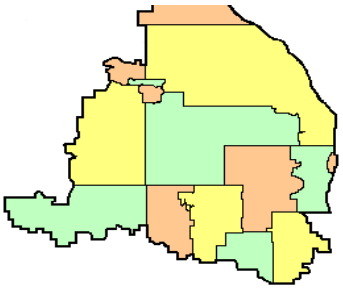
Shingle Creek Watershed Management Commission
West Mississippi Watershed Management Commission

3235 Fernbrook Lane N • Plymouth, MN 55447
Tel: 763.553.1144 • Fax: 763.553.9326
Email: judie@jass.biz • Website: www.shinglecreek.org



A meeting of the joint Technical Advisory Committee (TAC) of the Shingle Creek and West Mississippi Watershed Management Commissions is scheduled for 8:30 a.m., Thursday, March 24, 2016, at Crystal City Hall, 4141 Douglas Drive North, Crystal, MN.

A G E N D A

1. Approve agenda.*

2. **Speaker:** Lex Reinke, First State Tire Recycling, Isanti, MN. His topic is use of tire derived aggregate (TDA) within stormwater management systems. First State manufactures and supplies TDA for civil engineering applications.

3. Approve Minutes of February 4, 2016 meeting.*

4. 2016 Cost Share Program Applications.*
   a. Minneapolis – Blooming Alleys for Crystal Lake.*
      1) Maintenance Agreement Template.*

5. Update on Grant Projects.
   a. Connections at Shingle Creek.
   b. Public Art Reaeration Structures.
   c. Iron/Biochar Enhanced Sand Filters.*
   d. Twin Lake Carp Management.

6. Potential Rules and Standards Revisions.*
   a. Combined Wellhead Protection Area Boundary.*
   b. Original and Amended Wellhead Protection Areas.*
   c. DWSMA PSCI Map.*

7. Other business.

8. Next Meeting _____

*Attached
**Available at the meeting.

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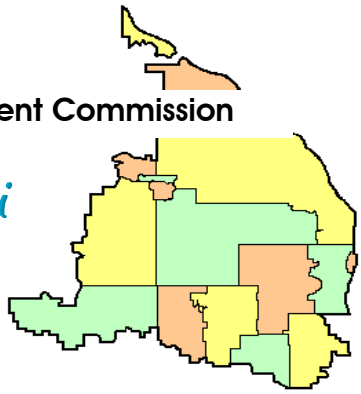


MINUTES
February 4, 2016

A meeting of the Technical Advisory Committee (TAC) of the Shingle Creek and West Mississippi Watershed Management Commissions was called to order by Chairman Richard McCoy at 8:41 a.m., Thursday, February 4, 2016, at Crystal City Hall, 4141 Douglas Drive North, Crystal, MN.

Present were: Andrew Hogg, Brooklyn Center; Jesse Struve, Brooklyn Park; Todd Tuominen, Champlin; Randy Kloepper, Crystal; Rick Lestina, Maple Grove; Chris Long, New Hope; Ben Scharenbroich, Plymouth; Richard McCoy, Robbinsdale; Diane Spector and Tom Langer, Wenck Associates, Inc.; and Judie Anderson, JASS.

Not represented: Minneapolis and Osseo.

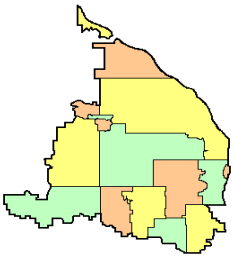
I. Motion by Struve, second by Hogg to approve the **agenda*** as presented. *Motion carried unanimously.*

II. Motion by Struve, second by Scharenbroich to approve the **minutes of the November 30, 2015 meeting**.* *Motion carried unanimously.*

III. **2016 Cost Share Applications.*** Shingle Creek and West Mississippi levied $100,000 and $50,000, respectively, for cost-share projects in 2016. Last December cities were asked to submit applications to the TAC for consideration and recommendation to the Commissions. One application was received, from the City of Brooklyn Park. The City is requesting $30,200 to share the cost of adding sumps with SAFL baffles and a small pond to treat road runoff prior to discharge into Bass Creek. Because the project does not add new impervious, the Commission's rules do not require the City to incorporate water quality BMPs. The drainage area is tributary to Bass Creek, which is designated as impaired for Biota, Dissolved Oxygen and Chloride and within the tributary area of the *E. coli* impairment for the Upper Mississippi River Bacteria TMDL. Motion by Scharenbroich, second by Long to recommend approval of this project for cost-share funding to the Shingle Creek Commission. *Motion carried unanimously.*

No other applications were received. The application period will remain open until funds are exhausted. If no other cost-share projects are approved in 2016, the unexpended funds will roll over to 2017.

IV. **Proposed 2016 CIP Revisions.*** One project was submitted to the TAC for addition to the CIP. Crystal requests to add the Becker Park Infiltration Project to the 2018 CIP, with construction and funding in 2019. With the 2015 revisions to Minnesota Rules 8410, this can be done through a Minor Plan Amendment as long as the County concurs. The procedure would be for the Commissions to initiate a Minor Plan Amendment, send notice to the cities and Hennepin County, and then the County will undergo its review and public hearing process. Once that is completed (likely in June), the Commissions could adopt the Amendment. Motion by Lestina, second by Scharenbroich to recommend approval of this addition to the CIP to the Shingle Creek Commission. *Motion carried unanimously.*



V. Grant Updates.

A. Becker Park Infiltration Project. The work plan associated with the $725,000 CWF grant is due in a few weeks. The Crystal Park and Recreation Commission will be undergoing visioning for Becker Park in early 2016. As soon as the CWF grant funds are contracted (expected by March 2016) Crystal and Staff will begin a more detailed geotechnical analysis and groundwater and hydrological modeling of this large underground infiltration gallery.

B. Connections at Shingle Creek. This project is on hiatus until spring.

C. Public Art Reaeration Project. A Request for Qualifications (RFQ) has been drafted and will be sent to an invited group of artists. Staff and Forecast will review submittals and select the top three to interview with the selection committee. The committee will select one to three artists/teams to move to the design phase. After approval of the final designs, the artist(s) will be commissioned to create their installation. Installation is expected to be completed in spring/summer 2017, with project completion by December 30, 2017, the expiration date of the grant.

D. Iron/Biochar Enhanced Sand Filters Project. Staff are gathering survey and as-built information for each of the potential ponds, and product information for the in-catch basin and above ground filter options. Possible pond locations include:

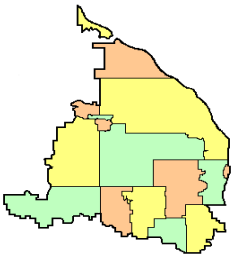
1. MnDOT 45th Avenue Pond near Perry Ave N, Robbinsdale
2. Gaulke Pond, Crystal (since replaced with Crystal Lions Park)
3. Olson Middle School Pond, Minneapolis
4. Champlin Drive and Highway 169 Pond, Champlin

E. Twin Lake Carp Management Project. Tom Langer, Wenck biologist, gave a brief presentation of the project. It included a timetable of related activities. Kickoff will be in March, with water quality monitoring continuing throughout the summer. Capturing and marking fish, implanting radio tags and installing fixed antennas will occur in late summer. The tracking of fish movement will occur from July 2016 through December 2017. Commercial fish removal will take place in January 2018. Water quality and vegetation monitoring will occur throughout 2018 with an aquatic vegetation management plan finalized in November 2018. The final grant report is due in August 2019. Langer's presentation can be viewed at http://www.shinglecreek.org/tac-meetings.html.

The grant also includes funding for a robust community engagement process. This process could include enlisting lake association volunteers to accompany Staff on tracking runs; training volunteers to recognize and report invasive aquatic vegetation; enlisting volunteers to help as labor during the catch and clip and catch and count operations; offering introductory limnology and "Ask a Fish Biologist" workshops; and maintaining active Facebook and Twitter accounts to share ongoing monitoring and reporting observations.

[Long departed 10:00 a.m.]

VI. Both Shingle Creek and West Mississippi budgets fund to complete one **subwatershed assessment** per year. The TAC received one request for a subwatershed assessment in 2016, from the City of Plymouth, to evaluate the area tributary to Pike Creek/Pike Lake.* The City of Minneapolis submitted a request for 2017 to complete an assessment in its Shingle Creek drainage area.* Motion by Lestina, second by Hogg to recommend approval of the Plymouth project for funding in 2016 to the Shingle Creek Commission. *Motion carried unanimously.* No requests were received from West Mississippi.



VI. Other Business.

A. A number of cities have responded with projects for inclusion in the presentation at the March regular meeting. A conflict has moved Hennepin County Commissioner Mike Opat's attendance from the February meeting to the March 10 meeting.

B. The **next meeting** is scheduled for March 24, 2016 at 8:30 a.m. at Crystal City Hall. A speaker will present on tire derivative products.

The meeting was adjourned at 10:13 a.m.

Respectfully submitted,

Judie A. Anderson
Recording Secretary

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Shingle Creek
Watershed Management Commissions
Partnership Cost-Share Program Guidelines
December 2015

The Shingle Creek Watershed Management Commission will from time to time make funds available to its member cities to help fund the cost of Best Management Practices (BMPs) partnership projects with private landowners. The following are the guidelines for the award of cost-share grants from this program:

1. Projects on private property must be for water quality improvement, and must be for improvement above and beyond what would be required to meet Commission rules. Only the incremental cost of "upsizing" a BMP above and beyond is eligible.
2. Priority is given to projects in a priority area identified in a subwatershed assessment or TMDL.
3. Commission funds must, at a minimum, be matched 1:1.
4. The cost of land acquisition may be included as local match.
5. The minimum cost-share per project is $10,000 and the maximum is $50,000.
6. Projects must be reviewed by the Technical Advisory Committee (TAC) and recommended to the Commissions for funding.
7. Cost-share is on a reimbursable basis following completion of project.
8. The TAC has discretion on a case-by-case basis to consider and recommend to the Commissions projects that do not meet the letter of these guidelines.
9. Unallocated funds will carry over from year to year and be maintained in a designated fund account in an amount determined by the Commission.
10. The property owner must dedicate a public easement or equivalent sufficient to install and maintain the BMP.
11. The Member City must obtain a recordable maintenance agreement from the property owner that specifies maintenance requirements and schedule; authorizes the City to inspect the BMP and order maintenance and improvement; and authorizes the City to undertake ordered maintenance and improvement not completed by the property owner, and assess the cost that work to the property.
12. The standard Commission/Member Cooperative Agreement will executed prior to project construction.

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Shingle Creek Watershed Management Commissions
Partnership Cost-Share Program Application
December 2015

City:	Minneapolis
Contact Name:	Ariah Fine
Contact Phone:	612-588-1155
Contact Email:	ariah@clevelandneighborhood.org
Project Name:	Blooming Alleys for Crystal Lake
Total Project Cost:	$34,660
Amount Requested:	$17,000
Project Location:	Cleveland Neighborhood of Minneapolis
Owner:	
Address:	
City, State, Zip:	
Phone:	
Email:	

1. Describe the BMP(s) proposed in your project. Describe the current condition and how the BMP(s) will reduce pollutant loading and/or runoff volume. Note the estimated annual load and volume reduction by parameter, if known, and how they were calculated. Attach figures showing project location and BMP details including drainage area to the BMP(s).

Blooming Alleys for Crystal Lake addresses a nutrient impairment, creates native habitat for pollinators, and engages the Cleveland community in learning about and implementing stormwater management practices. This proposal would fund a demonstration Blooming Alley in the Cleveland Neighborhood of Minneapolis, 95% of which drains to Crystal Lake in Robbinsdale, MN. Crystal Lake is impaired for excess nutrients. The TMDL study details a necessary nutrient reduction of 72% and designates reduction of Phosphorus from urban runoff by retrofitting stormwater Best Management Practices (BMPs) as having the greatest impact. The TMDL implementation plan also calls for environmental stewardship, which is a strong focus of this project.

Additionally, Cleveland lies within Flood Area Five (Minneapolis 1997 Flood Program). During heavy rains, the storm sewer system overflows, leading to public and private property flooding to the extent of impassable streets. Our project builds on a City capital project (2011) along 37th Ave N to address this issue. Our focus is on the blocks immediately adjacent to 35th Ave N as this area continually experiences severe flooding. Engaging private property owners to mitigate runoff at the source is a necessary component of a comprehensive plan to eliminate area flooding, improve water quality in Crystal Lake, create pollinator habitat, and enhance livability.

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Our project builds on a data-driven, citizen-based project methodology that leverages social capital and engineering expertise to maximize ecological and community benefits. A Metro Blooms analysis of other subwatersheds which have implemented neighborhood-scale projects, including the ENRTF supported Citizen-Based Approach to Stormwater Management and the Clean Water Funded Nokomis Neighbors for Clean Water project, indicates that on a typical urban lot, the majority (>60%) and most polluted runoff drains to the alleyway. Through stormwater retrofits on residential property adjacent to alleyways we are able to capture up to 90% of runoff and associated pollutants during a 1.25" rain event (WinSLAMM). Estimated reductions/year (based on WinSLAMM modeling for similar alley projects):

- 170,000 gallons runoff
- .4 lbs Total Phosphorus
- 150 lbs Sediment

The Blooming Alleys approach has proven effective in southwest Minneapolis where 18 Blooming Alleys have already been or are being installed in 2016. The benefit of these projects goes beyond the immediate participants. One participant in south Minneapolis commented "this whole process has made me more aware of the runoff situation and any future work I do on my property will take that into account. I will also be talking to my neighbor to the south about the drainage off his garage." The City of Minneapolis partners with Cleveland Neighborhood Association (CNA) and Metro Blooms to adapt the program in North Minneapolis to serve a more diverse demographic. We build on prior community raingarden projects in Cleveland (30) to engage property owners along one demonstration alley to learn about and install stormwater management practices in driveways and backyards, adjacent to the alleyway. Practices include raingardens, permeable pavement, native plantings, and gutter/downspout re-direction. Based on prior experience, we expect 25-50% of alley residents to participate, which results in the installation of 10-15 new stormwater BMPs. Typical BMP size ranges from 80-300 square feet. Working with entire blocks reduces cost, improves aesthetics and adoption, strengthens social fabric, and creates natural pollinator and pedestrian pathways.

Demonstration location is selected based on potential for runoff capture and interest in participation. To engage residents, CNA recruits 1-2 Alley Captains who in turn invite their neighbors to an Alley Party, led by Metro Blooms, to learn about the project (goal: 30% participation/alley). Metro Blooms & the City of Minneapolis are hosting a Raingarden Workshop in North Minneapolis in May which will also be utilized to recruit Alley Captains & educate residents. At the Alley Party participants learn about project details and discuss potential alley and individual property designs. Following the party, each participant has a site consultation with Metro Blooms and receives a plan showing opportunities for stormwater management, pollinator habitat and associated costs (example plan attached – completed plans will be shared with Shingle Creek). Residents may be required to pay or contribute through volunteer labor 5-10% of project cost. Metro Blooms and CNA hire a subcontractor to install permeable pavement projects and work with the Conservation Corps of Minnesota to install raingardens and native plantings. Final participant information, BMP location & size, and associated pollutant/runoff reductions will be provided to Shingle Creek Watershed Management Commission

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following installation. We'll also share # of volunteer hours contributed to the project, # of Conservation Corps young adults trained, and total number of citizens engaged.

Every participant is required to sign an agreement with CNA to maintain practices for at least 10 years. The City of Minneapolis contracts with CNA to manage and enforce these agreements. In turn, CNA works with Metro Blooms to host maintenance trainings and to evaluate the practices annually through their garden award & recognition program. Each practice receives a score. Those that score below average receive written information on necessary maintenance. If the practice is continually not maintained, Metro Blooms maintains the practice for a fee, paid for by CNA. Community-led projects like the one we propose result in higher levels of engagement and adoption than typical cost share programs as well as improved community resilience and long-term improvement of impaired water bodies.

Cleveland Neighborhood Association and Metro Blooms plan to utilize the demonstration Blooming Alley to leverage an LCCMR application to expand the project to 5 more blocks throughout the Cleveland Neighborhood and implement a paired-watershed study for statistically supported documentation on stormwater BMP effectiveness.

2. If this request is for cost share in "upsizing" a BMP, explain how the upsize cost and benefit were computed.

n/a

3. Show total project cost, amount of cost share requested, and the amount and source of matching funds.

Total Project Cost: $34,660
Cost Share Requested: $17,000
Matching Funds (Total $17,660):

- Hennepin County: $10,000 - approved
- Clean Water Fund, Conservation Corps of Minnesota: $4,200 - approved
- City of Minneapolis (Raingarden Workshop): $3,460 – approved

4. What is the project schedule, when will work on the BMP(s) commence and when will work be complete?

May – August 2016: Outreach & Engagement; includes Raingarden Workshop at North Regional Library on May 21st, block identification, alley captain & participant engagement, and Alley Party
June – September 2016: Site consultations, stormwater management plans, designs, participant commitments. Installation & maintenance agreements.

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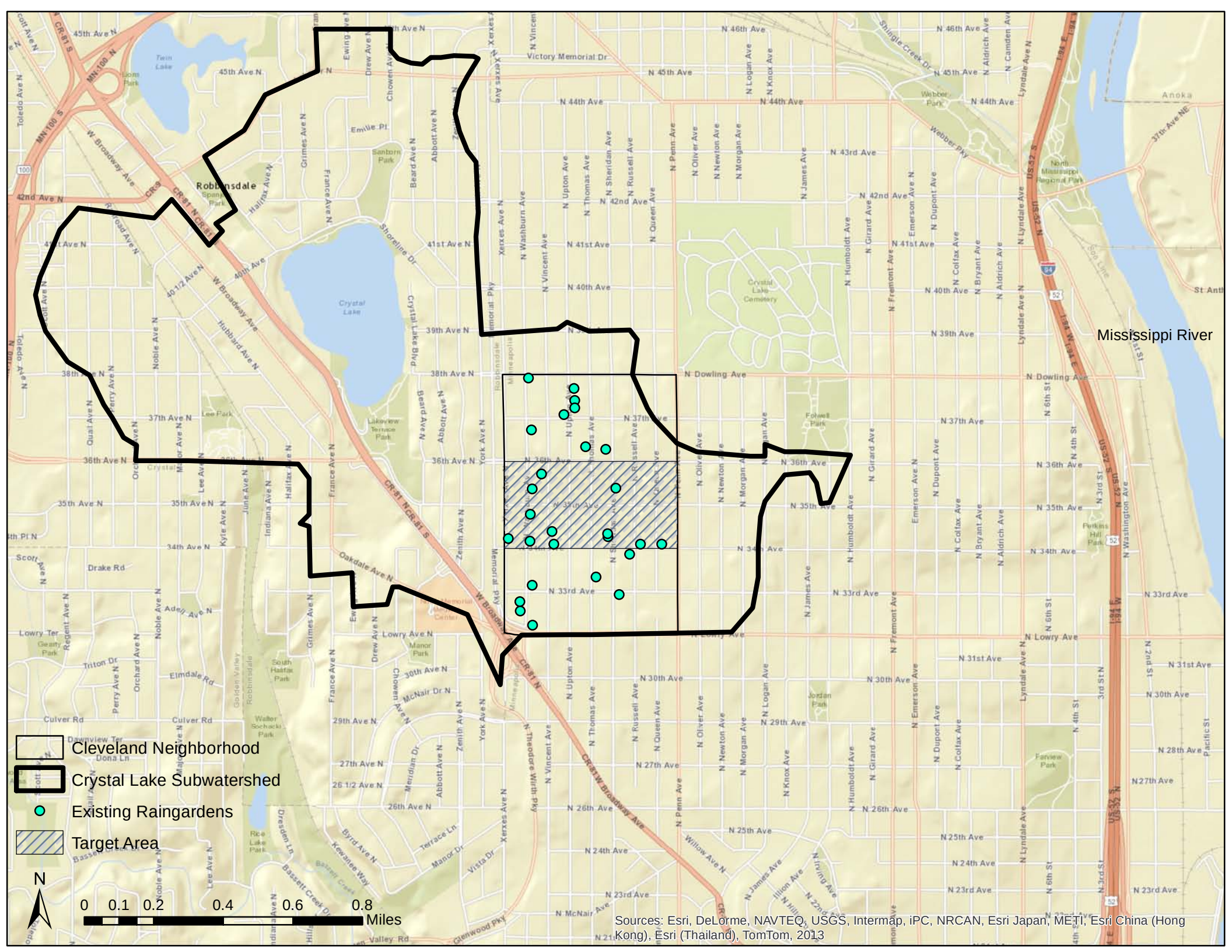
September – November 2016: Construction management & installation. Raingarden installations scheduled for September 12th – 15th. Permeable pavement installations dependent on contractor availability.
November – December 2016: Reporting and wrap-up

The member City must verify that a public easement (or equivalent) is dedicated and that an Operations and Maintenance Agreement has been executed and recorded prior to release of any funds.


Cleveland Neighborhood
Crystal Lake Subwatershed
Existing Raingardens
Target Area
N
0 0.1 0.2 0.4 0.6 0.8
Miles
Mississippi River
Robbinsdale
Crystal Lake
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

Potential Project Sites within Cleveland Target Area

Downspouts lead directly to alleyway; area for native filter strip between garage and alley

Area for potential raingarden adjacent to alleyway

Potential permeable pavement site

PERMEABLE PAVEMENT
167 SQ FT

(typical 4' 2" paver width)

EXTRA PAVEMENT
61SQ FT

(optional paver width to match garage foundation)

RAINGARDEN
200 SQ FT

Redirect existing downspout

ALLEY

40'

Pavers 167 sq ft

4' 2"

(optional Pavers 61 sq ft)

3'

23'

roof 330 sq ft
(pavers)

add gutter - 22'

drive 375 sq ft
(pavers)

roof 110 sq ft
(raingarden)

23'

Raingarden
200 sq ft

13'

(raingarden)

(pavers)

(swale)

(raingarden)

(pavers)

(swale)

(raingarden)

add gutter - 32'

roof 250 sq ft
(raingarden)

redirect gutter

roof 775 sq ft
(raingarden)

roof 775 sq ft
(raingarden)

LEGEND

- Alleyshed
- Direction of Water Flow
- Treated Impervious Surfaces
- Existing Gutters and Downspouts
- Proposed Gutters or Gutter Redirection
- Proposed Raingarden (Raingarden 75 sq ft)
- Proposed Permeable Pavement

GRAPHIC SCALE

0 5 10 20

(IN FEET)
1 inch = 10 ft.

NORTH

Nokomis Blooming Alleys

Hanks Residence

5242 Bloomington Ave S, Minneapolis, MN

Concept Plan

Example Blooming Alley Projects

Permeable pavement strip along edge of driveway captures runoff from garage and driveway. Adjacent raingarden captures runoff from house downspout and backyard.

Permeable pavement overflows to neighboring raingarden

Alley raingarden and native filter strip (year 1)

Alley Tour near Lake Nokomis to promote Blooming Alleys

Exhibit A
MAINTENANCE AGREEMENT TEMPLATE

MINNEHAHA CREEK WATERSHED DISTRICT
Stormwater BMP Maintenance Agreement

This agreement, entered into to support collaborative water-resource protection and education and outreach efforts, is made between the Minnehaha Creek Watershed District (District) and [***insert names***] (together, Landowner), fee title owner of the property at [***insert address***] on which a stormwater best management practice (BMP) has been constructed with the funding support of the District (the Property).

WHEREAS Landowner has consented and contributed to the construction of the rain garden shown in the site plan and design attached to and incorporated into this agreement as Attachment A (the stormwater BMPs), for water resource protection demonstration and education purposes;

WHEREAS the District has committed to contributing funding to the construction of the Rain Garden; and

WHEREAS Landowner wishes to assume the obligations hereunder to induce the District to contribute funding for the construction of the stormwater BMP, and agrees that there is valuable consideration for the obligations hereunder, and that this instrument is legally binding.

NOW THEREFORE Landowner and District agree as follows:

1. Maintenance. Landowner will maintain the stormwater-management improvements for 10 years from the date of Landowner's execution of this agreement. Landowner must inspect and repair or replace the stormwater best management practices (BMPs) components, plants and mulch and maintain as follows:

Pervious Pavers and Pervious Concrete. The primary maintenance requirement for permeable pavers is to remove debris and dirt from the surface. Fine debris and dirt accumulate in the openings and reduce the pavement's permeability. Routine maintenance is essential to reduce clogging over time. Pervious pavement areas described in the Site Plan and Work Plan attached as Exhibit A to the agreement must be maintained as follows:

a. Limit the amount of leaves, tree litter, and grass clippings on the permeable pavement by sweeping or blowing them off the surface as necessary. This will reduce the amount of material available to clog the surface of the pavement.
b. Inspect at least once each year after a major storm and otherwise annually for clogging of the surface. To remedy clogging, vacuum surface openings in dry weather to remove dry, encrusted sediment as necessary; alternatively, use a high-pressure washer to restore permeability of the surface. If necessary, add additional aggregate fill material made up of the same clean materials used in the original installation.
c. In larger applications, conventional street sweepers equipped with vacuums, water, and brushes can be used to restore permeability for driveways and are recommended for maintenance of parking lots. Vacuum sweep ideally four (4) times a year, properly disposing of the removed material.

d. Damaged interlocking paving blocks that impair the structural integrity of the surface should be replaced. If water stands for an extended period of time, Homeowner will remove and replace the base materials.
e. Avoid the use of de-icing chemicals and sand. By observation, many pervious pavements eliminate ice buildup because melt water can drain through the surface.

You can increase the longevity of the system by following the maintenance schedule for vacuum sweeping and high-pressure washing, restricting the area's use by heavy vehicles, limiting the use of de-icing chemicals and sand, and implementing a stringent sediment control plan.

Raingardens. The primary maintenance requirement for rain gardens is that of inspection and repair or replacement of the garden's components, plants and mulch. Generally, this involves routine maintenance similar to any landscaped area. Raingardens described in the Site Plan and Work Plan attached as Exhibit A to the agreement must be maintained as follows:

a. Raingarden plants should receive approximately 1'' of water per week during the growing season for the first two years after planting. During years 3 and 4, the plants need only be watered in times of drought. Watering should occur in the morning hours. Homeowner will manually water as necessary to supplement rainfall.
b. Visually inspect and repair erosion yearly. Use small stones to stabilize erosion along drainage paths and re mulch any void areas as needed.
c. Homeowner will inspect annually; keep clean of excess sediment and debris. Homeowner will replace the top two to five inches of media as necessary if raingarden is not sufficiently draining, so as not to impede filtration of sediment and oils.
d. Remove and replace all dead and diseased plantings as necessary each spring to maintain ecological health and function.
e. Prune excess growth annually or more often, if desired. Trimmed materials may be recycled back in with replenished mulch. After rainstorms, inspect the cell and make sure that drainage paths are clear and that ponding water dissipates over 24 hours. (Water may pond for longer times during the winter and early spring.)
f. Weed regularly, as needed.

Reporting. Homeowner will submit to the MCWD annually a brief written report that describes the maintenance activities performed under the Agreement to which this Exhibit is attached, including dates, locations of inspection, maintenance activities performed and photographs of the Project.

The District and its representatives may enter the Property at reasonable times to inspect the condition of the Rain Garden and confirm proper maintenance.

2. Signage; Public Access; Publicity. The District, at its own cost and in consultation with Landowner, may place and maintain appropriate signage on the Property identifying and describing the Rain Garden and informing the public of its purposes. On reasonable notice to

Landowner, District representatives may accompany members of the public onto the Property to view the Rain Garden from time to time. This agreement does not create any right of public entry onto the Property except as coordinated with Landowner and accompanied by an District representative. In communicating to funding or oversight agencies or in public communications about District programs, the District may cite the Rain Garden and its location and may depict the Rain Garden in text, photographs or other media.

3. Sale of the Property. Landowner will notify the District at least 30 days before Landowner conveys the Property and will facilitate communication between the District and the purchaser of the Property to help ensure continued maintenance of the Rain Garden.

4. Notices. Any written communication required under this agreement will be addressed to the other party as follows, subject to written notice of a change of address:

To the District:
Cost-Share Specialist
Minnehaha Creek Watershed District
15320 Minnetonka Boulevard
Minnetonka MN 55345

To Landowner:
Name:_____
Address:_____
_____
_____

Intending to be bound, the parties execute and deliver this agreement.

LANDOWNER

_____ Date:
Name: _____

_____ Date:
Name: _____

MINNEHAHA CREEK WATERSHED DISTRICT

By: _____ Date:
Administrator

Shingle Creek and West Mississippi Watershed Management Commissions
Iron- and Biochar-Enhanced Sand Filters Project

Urban stormwater conveys bacteria such as *E. coli* to receiving waters, where contact can be a human health risk. Shingle Creek, the Upper Mississippi River, and many other urban and rural streams in Minnesota have been designated as Impaired Waters for periodically exceeding the state water quality standard for bacteria, and must identify sources and strategies for reducing bacterial loading into those waters. In agricultural areas, bacteria sources may be readily apparent – concentrations of livestock or other animals, application of manure to fields, or septic systems. However, in urban areas bacteria sources are diffuse –pet and wildlife waste, sanitary overflows and leakages - and options for reducing loads are limited. The Shingle Creek and West Mississippi Watershed Management Commissions obtained a federal grant to fund a project to field-trial three applications of a new promising yet simple technology in various locations in these urban/suburban watersheds in Hennepin County, Minnesota.

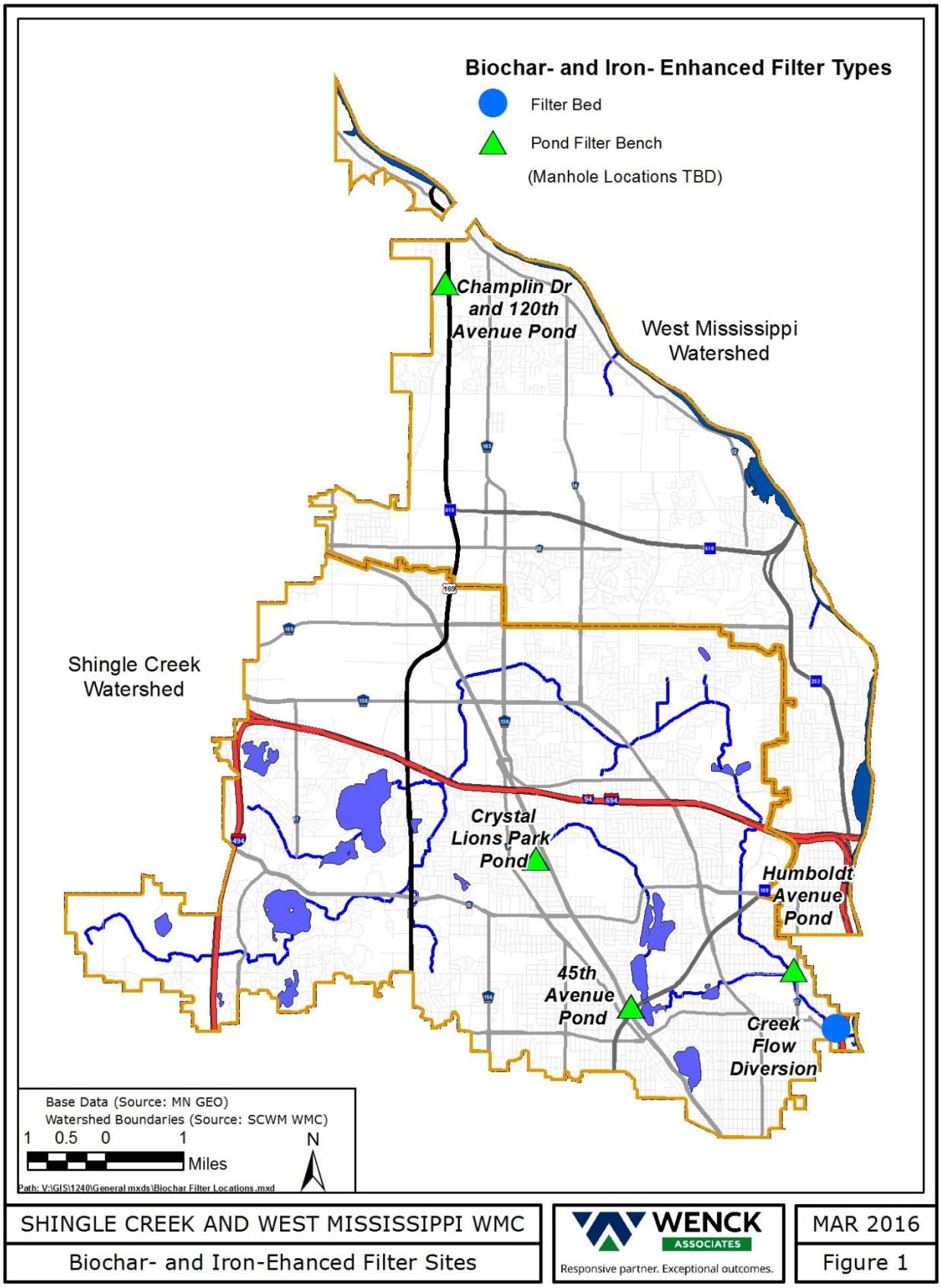
Technical assistance is being provided by the University of Minnesota's St. Anthony Falls Lab, which has developed and spurred the use of iron-enhanced sand filter benches on stormwater ponds to remove dissolved phosphorus from urban runoff. Biochar – a specially engineered type of ground charcoal – added to iron-enhanced sand filters has been effective in lab experiments at removing bacteria in synthetic stormwater. The three field trials will test the effectiveness of these filters at treating real-world stormwater runoff.

The first application of this biochar-enhanced technology is modifying four existing stormwater treatment ponds with enhanced Minnesota Filter benches (see Figure 1). Inflow, outflow, and ambient water quality will be monitored in the four ponds to assess the effectiveness of the filters. There are thousands of stormwater ponds in the Twin Cities Metro Area and growing interest in retrofitting them with sand filter benches. Quantifying the impact of adding biochar to the sand will add a powerful new tool to the urban stormwater toolbox.

Bacteria in stormwater has also been found in storm sewer conveyances and manhole sumps. The second application of this technology will test whether a biochar-enhanced medium in a manhole can effectively remove bacteria. A standard manhole sediment control insert will be modified with to incorporate an enhanced sand filter to treat stormwater flowing into the basin. Two devices will be installed and monitored, not only for removal effectiveness but also for maintenance and durability.

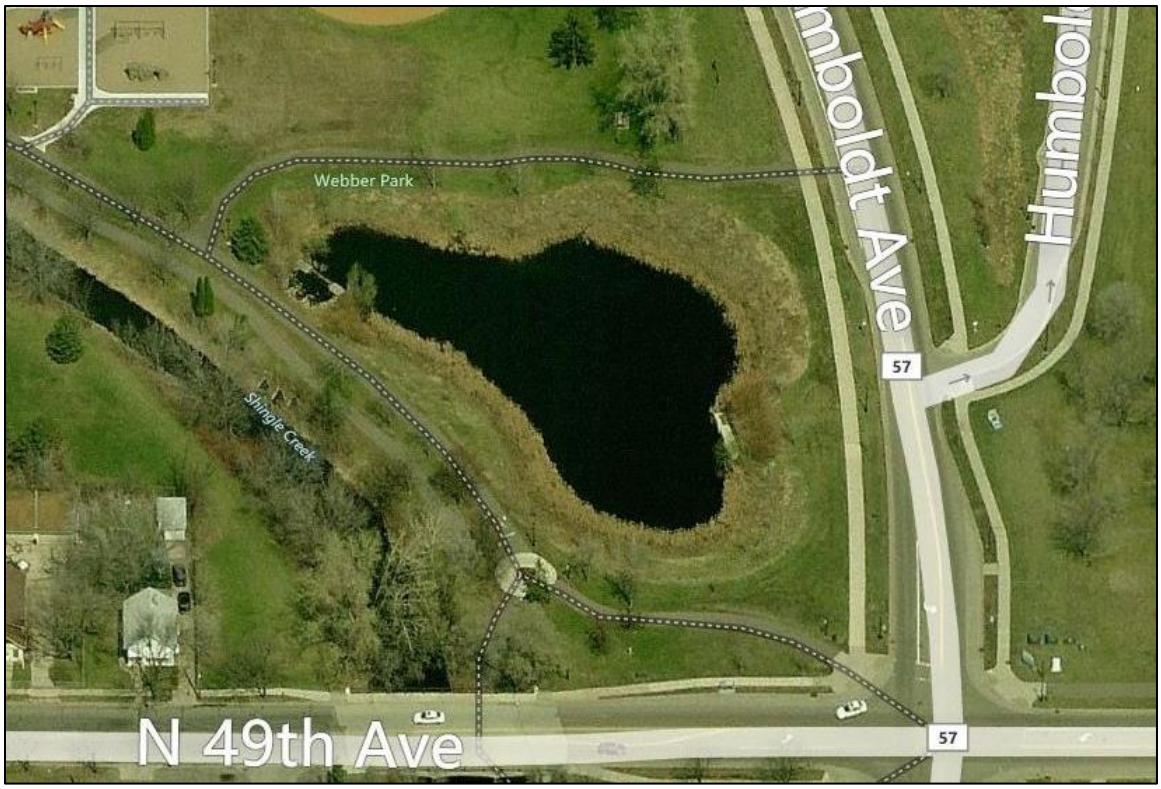
The final application of this technology is a filter to directly treat diverted flow from Shingle Creek. An iron- and biochar-enhanced filterbed will be constructed in a heavy duty steel chest similar to the boxes typically used to house creek monitoring equipment. A pipe will intercept flow from the creek and route it to the filter, where it will percolate to the bottom and then be piped back to the creek. Of interest is whether the removals from this type of direct treatment can be scaled up to make an impact on concentrations in the Creek.

The results of this field testing and monitoring will be used to develop technical designs and specifications that can be used by stormwater managers as they undertake water resource protection and improvement projects in urban areas.



SHINGLE CREEK AND WEST MISSISSIPPI WMC	WENCK ASSOCIATES Responsive partner. Exceptional outcomes.	MAR 2016
Biochar- and Iron-Ehanced Filter Sites		Figure 1

45th Avenue N Pond, Robbinsdale

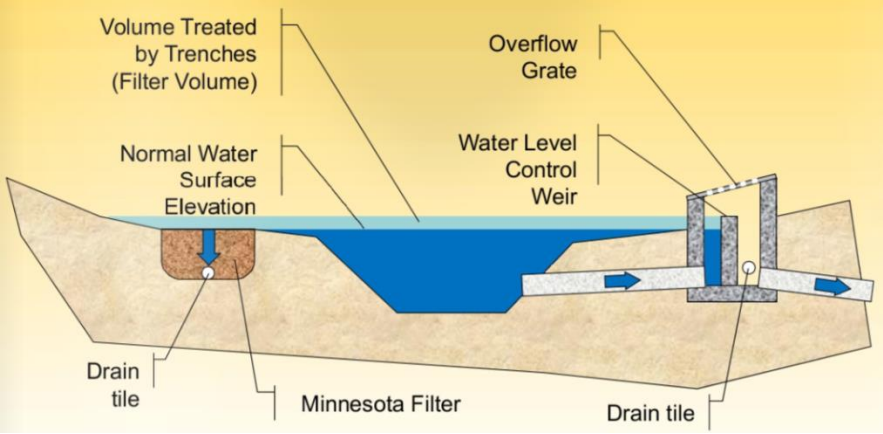


Humboldt Avenue N Pond, Minneapolis

120th Avenue N/Champlin Dr Pond, Champlin

Crystal Lions Park Pond, Crystal

MINNESOTA FILTER



Cross section of a Minnesota Filter in Prior Lake, Minnesota. (St. Anthony Falls Lab, University of Minnesota)

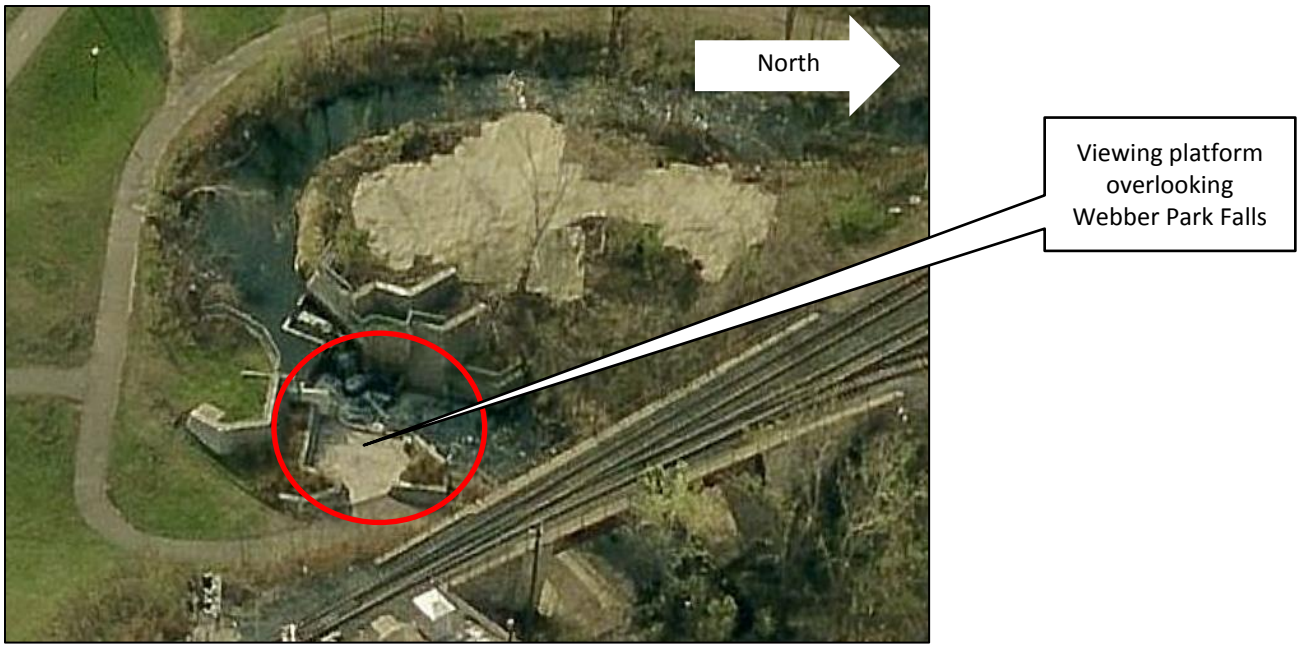
A Minnesota Filter rings this pond in Prior Lake, Minnesota. When the pond elevation rises, water percolates through the sand filter. The iron filings in the sand filter adsorb the dissolved phosphorus in the pond water. In this project four existing ponds will be retrofit with Minnesota Filters. Biochar will be added to the iron-enhanced sand filter medium to reduce bacteria in pond outflow. Water quality flowing into, out of and in the pond will be monitored to measure effectiveness.

CATCH BASIN INSERTS

The second application is a standard catch basin sediment-control insert such as the one shown at left, modified to incorporate an iron- and biochar-enhanced sand filter medium. The top "layer" of the insert will catch sediment, debris, and organic material. This layer can be easily lifted out and cleaned off. The bottom layer will contain the enhanced sand medium, which will filter out smaller particles, dissolved phosphorus, and bacteria.

CREEK DIVERSION

The proposed Shingle Creek off-line diversion will be located at Webber Park Falls in Minneapolis. The filterbed will be incorporated into a stainless steel chest, such as the one shown above, placed on a viewing area overlooking the falls (see below). A pipe will extend out to the creek to carry streamflow to the box. After percolating through the filter, flow will return to the creek via an outlet pipe. Measuring bacteria concentration in the inflow and outflow will help determine if a filter medium could make an appreciable direct reduction in streamflow concentration.



Technical Memo

WENCK ASSOCIATES

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To: Shingle Creek/West Mississippi TAC

From: Ed Matthiesen, P.E.
Diane Spector

Date: March 18, 2016

Subject: Potential Rules and Standards Revisions

Recommended TAC Action	Discuss the potential revisions to the Rules and Standards and return recommendations for amendment to the Commissions.

We continue to monitor ongoing technology and engineering practice changes that may have an impact on the Commissions' development rules and standards. Three items have come up recently that we discussed by the Commissions at the March 10, 2016 regular meeting. The Commissions have asked the Technical Advisory Committee (TAC) to discuss these potential revisions and make recommendations for any rules and standards changes.

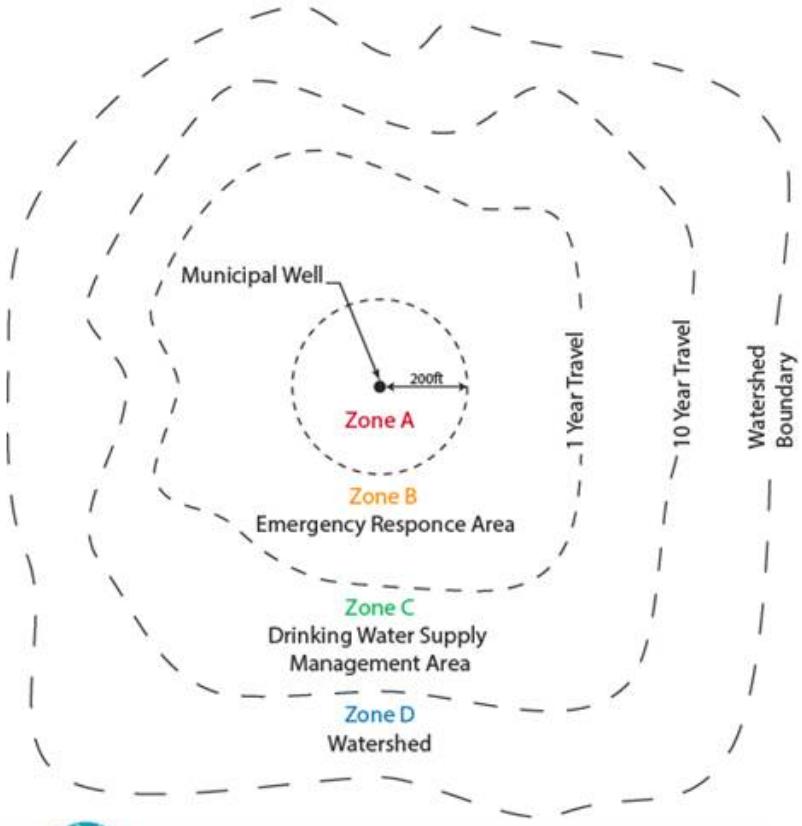
1. Drinking Water Protection

The Commissions' rules and standards prohibit infiltration within the one year time-of-travel zone of any drinking water well. This is very broad and in some cases infiltration of runoff from certain types of impervious may be allowable. We've been working with some other WMOs to refine those definitions. On the next page is a diagram Ed developed based on his discussions with local, state and EPA officials. The concept is to create zones around municipal drinking water wells based on modeling completed for the local Wellhead Protection Plans. Infiltration would be prohibited in the zone closest to the well, with infiltration limitations becoming less restrictive the further away from the well. The second figure shows the location of municipal Emergency Response Areas (ERAs) and Drinking Water Supply Management Areas (DWSMAs) across the Shingle Creek and West Mississippi watersheds *as of September 2014*. Many of these areas are being remodeled as cities are updating their Wellhead Protection Plans. In some cases, the DWSMAs have changed considerably. Attached is a set of figures from the City of Brooklyn Center showing the remodeled zones and how they compare between the old and new.

Some questions for consideration:

1. Is this something you even want to consider?
2. Does it seem workable and fit in with your other WHP responsibilities?
3. Since so much of Shingle Creek is within a DWSMA, for administrative ease should the whole watershed outside the ERAs be treated as a Zone C?
4. How should DWSMA Vulnerability be taken into account?
5. What other concerns do you have or examples to share?

Infiltration Practices in Relation to a Drinking Water Supply Management Area



Shingle Creek
Watershed Management Commissions
West Mississippi

Zone A No Infiltration Allowed
Within 200 ft of a Municipal Well

Zone B Emergency Responce Area (ERA)

Roof Infriltration Allowed

All Other Hard Surfaces Must
Filtrate Prior to Discharge to a
Storm Sewer, Ditch or Creek

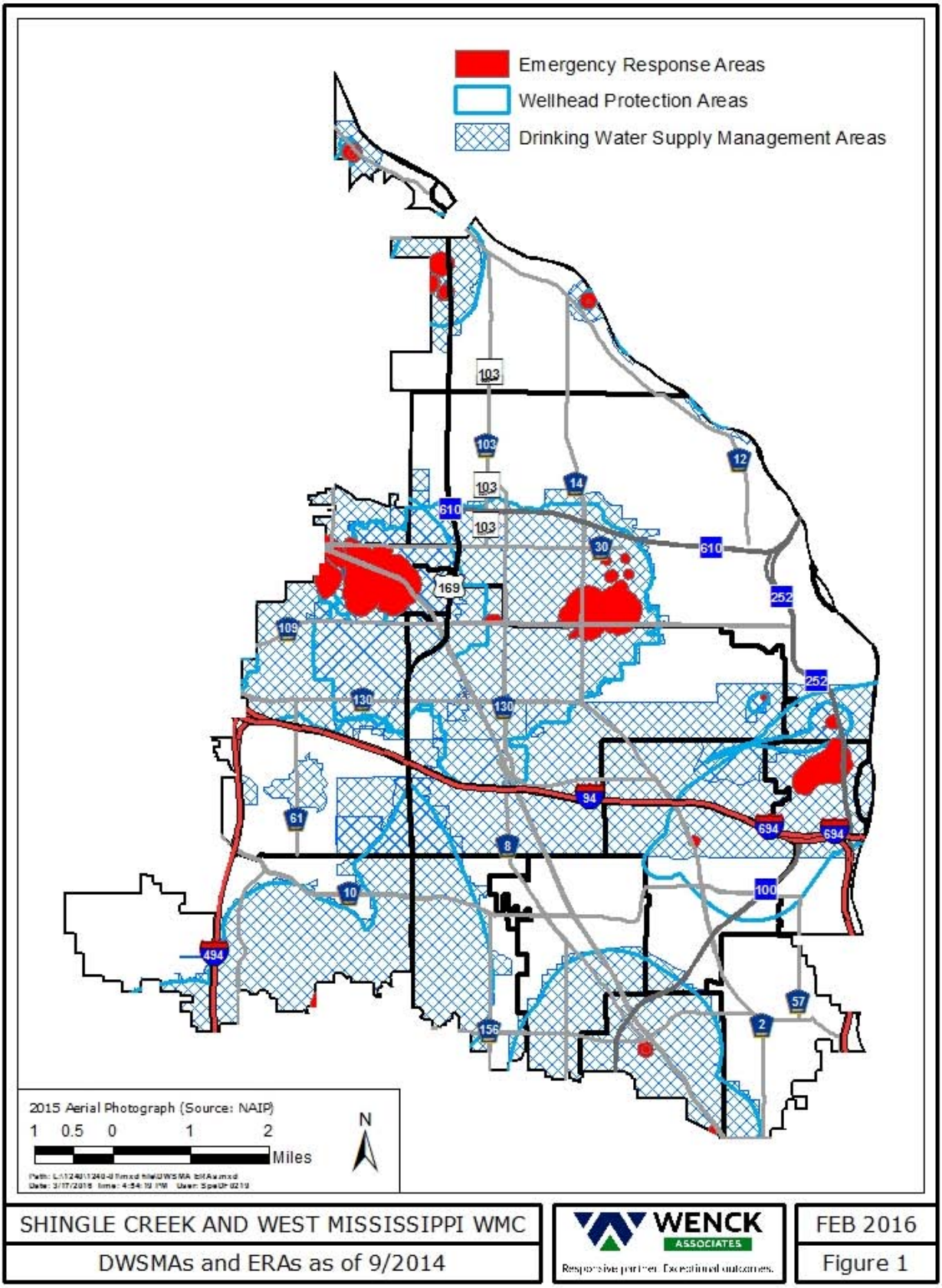
Zone C Drinking Water Supply Management Area (DWSMA)

Roof Infiltration Allowed

All Other Hard Surfaces Must
Filtrate Prior to Infiltration

Zone D Watershed

All Hard Surfaces can be Infiltrated



SHINGLE CREEK AND WEST MISSISSIPPI WMC

DWSMAs and ERAs as of 9/2014

WENCK ASSOCIATES

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FEB 2016

Figure 1

2. Application of Rules to Sidewalks and Trails

Linear projects such as sidewalks and trails do not lend themselves well to traditional bioinfiltration BMPs to accomplish the 1.3" of infiltration needed to meet water quality and infiltration requirements. These linear projects are typically sloped to sheetflow runoff to the boulevard or shoulders of the trails. We have developed a preliminary standard that would allow the applicant to meet that requirement by amending the soil receiving the sheetflow to a certain width depending on soil type (see diagram on following page).

3. BMP Banking

A discussion at a previous TAC meeting broached the subject of BMP banking. For example, a City has an opportunity to install a BMP with a project that would not require it, or that would go above and beyond what the Commission requires. Can they "bank" that extra treatment capacity to be used on a future project where treatment is required but infeasible? This is similar to wetland banking.

Some questions for consideration:

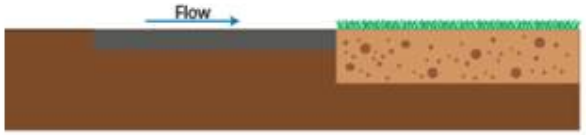
1. Is this feasible?
2. Under which circumstances it would be allowable?
3. Should the use of credits be limited to projects draining to the same receiving water?
4. How it would be documented?

Trail Infiltration Summary

Trail A Soils 1:1 Ratio

B Soils 4:1 Ratio

C & D Soils

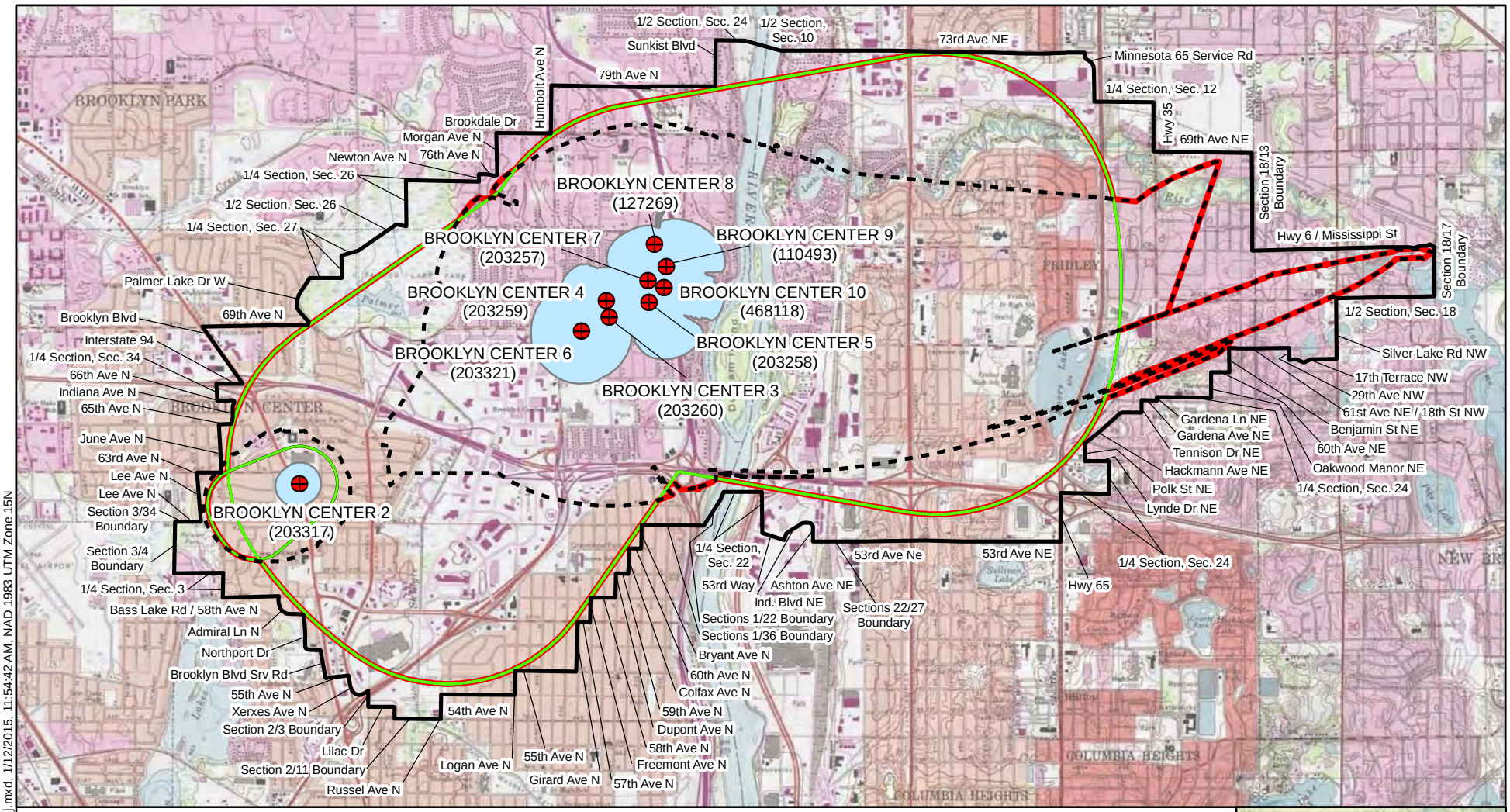


Amended Soils needed at 1:1 Wide Ratio in receiving area

Therefore:

- 10' Wide Trail next to A soils then 10' grassed area
- 10' wide Trail next to B soils then 40' grassed area
- 10 ' wide Trail next to C or D soils needs a 1:1 ratio of Amended Soils

Shingle Creek Watershed Management Commissions West Mississippi



City Well

10-Year Composite Capture Zone (porous flow)

Fracture Flow Capture Area

Combined Wellhead Protection Area

Drinking Water Supply Management Area

Emergency Response Area (1-yr time of travel))

IWMZ (Inner Wellhead Management Zone Note: Hidden Behind Well Symbol)

N

0 4,000 Feet

7-County Metro Area

Site

Source: ESRI, DigitalGlobe, GeoEye i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
Copyright 2013 National Geographic. Minnesota County Well Index.

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St. Paul, Minnesota 55112
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CITY OF BROOKLYN CENTER

BROOKLYN CENTER, MINNESOTA

COMBINED WELLHEAD PROTECTION AREA BOUNDARY AND DRINKING WATER SUPPLY MANAGEMENT AREA

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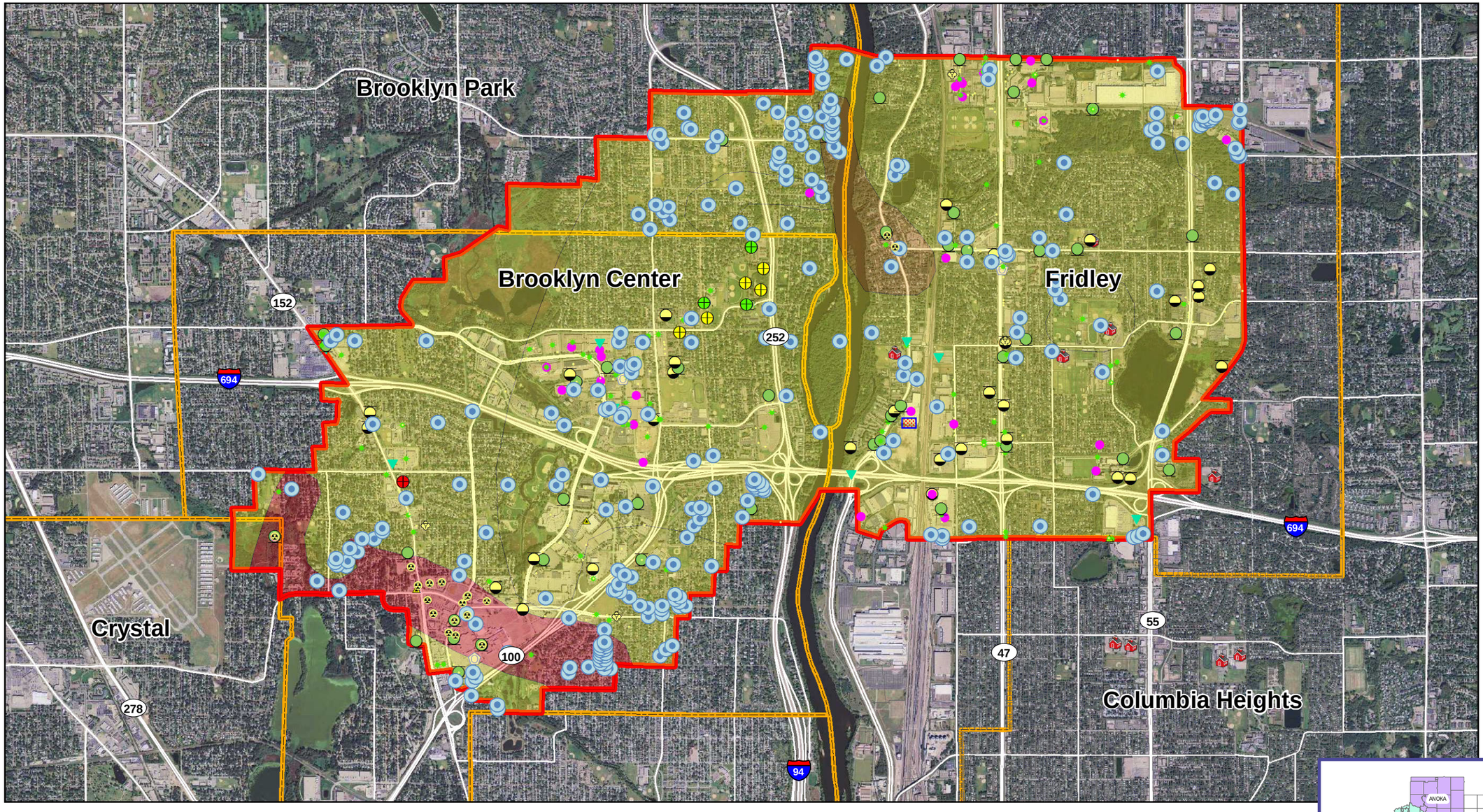


Legend

well

Activity

Hazardous Waste, LQG

Class 5 Well

Hazardous Waste, Small to Minimal QG

Industrial Stormwater Permit

Leak Site

Multiple Activities

Petroleum Brownfield

State Assessment Site

Tank Site

Voluntary Investigation & Cleanup (VIC)

Wastewater Discharger

DWSMA

City Boundaries

DWSMA Vulnerability

Vuln

Moderate

High

Very High

Pwss

WELLNAME

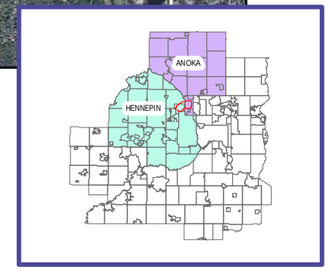
BC10; BC3; BC6; BC7; BC9

BC2

BC4; BC5; BC8

Parcels Anoka Cty

DWSMA PCSI Map
Brooklyn Center, Mn
EXHIBIT 1



3,000 1,500 0 3,000 Feet

Source: *DWSMA vulnerability as delineated by LBG, INC.
PCSI by MDH

TKDA

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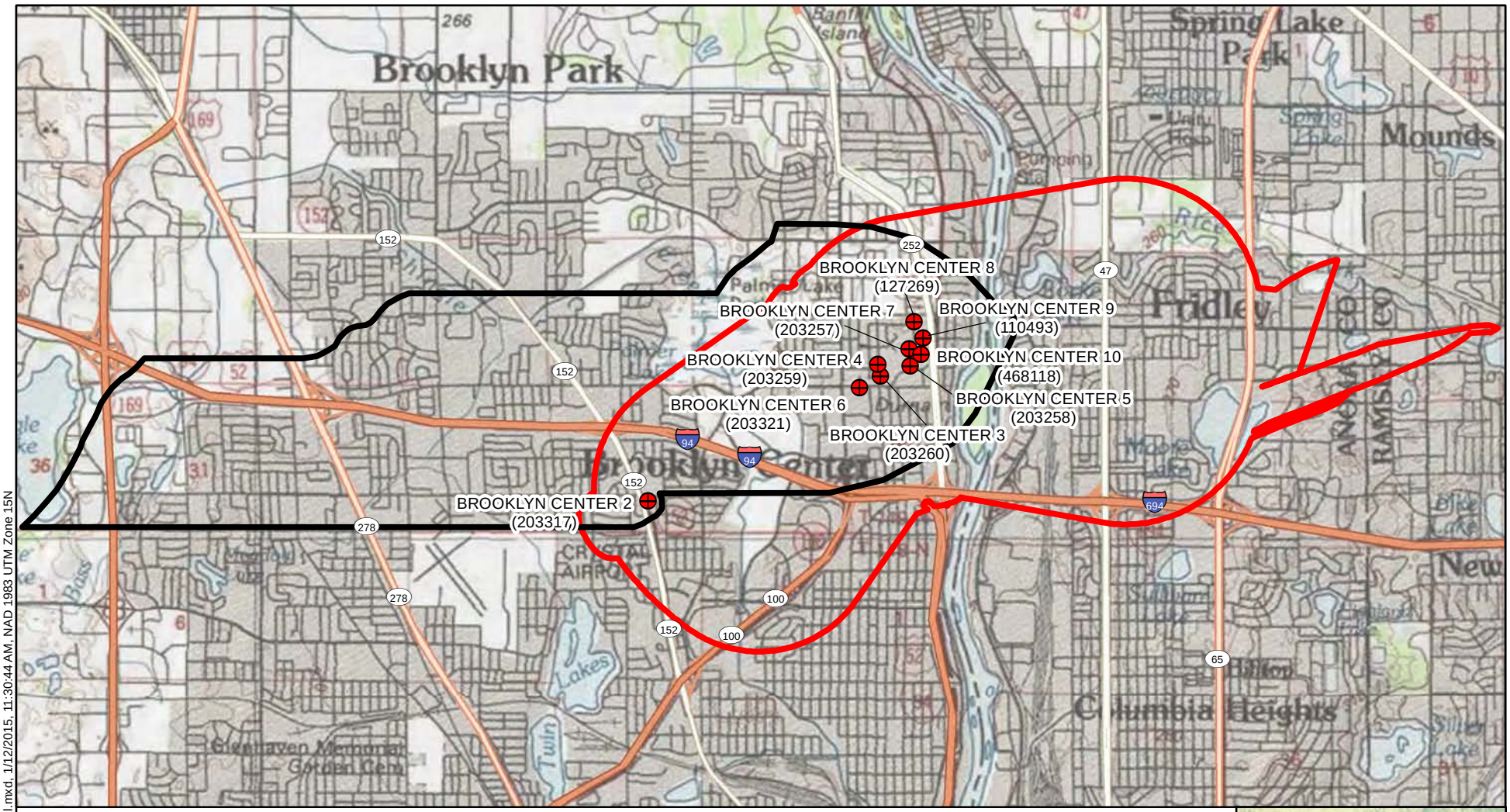

Source: ESRI, DigitalGlobe, GeoEye i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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CITY OF BROOKLYN CENTER

BROOKLYN CENTER, MINNESOTA

ORIGINAL AND AMENDED WELLHEAD PROTECTION AREAS

FILE:	g3brklyncntrwhp01l.MXD	DATE:	1/9/2015	FIGURE:	11

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