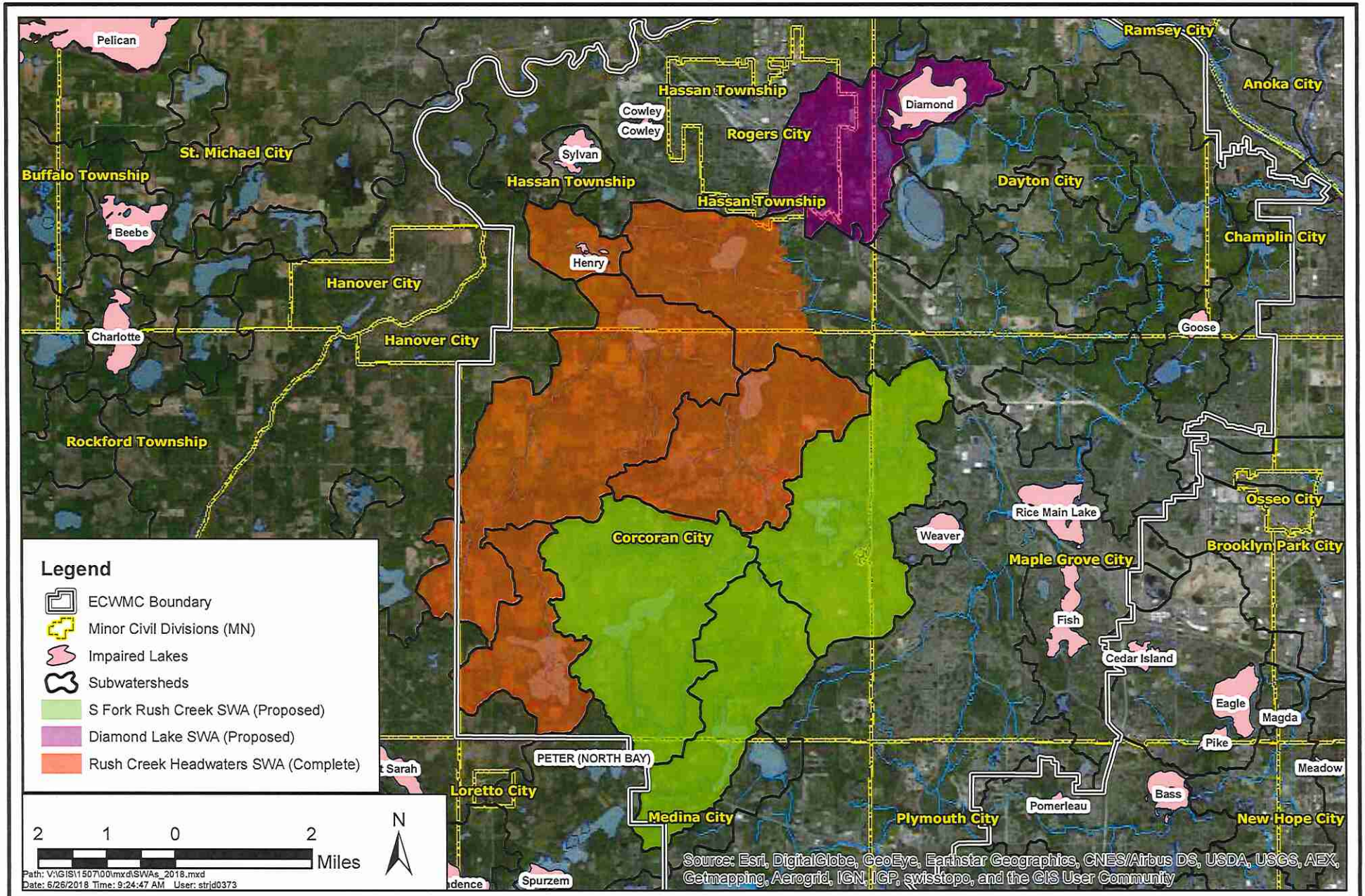
*To be negotiated between member cities

The purpose of the South Fork Rush Creek SWA would be to identify high-loading areas and specific best management practices (BMP's) to reduce nutrient loads, bacteria, and volume to the overall watershed system. Additionally, it would assist in planning stormwater improvements within the subwatershed. The Commission and member cities would have specific and applicable information that identify practices and implementation opportunities in order to meet TMDL load reductions or to protect our natural resources.

If you have any questions feel free to contact me at your convenience at 763-400-7028 or kmattson@ci.corcoran.mn.us.

Respectfully,

Kevin Mattson
Public Works Director




| | | |
|---|---|---|
| ELM CREEK WATERSHED MANAGEMENT COMMISSION | WENCK ASSOCIATES Responsive partner. Exceptional outcomes. | JUNE 2018 |
| Proposed SWA Schedule | | Figure 1 |

resourceful. naturally.
engineering and environmental consultants

BARR

# Technical Memorandum

**To:** BCWMC Technical Advisory Committee (TAC)
**From:** Barr Engineering Co.
**Subject:** Supplemental Information for BCWMC Review of Stormwater MTDs
**Date:** July 2, 2019
**Project:** 23/27-0051.45 2019 008
**c:** Laura Jester, BCWMC Administrator

## Background

At their May 29, 2019 meeting the Bassett Creek Watershed Management Commission's (BCWMC's) Technical Advisory Committee (TAC) reviewed a Technical Memorandum for stormwater Manufactured Treatment Devices (MTDs), which is enclosed as Attachment 1. At that meeting, the TAC recommended the following actions:

1. Cooperate with other watershed management organizations to send a letter to the Minnesota Pollution Control Agency (MPCA), formally requesting that the MPCA evaluate the performance of stormwater MTDs and include protocols for MTDs in the Minnesota Stormwater Manual (Option 1). The BCWMC approved this recommendation at their June 20, 2019 meeting.

2. Direct the BCWMC Engineer to provide additional information at the next TAC meeting regarding:

    a. Relying on a third-party entity's certification/verification to set a blanket total phosphorus removal (i.e., 50% for the State of Washington's Technology Assessment Protocol – Ecology (TAPE) program) (Option 3)

        *Option 3: Require that applicants provide verification or certification of stormwater MTDs from a specific, or one of a group of specific, third-party entities, such as WADOE-TAPE-GULD, NJDEP/NJCAT, or Canadian ETV program. The BCWMC will accept the verified or certified pollutant removal efficiencies as applied to the development/redevelopment site, as long as the MTDs are designed in accordance with the manufacturer's recommendations.*

    b. Relying on the data from a third-party entity's certification/verification to set phosphorus removals (Option 6)

        *Option 6: Same as option 3, but also require that applicants provide the MTD testing data used for the verification or certification, including the particulate phosphorus loading, the particulate phosphorus removal efficiency, the dissolved phosphorus*

*loading, and dissolved phosphorus removal efficiency. The BCWMC will review and accept the median pollutant removal efficiencies from the MTD testing data used for the verification or certification as applied to the respective particulate and dissolved phosphorus loading values for the development/ redevelopment site, as long as the MTDs are designed in accordance with the manufacturer's recommendations.*

c. "Integrating" the cities' and BCWMC's review processes (i.e., should the process change when MTDs are proposed?)

d. The TAPE program protocols

This memorandum provides the requested supplemental information.

## Comparable Stormwater Treatment Methods

To better understand the application of MTDs, it can be helpful to compare these devices to other conventional stormwater BMPs. For example:

- A MTD that provides filtration is often comparable to a sand filter BMP.
- A MTD that provides filtration and chemical treatment is often comparable to an iron enhanced sand filter (IESF) BMP.
- A MTD that provides filtration with a vegetative component is often comparable to a biofiltration basin (or rain garden) BMP.

While this may help understand the mechanisms for stormwater treatment, applying and modeling these MTDs is difficult due to the variance in treatment efficiency. The following development/redevelopment example is included to illustrate Option 3 and Option 6.

### Example Project:

A development/redevelopment project in the Bassett Creek watershed creates 1.5 acres of new/fully reconstructed impervious surfaces. The site consists of primarily clay soils, therefore the applicant plans to utilize flexible treatment option (FTO) #2 to provide 60% total phosphorus (TP) removal.

The assumed loading breakdown between particulate phosphorus (PP) and dissolved phosphorus (DP) varies between different stormwater quality modeling software.

**Table 1: Phosphorus loading for common water quality modeling programs**

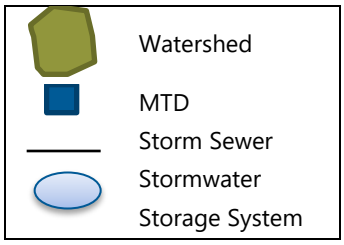
| Component | MIDS (lb/year) | MIDS (%) [1] | P8 (lb/year) | P8 (%) [2] |
|---|---|---|---|---|
| PP | 1.472 | 55 | 3.6 | 68 |
| DP | 1.205 | 45 | 1.7 | 32 |
| TP | 2.677 | | 5.3 | |

[1] Based on information developed by Saint Anthony Falls Laboratory and the City of Prior Lake during MIDS development.
[2] Based on the Nationwide Urban Runoff Program (NURP) study in 1986 by the U.S. Environmental Protection Agency (EPA).

**Table 2: Required phosphorus removal for common water quality modeling programs**

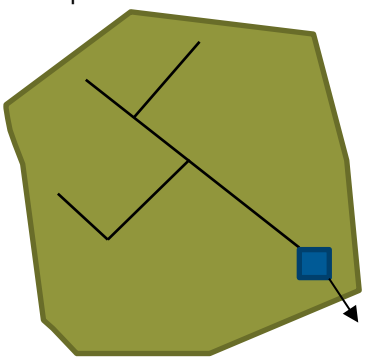
| Water Quality Modeling Program | Required TP Removal (%) | Required TP removal (lb/year) |
|---|---|---|
| MIDS | 60 | 1.61 |
| P8 | 60 | 3.18 |

The following calculations use the MIDS calculator to evaluate the example stormwater treatment systems. Based on the information shown in Table 1, utilizing P8 to model the example stormwater treatment systems will provide different results, however, we anticipate the results to follow a similar pattern for TP removal. Note: P8 may show that the single MTD for stormwater treatment the BCWMC requirements for water quality when applied using alternative 6 due to a higher percentage of particulate phosphorus within the total phosphorus loading.



## Scenario 1: Single MTD for Stormwater Treatment

MTD provides 85% PP removal; 25% DP removal; certified for 50% TP removal



### Application of Option 3 for Scenario 1 TP Removals:

$$MIDS\ TP\ Removal = (1.47\ PP\ Loading) \times (0.5) + (1.21\ DP\ Loading) \times (0.5) = 1.34 \frac{pounds}{year}$$

$$\boldsymbol{Percent\ MIDS\ TP\ Removal} = \frac{1.34\ TP\ Removal}{2.68\ TP\ Loading} = \mathbf{50}\%$$

### Application of Option 6 for Scenario 1 TP Removals:

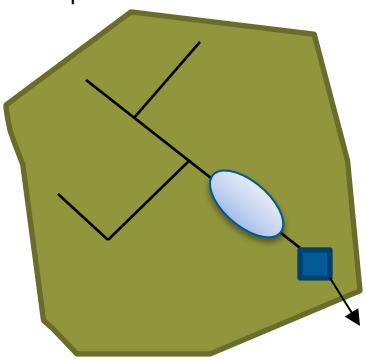
$$MIDS\ TP\ Removal = (1.47\ PP\ Loading) \times (0.85) + (1.21\ DP\ Loading) \times (0.25) = 1.55 \frac{pounds}{year}$$

$$\boldsymbol{Percent\ MIDS\ TP\ Removal} = \frac{1.55\ TP\ Removal}{2.68\ TP\ Loading} = \mathbf{58}\%$$

## Scenario 2: Stormwater Storage System Routed to MTD for Stormwater Treatment

6000 cubic-foot stormwater storage system (Design Level 2 pond) provides 82% PP removal; 8% DP removal

MTD provides 85% PP removal; 25% DP removal; certified for 50% TP removal



### Application of Option 3 for Scenario 2 TP Removals:

$$MIDS\ TP\ Removal\ (Pond) = (1.47\ PP\ Loading) \times (0.82) + (1.21\ DP\ Loading) \times (0.08) = 1.30 \frac{pounds}{year}\ (49\%)$$

$$MIDS\ TP\ Removal\ (MTD) = (0.26\ PP\ Loading) \times (0.5) + (1.11\ DP\ Loading) \times (0.5) = 0.69\ \frac{pounds}{year}\ (26\%)$$

$$\boldsymbol{Percent\ MIDS\ TP\ Removal} = \frac{1.99\ TP\ Removal}{2.68\ TP\ Loading} = \mathbf{74}\%$$

### Application of Option 6 for Scenario 2 TP Removals:

$$MIDS\ TP\ Removal\ (Pond) = (1.47\ PP\ Loading) \times (0.82) + (1.21\ DP\ Loading) \times (0.08)$$

$$= 1.30 \frac{pounds}{year}\ (49\%)$$

$$MIDS\ TP\ Removal\ (MTD) = (0.26\ PP\ Loading) \times (0.85) + (1.11\ DP\ Loading) \times (0.25)$$

$$= 0.50\ \frac{pounds}{year}\ (19\%)$$

$$\boldsymbol{Percent\ MIDS\ TP\ Removal} = \frac{1.80\ TP\ Removal}{2.68\ TP\ Loading} = \mathbf{67}\%$$

### City Review Process:

Currently, the BCWMC Engineer receives submittals for development/redevelopment projects when the design is complete (e.g., when the city approves the final plat). Sometimes the applicant sends the plans out to bid concurrent with the BCWMC Engineer's review. For proposed projects with MTDS, we recommend that the member cities consider coordinating with the BCWMC Engineer early in the applicant's design process – for example, after concept plan approval. This recommendation is based on the added complexity of reviewing MTDs and the potential for significant changes to the proposed plans/design based on the BCWMC Engineer's findings. The coordination is anticipated to include, at a minimum, a discussion with the member city and/or potential applicant regarding required submittals, and could go so far as to include a preliminary review (i.e., review of third-party data to set phosphorus removals). The early coordination/preliminary review may help minimize significant design changes or challenges regarding storm water treatment.

### Washington State Department of Ecology: Technology Assessment Protocol – Ecology

The Washington State Department of Ecology (WADOE) has a Technology Assessment Protocol – Ecology (TAPE) program used to provide certification of MTDs for removal efficiencies of total suspended solids (TSS) and TP. The TAPE program sets a protocol for testing and then reviews the laboratory and field testing data. The laboratory and field testing must be performed or contracted by the MTD manufacturer and must be performed under the established TAPE protocols. If the testing data meets the minimum certification requirements, WADOE provides a TAPE certification for the TSS and/or TP removal efficiencies. The TAPE process includes a series of use level designations (Pilot, Conditional, General) that are achieved based on submittal and review of sufficient laboratory and field data. The desired outcome is the General Use Level Designation (GULD) certification. TAPE Certifications overview is enclosed as Attachment 2. The TAPE review fees to obtain certification, provided as part of a GULD, total approximately $30,000.

## Recommendation:

We recommend the following:

1. Consider convening a work group comprised of other local watershed districts, watershed management organizations, municipalities, the MPCA, and the University of Minnesota (St. Anthony Falls Lab) to discuss MTDs. The purpose of the work group would be to share information and suggest procedures/best practices regarding MTD review and approval.
2. In the interim, implement Option 6 for BCWMC review of MTDs to require WADOE TAPE certification and apply the removal efficiencies of the MTD, based on the testing data, to the water quality treatment calculations.
3. The BCWMC should consider developing a generalized guidance for using MTDs as part of a stormwater treatment system, including required submittals, which the member cities could provide to developers. This would likely require a modification of the Requirements for Improvements and Development Proposals Document.

Attachment 1

resourceful. naturally.
engineering and environmental consultants

BARR

# Technical Memorandum

**To:** BCWMC Technical Advisory Committee (TAC)
**From:** Barr Engineering Co.
**Subject:** Stormwater Manufactured Treatment Devices
**Date:** May 22, 2019
**Project:** 23/27-0051.45 2019 008
**c:** Laura Jester, BCWMC Administrator

## 1.0 Problem Statement

The Commission has seen an increase in the use of proprietary stormwater manufactured treatment devices (MTDs) for development and redevelopment projects. There are not widely accepted levels of treatment or pollutant removal efficiencies associated with these devices and while most proprietary MTDs undergo testing and third party review, the conditions that they are tested under may not be consistent with the conditions in the Bassett Creek watershed. At their April 18, 2019 meeting, the BCWMC directed the TAC to provide direction to the Commission and BCWMC Engineer regarding review and acceptance of proprietary stormwater manufactured treatment devices (MTDs).

## 2.0 Background

The BCWMC adopted the Minnesota Pollution Control Agency's (MPCA) minimal impact design standards (MIDS) in 2015, per policies in the BCWMC's 2015 – 2025 Watershed Management Plan (Plan). MIDS includes water performance quality goals for development and redevelopment projects that create more than one acre of new and/or fully reconstructed impervious surface. The BCWMC modified their water quality performance goals in 2017 for linear projects.

The BCWMC Requirements for Improvements and Development Proposals (Requirements) document states that non-linear development and redevelopment projects that create more than one acre of new and/or fully reconstructed impervious surfaces, on sites without restrictions, must meet the BCWMC water quality performance goals. These goals (from MIDS) include onsite retention of 1.1 inches of runoff from the new and fully reconstructed impervious surfaces. Sites with restrictions, such as shallow depth to bedrock, contaminated soils, shallow groundwater, tight clay soils, existing site constraints or zoning requirements, etc., may follow the flexible treatment options (FTO) approach. The most common outcome of the FTO approach is a revised water quality performance goal of FTO #2, which requires onsite retention to the maximum extent practicable and removal of 60% of the total phosphorus load from the new and fully reconstructed impervious surfaces at the site. For the purposes of this discussion, we assumed that stormwater MTDs are designed and implemented as part of the stormwater management system to meet the FTO #2 water quality performance goal.

The BCWMC Requirements document states that to meet the BCWMC water quality performance goals or FTO, BMPs must be designed in accordance with the Minnesota Stormwater Manual or as otherwise approved by the BCWMC. The Minnesota Stormwater Manual does not provide design guidance for stormwater MTDs and does not currently provide certification or approval of stormwater MTDs. Therefore, the applicant must demonstrate, to the satisfaction of the BCWMC Engineer and the Commission, that

their proposed stormwater MTD is designed appropriately and provides pollutant removals, in conjunction with the rest of the stormwater management system, that meet the BCWMC water quality performance goals or FTO. The project review fee schedule includes a $1,000 add-on fee for projects involving review of alternative BMPs (i.e., BMPs not included in the Minnesota Stormwater Manual).

## 3.0 Types of stormwater treatment

Stormwater BMPs can provide stormwater treatment to reduce or limit downstream pollutant loading in several ways and many stormwater MTDs utilize a combination of the following practices:

- Pretreatment: upstream sedimentation, screening, and/or energy dissipation to protect and extend the long-term functionality of the downstream BMP
- Infiltration: stormwater enters the soil at the source; sediment and pollutants remain onsite.
- Sedimentation: as part of stormwater detention, sediment and non-dissolved (particulate) pollutants settle to the bottom of the water column
- Filtration: stormwater is routed through a filtering medium to trap sediment and pollutants but allow stormwater to pass through
- Biofiltration: similar to filtration, but additional pollutant removal is provided by evapotranspiration from the vegetation
- Chemical Treatment: chemicals are used to target and trap, settle, or breakdown specific pollutants.

## 4.0 Conventional Stormwater BMPs

The MPCA's Minnesota Stormwater Manual provides estimated median pollutant removal percentages for conventional stormwater BMPs as shown in Table 1.

**Table 1: Conventional stormwater BMPs and estimated median pollutant removal efficiencies**

| Practice | Treatment Type | Pollutant Removal Efficiencies (%) | | | |
|---|---|---|---|---|---|
| | | Total Suspended Solids (TSS) | Total Phosphorus (TP) | Particulate Phosphorus (PP) | Dissolved Phosphorus (DP) |
| Infiltration [1] | Infiltration | 100[2] | 100[2] | 100[2] | 100[2] |
| Biofiltration | Biofiltration | 80 | 44-71 | 80 | 0-60 |
| Sand filter | Filtration | 85 | 50 | 91 | 0 |
| Iron enhanced sand filter | Filtration and Chemical Treatment | 85 | 77 | 91 | 60 |
| Dry Swale | Pretreatment | 68 | 44-71 | 80 | 0-60 |
| Wet Swale | Pretreatment | 68 | 0 | 0 | 0 |
| Stormwater Pond [3] | Sedimentation | 84 | 50 | 91 | 0 |
| Stormwater Wetland | Sedimentation and Biofiltration | 73 | 38 | 69 | 0 |
| Permeable Pavement | Infiltration or Filtration | 74 | 45 | 82 | 0 |
| Green Roof | Pretreatment | 85 | 0 | 0 | 0 |

[1] BMPs designed to infiltrate stormwater runoff, such as infiltration basins/trenches, bioinfiltration, permeable pavement with no underdrain, tree trenches with no underdrain, and BMPs with raised underdrains.

[2] Pollutant removal is 100 percent for the volume infiltrated and 0 percent for the stormwater bypassing the BMP. For filtered stormwater, see values for the other BMPs in the table.

[3] Dry ponds do not receive credit for volume or pollutant removal.

## 5.0 Stormwater Manufactured Treatment Devices on the Market

There are many options on the market for stormwater MTDs. Two manufacturers that appear to be active in Minnesota are Bio Clean Environmental and Contech Engineered Solutions. Table 2 lists a number of manufacturers that provide MTDs for filtration, biofiltration, or chemical treatment. MTDs designed primarily for pretreatment, infiltration, or sedimentation practices are not included in the table.

**Table 2: Manufacturers and stormwater MTDs**

| Manufacturer | MTD | Treatment Type |
|---|---|---|
| AquaShield | Aqua-Filter with Perlite Media | Filtration and Chemical Treatment |
| AquaShield | BioFilter | Biofiltration |
| BaySaver Technologies | BayFilter with Enhanced Media Cartridges | Filtration and Chemical Treatment |
| Bio Clean Environmental Services | Kraken Filter | Filtration |
| Bio Clean Environmental Services | Modular Wetland Systems | Biofiltration |
| Bio Clean Environmental Services | Water Polisher | Filtration |
| Contech Engineered Solutions | Filterra | Biofiltration |
| Contech Engineered Solutions | Jellyfish Filter | Filtration |
| Contech Engineered Solutions | StormFilter with PhosphoSorb Media | Filtration and Chemical Treatment |
| Cultec | StormFilter 330 | Filtration |
| Environmental 21 | ESK Koala | Filtration |
| Environmental 21 | PuriStorm | Filtration |
| Hydro International | Bioinfiltrator | Biofiltration |
| Hydro International | Up-Flo Filter with CPZ Media | Filtration and Chemical Treatment |
| Lane Enterprises | StormKleener | Filtration |
| Oldcastle Infrastructure | BioMod | Biofiltration |
| Oldcastle Infrastructure | BioPod | Biofiltration |
| Oldcastle Infrastructure | PerkFilter with ZPC Media | Filtration and Chemical Treatment |
| Rotondo Environmental Solutions | StormGarden | Biofiltration |
| StormTree | Tree Filter | Biofiltration |
| StormTree | DrainGarden | Biofiltration |
| StormwateRx | Aquip | Filtration |
| SunTree Technologies | Nutrient Removing Filtration System (NRFS) | Filtration and Chemical Treatment |
| SunTree Technologies | NutriMax Engineered Wetlands | Biofiltration |
| SunTree Technologies | SkimBoss UpFlow Filter | Filtration and Chemical Treatment |

## 6.0 Specific Examples from BCWMC Development Reviews

As part of the review process for development and redevelopment projects in the Bassett Creek watershed, the BCWMC Engineer has reviewed stormwater MTDs for the following projects:

- Ridgedale Active Adults [Avidor] Apartments - Minnetonka (BCWMC #2018-16)
    - Contech Engineered Solutions – StormFilter with PhosphoSorb Media
    - Bio Clean Environmental Services – Kraken Filter
- Ridgedale Executive Apartments - Minnetonka (BCWMC 2018-28)

  - Bio Clean Environmental Services – Kraken Filter
- Marsh Run Apartments- Minnetonka (BCWMC #2019-06)
  - Contech Engineered Solutions – Jellyfish Filter
  - Contech Engineered Solutions – StormFilter with PhosphoSorb Media

# 7.0 Third Party Testing Overview

Manufacturers of stormwater MTDs often subject their devices to third party testing to establish or verify treatment and pollutant removal efficiency. Third-party entities provide varying levels of verification or certification (Table 3) and pollutant removal efficiencies also vary between manufacturer claims, laboratory testing, and field testing (Table 4).

**Table 3: Third party entities, programs, and approvals**

| Entity | Program | Approval | Approval Qualifications | Approval Level |
|---|---|---|---|---|
| State of Washington Department of Ecology (WADOE) | Technology Assessment Protocol – Ecology (TAPE) | Pilot Use Level Designation (PULD) | Laboratory Testing Data | N/A |
| | | Conditional Use Level Designation (CULD) | Laboratory Testing Data and Field Testing Data | N/A |
| | | General Use Level Designation (GULD) | Laboratory Testing Data and Field Testing Data following TAPE protocol | Removal of 50% TP and 80% TSS |
| New Jersey Corporation for Advanced Technology (NJCAT) | Technology Verification Program | Verification | Laboratory Testing and Assessment of Data Quality (QA/QC) | N/A |
| State of New Jersey Department of Environmental Protection (NJDEP) | Process for Approval of Use for MTDs | Certification | NJCAT Verification | Removal of 80% TSS |
| Canadian Environmental Technology Verification (ETV) Program | General Verification Protocol (GVP) and General Test Protocol | Verification and Certification | Laboratory Testing Data and Field Testing Data | N/A |
| Environmental Protection Agency (EPA) | Environmental Technology Verification (ETV) Program [1] | Verification | Unknown | Unknown |

[1] Program Dissolved in 2014

**Table 4: Devices and removal efficiencies**

| Manufacturer and MTD | Removal Efficiency (%) [1] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Manufacturer's Performance Claims [3] | | | | Laboratory Testing | | | | Field Testing | | | | WADOE TAPE Certification | | NJDEP Certification | |
| | TSS | TP | PP | DP | TSS | TP | PP | DP | TSS | TP | PP | DP | TSS | TP | TSS | TP |
| AquaShield Aqua-Filter with Perlite Media | - | - | - | - | 91 | 92 | - | - | 92 | 69 | - | - | CIP | CIP | 80 | - |
| AquaShield BioFilter | - | - | - | - | | | | | | | | | - | - | - | - |
| BaySaver Technologies BayFilter with Enhanced Media Cartridges | 80 | 65 | - | - | 81.5 | - | - | 55 | 80 | 64 | - | - | 80 | 50 | 80 | - |
| **Bio Clean Environmental Services Kraken Filter [2]** | **89** | **72** | **-** | **-** | **83 [4]** | **-** | **-** | **-** | **91** | **75** | **-** | **-** | **CIP** | **CIP** | **80** | - |
| Bio Clean Environmental Services Modular Wetland Systems | 85 | 64 | - | 67 | 91 | - | - | - | 85 | 65 | - | - | 80 | 50 | - | - |
| Bio Clean Environmental Services Water Polisher | 85 | 70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Contech Engineered Solutions Filterra | 86 | 70 | - | - | 83 | - | - | 50 [5] | 85 | 73 | | | 80 | 50 | 80 | - |
| **Contech Engineered Solutions Jellyfish Filter [2]** | **89** | **59** | **-** | **-** | **86 [6]** | **-** | **-** | **-** | **89** | **59** | **-** | **-** | **CIP** | **CIP** | **-** | - |
| **Contech Engineered Solutions StormFilter with PhosphoSorb Media [2]** | **89** | **82** | **-** | **50** | **88 [4,6]** | **-** | **-** | **50** | **85** | **75** | **-** | **-** | **80** | **50** | **80** | - |
| Cultec StormFilter 330 | 70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Environmental 21 ESK Koala | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Environmental 21 PuriStorm | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hydro International Bioinfiltrator | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hydro International Up-Flo Filter with CPZ Media | - | - | - | - | 87 [4] | - | - | - | 90 | - | - | - | - | - | 80 | - |
| Lane Enterprises StormKleener | 80 | - | - | - | 81 | - | - | - | 86 | | | | - | - | 80 | - |
| Oldcastle Infrastructure BioMod | - | - | - | - | | | | | | | | | - | - | - | - |
| Oldcastle Infrastructure BioPod | - | - | - | - | 81 | 97 | - | - | 84 | 64 | - | - | 80 | 50 | 80 | - |
| Oldcastle Infrastructure PerkFilter with ZPC Media | 80 | 60 | | | 82 [6] | - | - | - | 85 | 62 | - | - | 80 | 50 | 80 | - |
| Rotondo Environmental Solutions StormGarden | - | - | - | - | 81 | 18 | - | 5.4 | 85 | 54 | | | CIP | CIP | - | - |
| StormTree DrainGarden | - | - | - | - | 94 | 38 | - | - | - | - | - | - | - | - | - | - |
| StormTree Tree Filter | 85 | 63 | | | 94 | 38 | - | - | - | - | - | - | CIP | CIP | - | - |
| StormwateRx Aquip | - | - | - | - | - | - | - | - | 98 | 60 | - | - | CIP | CIP | - | - |
| SunTree Technologies Nutrient Removing Filtration System with Biosorption Activated Media | 95 | 95 | - | - | 67 | - | - | - | 61 | - | - | - | - | - | 50 | - |
| SunTree Technologies NutriMax Engineered Wetlands | 83 | 57 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SunTree Technologies SkimBoss UpFlow Filter | 81 | 79 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

[1] Removal efficiencies either reported as average or median values, depending on reporting. When both are provided, the median value was generally used.
[2] Manufacturers and MTDs in **bold** have been submitted to the BCWMC for review
[3] Manufacturers' performance claims obtained from brochures or websites
[4] Suspended sediment concentration (SSC) removal efficiency, not TSS removal efficiency
[5] Orthophosphate removal efficiency, not DP removal efficiency
[6] Sil-Co-Sil 106 use to simulate TSS
CIP = Certification in Progress

# 8.0 Modeling Alternatives and Assumptions

The BCWMC Requirements document states that the MIDS calculator, P8, WINSLAMM, or other BCWMC-approved approaches may be used to demonstrate compliance with BCWMC water quality goals or FTOs. The MPCA's Minnesota Stormwater Manual lists 28 models or tools that include water quality modeling, but the MIDS calculator, P8, or hand calculations are the most commonly submitted documentation for compliance with the BCWMC's water quality goals or FTOs.

## 8.1 MIDS Calculator

The MIDS calculator was developed to assist designers and regulators in determining conformance to the MIDS performance goals. The MIDS calculator is a tool used to determine stormwater runoff volume and pollutant reduction capabilities of various low impact development BMPs. The MIDS calculator estimates the stormwater runoff volume reductions for various BMPs based on the MIDS performance goal (retain 1.1 inches of runoff from impervious surfaces) and annual pollutant load reductions for total phosphorus and total suspended solids. The MIDS calculator divides the total phosphorus concentration into dissolved and particulate phosphorus at a ratio of 45% and 55%, respectively. This means that an applicant must treat or retain a portion of the dissolved phosphorus to achieve 60% total phosphorus removal.

Stormwater BMPs that are not specifically included in the MIDS calculator, such as stormwater MTDs, can be added to the calculator using the "other" BMP option. The "other" BMP option allows user-defined stormwater volume and pollutant reduction amounts to be entered. However, the MPCA's Minnesota Stormwater Manual states that the user must provide evidence and support for each of the stormwater volume and pollutant reduction amounts entered in the "other" BMP. Thus, the applicant must provide evidence and support for their pollutant reduction claims.

The issue that arises during most development and redevelopment reviews is that the removal efficiency breakdown between particulate phosphorus and dissolved phosphorus is not provided by manufacturers, laboratory testing, field testing, or third party entities; therefore, applicants do not have adequate information to use in the MIDS calculator.

## 8.2 Program for Predicting Polluting Particle Passage thru Pits, Puddles, and Ponds (P8)

The P8 model predicts the generation and transport of stormwater runoff pollutants in urban watersheds. In P8, continuous water-balance and mass-balance calculations are performed on a user-defined system consisting of watersheds, devices, particle classes, and water quality components.

The default settings in P8 include five particle classes based on the velocity at which the particle classes settle. These settling velocities range from 0.03 – 15 feet per hour for particulate particle classes. Dissolved pollutants are assumed to have a settling velocity of zero.

Water quality component concentrations are computed from the concentrations of each particle class and the particle compositions (mg/kg). Particle compositions have been calibrated so that median runoff concentrations correspond to values reported by the Nationwide Urban Runoff Program (NURP). Using the default particle size distribution (PSD) for a median site (NURP50 PSD) results in a division of the total phosphorus concentration into dissolved and particulate phosphorus at a ratio of 70% and 30%,

respectively. The applicant still must provide evidence and support for the pollutant reduction claims, however, this means that an applicant does not necessarily need to treat or retain a portion of the dissolved phosphorus in order to achieve 60% TP removal.

# 9.0 Options for BCWMC review of Stormwater MTDs

Table 5 includes options for BCWMC review of stormwater MTDs. Following each option are the BCWMC Engineer's recommendations and/or comments.

**Table 5: Options for BCWMC review of stormwater MTDs**

| No. | Option | Comments |
|---|---|---|
| 1 | Require that stormwater MTDs be certified or approved by the MPCA, and listed in the stormwater manual with recommended pollutant removal efficiencies, prior to acceptance. | Recommended (as a long term option):<br>• This option removes the burden of accepting stormwater MTDs and verifying their pollutant removal efficiencies from the BCWMC and places it on the MPCA. If the MPCA were to develop and provide statewide guidance, protocols, or certifications for MTDs, this has the potential to greatly simplify the development/redevelopment review process for BCWMC and others (e.g., other watershed organizations and cities).<br>• We recommend the BCWMC send a letter to the MPCA, formally requesting that they evaluate MTDs and include development protocols in the Minnesota Stormwater Manual.<br><br>Not Recommended (as a short term option):<br>• We understand the MPCA has solicited input regarding evaluating stormwater MTDs. However, it is unknown if the MPCA will take this on and development of protocols, guidance, or a certification program would likely be a number of years away from publication.<br>• Selecting this option now would essentially prohibit the use of stormwater MTDs in the Bassett Creek watershed to meet BCWMC water quality performance goals or FTOs, which may limit the stormwater treatment options for developers in the watershed. |
| 2 | Accept pollutant removal efficiencies of stormwater MTDs as indicated in applicant submittal, as long as the MTDs are designed in accordance with the manufacturer's recommendations and the submittal is provided with a professional engineer's (PE) stamp. | Not recommended:<br>• Pollutant removal efficiencies provided by manufacturers are based on site conditions that may not be consistent with site conditions in the Bassett Creek watershed; namely a different proportion of particulate phosphorus and dissolved phosphorus loading.<br>• This difference in site conditions can lead to pollutant removal efficiencies in the Bassett Creek watershed that are lower than those reported by the manufacturers and third party testing entities.<br>• Most applicants are unaware of the discrepancy and may not understand or be concerned with the effect on the watershed. |
| 3 | Require that applicants provide verification or certification of stormwater MTDs from a specific, or one of a group of specific, third-party entities, such as WADOE-TAPE-GULD, NJDEP/NJCAT, or Canadian ETV program. The BCWMC will accept the verified or certified pollutant removal efficiencies as applied to the development/redevelopment site, as long as the MTDs are designed in accordance with the manufacturer's recommendations. | Not recommended:<br>• Similar to option 2, verified or certified pollutant removal efficiencies provided by third-party entities are still based on site conditions that may not be consistent with site conditions in the Bassett Creek watershed; namely a different proportion of particulate phosphorus and dissolved phosphorus loading.<br>• This difference in site conditions can lead to pollutant removal efficiencies in the Bassett Creek watershed that are lower than those reported by the manufacturers and third party testing entities.<br>• In addition, most applicants are unaware of the discrepancy and may not understand or be concerned with the effect on the watershed. |
| 4 | Same as options 2 or 3, but also require monitoring of all proprietary stormwater MTDs. | Not recommended:<br>• Same as option 2 or 3, and member cities have expressed that monitoring places an undesirable burden on them to develop and implement a monitoring program that is accurate, fair, and reproducible.<br>• This would also require staffing and funding resources, which could be more effectively spent in other ways. We would prefer an overall program led by the MPCA, based on monitoring, as a long-term solution, see option 1.<br>• Alternatively, a group of watershed districts and watershed management organizations could implement a monitoring program. |
| 5 | Same as option 3, but also require a breakdown of particulate and dissolved phosphorus removal efficiencies. The BCWMC will accept the verified or certified pollutant removal efficiencies for particulate and dissolved phosphorus as applied to the development/ redevelopment site, as long as the MTDs are designed in accordance with the manufacturer's recommendations. | Recommended (but may not be feasible):<br>• The verified or certified pollutant removal efficiencies with a breakdown of particulate and dissolved phosphorus provided by third-party entities allows for an accurate application of pollutant removal efficiencies for the site conditions in the Bassett Creek watershed.<br>• This may be infeasible because third party entities currently do not provide verification or certification to this level. |
| 6 | Same as option 3, but also require that applicants provide the MTD testing data used for the verification or certification, including the particulate phosphorus loading, the particulate phosphorus removal efficiency, the dissolved phosphorus loading, and dissolved phosphorus removal efficiency. The BCWMC will review and accept the median pollutant removal efficiencies from the MTD testing data used for the verification or certification as applied to the respective particulate and dissolved phosphorus loading values for the development/ redevelopment site, as long as the MTDs are designed in accordance with the manufacturer's recommendations. | Recommended (as alternative to option 5):<br>• This requires the MTD to be verified or certified by a third party entity, but allows the BCWMC to evaluate the MTD testing data, including the respective particulate and dissolved phosphorus loading and removal efficiencies to ensure that the pollutant removal efficiencies are accurately applied for the site conditions in the Bassett Creek watershed. |

## Attachments:

Brochures for select stormwater MTDs previously reviewed by BCWMC

**Brochures for select stormwater MTDs previously reviewed by BCWMC**

**Bio Clean Environmental Services – Kraken Filter**

Bio Clean

A Forterra Company

# Kraken™ Filter

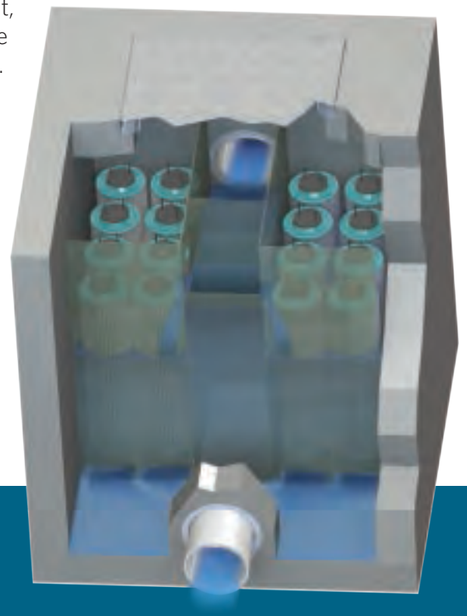
## A Stormwater Filtration Solution

# OVERVIEW

The Bio Clean Kraken™ Filter is a state-of-the-art system utilizing advanced membrane filtration, ensuring a high level of removal for not only TSS, but also metals, trash, nutrients, and hydrocarbons. The Kraken™ membrane filter cartridge provides high flow rates and over 170 sq. ft. of surface area. This much surface area allows it to operate at a loading rate of only 0.05 gpm/sq. ft. to ensure maximum performance and minimum maintenance. The Kraken™ Filter's low loading rate successfully overcomes high maintenance requirements and frequent clogging issues often found in other filter systems advertising high loading rates.

Each membrane filter cartridge is lightweight, washable, reusable, and more sustainable than typical granular-filled media cartridges. By eliminating the need to purchase new granular media and dispose of spent media, the Kraken™ Filter provides lower life cycle and maintenance costs.

Each filter cartridge is equipped with easy-to-grab handles and is pressure fitted, allowing it to be quickly removed, cleaned, and reattached without the use of tools.





## PERFORMANCE

**85-89%** REMOVAL OF TOTAL SUSPENDED SOLIDS (TSS)

**72%** REMOVAL OF PHOSPHORUS

## ADVANTAGES

- NO GRANULAR MEDIA TO REPLACE
- HIGH FLOW RATES AND MAXIMUM SURFACE AREA
- LOADING RATE OF 0.05 GPM / SQ. FT. FOR MINIMAL MAINTENANCE
- MEMBRANE FILTER CARTRIDGES CAN BE EASILY REMOVED AND CLEANED BY HAND
- BUILT-IN PRETREATMENT CHAMBER CAPTURES TRASH, SEDIMENTS, DEBRIS, AND HYDROCARBONS
- FILTER CARTRIDGE DRIES OUT BETWEEN STORM EVENTS TO PREVENT BIOFILM GROWTH WHICH CAN CAUSE CLOGGING AND OTHER PERFORMANCE ISSUES
- NJDEP ONLINE INSTALLATION APPROVED

# APPROVALS

The Kraken™ Filter has received NJCAT Verification for 89% TSS removal and NJDEP Certification at an 80% TSS removal rate. In addition, the Kraken™ Filter NJCAT Verification is also for online installations.

NJCAT Verified

NJDEP Certified

# TAPE PERFORMANCE

The Kraken™ Filter completed its TAPE field testing in the spring of 2016. The Kraken™ has met the performance benchmarks for basic treatment (TSS) and phosphorus. The system features washable and reusable cartridges to reduce overall maintenance costs.

| POLLUTANT | AVERAGE INFLUENT CONCENTRATION (mg/L) | AVERAGE EFFLUENT CONCENTRATION (mg/L) | REMOVAL EFFICIENCY |
|---|---|---|---|
| Total Suspended Solids | 73.1 | 7.0 | 85% |
| Total Phosphorus | 0.151 | 0.034 | 72% |
| Suspended Solids Conc. | 151.3 | 6.9 | 89% |
| Nitrogen (TKN) | 1.5 | 1.0 | 31% |
| Fecal Coliform | 692 | 355 | 60% |
| Motor Oil | 4.6 | 0.7 | 81% |
| Total Zinc | 0.158 | 0.054 | 54.3% |
| Total Copper | 0.042 | 0.017 | 52% |
| Diesel Range Organics | 1.2 | 0.4 | 65% |

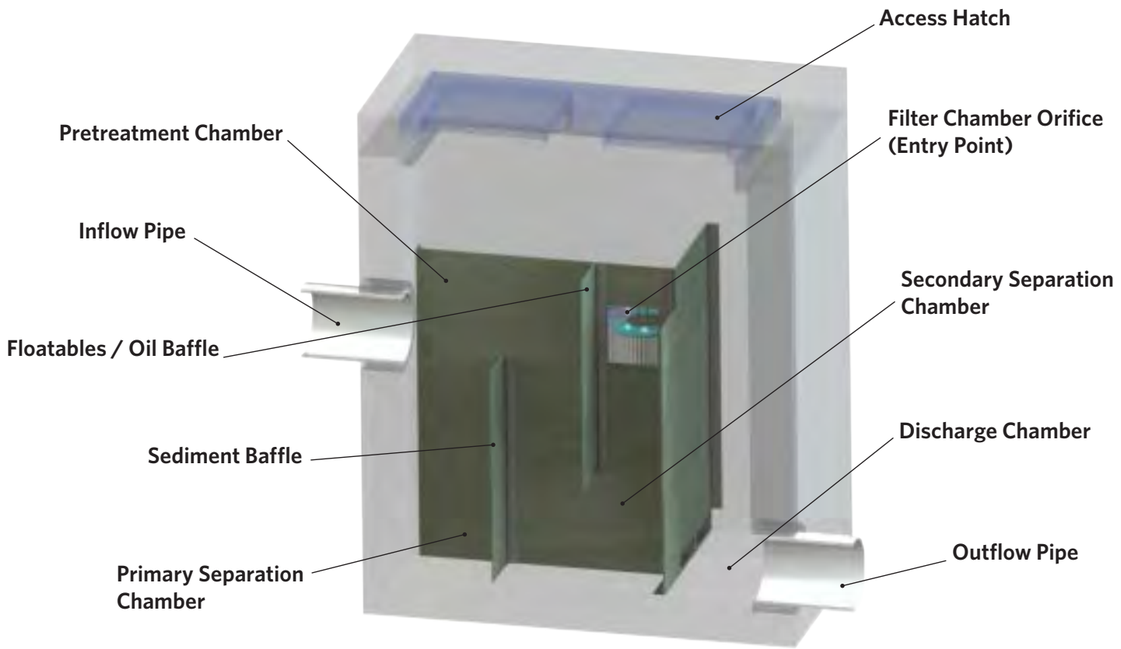
# SPECIFICATIONS

Based on Max Cartridge Capacity

| MODEL # | STRUCTURE SIZE (ft. x ft.) | CARTRIDGE CAPACITY | MAX MEDIA SURFACE AREA (sq. ft.) | TREATMENT FLOW CAPACITY (cfs) |
|---|---|---|---|---|
| KF-4-4 | 4′ x 4′ | 9 to 16 | 2720 | 0.30 |
| KF-4-6 | 4′ x 6′ | 17 to 24 | 4080 | 0.46 |
| KF-4-8 | 4′ x 8′ | 25 to 32 | 5440 | 0.61 |
| KF-8-8 | 8′ x 8′ | 33 to 48 | 8160 | 0.91 |
| KF-8-10 | 8′ x 10′ | 49 to 65 | 11220 | 1.25 |
| KF-8-12 | 8′ x 12′ | 66 to 78 | 13260 | 1.48 |
| KF-8-14 | 8′ x 14′ | 79 to 96 | 16320 | 1.82 |
| KF-8-16 | 8′ x 16′ | 97 to 114 | 19380 | 2.16 |
| KF-10-16 | 10′ x 16′ | 115 to 152 | 25840 | 2.88 |

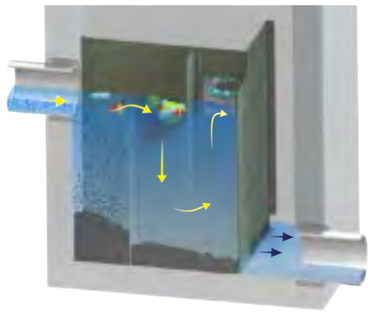
See design manual for list of all models. Many other models and structure sizes are available for higher flows. Please contact us for more details.

# OPERATION



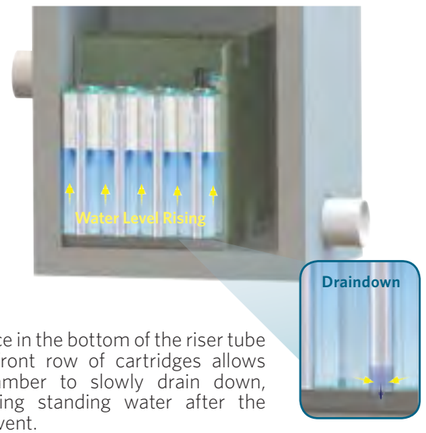

## 1 PRETREATMENT

To reduce loading on the membrane cartridge, runoff is initially passed through the pretreatment chamber to capture trash, hydrcarbons, and sediments. Once runoff is pretreated, it is directed to the filter chambers for primary treatment.



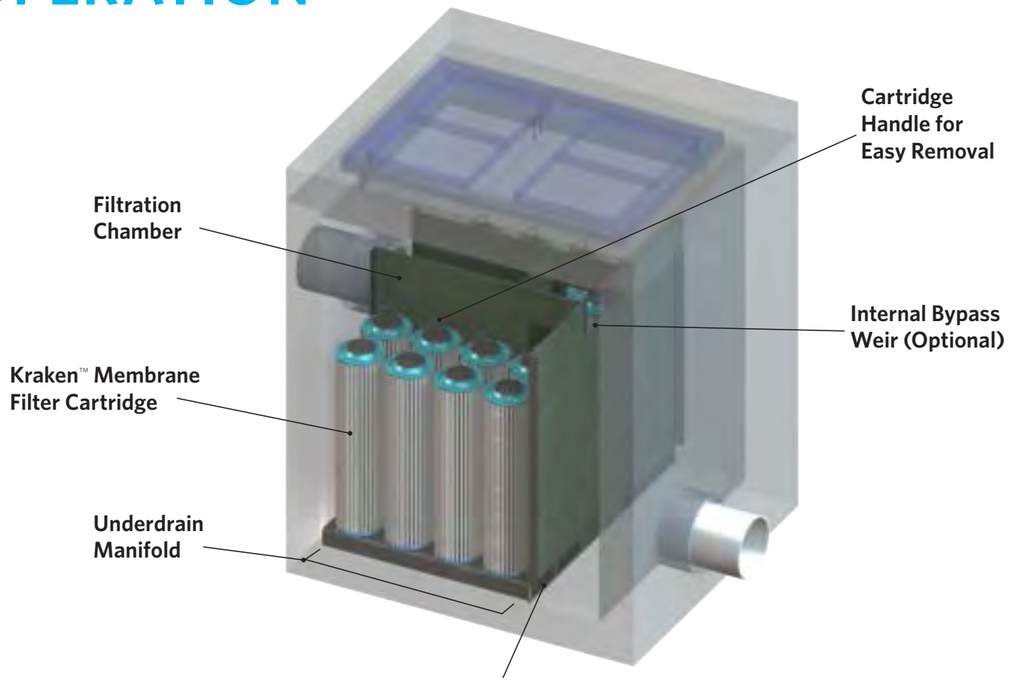
## 2 MEMBRANE FILTRATION FILL-UP

During the fill-up process, a riser tube prevents flow through the membrane cartridge until the water level nears the top of the cartridge. This ensures loading is evenly distributed over the vertical height of the cartridge maximizing efficiency.



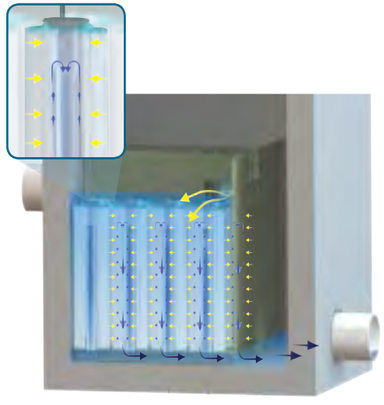

An orifice in the bottom of the riser tube in the front row of cartridges allows the chamber to slowly drain down, eliminating standing water after the storm event.

# OPERATION



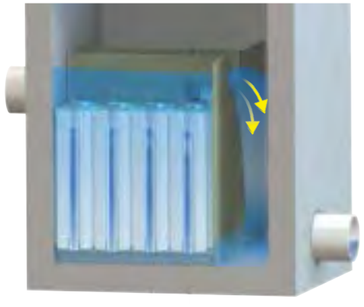

## 3 MEMBRANE FILTRATION PEAK CAPACITY

As the water level reaches the top of the membrane cartridges, flow through will begin. The riser tube creates an upward flow path within each cartridge to increase performance. Treated water then passes down the riser tube and collects in the underdrain manifold and flows to the discharge chamber.



## 4 BYPASS

An optional internal bypass is available with most system configurations. When flows exceed the treatment capacity of the system, the water level rises and goes into bypass. High flows are conveyed from the pretreatment chamber directly to the discharge chamber to prevent scouring of fine sediments captured within the filtration chamber.



# INSTALLATION

Small footprint reduces installation and shipping costs.

No deep sump chamber (as found with tentacle-type systems) and reduces excavation costs.

# MAINTENANCE

Lowest lifecycle cost of any media filter with fast and simple maintenance procedures.


Easily cleaned with a standard vacuum truck, and reusable cartridge can be cleaned with a standard garden hose.

Bio Clean
A Forterra Company

5796 Armada Drive Suite 250
Carlsbad, CA 92008
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

011019R1A

# Brochures for select stormwater MTDs previously reviewed by BCWMC

**Contech Engineered Solutions – Jellyfish Filter**

CONTECH®
ENGINEERED SOLUTIONS

# Jellyfish® Filter
## Stormwater Treatment

# The experts you need to solve your stormwater challenges

**Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.**

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

## Your Contech Team

**STORMWATER CONSULTANT**

*It's my job to recommend the best solution to meet permitting requirements.*

**STORMWATER DESIGN ENGINEER**

*I work with consultants to design the best approved solution to meet your project's needs.*

**REGULATORY MANAGER**

*I understand the local stormwater regulations and what solutions will be approved.*

**SALES ENGINEER**

*I make sure our solutions meet the needs of the contractor during construction.*

**Contech is your partner in stormwater management solutions**

# Setting new standards in Stormwater Treatment – Jellyfish® Filter

*The Jellyfish Filter has been tested in the field and laboratory, and has received approval from numerous stormwater regulatory agencies.*

The Jellyfish Filter is a stormwater quality treatment technology featuring high flow pretreatment and membrane filtration in a compact stand-alone system. Jellyfish removes floatables, trash, oil, debris, TSS, fine silt-sized particles, and a high percentage of particulate-bound pollutants; including phosphorus, nitrogen, metals and hydrocarbons. The high surface area membrane cartridges, combined with up-flow hydraulics, frequent, passive backwashing, and rinseable/ reusable cartridges ensure long-lasting performance.

Jellyfish® Filter

# How the Jellyfish® Filter Treats Stormwater

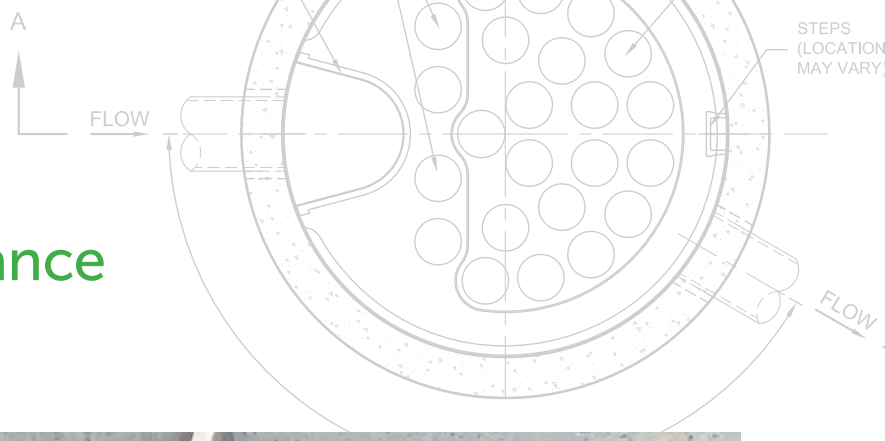
## Tested in the field and laboratory ...

- Stormwater enters the Jellyfish through the inlet pipe and traps floating pollutants behind the maintenance access wall and below the cartridge deck.
- Water is conveyed below the cartridge deck where a separation skirt around the cartridges isolates oil, trash and debris outside the filtration zone.
- Water is directed to the filtration zone and up through the top of the cartridge where it exits via the outlet pipe.
- The membrane filters provide a very large surface area to effectively remove fine sand and silt-sized particles, and a high percentage of particulate-bound pollutants such as nitrogen, phosphorus, metals, and hydrocarbons while ensuring long-lasting treatment.
- As influent flow subsides, the water in the backwash pool flows back into the lower chamber. This passive backwash extends cartridge life.
- The draindown cartridge(s) located outside the backwash pool enables water levels to balance.

*Jellyfish® Filter Standard Configuration*

*Learn More:*
*www.ContechES.com/jellyfish*

**Pretreat bioretention or infiltration with Jellyfish to extend service life.**




# Jellyfish® Filter Performance Testing Results

## APPLICATION TIPS

- The Peak Diversion Jellyfish provides treatment and high-flow bypass in one structure, eliminating the need for a separate bypass structure.
- LID and GI are complemented by filtration solutions, as they help keep sites free from fine sediments that can impede performance, remove unsightly trash, and provide a single point of maintenance.
- Selecting a filter with a long maintenance cycle and low maintenance cost will result in healthy waterways and happy property owners.

*The pleated tentacles of the Jellyfish® Filter provide a large surface area for pollutant removal.*

| POLLUTANT OF CONCERN | % REMOVAL |
|---|---|
| Total Trash | 99% |
| Total Suspended Solids (TSS) | 89% |
| Total Phosphorus (TP) | 59% |
| Total Nitrogen (TN) | 51% |
| Total Copper (TCu) | > 50% |
| Total Zinc (TZn) | > 50% |

*Sources:*
*TARP II Field Study – 2012 JF 4-2-1 Configuration*
*MRDC Floatables Testing – 2008 JF6-6-1 Configuration*

# Jellyfish® Filter Features and Benefits

| FEATURE | BENEFITS |
|---|---|
| High surface area membrane filtration | Low flux rate promotes cake filtration and slows membrane occlusion |
| High design treatment flow rate per cartridge (up to 80 gpm (5 L/s)) | Compact system with a small footprint, lower construction cost |
| Low driving head (typically 18 inches or less (457 mm)) | Design flexibility, lower construction cost |
| Lightweight cartridges with passive backwash | Easy maintenance and low life-cycle cost |

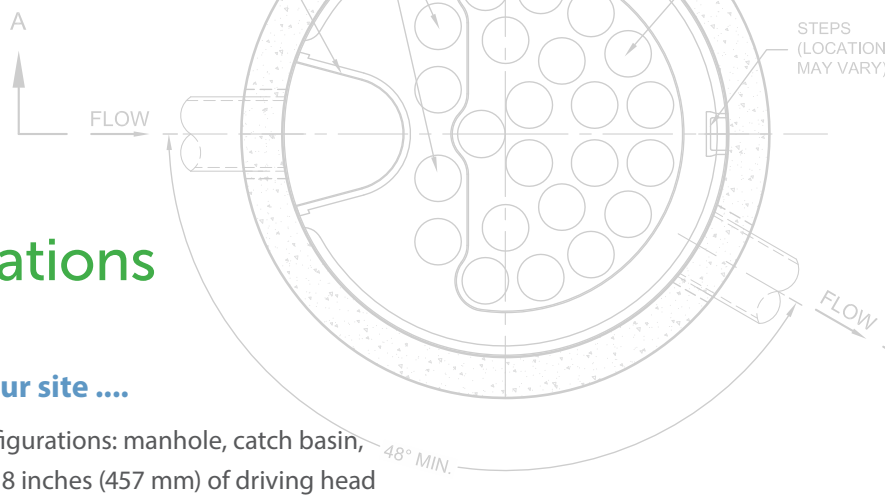
**The Jellyfish Filter can be configured in a manhole, catch basin, or vault.**

# Select Jellyfish® Filter Certifications and Verifications

The Jellyfish Filter has been reviewed by numerous state and federal programs, including:

- New Jersey Corporation for Advanced Technology (NJCAT) – Field Performance per TARP Tier II Protocol
- Washington State Department of Ecology (TAPE – CULD)
- Maryland Department of the Environment (MD DOE)
- Canada ISO 14034 Environmental Management - Environmental Technology Verification (ETV)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)

## Field tested and performance verified

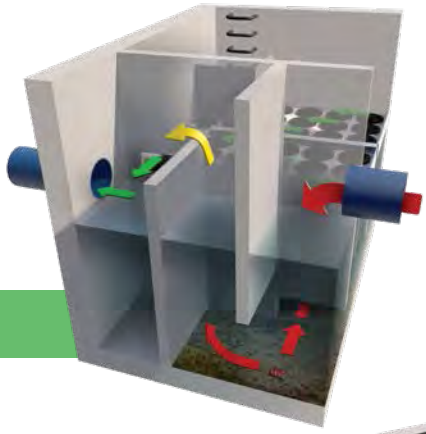



# Jellyfish® Filter Configurations

### Multiple system configurations to optimize your site ....

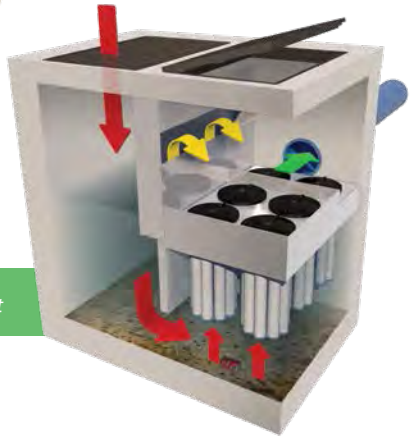
The Jellyfish Filter can be manufactured in a variety of configurations: manhole, catch basin, vault, fiberglass tank, or custom configurations. Typically, 18 inches (457 mm) of driving head is designed into the system. For low drop sites, the designed driving head can be less.

*Manhole*



*Vault*

*Curb Inlet*



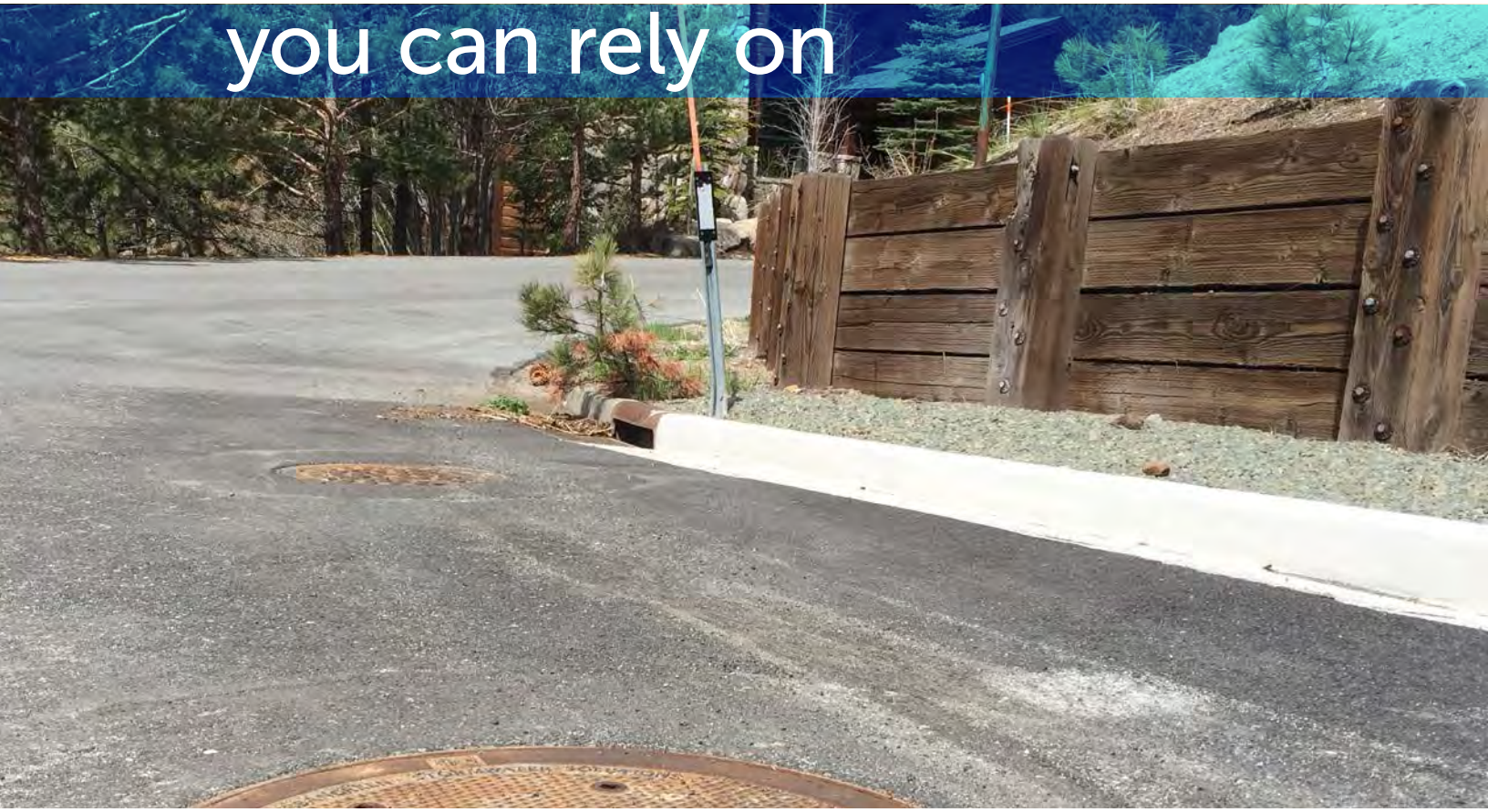
*Grated Inlet*

# Jellyfish® Filter Maintenance

- Jellyfish Filter cartridges are light weight and reusable
- Maintenance of the filter cartridges is performed by removing, rinsing and reusing the cartridge tentacles.
- Vacuum extraction of captured pollutants in the sump is recommended at the same time.
- Full cartridge replacement intervals differ by site due to varying pollutant loading and type, and maintenance frequency. Replacement is anticipated every 2-5 years.
- Contech® has created a network of Certified Maintenance Providers to provide maintenance on stormwater BMP's.

*The Jellyfish® Filter tentacle is light and easy to clean.*

# A partner you can rely on



STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

## THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

## TAKE THE NEXT STEP

For more information: www.ContechES.com



CONTECH® ENGINEERED SOLUTIONS

Get social with us:

800-338-1122 | www.ContechES.com

# Brochures for select stormwater MTDs previously reviewed by BCWMC

## Contech Engineered Solutions – StormFilter with Phosphosorb Media

CONTECH®
ENGINEERED SOLUTIONS

# The Stormwater Management StormFilter®

# The experts you need to solve your stormwater challenges

**Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.**

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

## Your Contech Team

**STORMWATER CONSULTANT**

*It's my job to recommend the best solution to meet permitting requirements.*

**STORMWATER DESIGN ENGINEER**

*I work with consultants to design the best approved solution to meet your project's needs.*

**REGULATORY MANAGER**

*I understand the local stormwater regulations and what solutions will be approved.*

**SALES ENGINEER**

*I make sure our solutions meet the needs of the contractor during construction.*

**Contech is your partner in stormwater management solutions**

# Flexible Stormwater Filtration Technology

*An 8' x 24' Stormwater Management StormFilter with 60 cartridges is used to remove pollutants from runoff at Surfers Point Beach in Ventura, California.*

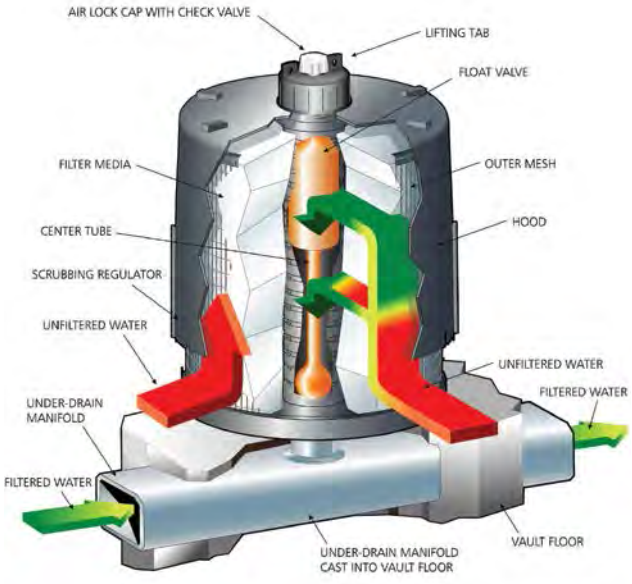
As stormwater quality regulations become more stringent, engineers need a filtration device that can tackle the most challenging pollutants and provide the flexibility to meet the needs of a variety of sites.

The Stormwater Management StormFilter® is an underground stormwater treatment device comprised of one or more structures that house rechargeable, media-filled cartridges that trap particulates and adsorb pollutants from stormwater runoff such as total suspended solids, hydrocarbons, nutrients, metals, and other common pollutants. With media options to target multiple or specific pollutants, multiple system configurations, and field and laboratory performance verified by the most stringent stormwater technology evaluation organizations; the StormFilter provides engineers the most flexible and most reliable manufactured treatment technology available.

The Stormwater Management StormFilter®

# How the StormFilter Treats Stormwater

During a storm, runoff passes through the filtration media and starts filling the cartridge center tube. The air inside the hood is purged through a one-way check valve as the water rises. When water reaches the top of the float, buoyant forces pull the float free and allow filtered water to exit the cartridge. A siphon is established within each cartridge that draws water uniformly across the full height of the media bed ensuring even distribution of pollutants and prolonged media longevity. After the storm, the water level in the structure starts falling. A hanging water column remains under the cartridge hood until the water level reaches the scrubbing regulators at the bottom of the hood. Air then rushes through the regulators, breaking the siphon and creating air bubbles that agitate the surface of the filter media, causing accumulated sediment to settle on the treatment bay floor. This unique surface-cleaning mechanism prevents surface blinding and further extends cartridge life.




*Learn More:*
*www.ContechES.com/stormfilter*

## The StormFilter has a 20+ year history of successful installations and over 200,000 cartridges installed worldwide.

| FEATURE | BENEFIT |
|---|---|
| Siphon actuated, high surface area media cartridges | Stormwater is drawn evenly through the filter media providing efficient, effective stormwater treatment |
| Multiple cartridge heights | Flexibility to meet site-specific hydraulic needs and reduce system size and costs |
| Multiple media options | Ability to target specific pollutants of concern including TSS, phosphorus, heavy metals, and hydrocarbons |
| Internal peak bypass and multiple configurations | Design flexibility to meet your unique site requirements |
| Maintenance intervals of one to five years | Fewer maintenance events and reduced long-term ownership costs |
| Performance verified by both the WA DOE and NJ DEP | Superior pollutant capture with confidence |
| Arrives to the jobsite fully assembled | Factory build ensures quality and a simple, fast installation onsite |

**Design flexibility to meet your unique site requirements**

# StormFilter Media Options

## Flexibility to target site-specific pollutants ...

- PhosphoSorb® is a lightweight media built from a Perlite-base that removes total phosphorus (TP) by adsorbing dissolved-P and filtering particulate-P simultaneously.
- CSF® Leaf Media is created from deciduous leaves processed into granular, organic media. CSF is most effective for removing soluble metals, TSS, oil and grease, and buffering acid rain.
- Perlite is naturally occurring puffed volcanic ash. Effective for removing TSS, oil, and grease.
- Zeolite is a naturally occurring mineral used to remove soluble metals, ammonium, and some organics.
- GAC (Granular Activated Carbon) has a micro-porous structure with an extensive surface area to provide high levels of adsorption. It is primarily used to remove oil and grease and organics such as PAHs and phthalates.

| | PHOSPHOSORB | CSF | ZPG | PERLITE |
|---|---|---|---|---|
| Sediments | ✓ | ✓ | ✓ | ✓ |
| Oil and Grease | ✓ | ✓ | ✓ | ✓ |
| Soluble Metals | ✓ | ✓ | ✓ | |
| Organics | | ✓ | ✓ | |
| Nutrients | ✓ | ✓ | ✓ | |
| Total Phosphorus | ✓ | | | |

*Note: Indicated media are most effective for associated pollutant type. Other media may treat pollutants, but to a lesser degree.*

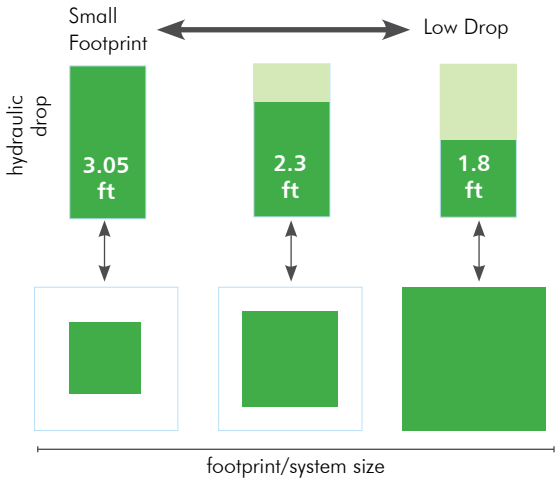
*ZPG™ media is a proprietary blend of zeolite, perlite, and GAC, and is also available.*

# Cartridge Options

## Flexibility to reduce size and costs ...

Every site is different, and one size does not fit all. Multiple cartridge heights give you design flexibility to design the StormFilter specifically for your site and reduce the cost of the system for the owner.

- 27″ cartridge – Capitalizing on sites with at least 3.05 feet of available driving head, media surface area is maximized to allow the greatest treatment rate per cartridge; best for sites with footprint constraints
- 18″ cartridge - The original StormFilter cartridge size provides a middle ground and operates with 2.3 feet of driving head
- Low Drop – Provides filtration treatment with only 1.8 feet of headloss; best for sites with limited by hydraulic constraints




| CARTRIDGE FLOW RATES | | | |
|---|---|---|---|
| Cartridge Height | 2 gpm/ft² | 1.67* gpm/ft² | 1 gpm/ft² |
| 12″ LD | 10 gpm | 8.35 gpm | 5 gpm |
| 18″ | 15 gpm | 12.53 gpm | 7.5 gpm |
| 27″ | 22.5 gpm | 18.79 gpm | 11.25 gpm |

** For use with Phosphosorb media as per WA DOE GULD approval.*

| MASS LOAD CAPACITY | | | |
|---|---|---|---|
| Cartridge Height | 2 gpm/ft² | 1.67* gpm/ft² | 1 gpm/ft² |
| 12″ LD | 15 lbs | 18 lbs | 24 lbs |
| 18″ | 22.5 lbs | 27 lbs | 36 lbs |
| 27″ | 33.8 lbs | 40.45 lbs | 54 lbs |

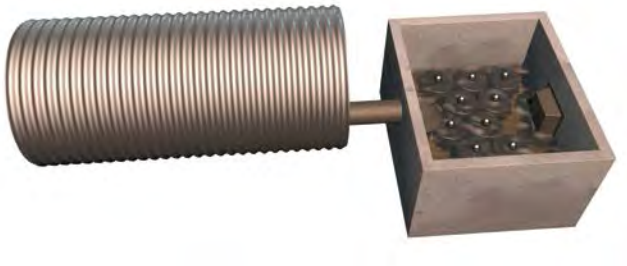
** For use with Phosphosorb media as per WA DOE GULD approval.*

# Configurations

### Flexibility to accommodate flows, project footprints, and hydraulics ...

The structures that house the filter cartridges can be constructed in a variety of ways to accommodate a wide range of flows, project footprints, and variable hydraulic conditions. Standard configurations include catch basin,  manhole, vault, curb inlet, and linear grate.

- **The Peak Diversion StomFilter** provides treatment and high flow bypass in one precast vault, eliminating the need for an external bypass or junction structures.
- **The Volume StormFilter** is designed to meet volume-based treatment regulations and can be combined with upstream storage to treat and drawdown the water quality volume within the required drain down time.
- **The Cast-in-Place StormFilter** structures allow the highest degree of flexibility and are available for installations within buildings or other areas where precast structures cannot be accommodated.  On-site Contractor assistance is provided to ensure the finished product meets Contech's standards for fit and function.



# Select StormFilter Approvals

The StormFilter has been verified by some of the most stringent stormwater technology evaluation organizations in North America, including:

- Washington State Department of Ecology (TAPE) GULD – Basic, Phosphorus
- New Jersey Department of Environmental Protection (NJ DEP)
- North Carolina Department of Environmental Quality (NC DEQ)
- Maryland Department of the Environment (MD DOE)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)
- Maine Department of Environmental Protection (ME DEP)
- St. Louis Metropolitan Sewer District

**Verified by some of the most stringent organizations**

# StormFilter Maintenance

## APPLICATION TIPS

- Clogging is a major factor in the failure of filter systems. Look for systems that offer mechanisms that prevent clogging, extend service life, and reduce life-cycle cost.
- A compact design reduces construction, installation, and life-cycle cost, so look for systems that offer the most flexibility in design and construction.
- All media filters will eventually need to be replaced. Look for filters that have lightweight cartridges and provide easy access for maintenance.

*An easy-to-access treatment system can make all the difference in maintenance expenses.*

Every manufactured filtration device will eventually need routine maintenance. The question is how often and how much it will cost. Proper evaluation of long-term maintenance costs should be a consideration when selecting a manufactured treatment device. The StormFilter has been optimized to reduce long-term maintenance costs with proven, repeatable performance in the laboratory and in the field.

- **Reduce Life Cycle Costs** - StormFilter has been designed for predictable maintenance intervals ranging from 1 to 5 years, resulting in fewer maintenance events and reduced life-cycle costs compared to other filtration devices.
- **Easy to maintain** - All StormFilter structures provide access for inspection, media replacement, and washing of the structure. Visual indicators for maintenance are observable from the surface.
- **Cartridge replacement program** provides refurbished cartridges that are shipped to your site ready to install. Contech arranges for empty cartridges to be picked up and shipped back, reducing cartridge costs and environmental impact.
- **Maintenance support** - Contech has created a network of Certified Maintenance Providers to provide StormFilter maintenance at the lowest possible cost.

# A partner you can rely on

STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

## THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

## TAKE THE NEXT STEP

For more information: www.ContechES.com



CONTECH® ENGINEERED SOLUTIONS

Get social with us:

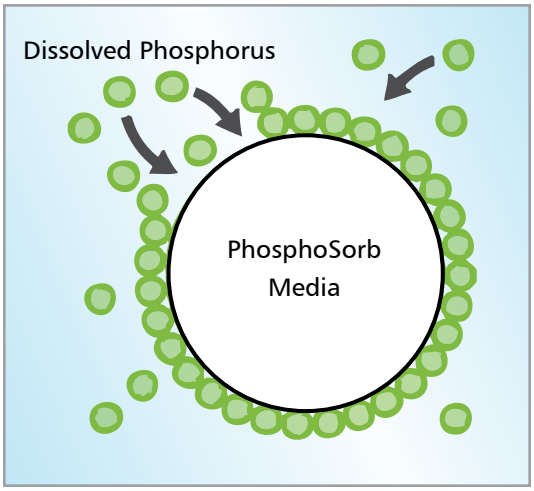
800-338-1122 | www.ContechES.com

CONTECH ENGINEERED SOLUTIONS

# Introducing PhosphoSorb® Media

## Effectively target TSS and Total Phosphorus in one lightweight media

Manufactured in an environmentally-friendly manner, PhosphoSorb is a lightweight media built from a Perlite base. This innovative, engineered filtration media removes total phosphorus (TP) from stormwater runoff by absorbing dissolved-P and filtering particulate-P simultaneously. Field tests of the PhosphoSorb media showed a load reduction of 89% TSS and 82% total phosphorus with an average influent concentration of 380 mg/L and 0.33 mg/L respectively.



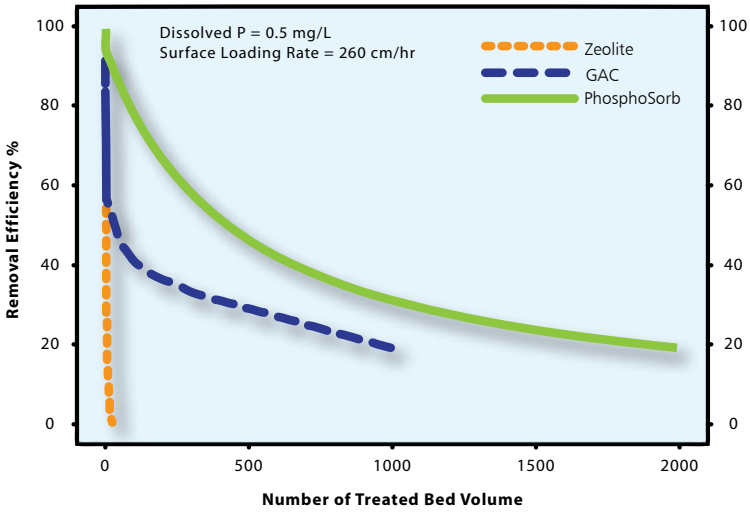

### Physical Characteristics of PhosphoSorb:

| Nominal Size (mm) | Bulk Density Lbs/ft³ | Effective Bed Porosity (%) | Specific Surface Area (m²/g) |
|---|---|---|---|
| 1.4-6.3 | 20-25 | 65%-80% | 20-30 |

State of Washington TAPE GULD Basic Phosphorus

### Key Benefits:

- Removes both TSS and TP from stormwater runoff
- Removal of both soluble and total Phosphorus can exceed 50%
- Low impact product life cycle – no production by-products
- Lightweight media – easy to handle, ship and deploy
- Flexible deployment – for use in the Stormwater Management StormFilter® and as a biofiltration soil amendment




In laboratory testing, PhosphoSorb removed 50% of the first 1,000 treated empty bed volumes (EBVs) of 0.5 mg/L influent dissolved P solution, and lasted for at least 2,000 treated EBVs.

CONTECH ENGINEERED SOLUTIONS

**Toll Free: 1-800-338-1122**
**www.ContechES.com**

Attachment 2

# Technology Assessment Protocol – Ecology (TAPE)

## Process Overview

DEPARTMENT OF ECOLOGY
State of Washington

September 2018
Publication no. 18-10-039
Revision of 11-10-010

## Publication and Contact Information

This report is available on the Department of Ecology's website at
https://fortress.wa.gov/ecy/publications/summarypages/1110010.html

For more information contact:

Water Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

Phone: 360-407-6600

Washington State Department of Ecology - www.ecology.wa.gov

| | |
|---|---|
| o Headquarters, Olympia | 360-407-6000 |
| o Northwest Regional Office, Bellevue | 425-649-7000 |
| o Southwest Regional Office, Olympia | 360-407-6300 |
| o Central Regional Office, Yakima | 509-575-2490 |
| o Eastern Regional Office, Spokane | 509-329-3400 |

***Accommodation Requests***
*To request ADA accommodation including materials in a format for the visually impaired, call Ecology at 360-407-6600 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with speech disability may call TTY at 877-833-6341.*

# Technology Assessment Protocol – Ecology (TAPE)

## Process Overview

Water Quality Program
Washington State Department of Ecology
Olympia, Washington

*This page intentionally left blank*

# Table of Contents



# List of Tables

*This page intentionally left blank*

# Acknowledgements

Ecology manages the TAPE program with considerable assistance from a Stakeholders Advisory Group (SAG) and Board of External Reviewers (BER). Ecology appreciates the efforts of the committee members and their willingness to share their expertise. The authors would like to thank the following people for their contributions:

**Core Technical Team**

| Name | Organization |
|---|---|
| Douglas C. Howie, P.E. | Washington State Department of Ecology |
| Joel Baker, Ph.D. | University of Washington Tacoma |
| Carla Milesi | Washington Stormwater Center |
| John Lenth | Herrera Environmental Consultants |
| Dylan Ahearn, Ph.D. | Herrera Environmental Consultants |

**Stakeholders Advisory Group**

| Name | Organization |
|---|---|
| Dawn Anderson | Pierce County |
| David Batts | King County Department of Natural Resources and Parks |
| Matt Zarecor | Spokane County, Engineering & Roads |
| Dana de Leon, P.E. | City of Tacoma, Environmental Services |
| Jeff Killelea | Washington State Department of Ecology |
| Anita Fichthorn | Port of Tacoma |
| Dan Gunther | Oregon Department of Transportation |
| Mieke Hoppin | City of Tacoma, Environmental Services |
| Doug Hutchinson | Seattle Public Utilities |
| Mark Maurer | Thurston County |
| Chris May, Ph.D. | Kitsap County Public Works |
| Alex Nguyen | Washington State Department of Transportation |
| Henry Stevens | City of Portland |

**Board of External Reviewers**

| Name | Organization |
|---|---|
| Seth Brown | Storm and Stream Solutions, LLC |
| G. Allen Burton, Ph.D. | University of Michigan |
| Allen P. Davis, P.E., Ph. D. | University of Maryland |
| Don Carpenter | Drummond Carpenter, PLLC |
| Dennis Helsel, Ph.D. | Practical Stats |
| James Houle | University of New Hampshire Stormwater Center |
| Dick Magee, P.E., Sc.D. | NJCAT |
| Kurt Marx | Marx Environmental Consultants |
| Dipen Patel | California State University, Sacramento |
| Larry Roesner, Ph.D., P.E. | Colorado State University |
| David Sample | Virginia Tech |
| Eric Strecker, P.E. | Geosyntec Consultants |

*This page intentionally left blank*

# Introduction

This document provides an overview of the Technology Assessment Protocol-Ecology (TAPE) process for vendors, designers, and manufacturers (referred to as 'proponents') who wish to have their stormwater treatment technologies verified and certified by the Washington State TAPE program. This guide walks proponents through the TAPE process, providing an overview of the program and the specific steps required for certification. Specific guidance for designing, executing, and reporting on performance monitoring is detailed in two companion Ecology documents:

- *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE)* (Publication 11-10-061) *(aka,* TAPE Technical Guidance Manual*)*
- *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Publication 04-03-030).

Ecology updated the TAPE Technical Guidance Manual in September 2018[1]. Ecology may consider field data collected prior to September 2018 to satisfy the performance goals of TAPE. Previously collected field data must meet either the 2011 or the 2018 TAPE guidelines and include an Ecology approved Quality Assurance Project Plan, and third party review confirming that monitoring was conducted and samples were analyzed in accordance with the cited TAPE protocol and the approved QAPP. TAPE requires all new applicants to pay a fee at three stages in the certification process. Please refer to the Fee Structure Program for a description of these fees.

# Overview of TAPE

The TAPE program provides a peer-reviewed regulatory verification and certification process for emerging stormwater treatment technologies. The TAPE program is administered by the Washington State Department of Ecology (Ecology), with assistance from staff at the Washington Stormwater Center (www.wastormwatercenter.org/), which provides stormwater management assistance including guidance on certification of emerging treatment technologies.

The stormwater management manuals for western and eastern Washington include design criteria and performance goals for stormwater treatment facilities in the state of Washington (stormwater management manuals). Volume V, Chapter 12 (Stormwater Management Manual for Western Washington (SWMMWW)) and Chapter 5, Section 12 (Stormwater Management Manual for Eastern Washington (SWMMEW)) of the manuals discuss Ecology's evaluation and approval process for emerging treatment technologies. The stormwater manuals do not provide criteria for the selection and sizing of emerging technologies because the technologies and the knowledge of them are rapidly evolving.

[1] Proponents accepted into the TAPE program prior to September 2018 may choose to follow either the new protocol (September 2018) or the old protocol (July 2011). Proponents submitting a technology to the TAPE program for the first time can choose between the new protocol and the old protocol until March 31, 2019, after which your QAPP must follow the new protocol. Your QAPP must state which of the two protocols is followed.

Ecology and the Washington Stormwater Center established a Board of External Reviewers (BER) to:

- Review emerging treatment technology design and performance data and recommend whether or not to certify the technology.
- Provide overall advice and guidance as the TAPE program evolves and improves.

Proponents must demonstrate performance by testing their stormwater treatment technology at field sites in the Pacific Northwest or at pre-approved testing sites located in other parts of the United States. The testing protocol is specifically designed to evaluate flow-through best management practices (BMPs) with relatively short detention times, and may not be suitable for all stormwater treatment technologies. Ecology has developed an alternative monitoring protocol that applies to long-detention BMPs (e.g., wet ponds) (Ecology 2018b). This document is included as an Appendix in the *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies*.

Based on BER technical reviews, Washington Stormwater Center staff members advise Ecology regarding which new stormwater treatment technologies meet performance goals and therefore, should be added to the list of approved technologies in the stormwater management manuals. Ecology makes the final decision to certify new stormwater treatment technologies.

# Criteria for certification

Certification of emerging technologies depends on their performance relative to one or more of five performance goals (Table 1).

**Table 1. TAPE Performance Goals**[a]

| Performance Goal | Influent Range | Criteria |
|---|---|---|
| Basic Treatment | 20-100 mg/L TSS | Effluent goal < 20 mg/L TSS |
| | 100-200 mg/L TSS | ≥ 80% TSS removal |
| Dissolved Metals Treatment | Dissolved copper 0.005 - 0.02 mg/L | Must meet basic treatment goal and exhibit ≥ 30% dissolved copper removal |
| | Dissolved zinc 0.02 - 0.3 mg/L | Must meet basic treatment goal and exhibit ≥ 60% dissolved zinc removal |
| Phosphorus Treatment | Total phosphorus (TP) 0.1 to 0.5 mg/L | Must meet basic treatment goal and exhibit ≥ 50% TP removal |
| Oil Treatment | Total petroleum hydrocarbon (TPH) > 10 mg/L | 1) Daily average effluent TPH concentration < 10 mg/L<br>2) Maximum effluent TPH concentration of 15 mg/L for a discrete (grab) sample |
| Pretreatment [b] | 50-100 mg/L TSS | < 50 mg/L TSS |
| | 100-200 mg/L TSS | ≥ 50% TSS removal |

mg/L - milligrams per liter
TP - total phosphorus
TPH - total petroleum hydrocarbons
TSS - total suspended solids

a. See TAPE Technical Guidance Manual for further details.
b. Pretreatment technologies generally apply to (1) project sites using infiltration treatment and (2) treatment systems where pretreatment is needed to ensure and extend performance of the downstream basic or dissolved metals treatment facilities.

# Use level designations

Ecology evaluates the existing data on a stormwater treatment technology to assign use level designations that determine how many installations may occur in Washington and what the monitoring requirements are for obtaining additional data on treatment performance. Depending on the relevance, amount, and quality of performance data provided with the application for certification, Ecology will initially place the technology into one of two use level designation categories: pilot use level designation (PULD) or conditional use level designation (CULD) (Table 2). PULDs are typically given when there are sufficient laboratory data available to indicate a treatment technology may meet the performance goals for TAPE that are described in Table 1. Ecology typically issues CULDs when there are both laboratory and field data available for a treatment technology that would indicate an even greater likelihood of meeting these performance goals. Applicants may use field data that does not meet the data requirements of TAPE for CULD approval. The PULD and CULD allow installation and operation of the technology in the state of Washington in order to gather the performance data required for final general use level designation (GULD) certification. More information on the TAPE program is available on Ecology's website.

**Table 2. TAPE Use Level Designations**

| Use Level Designation | Minimum Data Required for Certification [a] | Time Limit (months) [b] | Maximum Number of Installations in Washington State | Field Testing Required Under Designation to achieve GULD |
|---|---|---|---|---|
| Pilot (PULD) | Laboratory | 30 | 5[c] | A minimum of one site located in the Pacific Northwest or at an approved Alternative Stormwater Technology Evaluation Facility; *all* sites installed in Washington state must be monitored [d] |
| Conditional (CULD) | Field data required; laboratory data may supplement but not substitute for required field data. | 30 | 10[c] | A minimum of one site located in the Pacific Northwest or at an approved Alternative Stormwater Technology Evaluation Facility |
| General (GULD) | Field data following TAPE protocol required; laboratory data may supplement but not substitute for required field data | Unlimited | Unlimited [e] | None |

a. Proponent must supply all available performance data with the initial application. PULD and CULD approvals will depend on the relevance, amount, and quality of data. Submittal of data does not ensure approval.
b. From the time the original use level designation is received from Ecology. Proponents with a PULD or CULD are typically allowed a maximum of 30 months to prepare a QAPP, receive QAPP approval, conduct stormwater monitoring according to the QAPP, and prepare a TER requesting CULD or GULD certification for their stormwater treatment technology. Proponents requiring extensions on the 30-month use level designation, or the submittal of a QAPP or TER, must submit a request to Ecology at least 2 weeks before the due date. Ecology will grant extensions only if the proponent shows that progress is being made toward completing required TAPE components.
c. Installation limit applies to devices installed to meet new and redevelopment treatment criteria. There is no installation limit for stormwater retrofit or industrial permit projects.
d. Local governments covered by a municipal stormwater National Pollutant Discharge Elimination System (NPDES) permit must submit a Notice of Intent form to Ecology when a PULD technology is proposed for installation in their jurisdiction.
e. Subject to conditions imposed by Ecology (i.e., maximum flow rates, limitations on drainage basin size, locations for use, and others as appropriate) listed in the GULD document posted on Ecology's website. Local jurisdictions may impose additional conditions.

# What does certification mean?

Ecology designed the TAPE certification process to ensure that the approved treatment technologies meet applicable design criteria and performance goals for new development and redevelopment. TAPE certification means that the new technology has successfully met the TAPE performance goals, when they properly install, operate, and maintain the device.

However, TAPE certification does not mean the technology is appropriate for any and all stormwater treatment applications. Local governments should use TAPE certification as one of many factors when selecting or allowing specific stormwater control and water quality treatment solutions for use in their jurisdiction. Jurisdictions should base selection of a treatment technology on a cost-benefit analysis and not simply on the fact that a technology is TAPE-certified. Although TAPE is a Washington State protocol, several other states, counties, and cities use TAPE certification to determine whether to allow installation of a technology within their jurisdiction.

The TAPE performance goals do not address capital costs, costs for operation & maintenance (O&M), or costs for material disposal; however, proponents are encouraged to provide this supplemental information in their Technical Evaluation Report (TER). In addition, the TAPE certification process represents specific influent concentration ranges and does not typically include an assessment of long-term performance. Local governments should take these and other factors, into account when evaluating the potential use of a TAPE-certified treatment technology.

There is no specific analysis of maintenance frequency within the TAPE review process The same device will require different maintenance activities depending on the land use upstream of the device. With only one field site required, TAPE does not address general maintenance requirements.

# Steps to certification

***Step 1.*** Complete the *Emerging Stormwater Treatment Technologies: Initial Application for Certification (Initial Application)* and pay the application fee. A copy of the Initial Application form is included in the *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE).* The *Initial Application* includes information about your technology and the performance data you have collected to help us evaluate whether your technology shows promise of meeting the TAPE performance goals. If an application contains confidential business information (CBI), you must identify the information in your application. Ecology will consider if the information, according to WA state law, is confidential and inform you of our findings. Ecology will not share confidential information with others.

When we receive a completed *Initial Application*, we will assign your technology a case number and contact you if any additional information is required. The Washington Stormwater Center may ask up to three members of the BER to review and provide comments on the application. If after reviewing this information Ecology finds that your technology shows promise of meeting TAPE goals, Ecology will grant your technology either a pilot or a conditional use level designation (PULD or CULD). Our goal is to grant a use level designation within one to two months from receipt of your complete *Initial Application*. Once the proponent finds a suitable monitoring site and notifies Ecology, the deadlines for QAPP and TER submittal are set.

## Initial Application:

**Submit one (1) text-searchable electronic (.pdf) copy, and one (1) signed copy of the TAPE confidentiality agreement**

Your *Initial Application* must include as much of the following information as possible. If using data from testing following other protocols, describe how data is similar to or differ from TAPE guidelines (e.g., storm depth, sample type). If you provide insufficient information in your *Initial Application,* Ecology will return the application to you without review, pending receipt of adequate information. At a minimum, applicants should submit the following information:

- Description of physical, chemical, and/or biological treatment functions.
- Design drawings/photographs.
- Description of construction materials.
- Equipment dimensions.
- Design flow rate (gallons per minute [gpm], cubic feet per second [cfs], inches per hour [in/hr]).
- Explanation of site installation requirements (e.g., necessary soil characteristics, hydraulic grade requirements, depth to groundwater limitations, utility requirements).
- Description of any pretreatment requirements or recommendations.
- Description of any components of the treatment system that may contain copper, zinc, or phosphorus or any other constituent of concern that might contribute to increased pollutant concentrations in the effluent.
- Description of any components (i.e., concrete) that may result in pH fluctuations in the effluent.
- Detailed description of the sizing methodology.
- Expected treatment capabilities.
- Maintenance procedures.
- Description of bypass process.
- Comparison of size of laboratory unit to typical field units (if laboratory testing data is submitted).
- Raw water quality data.
- Summary of water quality data and removal calculations.
- Statistical analysis.
- Flow rate(s) used for laboratory testing.
- Influent and effluent flow data.
- Storm event information.
- Any other information or data that will help determine if your treatment technology can meet or does meet TAPE's performance goals.

***Step 2.*** Design a performance evaluation study and write a Quality Assurance Project Plan (QAPP). The study must generate performance data of sufficient quality and quantity to evaluate with adequate statistical power how the technology performs in the field. Detailed

guidance for designing your study, including how to write the QAPP is provided in the *TAPE Technical Guidance Manual* and in Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Website links identified earlier). Finding a field site with suitable stormwater flows and influent ranges specified in the *TAPE Technical Guidance Manual* and Table 1 of this document is often challenging; consequently, proponents are encouraged to identify sites early in the process of designing the study.

Selecting multiple field sites is often advantageous to the proponent; the QAPP must address field conditions at each field site where data collection will occur. Local governments covered by a municipal stormwater National Pollutant Discharge Elimination System (NPDES) permit must submit a Notice of Intent form (Appendix 3) to Ecology for every PULD technology proposed for installation in their jurisdiction.

## QAPP:

**Submit one (1) text-searchable electronic (.pdf) copy. Proponents with a PULD must include a copy of the completed Notice of Intent form (Appendix 3) with the QAPP.**

***Refer to the TAPE confidentiality section below for submittal requirements for QAPPs containing confidential business information.***

At least three experts chosen from the BER will review the completed QAPP. The BER member review addresses the following question:

> *If the monitoring program described in the proponent's QAPP is substantively followed and completed, will the resulting data and statistical analyses allow Ecology to rigorously evaluate the technology's performance against the stated TAPE performance goals?*

Washington Stormwater Center staff will consolidate comments from the three BER members and forward the consensus recommendation to Ecology. There may be several steps in the review process as Ecology requests additional information from the applicant. If there is substantial disagreement among the external reviewers, we may request that additional BER members review the QAPP. The final decision to approve the QAPP rests with Ecology.

The proponent must submit a QAPP that meets Ecology's QAPP guidance and *TAPE Technical Guidance Manual* requirements within six months of finding a suitable monitoring site and notifying Ecology. Within three months[2] of receipt of the final QAPP, Ecology will complete the review and make a decision whether field testing can commence.

***Step 3.*** Install, operate, and monitor the technology at one or more field sites in the Pacific Northwest or at an Ecology-approved Alternative Stormwater Technology Evaluation Facility. A list of approved facilities can be found on the Ecology website.

[2] If circumstances prevent completion of Ecology's review within the stated review period, Ecology will notify the proponent of the reason for the delay and provide an estimated review schedule.

Ecology must approve the QAPP prior to the start of field-testing. The proponent must use the approved QAPP to guide project management during this phase of the certification process. While Ecology and the Washington Stormwater Center staff are available to discuss issues arising during the field study, the proponent's project team is responsible for monitoring the site(s) according to the QAPP.

***Step 4.*** Send us the results. Upon completion of the field sampling, use the data analysis and statistical techniques described in your approved QAPP to summarize the results and write the Technical Evaluation Report (TER). Instructions for completing the TER are found in the *TAPE Technical Guidance Manual.* Note that an independent professional third party must review key elements of the TER for all submittals that contain field monitoring data collected by a vendor or manufacturer of a stormwater treatment technology before you send it to us for review. Proponents must fill out the Excel database template with raw field data, storm data, and site information. Ecology will forward this information to the International Stormwater Database following final GULD approval.

**TER:**

**Submit one (1) text-searchable electronic (.pdf) copy, and one (1) .CSV file with raw analytical and storm event data.**

***Refer to the TAPE confidentiality section below for submittal requirements for TERs containing confidential business information.***

We will review each TER for completeness and then ask at least three members of the BER to conduct a thorough examination of your results, interpretations, and findings. For consistency whenever possible, TAPE will use the same reviewers who evaluated your QAPP for the review of the TER. TAPE will compile the results of the external reviews and will send a summary recommendation to Ecology. There may be requests for more information from the BER or Ecology during the TER review. Ecology intends to complete the review of your TER and make a final certification decision within three months of receiving the TER. If Ecology approves the TER, the technology receives a GULD. At a minimum the GULD identifies the type of approved treatment (basic, dissolved metals, phosphorus, and/or oil), the design flow rate, and the required maintenance interval. Ecology is responsible for the final certification decision.

# Submitting information to Ecology

Initial Applications, QAPPs, and TERs, along with the appropriate fees should be sent to the Washington State Department of Ecology, using the contact information provided below. Fee information is provided at the end of this document.

| | |
|---|---|
| **Send the following:**<br><br>• Applications<br>• QAPPS<br>• TERS<br>• Fees | **Please make checks payable to**:<br><br>***Department of Ecology*** |
| **Send to:**<br><br>TAPE Program<br>Washington State Department of Ecology<br>Cashiering<br>P.O. Box 47611<br>Olympia, WA 98504-7611 | |
| **Questions?**<br><br>(360) 407-7052<br>ldar461@ecy.wa.gov | |

## Confidentiality

Proponents may request that certain records or other information be considered confidential. Such requests will be considered by Ecology consistent with Washington State law (RCW 43.21A.160). In order for such records or information to be considered confidential, the proponent must certify that the records or information is unique to the design and construction of the technology, or release to the public or to a competitor would adversely affect the competitive position of the proponent. The proponent must request that such records or information be made available only for the confidential use of Ecology. All monitoring data including, but not limited to, laboratory results and field measurements, QA/QC data, data qualifiers, and monitoring site information cannot be considered confidential.

To make a request for confidentiality, the proponent must clearly mark only those pages that contain confidential material with the word "confidential" and submit these pages as a separate file to Ecology. Placeholder pages must be placed in the document that state "confidential material has been provided as a separate document to Ecology." The proponent must also provide a letter of explanation as to why these pages are confidential. Ecology will review the request and send notice to the proponent either granting or denying the confidentiality request. Proponents may request return of material if Ecology denies the request for confidentiality. At a minimum, requests for confidentiality require a 1-month review.

*This page intentionally left blank*

# TAPE Fee Structure

**Fee Structure for Program Participation**

| Fee category | Amount | Due |
|---|---|---|
| Initial Application | $ 5,000 | Upon submittal of *Initial Application* |
| Quality Assurance Project Plan (QAPP) review | $ 10,000 | Upon submittal of final QAPP [a] |
| Technical Evaluation Report (TER) review | $ 15,000 | Upon submittal of final TER [b] |
| a. Fee must be paid before Ecology updates the TAPE website to reflect the change in the technology's status. Collection of fee does not guarantee approval of QAPP.<br>b. Fee must be paid before Ecology updates the TAPE website to reflect the technology's new General Use Level Designation (GULD). Collection of fee does not guarantee approval of TER or guarantee GULD status. | | |
| **Please make checks payable to**: Department of Ecology and send to: TAPE Program Washington State Department of Ecology, Cashiering, P.O. Box 47611, Olympia, WA 98504-7611 | | |

TAPE is administered by the Washington State Department of Ecology with assistance from staff at the Washington Stormwater Center. The Washington Stormwater Center is a partnership between the City of Puyallup, the University of Washington Tacoma, and the Washington State University Puyallup Research and Extension Center.

*This page intentionally left blank*

# Appendix 1. Acronyms

| | |
|---|---|
| BER | Board of External Reviewers |
| BMP | Best management practices |
| CULD | Conditional Use Level Designation |
| GULD | General Use Level Designation |
| NPDES | National Pollutant Discharge Elimination System |
| O&M | Operation and maintenance |
| PULD | Pilot Use Level Designation |
| QAPP | Quality Assurance Project Plan |
| TAPE | Technology Assessment Protocol-Ecology |
| TER | Technical Evaluation Report |
| TP | Total phosphorus |
| TPH | Total petroleum hydrocarbons |
| TRC | Technical Review Committee |
| TSS | Total suspended solids |

*This page intentionally left blank*

# Appendix 2. References

Ecology 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, No. 04-03-030. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/programs/eap/qa/docs/QAPPtool/Mod3%20Guidelines/GuidelinesforPreparingQAPPS.pdf)

Ecology 2012. *Stormwater Management Manual for Western Washington*, No. 05-10-029, 05-10-030, 05-10-031, 05-10-032, 05-10-033. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/programs/wq/stormwater/manual.html)

Ecology 2018a. *Guidance for Evaluating Emerging Stormwater Treatment Technologies. Technology Assessment Protocol – Ecology (TAPE),* No. 11-10-061, a revision of No. 02-10-037. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/biblio/0210037.html)

Ecology 2018b. *Guidance for Evaluating Emerging Stormwater Treatment Technologies-Technology Assessment Protocol—Ecology (TAPE) Appendix: Modification: Evaluating Stormwater Treatment Technologies with Long Detention Times.* Washington State Department of Ecology, Olympia, Washington.

Ecology 2018c. *Stormwater Management Manual for Eastern Washington*, No. 04-10-076. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/programs/wq/stormwater/easternmanual/manual.html)

*This page intentionally left blank*

# Appendix 3. Notice of Intent Form for PULD Technologies

*This page intentionally left blank*

DEPARTMENT OF ECOLOGY
State of Washington

# Notice of Intent

## *Pilot Use Level Designation Technologies*

| Treatment Facility Vendor Information | | | | |
|---|---|---|---|---|
| Company: | | Contact Name: | | |
| Business Phone: | Fax (optional): | Street Address: | | |
| Company Web Address: | | | | |
| Email: | | City: | State: | Zip+4: |
| Facility Name and Size: | | | | |
| Development Level Designation Sought: | | | | |
| Target Pollutants: | | | | |

| Project Information | |
|---|---|
| Project Name: | Contact Name: |
| Local Agency with Jurisdiction: | Street Address: |
| Desired Installation Date: | City: |
| Project Type: | |
| Facility Discharge Receiving Water: | |
| Describe Proposed Testing Plan (e.g. number storms, parameters, test period, who will do work, etc.): | |

| Local Government Certification and Acceptance | | |
|---|---|---|
| Printed/Typed Name | Agency | Title |
| Signature | | Date |

Submit completed forms to the following address:

Washington Department of Ecology – TAPE Coordinator
Water Quality Program
PO Box 47696
Olympia, WA 98504-7696

If you have questions about this form, contact the following Ecology staff:

Douglas Howie at (360) 407-6444 or douglas.howie@ecy.wa.gov

## Background Information

Local governments with a National Pollutant Discharge Elimination System (NPDES) permit must submit this Notice of Intent Form to Ecology, and receive Ecology's approval prior to installing a pilot-designated technology (except in retrofit situations). All other jurisdictions are also encouraged to notify Ecology when a Pilot Use Level Designation (PULD) technology is proposed.

Local governments may allow PULD technologies to be installed **provided that** the vendor and/or developer agree(s) to conduct additional field testing based on the TAPE at **all** installations to obtain a general use level designation (GULD). Field-testing must be completed at a minimum of one site in the Pacific Northwest*, or at a pre-approved testing site located in other parts of the United States, to obtain a general use level designation.

* *Pacific Northwest refers to locations in Washington, Oregon, Northern California or British Columbia with rainfall distributions typical of a Pacific Northwest maritime climate, where long duration, low intensity storms predominate and stormwater contains mostly silt sized particles.*

item 08b

# SMART SALTING LEVEL 1 MPCA CERTIFICATION COURSE FOR PARKING LOTS AND SIDEWALKS

**THE COURSE IS FREE, BUT SPACE IS LIMITED.**

**REGISTER TODAY!**
**BASSETTCREEKWMO.ORG**

## FRIDAY, MARCH 6TH 2020 *(IN CASE OF A BIG SNOW, BACKUP DATE IS MARCH 13TH)*

9:00 am – 2:30 pm at the Plymouth City Hall, 3400 Plymouth Blvd, Plymouth MN 55447

## WHO SHOULD COME

- Property owners and managers
- Private winter maintenance contractors
- Snowplow drivers
- Parking lot, sidewalk, & trail maintenance staff from counties, cities, park districts & school districts

**ATTENDEES WILL RECEIVE** a complimentary light breakfast and lunch and a Winter Maintenance for Parking lots and Sidewalks manual. Participants can take an optional test to earn the Minnesota Pollution Control Agency (MPCA) Level I Smart Salting Certification in winter maintenance. The certified individuals will be listed on the MPCA website.

SAFER FOR LAKES & STREAMS
CERTIFIED
SMART SALTER
SAFE FOR PEOPLE

Through presentations and class exercises, participants will learn how to integrate science and practical winter maintenance to minimize environmental impacts.

- Application rates of materials
- Equipment calibration
- Accounting for various weather Conditions
- Storing materials
- New maintenance methods
- De-icing and anti-icing
- Environmental effects

PRESENTED BY FORTIN CONSULTING WITH FUNDING FROM THE MPCA

City of Plymouth

Bassett Creek Watershed Management Commission