

Reducing Increased Risk of Flooding

Recommendations of the Stormwater Technical Advisory Committee
of the Dane County Lakes & Watershed Commission
and the Capital Area Regional Planning Commission



May 4, 2017

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Attachment II 2009 CARPC Report Environmental Resources TAC Report

Cover Photo by Mike Kakuska: Lake Mendota 2008

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1. EXECUTIVE SUMMARY

Increased stormwater runoff from urban development across Dane County has led to increased flood risk for the Yahara Lakes, and for streams, lakes and wetlands in other watersheds. Earlier studies¹ have led to incremental improvements in the management of runoff volume from urbanized areas, but the risk of flooding continues to increase as the result of a net increase in runoff from new urban development.

In response to this concern, the Dane County Lakes & Watershed Commission and the Capital Area Regional Planning Commission convened a joint Stormwater Technical Advisory Committee² (TAC) to make recommendations for improving control of stormwater runoff volume. The TAC was charged to:

- a. Articulate overall goals and benefits of stormwater volume control practices, such as infiltration practices.
- b. Review the effectiveness of existing volume-control standards.
- c. Identify pros and cons of a county-wide 100% volume control requirement³, including feasibility.
- d. Review current Capital Area Regional Planning Commission recommendations, and requirements by municipalities, for internally drained areas as they apply to urban development.
- e. Develop recommendations to the Dane County Lakes and Watershed Commission and Capital Area Regional Planning Commission for stormwater program and policy improvements/actions.
- f. Develop model ordinance language to support implementation of TAC recommendations.
- g. Provide a completed report including recommendations, or at a minimum an extensive status report to LWC and CARPC, within 6 months.

¹ 2005 Dane County Stormwater Infiltration Task Force; 2009 Capital Area Regional Planning Commission Environmental Resources Technical Advisory Committee

² See Appendix I for TAC members

³ The term “100% volume control” means to infiltrate, evapotranspire, or beneficially reuse 100% of the difference in runoff volume between pre-development and post-development for the 1981 Dane County design storm. It does not mean zero runoff from a site.

Between July 2016 and April 2017, the TAC held a series of technical discussions and received both oral and written stakeholder input (Appendix VIII), resulting in the following recommendations:

1. Require county-wide that new development not increase stormwater runoff volumes above pre-development levels (100% volume control).
2. Require 50% volume control for redevelopment in existing urban areas.
3. Require 100% volume control of runoff for internally drained areas (i.e. greater than 20,000 ft² of one foot or deeper ponded area); require storage volume within internally drained areas for back-to-back 100-yr, 24-hr storms; require development of emergency drawdown (pumping) plans for internally drained areas.
4. Establish a county-wide volume-trading (fee-in-lieu) program as an alternative when on-site control would be costly, inefficient, or prohibited.
5. Consider capital projects and/or grant funding for implementing volume control practices in developed areas, and in rural areas not subject to volume control regulations.
6. Develop policies and procedures to facilitate the standardization of the design and installation of infiltration practices.

Implementation of these recommendations will reduce the risk of future flood damage from new development to homes and businesses through the adoption of a “no net increase” approach to controlling stormwater runoff from new development and re-development. These recommendations can help to reduce flood risks in existing urban areas that are also being addressed by municipalities through other means. However, these recommendations do not address the existing flood risk attributable to runoff from existing urbanized areas.

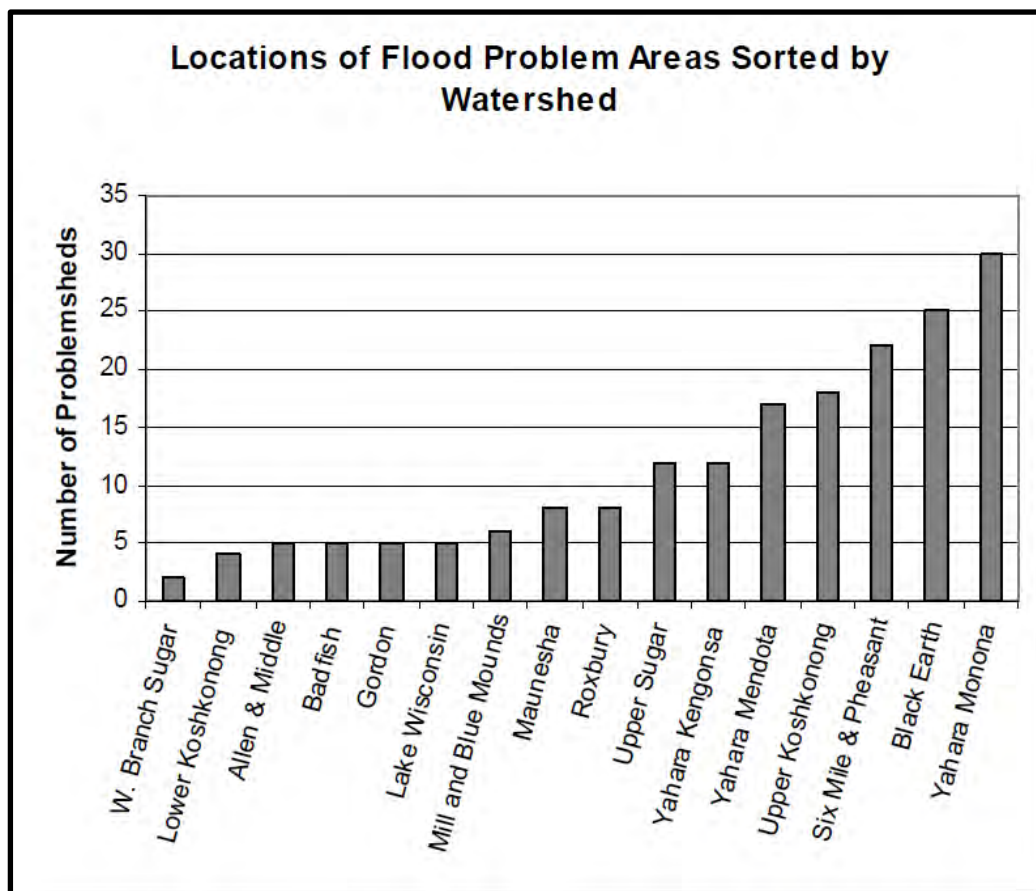
The TAC recognizes that meeting a 100% runoff volume control standard could result in additional expense and other constraints on urban development. In addition, the TAC recognizes that there are multiple compliance cost allocation strategies that could be adopted. While costs to implement the additional on-site volume control requirement will vary, a small number of example scenarios are included in this report to illustrate how the changes might be achieved. This report recommends a runoff volume-trading (fee-in-lieu) program that would provide developers with flexibility to meet volume control requirements and at a reduced cost through pooled participation in larger regional volume control facilities or by trading for excess stay-on capacity at other locations.

2. INTRODUCTION

Flooding has had a significant financial impact in Dane County (see list below). According to National Weather Service records, flood events account for four of the eight most costly weather events to affect Dane County since 2000. Combined, the five flood events that have occurred since 1993 account for an estimated \$131.6 million in property damage, crop loss, and governmental response and infrastructure repair costs. While the Yahara Lakes have experienced the majority of the flood problems, flood problem areas are found throughout the watersheds of Dane County (see figure below).

Date	Event	Property Damage (\$ Million)	Crop Loss (\$ Million)	Total (\$ Million)
June, 1993	Flood	\$12.6	\$10.0	\$22.6
June, 2000	Flood	\$6.1	\$3.2	\$9.3
July, 2006	Flood	\$10.0	\$0	\$10.0
August, 2007	Flood	\$6.8	\$5.0	\$11.8
June, 2008	Severe Storms and Flooding	\$13.5	\$64.4	\$77.9
	Total	\$49.0	\$82.6	\$131.6

Source: Dane County Emergency Management



Source: Dane County Multi-Hazard Mitigation Plan, October 2009

Flood risk has increased on the Yahara Lakes, as well as in other watersheds in the region, because of increases in stormwater runoff due to land development, and increases in the frequency of extreme rainfalls⁴. This report by the Stormwater Technical Advisory Committee recommends strategies for reducing risk from future land development by requiring no net increase storm runoff from development, and by implementing opportunities to retain storm runoff in undeveloped areas of the watershed. Adoption of these strategies county-wide would prevent increases in flood risk resulting from new land development and provide protection against future risk related to the magnitude and frequency of extreme rainfalls. The adoption of these recommended strategies will also provide environmental benefits, such as maintaining stream baseflows and habitat.

2.1 Flood Risk

Flood risk in Dane County has been increasing and will likely continue to increase unless appropriate actions are taken. The Yahara Lakes are especially flood prone due to their slow rate of drainage to the Rock River, and flooding of streets and homes is more likely when the lake levels are high. Annual maximum water levels of Lake Mendota have been generally increasing since 1916, and that rate has accelerated since the 1970s. (See Appendix II Fig. 1),

⁴ Wisconsin's Changing Climate-Impacts and Adaptation, Wisconsin Initiative on Climate Change Impacts, Madison, 2011

with eight of the ten highest Mendota lake levels over the past 100 years occurring since 1978. The maximum annual levels of Lake Monona have also been generally increasing since about 1980 (See Appendix II Fig. 2), with seven of the ten highest Monona levels over the past 100 years occurring since 1993. These increases coincide with the increase in impervious surfaces from urban development in the watershed.

2.2 Increasing Streamflows

Since 1970, Yahara River streamflows (gaged at McFarland) have been 30% higher than the streamflows over the previous 39 years (See Appendix II Fig.3). This has been partially due to increases in precipitation. Since 1970, annual average precipitation for the Madison area has been 13% greater than it had been for the previous 39 years (See Appendix II Fig. 4). Similar increases for annual precipitation as well as increases in extreme daily rainfall have been documented for most of the upper Midwest. Furthermore, climate scientists predict that the magnitude and frequency of extreme rainfall will continue to increase as a result of increasing concentrations of greenhouse gases in the atmosphere.

2.3 Urbanization

However, rainfall increases only explain about half of the observed increases in Yahara streamflow. The remaining half is due to increasing urban and suburban development across the Yahara watershed. Urban and suburban development increases the amount of stormwater runoff into the lakes by covering soils with impervious surfaces, such as rooftops, streets, and parking lots. The average annual stormwater runoff from typical undeveloped land in Dane County equals about 2 inches⁵ of rainfall per unit area. The average stormwater runoff from an impervious surface is about 21" inches per year. Most land development is not completely impervious, resulting in less than 21" of stormwater runoff.

Between 1990 and 2010 development in Dane County has increased by an average of about 2,300 acres per year.

Developed Area in Dane County (acres by decade)

<u>1990</u>	<u>2000</u>	<u>2010</u>
112,660	127,055	157,907

Source: Capital Area Regional Planning Commission Land Use Inventory Data

Since 2004 Dane County has required partial control of the volume of stormwater runoff from new developments. For the current requirements (90% of pre-development stay-on), the average annual stormwater runoff from a residential area with 1/8th acre lots and the most common county soil type is about five inches⁶. The difference in rainfall stay-on between an agricultural landscape and an urbanized area corresponds to stormwater runoff increases of about 150% over pre-development conditions. In many cases the percent increase in runoff can be much larger due to gaps in the County ordinance (3.3 below).

⁵ For Dane County the average annual rainfall series is the March 12 – December 2, 1981 rainfall for Madison. The rainfall total for this time period is 28.8 inches. For a typical pre-development runoff curve number of 68, the pre-development stay-on is 27.0 inches and runoff is 1.8 inches.

⁶ Pre-development stay-on is 27.0 inches, so 90% control is 24.3 inches of stay-on and 4.5 inches of runoff, or about 120,000 gallons per acre per year.

2.4 Draining the Landscape

There is another important way that urban and suburban development has increased stormwater runoff to the Yahara Lakes. When the Yahara watershed was glaciated, sediment from melting ice blocked surface drainage, resulting in variously sized areas that rarely if ever release surface runoff. These “internally drained areas” commonly contain ponds or wetlands that seasonally expand and contract. When these areas are developed, increased stormwater runoff causes increases in the maximum area and depth of the ponded areas. This has commonly led to construction of artificial outlets or drains that allow some or all of the increased stormwater runoff to drain to the Yahara Lakes. Examples include Acewood Pond in Madison, Stricker and Tiedeman ponds in Madison and Middleton, and Esser Pond in Middleton.

Figure 5 (Appendix II) illustrates the combined effects of increased impervious area from development and the drainage of internally drained areas in Madison and Middleton on the annual stormflows in Pheasant Branch, which drains an area that has experienced significant development over the past 25 years. The plot shows the annual ratio of Pheasant Branch stormflows to those of Black Earth Creek, which drains an area that has experienced very little development. The sharp increase in the ratio starting in the 1990s is due the development of the Pheasant Branch watershed and the construction of drains from internally drained areas to Pheasant Branch. A series of maps from 1968 through 2010 illustrate the urbanization of the watershed (see Appendix II Figure 6.). Note the approximately 900 acre expansion of the watershed that occurred between 2000 and 2010 with the connection of a previously internally drained area.

2.5 Other Impacts of Increased Stormwater Runoff Volumes

Increased stormwater runoff volumes can also create problems in the county besides flooding of the Yahara Lakes.

Increases in stormwater runoff increase both the volume and duration of stormflows in tributaries to the lakes, causing increases in stream channel erosion. Such erosion often damages structures, such as culverts and bridges. Stream channel erosion also increases the transport of sediment and phosphorus, degrading both water quality and stream habitat.

Impervious surfaces divert rainfall that would otherwise enter the soil. This reduces the groundwater recharge that maintains baseflow in streams (i.e. the continuous flow in a stream resulting from groundwater discharging to springs and seeps).

Unlike stormflow, which is intermittent, baseflow occurs at a relatively constant rate. For example, for the period 1954 to 2016 the baseflow of Black Earth Creek at Black Earth varied between about 15 and 50 cubic feet per second, while the stormflow varied between zero and 1,200 cubic feet per second. Also, because baseflow is mainly fed by groundwater, its temperature varies much less than that of stormflow. This constancy of rate and temperature provides ideal conditions for fish and other aquatic species; thus Dane County is blessed with very productive fisheries.

Population growth and increased development threatens baseflow in other ways. Most drinking water in Dane County is pumped from the ground, lowering water tables and reducing baseflow. Groundwater withdrawal is responsible for loss of some springs around the lakes such as those in the Spring Harbor neighborhood and around Lake Wingra. The Madison Metropolitan Sewerage District discharges about 60 cubic feet (3,000 gallons) per second of

treated wastewater to Badfish Creek, bypassing the Yahara Lakes (as required by law for water quality reasons). The diversion of this previously pumped groundwater is equal to about one third of the average Yahara River streamflow measured at McFarland. This baseflow diversion has increased the risk of lake levels falling below the approved WDNR summer minimums during drought years.

3. CURRENT STORMWATER MANAGEMENT REQUIREMENTS

3.1 Goals and Benefits of Stormwater Volume Control Practices

As discussed above, flood risk has increased because urban development has increased the volume of stormwater runoff reaching the lakes and streams, and because rainfall has increased. There are accepted methods for developing land without increasing storm runoff. These stormwater runoff “volume control” strategies incorporate management practices that promote infiltration or evapotranspiration of storm runoff (i.e. by increasing rainfall “stay-on”).

Stormwater volume and peak flow control requirements were initially established by the State of Wisconsin in October 2002 (implemented by October 2004) as means of reducing the bank erosion associated with extended periods of high streamflows due to increases in runoff quantity, and to help maintain baseflow in streams. Volume control is most commonly achieved by rainfall infiltration practices such as bio-retention facilities (including rain gardens), infiltration basins, subsurface infiltration systems, tree trenches, vegetated swales, and pervious pavement. Such practices also provide the benefit of recharging groundwater. Volume control can also be achieved with “green roofs,” which reduce stormwater volumes through evapotranspiration. Reducing stormwater runoff volumes through infiltration or evapotranspiration, instead of storing and releasing it, also reduces thermal impacts to streams.

Volume control practices also provide benefits beyond controlling volume and increasing baseflow. The vegetation typically included in such practices provides additional habitat, and adds aesthetically pleasing landscape features to an urban environment. They also provide opportunities for educating the public on the benefits of stormwater management practices.

Maintaining groundwater recharge is critical to maintaining stream baseflow, particularly in small headwater streams and groundwater-fed wetlands, and to replenishing some of the groundwater withdrawal for the region’s potable water supply. All types of volume control practices have the benefit of reducing flooding by eliminating some of the runoff volume.

3.2 Current Volume Control Regulations

Since 2004, Dane County has required the use of volume control strategies to provide partial control of the volume of stormwater runoff associated with land development. The County ordinance meets or exceeds the Wisconsin DNR volume-control requirements, which are intended to prevent stream erosion rather than lake flooding. However, the ordinance does not completely prevent increases in stormwater runoff volumes resulting from land development.

The Town of Westport, Village of DeForest, and Village of Cross Plains have adopted ordinances that require (with some exemptions) new development to maintain pre-development hydrology (100% of pre-development volume control). In addition, many communities have agreed to control post development runoff volumes to no more than pre-development runoff volume

levels for specific development areas as part of their urban service area amendments. (See Attachment VI for a detailed history of state and local volume control standards.)

3.3 Gaps in the Dane County Stormwater Ordinance

There are several provisions in the current Dane County Stormwater Ordinance that permit development that does not fully control stormwater runoff volumes:

- a. The maximum required volume control is 90%. This means that “stay-on” (the amount of rainfall that infiltrates or evapotranspires rather than running off) must be at least 90% of the pre-development stay-on for the average annual rainfall.⁷
- b. The land area dedicated to meeting the stay-on requirement is “capped” at 2% of the development site. When the cap area is reached, the development instead meets a reduced annual recharge requirement (which may be more difficult to meet than the infiltration standard).
- c. In accordance with State standards, infiltration exemptions are granted to redevelopment sites and to sites for which the soil infiltration rate beneath an infiltration practice would be less than 0.6 inches per hour (where the soil layer is not easily removed or manipulated), and for other cases such as high groundwater and shallow bedrock. Exempted sites are not required to achieve any volume control, even though some practices (e.g. green roofs) may be feasible and effective.

In addition, the Dane County ordinance does not specifically address internally drained areas⁸. Under the present ordinance, development in internally drained areas can result in increased volume of stormwater runoff, and increased water levels in local ponds and wetlands. Increases in runoff attributable to development in a closed watershed can increase local flood risk and lead to draining the area to a previously unconnected downstream water body. Such drainage is not currently regulated by the Dane County ordinance. However, many communities have taken actions to minimize the potential of increasing local and downstream flood risk for new development in internally drained areas as part of their urban service area expansions, as recommended by the Capital Area Regional Planning Commission (see Attachment VI).

4. RECOMMENDATIONS FOR MODIFYING THE DANE COUNTY STORMWATER ORDINANCE TO REDUCE FLOOD RISK

The Dane County Stormwater Technical Advisory Committee has reviewed the current volume control aspects of the Dane County stormwater ordinance and identified the following recommendations that aim to increase the amount of rainfall stay-on for new and redevelopment, thus reducing the risk of flooding for the Yahara Lakes and other county watersheds, and preventing increases in channel erosion, improving groundwater recharge, and maintaining stream baseflow across the County:

⁷ For Dane County the average annual rainfall series is the March 12 – December 2, 1981 rainfall for Madison. The rainfall total for this time period is 28.8 inches. For a typical pre-development runoff curve number of 68, the pre-development stay-on is 27.0 inches, so 90% control is 24.3 inches.

⁸ Internally drained areas are basins that are closed watersheds not connected to streams or other drainage due to topography, and often have permanent or ephemeral wetlands or ponds at the low point.

1. The County should revise the Dane County Stormwater Ordinance to most efficiently prevent future increases in stormwater runoff volume due to land development in each major watershed in the County, contingent on the development and adoption of a runoff-volume trading / fee-in-lieu program, as described in section 5. The revised ordinance should:
 - a. Require 100% volume control (either on or off site) of the pre-development runoff volume based on average annual rainfall for new development that is not in an internally drained area and not a redevelopment site. 90% volume control shall be met onsite where technically feasible. This requirement also eliminates caps and exemptions, and should not go into effect until a volume-trading / fee-in-lieu program has been established by the County with an explicit goal of creating projects with the lowest cost/volume ratio and where possible partnering on projects to reduce overall costs and increase benefits. For a site exempted by WDNR standards, the fee in lieu credit would be allowed to exceed the 10% gap between 90% and 100%.
 - b. Require 50% volume control (either on or off site) of the pre-development runoff volume based on average annual rainfall for redevelopment in existing urban areas. Redevelopment areas would be allowed to meet this requirement using fee-in-lieu program credits.
 - c. Development sites with approved stormwater management plans that predate these changes to the stormwater ordinance should be exempted (grandfathered).
 - d. Although flooding of the Yahara Lakes are a focus of this effort, the volume control requirement should be applied county-wide. Flood damage is experienced county-wide and will only increase unless a 'no net change' standard is enacted.
2. To protect local properties and aquatic resources located wholly or partly in an internally drained area Dane County should:
 - a. Develop an operational definition of internally drained areas and delineate internally drained areas in the county.
 - b. Require 100% on-site control of the average pre-development runoff volume based on average annual rainfall, regardless of the required effective area needed for the infiltration system. Use of fee in-lieu program credits would not be allowed in these areas, except for a site exempted by WDNR standards where a fee in lieu credit would be allowed to exceed the 10% gap between 90% and 100%.
 - c. Require provision of adequate storage within the internally drained area for the runoff volume from back-to-back 100-year 24-hr storms to define a flood protection elevation, and so that there is no increase in downstream flood risk during a 100-year event due to discharges from the internally drained area.
 - d. Require development of an emergency drawdown (pumping) plan to mitigate unanticipated local flooding.
 - e. Sites with stormwater management plans approved prior to the adoption of this ordinance should be exempted.

5. ESTABLISHING A RUNOFF VOLUME TRADING/FEE-IN-LIEU PROGRAM

In some cases, moving from the current Dane County standard of 90% to 100% volume control on-site for new development could require significant increases in cost and the land area that developers must dedicate to volume control. To illustrate this, Committee members used standard infiltration models to estimate the additional area that would be required to go from 90% to 100% control, based on a range of soil types and amount of impervious area. Their results, based on twenty seven different combinations of soil type, pre-development runoff curve number, and impervious area indicate that the increase in land area required to go from 90% to 100% control would range from 0.5% to 8.3 %, and average about 3% of the development site. (Appendix III provides full results.)

The Committee estimated that for a 100-acre residential subdivision the incremental cost increase to provide 100% volume control on site could be about \$3,000 per lot, or an increase of 3 to 5 percent⁹ (see Appendix IV). This estimate does not reflect the use of detention practices upstream of infiltration practices or the use of infiltration practices located in the right-of-way that could reduce the cost and amount of developable land required to meet the standard. Site design choices are also an important variable in the costs to achieve the standard on-site. For example, the Fitchburg Catalytic Project Report (EOR 2012) showed only 4 to 6% of the total site area was necessary to provide 100% peak and volume control, and demonstrated that potential infiltration practices could be co-located within the development.

A more cost effective way to achieve 100% pre-development volume control would be to implement a stormwater volume control trading program that would allow a developer to meet some portion of volume control by paying a fee in lieu that would be used to purchase volume credits from the County, a municipality, or a private party, thus implementing volume control off site (i.e. at some other location in the County).

The Committee estimated (Appendix IV) that the incremental cost increase for a typical residential subdivision to provide 100% volume control off site with volume trading using urban retrofit infiltration practices could range from \$130 to \$1,180 per lot, with an average of \$360 per lot. This could be a per lot cost increase of up to 2 percent based on the range of lot costs in the City of Madison.

Fees in lieu could be used by the County or other entity to purchase and manage rural internally drained areas that had been previously drained, reducing runoff to the lakes and providing opportunities to restore drained wetlands, mitigating impacts of past and future development. Figure 7 (Appendix II) shows a rural internally drained area of 200 acres that with proper controls installed could provide about 100 acre feet of volume control (credit). In comparison, the 100-acre development described in Appendix IV would need 22.5 acre feet of volume control credit to meet the additional 10% stay-on requirement of the proposed 100% of pre-development volume control recommendation.

The fees could also be used to reimburse new development for achieving greater than 100% control on site, or paid to a landowner for retrofitting a developed area with volume control

⁹ Typical improved lots in the City of Madison range from \$55,000 to \$100,000

practices. This volume-trading/fee-in-lieu program is expected to be the most cost effective way to implement runoff volume control off-site, and would also provide some protection against runoff from extreme rainfall.

To ensure that volume control practices are implemented in a cost-effective manner throughout the county, and that practices are well designed, constructed, and maintained, the Committee makes the following recommendations:

1. Dane County should establish a county-wide volume trading/fee-in-lieu program to facilitate off-site volume control where on-site control would not be feasible, or would be inefficient or prohibited. This program:
 - a. Would be administered by the Dane County Land and Water Resources Department, with oversight provided by an external board. This external board should be convened as soon as possible to assist the County in designing the trading program.
 - b. Be based on site-based rainfall stay-on volumes calculated using the 1981 rainfall standard, and comprise one-to-one rainfall volume trades.
 - c. Shall not be used to meet the current 90% standard.
 - d. Would allow volume trading for re-development and exempted sites. (Trading would be allowed for sites where 2% of the site area is dedicated to infiltration. Once reaching the 2% area dedication, trading can be used to meet the remaining volume requirements.)
 - e. Require trading for sites where on-site controls are prohibited.
 - f. Allow trading involving both public and private parties, with county oversight.
 - g. Promote trading in locations with the greatest need for volume control, such as the Yahara Lakes watershed.
 - h. Set an initial cost per unit volume of runoff controlled, prior to the proposed ordinance changes being approved.
 - i. Identify a regional volume control facility to be implemented prior to implementing fee in lieu for new and re-development.
2. To reduce the stormwater volume impacts of past development, Dane County should consider capital projects and/or grant funding to facilitate the implementation of volume control practices in developed areas, and also in rural areas not subject to volume control regulations. In doing so, the County should especially take advantage of opportunities that would provide other benefits, such as phosphorus control or ecosystem restoration. It should be noted that if these county projects were used in the volume trading program, they would not reduce the volume impacts of past development. But they could reduce the flood risk from existing urbanized areas if their capacity exceeds the volume credits allocated to them.
3. Dane County should develop policies and procedures to facilitate the standardization of the design and installation of infiltration practices. These policies and procedures should recommend:
 - a. Use of WDNR technical standards for maximum area contributing to an infiltration practice.
 - b. Use of test pits to determine on-site soil characteristics.
 - c. Engineering supervision during the construction of infiltration facilities.

- d. Post-construction performance evaluation of infiltration facilities.
4. The County should coordinate with local units of government that wish to manage their own stormwater programs by making available fee-in-lieu credits for County-managed regional volume control facilities. And, by acknowledging locally approved stay-on that meets the requirements of the ordinance.
5. Additional considerations for a stormwater volume trading program in Dane County:
- a. Allow creation of rainfall volume credits from new infiltration practices, beyond those required by regulations, that result in reductions of stormwater volume discharge to any surface water body in Dane County.
 - b. Volume credits could be created by municipalities or private developers, provided that they conform to the standards of, and are overseen by, the county-wide trading program. For example the calculated stay-on volumes could be certified and recorded by the Dane County Land and Water Resources Department.
 - c. Volume control credits could accrue from new volume control practices within Dane County, or in areas outside of the County contributing runoff to a Dane County watershed (e.g. the Yahara River Watershed in Columbia County).
 - d. New volume control practices could be created for both new and re-development projects located in established urban areas.
 - e. It may be desirable that volume control credits for a practice be used in the major county watershed in which that practice is located (i.e. Yahara River Watershed, Koshkonong Creek Watershed, Upper Rock River Basin, Sugar-Pecatonica River Basin, or Wisconsin River Basin).
 - f. For each project producing volume credits a maintenance agreement that meets Dane County requirements could be recorded.
 - g. If at any future time the credited practice is modified in a way that reduces its performance, the county-wide trading program could obligate the landowner to provide replacement volume control or reimburse the value of the lost credits.
 - h. The advantages and disadvantages of municipalities managing their own volume control trading program (subject to County standards) should be explored, for example:
 - i. Would the managing entity be allowed to set the price of a volume credit?
 - ii. Would the revenue produced by granting volume credits accrue to the managing entity for use in their trading program?
 - i. It may be advisable for construction to be completed on one or more volume control practices that would provide an aggregate stay-on volume adequate to provide the credits required to meet the expected development over the following 2-3 years.
 - j. If the demand for volume credits exceeds the availability from constructed practices, the volume trading program could provide credits in anticipation of new practices being implemented.

6. RECOMMENDATIONS FOR FUTURE ACTIONS AND CONSIDERATIONS

Columbia County

About 12% of the Lake Mendota watershed is in Columbia County (Appendix II Fig. 8) and not subject to Dane County regulations. This area is predominantly rural, and is not expected to experience significant urban development in the near future. However, about 50% of the internally drained areas in the Lake Mendota watershed are in Columbia County. Some of these areas have been partially or totally connected to the Yahara River in order to facilitate agriculture, while others remain disconnected. The connected areas provide potential opportunities for runoff volume trading.

On the other hand, drainage of currently disconnected areas would increase flood risk on the Yahara Lakes. Dane County should evaluate the potential impact of such drainage, and initiate discussion of managing these internally drained areas with Columbia County, regardless of action on the proposed volume control ordinance changes.

Improving Practices

During the course of the Committee's deliberations the need for additional changes to runoff management practices were identified. For example, Appendix V describes changes intended to improve the design and construction of stormwater management facilities.

Other future actions envisioned by the Committee include a re-evaluation of the runoff curve numbers used for defining existing and pre-existing conditions.

7. RESPONSE TO STAKEHOLDER COMMENTS ON THE PROPOSED RECOMMENDATIONS

Seventeen members of the public attended the March 20, 2017 meeting of the Technical Advisory Committee to provide comments on the 2/6/17 draft of the TAC recommendations, and written comments were also received (Appendix VIII).

Members of the real estate / land development sector voiced concerns that the recommended volume control standard would add cost to new development and reduce stocks of affordable housing in Dane County. The same group also noted an inequity by increasing costs for only new development, when much of the current flooding problem is due to existing development.

Stormwater management requirements are just one of numerous factors affecting development costs and housing prices. The Technical Advisory Committee believes that the additional cost to new development for meeting the proposed incremental increase in the existing volume control standard (without a volume trading option) could vary considerable from site to site based on many factors including site soil conditions and site design choices. To address these concerns, the TAC has proposed a volume trading program as a way of minimizing the additional costs to new development for meeting the recommended volume control standard.

The TAC recognizes that the use of general purpose tax revenue by Dane County, or stormwater utility fees by individual municipalities, are also options for funding volume control practices to address flooding problems due to both new and existing development. These alternatives could be considered independently of the policy question of whether or not new development should be held to a standard of no net increase in runoff volume and flood risk.

APPENDIX I

Members of the Stormwater Technical Advisory Committee:

Ken Potter, UW Madison - Chair
Jeremy Balousek, Josh Harder, John Reimer, Dane County Land & Water Resources
Brian Berquist, Town & Country Engineering
Caroline Burger, Brown & Caldwell
Sara Church, Vierbicher
Camilla Correll, Brett Emmons, EOR
Rick Eilertson, City of Fitchburg
Greg Fries, City of Madison
Dave Hart, WGNHS
Gary Huth, City of Middleton
Nathan Lockwood, D'Onofrio Kottke
Rob Montgomery, Montgomery Associates
Eric Rortvedt, WDNR
Mike Rupiper, Tony Vandermuss - Rapporteur, Capital Area Regional Planning Commission
Linda Severson, AE2S
Eric Thompson, MSA

Ex-officio Advisors:

Susan Jones, Dane County Office of Lakes and Watersheds
David S. Liebl - Facilitator, UW Madison and Wisconsin Initiative on Climate Change Impacts
Rebecca Power, Chair, Dane County Lakes & Watershed Commission
Caryl Terrell, Commissioner, Capital Area Regional Planning Commission

APPENDIX II
Figures and Maps

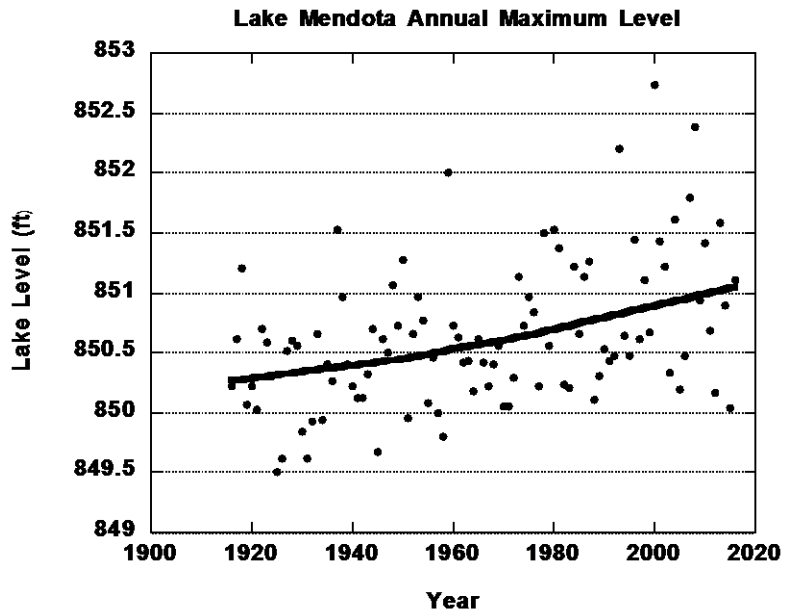


Figure 1. Annual maximum levels of Lake Mendota

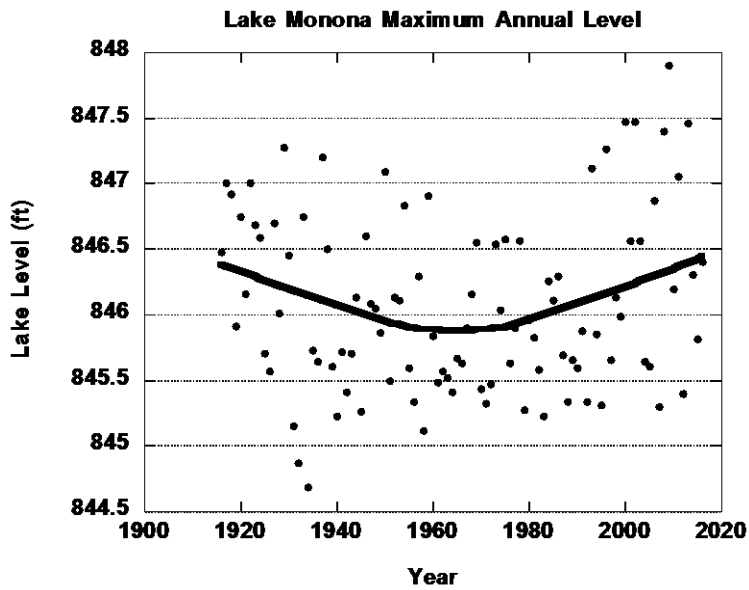


Figure 2. Annual maximum levels of Lake Monona

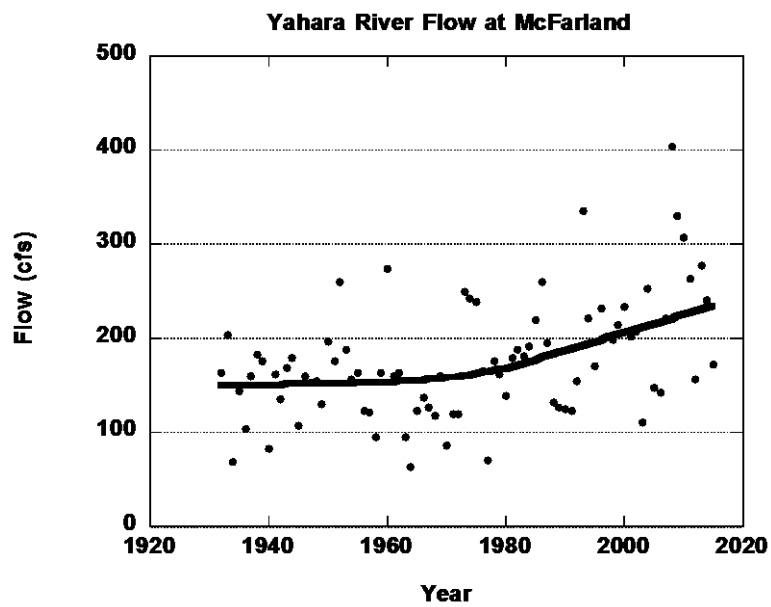


Figure 3. Annual average streamflows of the Yahara River at McFarland

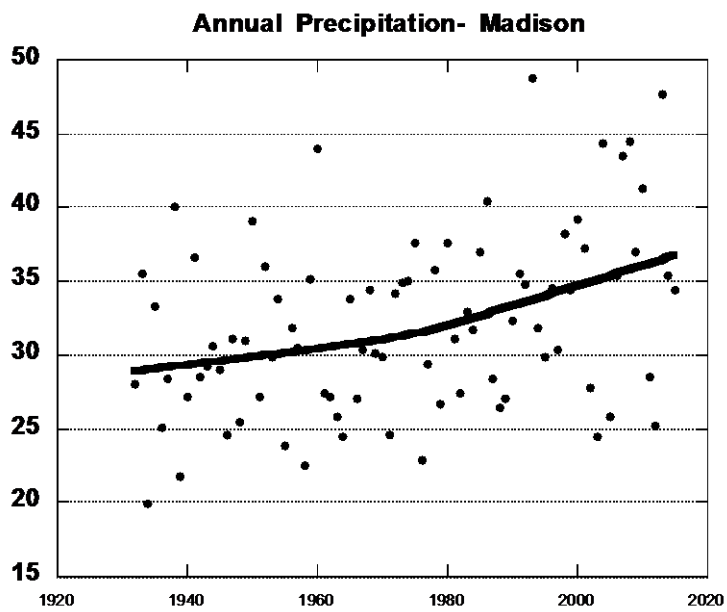


Figure 4. Madison annual average precipitation

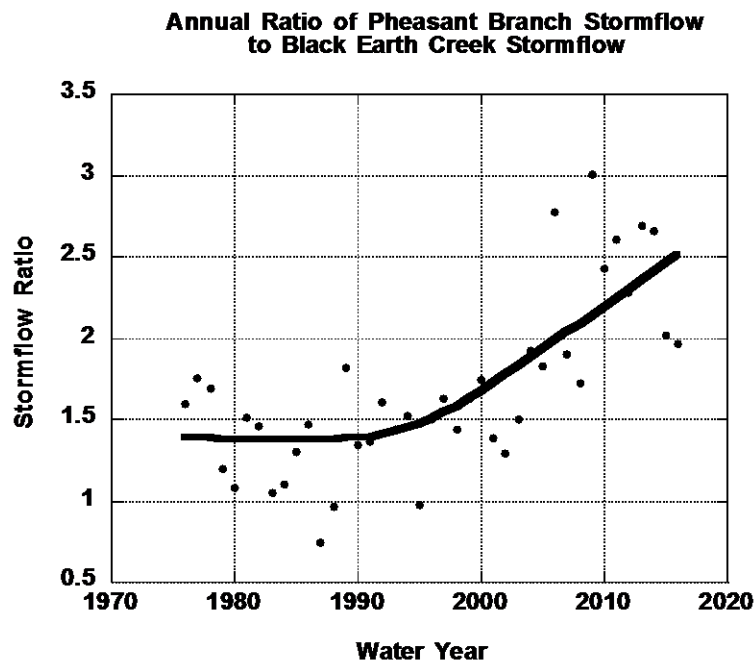


Figure 5. Annual ratio of Pheasant Branch Creek stormflow to Black Earth Creek stormflow. (Stormflows were computed by subtracting the estimated baseflow from the measured streamflow.)

History of Development in the Pheasant Branch Watershed

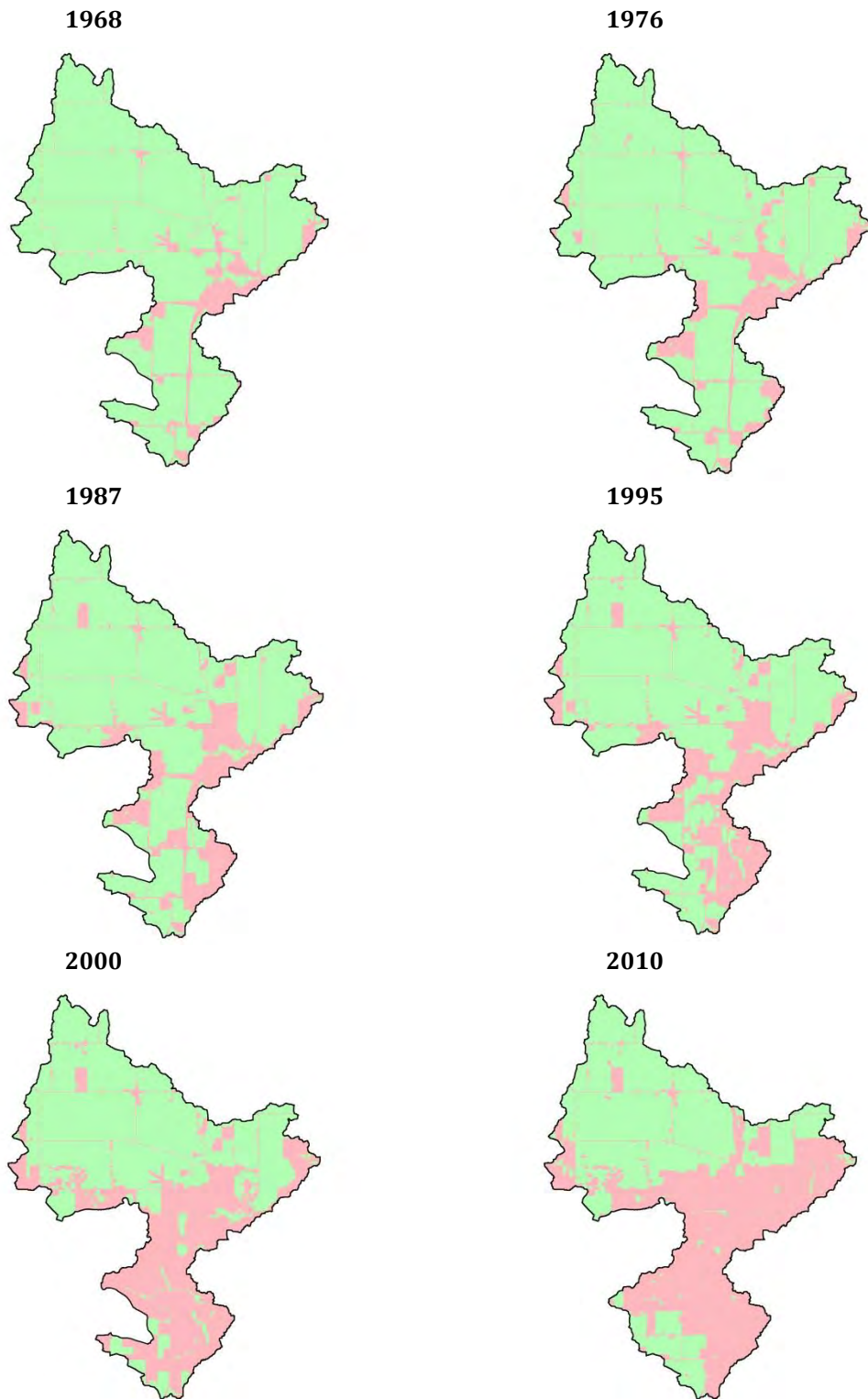
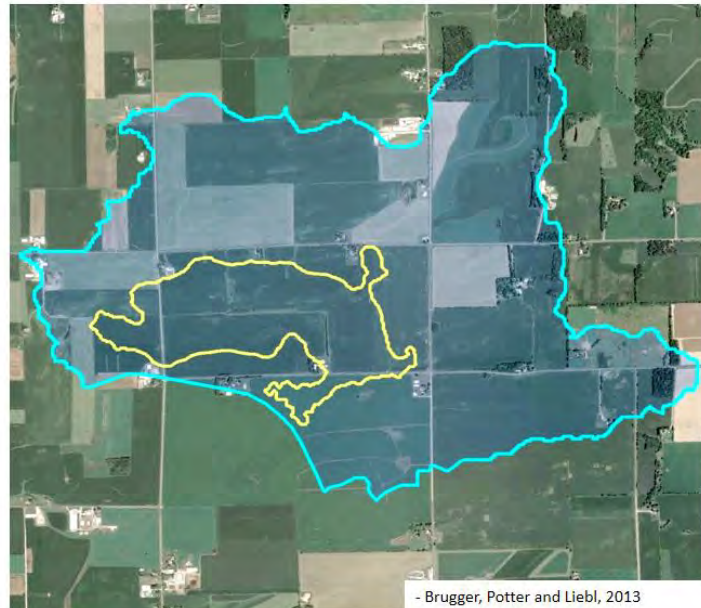


Fig. 6. Urbanized area (red) within the Pheasant Branch watershed. Source: CARPC

Figure 7. Example of Regional Volume Control



- Brugger, Potter and Liebl, 2013

Figure 7. 200 acre internally drained agricultural area (green boundary) draining to an area of wet weather ponding (yellow boundary)

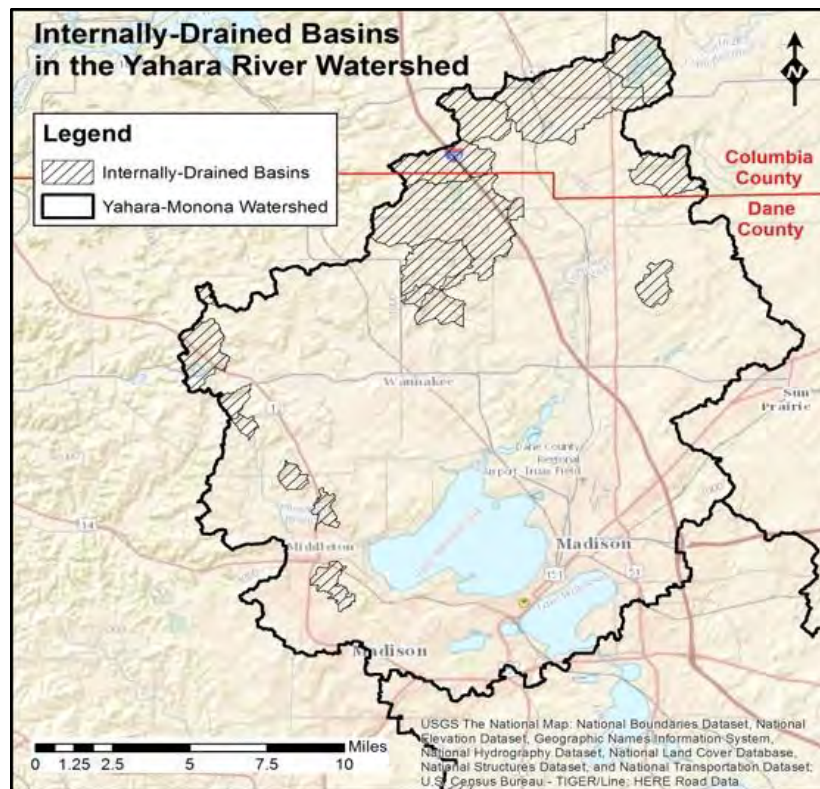


Figure 8.

APPENDIX III
Area required to meet 90% and 100% stay-on as modeled by WinSLAMM and RECARGA

WinSLAMM										
Native Soil Silt Loam (0.13 in/hr)										
				Percent of Site Required to Meet 90% Goal			Percent of Site Required to Meet 100% Goal			
Pre-Development CN	Existing Stay-On	90% Stay-On Goal	100% Stay-On Goal	40% Impervious	60% Impervious	80% Impervious	40% Impervious	60% Impervious	80% Impervious	
30 (Sandy Soils)	28.8	25.9	28.8	2.1%	4.0%	6.0%	6.6%	9.4%	11.9%	
68 (Silty Soils)	28.0	25.2	28.0	2.2%	3.9%	5.5%	5.0%	6.8%	9.0%	
83 (Clayey Soils)	24.8	22.4	24.8	1.0%	2.2%	4.0%	2.1%	3.8%	5.3%	
<i>*All results based on 6" Ponding depth and 24 Inches Engineered Soil</i>										
Native Soil Sandy Loam (0.5 in/hr)										
				Percent of Site Required to Meet 90% Goal			Percent of Site Required to Meet 100% Goal			
Pre-Development CN	Existing Stay-On	90% Stay-On Goal	100% Stay-On Goal	40% Impervious	60% Impervious	80% Impervious	40% Impervious	60% Impervious	80% Impervious	
30 (Sandy Soils)	28.8	25.9	28.8	1.2%	2.5%	3.8%	5.2%	7.4%	9.7%	
68 (Silty Soils)	28.0	25.2	28.0	1.2%	2.4%	3.5%	3.5%	5.1%	6.6%	
83 (Clayey Soils)	24.8	22.4	24.8	0.5%	1.3%	2.2%	1.1%	2.2%	3.3%	
Native Soil Sand (3.6 in/hr)										
				Percent of Site Required to Meet 90% Goal			Percent of Site Required to Meet 100% Goal			
Pre-Development CN	Existing Stay-On	90% Stay-On Goal	100% Stay-On Goal	40% Impervious	60% Impervious	80% Impervious	40% Impervious	60% Impervious	80% Impervious	
30 (Sandy Soils)	28.8	25.9	28.8	0.6%	1.3%	2.1%	3.8%	5.2%	6.8%	
68 (Silty Soils)	28.0	25.2	28.0	0.6%	1.2%	1.9%	2.0%	3.1%	4.2%	
83 (Clayey Soils)	24.8	22.4	24.8	0.2%	0.6%	1.0%	0.5%	1.1%	1.7%	

RECARGA									
Native Soil Silt Loam									
			Percent of Site Required to Meet 90% Goal			Percent of Site Required to Meet 100% Goal			
Predevelopment CN	90% Goal	100% Goal	40% Impervious	60% Impervious	80% Impervious	40% Impervious	60% Impervious	80% Impervious	
30	25.9	28.8	2.8%	5.4%	8.0%	6.5%	9.5%	12.3%	
68	24.3	27.0	2.5%	4.6%	6.7%	5.0%	7.4%	9.6%	
83	20.6	22.8	1.7%	3.1%	4.5%	3.0%	4.5%	6.0%	
<i>*All results based on 6" Ponding depth and 24 Inches Engineered Soil</i>									
Native Soil Sandy Loam									
			Percent of Site Required to Meet 90% Goal			Percent of Site Required to Meet 100% Goal			
Predevelopment CN	90% Goal	100% Goal	40% Impervious	60% Impervious	80% Impervious	40% Impervious	60% Impervious	80% Impervious	
30	25.9	28.8	1.9%	3.7%	5.7%	6.4%	9.3%	12.1%	
68	24.3	27.0	1.6%	3.0%	4.7%	3.5%	5.6%	7.4%	
83	20.6	22.8	1.1%	2.02%	3.01%	2.0%	3.0%	4.1%	
Native Soil Sand									
			Percent of Site Required to Meet 90% Goal			Percent of Site Required to Meet 100% Goal			
Predevelopment CN	90% Goal	100% Goal	40% Impervious	60% Impervious	80% Impervious	40% Impervious	60% Impervious	80% Impervious	
30	25.929	28.81	1.0%	2.2%	3.8%	6.4%	9.3%	12.1%	
68	24.3	27	0.8%	1.6%	2.6%	2.4%	3.8%	5.3%	
83	20.556	22.84	0.5%	1.0%	1.6%	1.0%	1.6%	2.2%	

APPENDIX IV

Examples of Estimated Cost for Increasing Volume Control

These examples are provided to show the approach used by the TAC to understand the potential economic impact of increasing the runoff volume control standard from 90-100%. Actual costs will vary significantly by location and development plan.

While implementing increased stay-on for a developed or redeveloping site can incur significant costs, implementing the same runoff volume reduction through infiltration in a large rural county-owned facility should dramatically reduce those costs.

Assumptions:

- 100 acre residential plat
- 40 acres road ROW & park
- 60 acres developable lots @ 5 lots per acre = 300 lots
- 60% impervious and silt loam soils
- Land cost = \$100,000 / acre
- Bioretention facility construction cost = \$5 per square foot

27.0" average annual pre-development stay-on (CN = 68) from RECARGA

24.3" = 90% of average annual pre-development stay-on (CN = 68)

Example 1. Cost if Met Onsite

From modeling by Linda Severson and Caroline Burger (see Appendix III) site area required for volume control was estimated to increase from 4.6% to about 7.4%, or from 4.6 acres to 7.4 acres for a 100 acre site.

Land cost = 2.8 acres x \$100,000 = \$280,000

Construction cost = 2.8 acres x 43,560 sq. ft. / acre x \$5 = \$609,800

Total cost increase = \$889,800 or about \$3,000 per lot

This estimated cost increase does not include the opportunity cost to the developer from reduced profit from using some of the land that would otherwise be saleable for additional infiltration area (that information is not publicly available).

It should be noted that site area ratios were determined using RECARGA Version 3.0 and these results do not reflect the use of detention practices upstream of infiltration practices or the use of infiltration practices located in the right-of-way that would reduce the amount of developable land required and the cost of meeting the standard.

Example 2. Cost if Met Off Site with Volume Trading - Urban Retrofit Practices

The Lake Wingra Watershed Management Plan, prepared by Strand Associates for the City of Madison, identified a cost range for various urban retrofit infiltrations practices ranging from \$0.04 to \$0.36 per cubic foot on a 20-year net present worth basis (see APPENDIX IV-3). The average urban retrofit infiltration practice cost is estimated to be \$0.11 per cubic foot. Volume trading would allow these urban retrofit practices to be used in existing areas that were developed before volume control standards were required.

$100 \text{ acres} \times (27.0 - 24.3 \text{ inches}) \times 1 \text{ foot} / 12 \text{ inches} \times 43,560 \text{ sq. ft.} / \text{acre} = 980,100 \text{ cubic feet}$

Cost increase = \$107,811 or ~ \$360 per lot

Cost increase range: \$39,200 to \$352,800, with an average of \$107,800.

\$130 to \$1,180 per lot, with an average of \$360 per lot.

Example 3. Cost if Met Offsite with Volume Trading - Rural Practices

The re-closure or partial re-closure of formerly internally drained sub-watersheds in rural areas that have been opened through ditching, culverts, or drain tile, offer another potential for volume trading. Cost estimates for these practices have yet to be developed, but it is believed that they will be less expensive than the average cost for urban retrofit practices. Especially since they are compatible with other efforts such as phosphorus reduction through Yahara WINs. Land costs are expected to be in the range of \$15,000 to \$17,000 per acre for wetlands based on the experience of Dane County and the City of Madison.

Facility	Infiltration Performance (ft3) at Varying Infiltration Rates			% of Total	OPCC	Total 20-Year Present Worth	20-Year NPW Cost/cf
	0.3 in/hr	0.5 in/hr	1.0 in/hr				
Structural Improvements							
Westmorland Park Bioretention Basin	374,616	431,244	557,568	6.9%	\$ 249,300	\$ 367,640	\$ 0.04
Downspout Disconnection Program (35% Watershed Participation)	950,893	950,893	950,893	15.2%	\$ 466,900	\$ 877,124	\$ 0.05
Rain Barrel Program (25% Watershed Participation)	339,605	339,605	339,605	5.4%	\$ 151,600	\$ 377,697	\$ 0.06
1,000 Private Residential Rain Gardens (Serving Roofs Only)	1,045,440	1,089,000	1,132,560	17.4%	\$ 1,047,600	\$ 1,654,205	\$ 0.08
Devolis Park (Axel Avenue) Bioretention	239,580	248,292	261,360	4.0%	\$ 331,200	\$ 479,671	\$ 0.10
Arbor Hills Greenway Infiltration (@1.63 in/hr)	535,788	535,788	535,788	8.6%	\$ 883,500	\$ 1,279,398	\$ 0.12
Glenway Wet Pond & Infiltration	779,724	779,724	779,724	12.5%	\$ 1,819,400	\$ 1,952,764	\$ 0.13
Grandview Boulevard Bioswale	326,700	335,412	344,124	5.4%	\$ 612,100	\$ 893,405	\$ 0.13
60 Private Commercial Rain Gardens (Serving Roofs Only)	128,066	130,680	135,907	2.1%	\$ 290,200	\$ 417,396	\$ 0.16
4 Acres Porous Pavement (Serving 12 acres)	888,624	888,624	888,624	14.2%	\$ 2,471,413	\$ 3,143,409	\$ 0.16
Monroe Street Green Street	196,020	226,512	291,852	3.6%	\$ 532,100	\$ 835,587	\$ 0.18
1,000 Terrace Rain Gardens	304,920	304,920	457,380	4.9%	\$ 1,370,500	\$ 2,184,378	\$ 0.36
TOTAL	6,109,976	6,260,694	6,675,385	100%	\$ 10,225,813	\$ 14,462,675	\$0.11 (avg)
Infiltration Gap to Meet Short-Term Goal	6,178,392	6,168,591	6,157,396				
Difference	-68,416	92,103	517,989				

Notes: OPCC = Planning level opinion of probable construction cost.
NPW=Net present worth
All costs are 1st Quarter 2014 dollars.

Table 3.03-11 Infiltration Performance and Cost-Effectiveness of Proposed Infiltration Facilities

1. City of Madison 1,000 Rain Garden Program—Continuation of this program will be instrumental in providing source area infiltration BMPs in the watershed for single-family residential and duplex land uses. This program could be expanded to the non-single-family residential and duplex sector (e.g., commercial, business, institutional, and multifamily residential). These programs are expected to serve mainly rooftops. Table 3.03-12 provides information on the opportunities for expansion of this program.

Land Use	Parcels in the Watershed	Rooftop Area (acres)
Residential (Single-Family and Duplex)	4,620	183
Nonresidential (Commercial, Business, Institutional, Multifamily Residential, and Institutional)	460	178

Table 3.03-12 Rain Garden Opportunities

For purposes of this plan, performance of residential and commercial rain gardens was evaluated with the assumptions shown in Table 3.03-13.

APPENDIX V
Recommendations for Changes to the Dane County Stormwater Manual

1. Modify the accepted value for engineered soil hydraulic conductivity from 3.94 in/hr to 3.60 in/hr to be consistent with the default value for a sand textured soil. This also the maximum allowed design infiltration rate for all soils.
2. Developers are expected to remove up to 5 feet of undesirable material in order to reach appropriate infiltrating soils to avoid claiming an exemption. *Note: Current expectation is 2 feet, 5 feet is consistent with DNR guidance when NR151 infiltration standard became effective in 2004.*
3. The drawdown time for underground infiltration practices should not exceed 72 hours from the end of the rainfall event and based on drawdown of a single rainfall event.
4. Where peak flow rate management and infiltration requirements are met in the same basin, an additional 2 feet of ponding above the infiltration ponding depth is acceptable (3-4 feet total ponding depending on practice) so long as the entire basin maintains a 72 hour drawdown. A figure/diagram illustrating this scenario should be developed.
5. Determining soil textural class and selecting a value from Table 2 of DNR Tech Standard 1002 is the preferred method for selection design infiltration rates, and shall be conducted by a licensed soil scientist, certified soil tester or equal. In-field testing of infiltration rates may be desirable to “ground truth” assumed infiltration values.
6. Side seepage rate for infiltration practices in WinSLAMM should be set to 0.01.
7. Effective infiltration areas and stormwater basin areas should be assigned source area 70 in WinSLAMM to reflect that they are not considered pervious for infiltration calculations. *Note: This is needed for effective infiltration area to prevent double counting of infiltration as a pervious area and as an infiltration device.*
8. When performing pre-development hydrologic calculations, depression areas shall be modeled as ponds in the pre-development model if they exceed 1 foot in depth and 20,000 sf in area. Depression areas smaller than these values may be modeled using the “ponded area” routines in TR55 and similar models.
9. When performing site evaluation for infiltration, soil test pits are recommended over soil borings.
10. As-built checklist and record drawings should be conducted by a Professional Engineer who affirms that the stormwater facility is in compliance with the approved design.

11. All facility maintenance agreements will be signed and recorded.

Stormwater Plan Checklist

This checklist must be completed as part of the Stormwater Permit As-built Submittal

Name of Project:

Location of Project:

Name of Professional Engineer:

As-built Date:

All submittals shall include this completed checklist, and certification statement below signed by the responsible licensed professional.

Additional comments may be warranted depending upon how submittal comments were addressed.

Required Certification

I, the undersigned, hereby certify that I am a Professional Engineer in the State of Wisconsin. I have reviewed the accompanying plan submission and checklist and to the best of my knowledge, I certify that construction of stormwater facilities are in compliance with the approved stormwater plan.

Licensed Professional Signature

Date

STORMWATER INFILTRATION BASIN CHECKLIST

Provide the following certifications related to construction methods of the facility:

- ☐ Compaction and smearing of the soils beneath the floor and side slopes of the of the facility have been minimized
- ☐ Native soil type encountered along extents is as designed (*if native soil infiltration rates are less than designed see post construction modeling checklist below*)
- ☐ Engineered soil composition
- ☐ Engineered soil load tickets
- ☐ Provide plant spacing and species
- ☐ Observation wells have been installed to the quantity and location in plan drawings
- ☐ Photo documentation of excavated basin, completed basin, and other relevant construction phases

Provide the following information related to the facility's surface area and available storage:

- ☐ Post construction verification of contours of the stormwater facility including any forebays
- ☐ Calculations of the surface area of the facility's soil surface
- ☐ Calculations of the volume of the of the facility as constructed (*If the constructed volume is less than the design see post construction modeling checklist below*)

Provide the following information related to the inlet and outlet structures within the facility:

- ☐ Diameter and material of all inlet and outlet pipes
- ☐ Invert elevations of all inlet and outlet pipes
- ☐ Dimensions and material of overflow structures
- ☐ Elevations of top of banks and overflow berm
- ☐ Drain tile installed at proper location (if applicable)

Provide the following information if the constructed facility is not in accordance with plan drawings and design:

- ☐ Perform modeling calculations for total suspended solids (New development: 80% reduction in TSS, Redevelopment: 40% reduction in TSS)
- ☐ Perform modeling calculations for peak discharge rates (1, 2, 10, and 100 year 24 hour storm events)

- ☐ Perform modeling calculations for infiltration (90% of predevelopment volume)
- ☐ Check box if the constructed design achieve performance standards for TSS, peak discharge, and infiltration

APPENDIX VI

History of State and Local Volume Control Standards

The first statewide stormwater runoff volume control standards were adopted in October 2002, when the Wisconsin Department of Natural Resources (WDNR) set runoff pollution performance standards for developed lands through Wis. Admin. Code Chapter NR 151. Implementation of the infiltration standard was phased in over two years, so that they became effective in October 2004. These rules were established as means of reducing the bank erosion associated with extended periods of high streamflows due to increases in runoff quantity, and to help maintain baseflow. In NR 151 of runoff volume control is referred as the “infiltration performance standard,” and is assessed by comparing the pre- and post-development runoff volume for a site based on an average annual rainfall series¹. However, it is more accurately called a volume control or stay-on standard because best management practices that utilize evapotranspiration or infiltration can be used to meet the standard. At that time, the volume control requirements for new development in NR 151 was 90% of pre-development for residential development and 60% of pre-development for non-residential development.² The rules also included certain areas that were exempt from meeting the infiltration standards due to concerns with the potential for groundwater contamination and established caps on the area required to be used to meet the standard (1% of disturbed land for residential sites, 2% for commercial). The exemptions and site area caps can have the effect of reducing the stay-on requirements in the standard and increasing runoff volumes above the target levels in the standard.

Dane County initially adopted the State infiltration standards into Ordinance Chapter 14 with a one-year sunset clause for the caps on the land required for infiltration practices. In September 2005, Dane County convened a Stormwater Infiltration Task Force to further evaluate the stormwater infiltration requirements, including the caps, as well as other approaches, and to make recommendations for possible changes in these standards. As a result of this work, the Task Force agreed unanimously on a number of recommendations for improving infiltration standards and practices in Dane County. A summary of the recommendations they made are³:

1. Amend the ordinance language to provide an option for developers to meet specific groundwater recharge goals in lieu of exceeding caps on the percentage of land required for infiltration devices. If a development would require more than 1% (residential) or 2% (non-residential) of the site to meet NR 151 infiltration standards, developers may choose to satisfy the Dane County infiltration standard by designing infiltration practices that (in addition to meeting minimum NR 151 standards) meet a recharge rate of 7.6 inches/year, which is the estimated county-

¹ For Dane County the average annual rainfall series is the March 12 – December 2, 1981 rainfall for Madison. The rainfall total for this time period is 28.8 inches. The largest single day rain event in the series is 2.59 inches.

² For the Dane County average annual rainfall series and a typical pre-development curve number = 68, pre-development stay-on = 27.0”, 90% = 24.3”, and 60% = 16.2”

³ The complete report of the 2005-2006 Dane County Stormwater Infiltration Task Force is included as Attachment I.

wide pre-development groundwater annual recharge rate. This option also requires mitigation of the effects of compaction on disturbed open areas.

2. Provide guidelines for the use of computer models for infiltration calculations that are part of the approval process; work with stakeholders to provide short courses, workshops, and other programs for installers of infiltration devices, to ensure effective practices; require and enforce “as-built certification” of installed infiltration devices.
3. Place a high priority on testing the effectiveness of installed infiltration practices to determine what works and what does not work, and why.
4. Establish appropriate groups to make recommendations about the status of, and future needs for, hydrological research and management in Dane County.
5. Provide funds for research and for additional staff for training, permit review, monitoring effectiveness of installations, and on-going review of infiltration standards.

In April 2008, the Town of Westport was the first community in the region to adopt a higher volume control standard into their stormwater management ordinance. Their ordinance requires all stormwater management plans to infiltrate 100% of the increased post-development runoff volume from the 100-year, 24-hour design storm with type-II distribution (as compared to the runoff volume from the pre-development 100-year, 24-hour design storm with type-II distribution). The Town adopted this standard in response to the flooding they were experiencing along the Lake Mendota shoreline. Their goal was to demonstrate that it was an attainable standard which, if it was also adopted by other communities, could lead to sustainable lake levels and less flooding.

In October 2009, the Capital Area Regional Planning Commission convened an Environmental Resources Technical Advisory Committee to provide technical recommendations on a more stringent volume control standard than was required under NR 151 and Dane County Chapter 14. The ERTAC met over a six month period to review and discuss some of the relevant literature on stormwater volume control, some of the volume control standards in use around the country, and modeling results from different volume control standards⁴. The ERTAC noted that the 60% standard for nonresidential development was so low that it did not require any volume control practices in many cases and recommended a 90% of pre-development volume control standard for both residential and non-residential development. They also recommended replacing the caps with an alternative to allow meeting the annual pre-development recharge rate determined from the Wisconsin Geological and Natural History Survey's report, *Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model* or by a site specific analysis when at least two percent (2%) of the site must be used for infiltration. In their recommendations, the ERTAC recognized the potential benefits of a runoff volume control standard to 100% of pre-development volumes, but it expressed several concerns related to the achievability and the cost versus benefit of adopting a

⁴ The complete recommendations of the 2009-2010 Technical Advisory Committees are included as Attachment II.

standard of no increase in pre-development runoff volumes. The ERTAC also recommended additional research efforts, data collection, and model improvements that should be conducted to provide the information needed to further evaluate this issue and recommended a 5-year time frame for reevaluation of the proposed standard.

Subsequently many communities in the region agreed with the Capital Area Regional Planning Commission recommendation to control post development runoff volumes to no more than pre-development runoff volume levels (for the one-year average annual rainfall period) for specific development areas as part of their Urban Service Area Amendments:

- City of Madison - Northeast Neighborhood (2010)
- City of Fitchburg – McGaw Neighborhood (2010)
- City of Middleton / Town of Westport - Bishops Bay Neighborhood (2010)
- City of Madison – Shadywood Neighborhood (2010)
- Village of DeForest -Bear Tree/Countryview Estates/Three Bridges Neighborhoods (2010-2011)
- Town of Windsor / Village of DeForest - Bear Tree Neighborhood (2012)
- City of Madison – Elderberry Neighborhood (2013)
- City of Verona - Area N and Area S (2016)

The ensuing development in these areas has helped to demonstrate the feasibility of meeting a volume control standard equal to 100% of pre-development conditions.

In September 2010, the Village of DeForest increased the volume control standard in their stormwater management ordinance to require all new development to design stormwater management practices such that the post-developed stay-on volume equals or exceeds 100% of the pre-developed stay-on volume as determined by the 1-year average annual rainfall series for Madison, WI. Their ordinance also provide for a fee in lieu of providing additional areas for volume control, if Volume Control practices required for a site exceed 1% of the total site area in residential or 2% of the total site area in non-residential developments.

In January 2011, the requirements in NR 151 were changed to 60% of pre-development infiltration for high (> 80%) imperviousness development, 75% of pre-development infiltration for medium (40 – 80%) imperviousness development, and 90% of pre-development infiltration for low (< 40%) imperviousness development. A major concern expressed with this change to the State standards is that it created the wrong incentive and encouraged developments to increase their percentage of imperviousness as a way of reducing their infiltration requirements.

In March 2011, Dane County amended Ordinance Chapter 14 to incorporate the recommendation of the CARPC TAC for a 90% of pre-development volume control standard for both residential and non-residential development. The ordinance amendment retained the alternate design criteria to meet or exceed the annual pre-development recharge rate if more than 2% of the site is required for infiltration. It also updated the annual pre-development recharge rate to that in the Wisconsin Geological and Natural History Survey's 2009 report, Groundwater Recharge in Dane County, Estimated by a GIS-Based Water- Balanced Model or subsequent updates, or by a site specific analysis using other appropriate techniques. It also required that at least two percent (2%) of the site must be used for infiltration if the alternative groundwater recharge design approach is taken.

In 2011, the Village of Cross Plains became the third community in the region to adopt the volume control standard of 100% of pre-development stay-on. This was in response a community concern over maximizing baseflow to Black Earth Creek.

Internally Drained Area (Closed Basin) Standards

Neither the State nor the County have stormwater volume control standards specific to closed basins or internally drained areas.

The City of Middleton was the first community to adopt additional volume control requirements for closed watersheds. Their ordinance requires new and redevelopment sites located wholly or partially within a closed watershed to infiltrate one hundred percent of the average annual pre-development infiltration volume, regardless of the effective area of the infiltration system.

Over the past decade, many communities in the region have agreed with the Regional Planning Commission recommendation to control post development runoff volumes to no more than pre-development runoff volume levels (for the one-year average annual rainfall period) for development areas within or draining to closed basins as part of their Urban Service Area

Amendments:

- City of Verona – Development in Morse Pond Basin (2005)
- City of Stoughton – Southwest Development (2008)
- City of Stoughton – West End Development (2011)
- Village of Brooklyn – Business Park (2012-2013)
- City of Madison – Old Sauk Road Development (2013)
- City of Madison – Schewe Road Development (2014)
- City of Fitchburg – Stoner Prairie Development (2014)
- City of Verona – Development in Morse Pond Basin (2016)

Proposed developments within internally drained areas since 2014 have also included recommendations for flood protection namely:

- Providing adequate storage for back to back 100-yr 24 hour storms, so that there is no increase in downstream flooding during a 100-year event due to pumped flows from the closed internally drained area.
- Developing an emergency draw down (pumping) plan to mitigate unanticipated flooding in the internally drained area.

APPENDIX VII

Stormwater Technical Advisory Committee of the Dane County Lakes & Watershed Commission
and the Capital Area Regional Planning Commission - Meeting Minutes

MINUTES
of the
Stormwater Technical Advisory Committee
of the Capital Area Regional Planning Commission
and the Dane County Lakes & Watershed Commission

July 18, 2016

5201 Fen Oak Dr., Madison WI – Conference Room AB

1:30 p.m.

Committee Members Present: Ken Potter, Jeremy Balousek, Brian Berquist, Caroline Burger, Sarah Church, Camilla Correll / Brett Emmons, Rick Eilertson, Greg Fries, Gary Huth, Nathan Lockwood, Rob Montgomery, Eric Rortvedt, Mike Rupiper, Linda Severson, Eric Thompson

Committee Members Absent: Nick Balster, Roger Bannerman, Dave Hart

Ex-officio Advisors Present: David Liebl, Rebecca Powers, Caryl Terrell

Ex-officio Advisors Absent: Sue Jones

Others Present: Bob Armstrong-WisDOT, Jon Becker-Cranes, Tony Vandermuss-CARPC, Joe Van Rossum-facilitator

1. Ken Potter began with an introduction to the TAC and provided a summary of his presentation “Landuse, Climate Change, and Yahara Lakes Flooding” (see July meeting packet).
2. Ken Potter discussed the objective of the TAC (see July meeting packet).
 - a. Noted the focus of the TAC recommendations is for county-wide implementation, not just the Yahara Chain of Lakes.
3. Introductions of all Committee Members, Ex-officio Advisors, and public present including initial comments from several present on hopes for TAC Focus.
 - a. Rob Montgomery noted that the intended volume standard is hard to achieve in agricultural landscapes as they inherently are unsuited to capturing and infiltrating runoff. Montgomery also noted the importance of representing all of the cost and benefits of implementation of an increased volume standard not simply infrastructure cost increase.
 - b. Caryl Terrell stressed the importance of the TAC charge as it relates to both observed urban and rural flooding.
 - c. Rick Eilertson noted a lack of land developers on the TAC committee and the importance of land owner buy-in with regard to increased standards.
 - i. Follow-up included the note that developer involvement will be addressed at a later date.
 - d. Linda Severson noted the variability of existing conditions for proposed conditions and suggested tiers of regulation to address varying conditions.
 - e. Brian Berquist noted that, as an engineer representing local villages, towns and cities will be looking for versatility in conforming with the TAC recommendations.
 - f. Eric Rortvedt noted the WDNR’s state charge to protect water quality and recognized that providing recommendations for a locally enforced reduced volume standard was not directly connected to the water quality standards and therefore would be locally enforceable. Rortvedt also noted the state’s desire to provide unified and consistent language with respect to ordinances.
 - g. Eric Thompson stressed the importance of defining the predevelopment status at the onset of development and suggested improving ordinance language related to predevelopment and expanding predevelopment curve numbers to more adequately reflect all site conditions. Thompson also noted the need for consistency in hydrologic modeling approaches. Finally, Thompson noted the need to focus beyond design intent to put as much or more importance on in-field implementation and future maintenance of infiltrating facilities to ensure long term conformance.

- h. Jon Becker (public) noted the need to focus on the total costs financial and environmental resulting from lake management including reduced shoreline habitat. Becker provided two hand-outs which will be posted at http://www.capitalarearpc.org/TAC_MeetingMaterials_2016.html
 - i. Bob Armstrong (public) noted the opportunity to focus on public education during and after implementation.
- 4. Joe Van Rossom discussed the ground rules and decision making process going forward.
 - a. A consensus was reached that consensus voting was the preferred method for voting.
 - b. Monthly meeting recurrence was confirmed.
 - c. The committee agreed that in the event of the absence of a member, a proxy could represent them and vote provided the individual was suitably prepared in advance to do so.
- 5. Mike Rupiper provided a summary of current county and local ordinances and typical CARPC conditions of approval related to volume control and closed basins. (see July meeting packet)
 - a. A discussion related to the 2% maximum site area devoted to infiltration practices followed with the conclusion that the maximum area requirement should be reconsidered as part of the TAC recommendations.
 - b. A discussion related to the appropriate level of site assessment for infiltration concluded a need for more specific guiding language.
 - i. Rortvedt announced that a WDNR TAC had just begun meeting for the update of Technical Standard 1003 – Infiltration Basins.
 - c. A discussion related to the determination of a baseline from where a curve number should be determined, whether it be a specific year, predevelopment conditions, or presettlement conditions concluded there is a desire for consistency and the requirement should be further considered as part of the TAC recommendations.
 - d. A discussion related to the need to be able to quantifiably define a closed basin was had.
- 6. A facilitated break out exercise occurred where 4-5 committee members addressed 1 of 4 key issues related to the TAC charge for 5 minutes and then switched to address each issue. A summary of the results is attached to the minutes. The four issues included the following:
 - a. (1) Adequacy of current stormwater requirements to prevent increase in flooding to the Yahara Lakes;
 - b. (2) Potential volume control practices and their likely effectiveness in preventing increases in lake flooding as a result of urbanization;
 - c. (3) Effectiveness of project-by-project practices versus a regional approach; and
 - d. (4) Potential regional volume control strategies.
- 7. Potter finished with a summary of the original objective the TAC is charged with addressing and provided next steps.
 - a. Potter confirmed he would synthesize the information offered during the meeting and provide a follow-up with his thoughts within a week.
 - b. Identified the potential need for a comprehensive regional stormwater plan that could be used for decision making across the region/county.
 - c. Confirmed the next meeting will be Monday, August 15, from 1:30-3:30 at the same location, 5201 Fen Oak Drive, Madison, Conf Rm AB.
- 8. Adjournment at 3:30 PM

Minutes prepared by Tony Vandermuss

Summary of Facilitated Break Out Exercise Comments Provided by Committee Members

(1) Adequacy of current stormwater requirements to prevent increase in flooding to the Yahara Lakes

- Definition of New vs. Redeveloped
- Need closed basin requirement and definition
- Need policy on applying standards including:
 - site assessment
 - modeling
 - number crunching (input)
- Uniform benchmark to apply standards
 - Predevelopment versus presettlement
- Volume control RCN & tc (runoff curve number and time of concentration) – think about more than just infiltration
- Pretreatment requirements
- If regional or lake flooding is the concern – flood insurance might be an answer.
- Reconsider 2% area threshold
- Language needed to demonstrate BSD/LID has been applied before saying can't meet requirement

(2) Potential volume control practices and their likely effectiveness in preventing increases in lake flooding as a result of urbanization

- Greywater reuse (pond water use) – integrated potable-waste-storm better
- Groundwater conservation strategies
- Maximum impervious density/connectivity
- Allow flood/stormwater storage in wetland setbacks
- Evaluate additional benefits of volume control; water quality (phosphorus reduction); groundwater recharge; groundwater dependent natural resources
- Closed basins as control structures
- Preserve the hydrograph
- Flexible road widths
- Bioretention
- Use road as treatment
 - granular material underneath
 - road and perforated pipes as option
- Infiltration basin
- Porous pavement/permeable pavers
- Rain troughs (not barrels)
- Elevated structures
- Green roofs

(3) Effectiveness of project-by-project practices versus a regional approach

- Project approach is site scale/decentralized
- Regional has less property to maintain
- Two interpretations means
 - Decentralized (widely disturbed) vs. Centralized
 - Evaluated/Design site by site vs. Regional planning/coordination
- Decentralized/Site scale
 - Pros – Reduced risk of groundwater flooding and co-benefit of habitat
 - Cons – Likely privately owned (sufficient maintenance?)
- Regional planning/Coordination is essential
 - Pro – Easier to manage
- Amount of land used

(4) Potential regional volume control strategies

- Regional Facilities (Watershed/Lake based)
- Fee in Lieu
- Stormwater Volume Trading
- Mitigation bank
- Retrofit projects
 - And applicability requirement
- Impervious Area Cap (by zoning?)
- Required native landscaping
 - Specification and performance credit/reduction
- Pretreatment key (& ongoing maintenance)
- Maintenance (coordinated annual/semi-annual inspections and reports)
- Preservation/enhancement of natural depressions
 - Identify at application step (protect by ordinance)
- Awareness and preservation of unmapped floodplains and conveyances

MINUTES
of the
Stormwater Technical Advisory Committee
of the Capital Area Regional Planning Commission
and the Dane County Lakes & Watershed Commission

August 15, 2016

5201 Fen Oak Dr., Madison WI – Conference Room AB

1:30 p.m.

Committee Members Present: Ken Potter, Jeremy Balousek, Brian Berquist, Caroline Burger, Sarah Church, Camilla Correll / Brett Emmons, Rick Eilertson, Greg Fries, Dave Hart, Gary Huth, Nathan Lockwood, Steve Gaffield (Rob Montgomery proxy), Mike Rupiper, Linda Severson

Committee Members Absent: Nick Balster, Roger Bannerman, Eric Rortvedt, Eric Thompson

Ex-officio Advisors Present: David Liebl, Rebecca Powers, Sue Jones, Tony Vandermuss

Ex-officio Advisors Absent: Caryl Terrell

Others Present: John Reimer-Dane County, Joe Van Rossum-facilitator

1. Ken Potter welcomed everyone back to the second meeting of the SW TAC.
2. Approval of Minutes of the July 18, 2016 Meeting.
 - a. Ken Potter requested a motion to approve the minutes of the July 18, 2016, Meeting; Mike Rupiper moved to approve; Steve Gaffield seconded. The motion passed unanimously on a voice vote.
3. Brett Emmons presented “Zero Discharge Stormwater Case Study, Inver Grove Hts, MN.”
4. Joe Van Rossom confirmed voting by consensus was to be used for decision making purposes.
 - a. Identified consensus voting as an iterative process with checkpoints.
 - b. Addressed inclusion minority views when needed should a full consensus cannot be reached.
 - c. Reiterated the importance of attendance to avoid backsliding and repeating previous meeting information and confirmed proxy attendance to facilitate.
5. Joe Van Rossom performed a consensus check of three topics. (see August meeting packet)
Defined “Fist-to-Five” voting metric as:
 - Fist – No support, Will work to block the proposal
 - One – No support, Will not block the proposal
 - Two – Minimal Support, Will work to move the proposal forward
 - Three – Neutral (Defined as Medium Support, Between Two and Four)
 - Four – Solid support, Clear intent to work for the proposal
 - Five – Strong support, Willing to serve as lead person for the proposal
 - a. Is there agreement on the need for ordinance changes to prevent increases in flood risk due to development in the Yahara Lakes watershed?
 - i. Several 5's and a single 1 were observed.
 1. Nathan Lockwood questioned whether flooding was truly a problem regionally as it related to lake levels. Is there damage, what is the frequency, or is it simply a risk assessment.

- a. Response by Rick Eilertson pointed to severe damage in Madison and Fitchburg resulting from storms this year and identified a need to look at what can be done within the watersheds to address flooding risks.
 - b. Mike Rupiper stated the agreed upon fact that the current standard allows a higher volume of water to go down stream post development. The long term implications of the cumulative impact of continued development compound the concern. He asserted that it is a powerful statement for a development to be able to say that the development does not increase runoff volume when they are complying with a 100% pre-development stay-on requirement.
 2. A discussion followed regarding whether the word "ordinance" encompassed the full extent of change necessary to minimize flood risk. The word "ordinance" was replaced with the word "policy" to better reflect the charge of the TAC.
 - ii. Following the discussion a second consensus check was performed. Additional 5's were observed and the lowest votes were 3's.
- b. Is there agreement on the need for these ordinance changes to apply county-wide?
 - i. The word "ordinance" was replaced with the word "policy" from the start.
 - ii. Several 5's and some 3's and 2's.
 1. Camilla Correll offered that policies such as these should be administered on a watershed scale and pointed to Columbia County, and the internally drained basins within, as a major contributor to volume in Dane County. Suggested that the whole system be evaluated prior to creating the policies.
 2. Greg Fries agreed that policies should be on a watershed basis however offered that each watershed may deserve differing standards.
 - a. Joe Van Rossom encouraged the group to focus on the statement as written to determine the groups consensus on if one policy can address the entire county.
 3. Jeremy Balousek stated that if an ordinance came to be, it would need to be county wide but it would be imperative that the ordinance is written to address the water resource needs of each watershed.
 4. Ken Potter summarized that the entire group would agree that the same rules should be applied to all watersheds. There may be similarities between them but they wouldn't be identical.
 - iii. Joe Van Rossom then offered a revised statement. Is there agreement on the need for policy changes to be applied countywide with distinctions made for individual watersheds or subwatersheds.
 1. Found strong agreement on the revised statement.
- c. Is there agreement on the need for some level of volume control requirement for redevelopment sites?
 - i. Several 5's and some 3's and 2's.
 1. Ken Potter pointed out that a redevelopment standard could be achieved in multiple ways include a fee-in-lieu of policy.
 2. Confirmed that street reconstruction would not be considered redevelopment.
 3. Found relatively strong agreement on need for volume control on redevelopment sites.
6. The group broke out into 4 subcommittees including Volume Control Standards, Volume Trading (including fee-in-lieu), Policy and Procedures for Standards of Practice, and Internally Drained Areas. (see August meeting packet)

7. Each group provided a summary report out. (see attachment for subcommittee notes summary)
 - a. Volume Control Standards – Greg Fries reported
 - b. Volume Trading (including fee-in-lieu) – Mike Rupiper reported
 - c. Policy and Procedures for Standards of Practice – Nathan Lockwood reported
 - d. Internally Drained Areas – Steve Gaffield reported
8. Additional comments provided.
 - a. Gary Huth noted an issue that has not been addressed is the long term effect of additional subsurface pollutant loading that would be associated with an increased infiltration standard.
 - b. David Liebl noted the need for a specific description of what the problem is we are trying to solve. How much runoff would need to be reduced versus what cost would be associated with the flood risk.
9. Adjournment at 3:45 PM

Minutes prepared by Tony Vandermuss

FINAL MINUTES
of the
Stormwater Technical Advisory Committee
of the Capital Area Regional Planning Commission
and the Dane County Lakes & Watershed Commission

September 19, 2016

5201 Fen Oak Dr., Madison WI – Conference Room AB

1:30 p.m.

Committee Members Present: Jeremy Balousek, Caroline Burger, Sarah Church, Camilla Correll, Rick Eilertson, Greg Fries, Dave Hart, Gary Huth, Nathan Lockwood, Rob Montgomery, Mike Rupiper, Linda Severson, Eric Rortvedt, Eric Thompson

Committee Members Absent: Roger Bannerman, Brian Berquist, Brett Emmons, Ken Potter

Ex-officio Advisors Present: Sue Jones, David Liebl, Caryl Terrell, Tony Vandermuss

Ex-officio Advisors Absent: Rebecca Powers

Others Present: Josh Harder-Dane County, John Reimer-Dane County, Noah DuFoe-Guiles-UW Graduate Student, Nick Hayden-Montgomery Associates

1. Mike Rupiper welcomed everyone back to the third meeting of the SW TAC.
2. Approval of Minutes of the August 15, 2016 Meeting.
 - a. Rick Eilertson offered the following corrections to the minutes. Nick Blaster should be amended to Nick Balster, Joe Van Rossom should be amended to Joe Van Rossum, and Sara Church should be amended to Sarah Church.
 - b. Mike Rupiper requested a motion to approve the amended minutes of the August 15, 2016, Meeting; Nathan Lockwood moved to approve; Camilla Correll seconded. The motion passed unanimously on a voice vote.
 - c. Gary Huth had several observations from the minutes, including
 - i. 100% control would lead to 50% reduction in volume should come with a couple of caveats including 100% can't be achieved in the developed area, only new development, loss of long term effectiveness of volume controls, and assumes modeling was based on 24-hour events and if we continue to see increased high intensity storms it may or may not have the same impactive reduction for high intensity storms.
 - ii. If internally drained areas are constrained to maintain volumes within the basin, could that result in flooding within the internally drained area that it wouldn't have seen before.
3. Nick Hayden presented a background to his paper Hayden, Nicholas G., Kenneth W. Potter, and David S. Liebl, 2016. Evaluating Infiltration Requirements for New Development Using Extreme Strom Transposition: A Case Study from Dane County, WI. *Journal of the American Water Resources Association*. (JAWRA) 1-9. DOI: 10.1111/1752-1688.12441. (Paper was distributed as background)
 - a. Noted that the results are based on using an infiltration facility only to achieve target infiltration percentages. Mike Rupiper distributed a summary of projects that have been recently submitted to CARPC that have achieved 90% stay-on and 100% stay-on. There were 11 for each stay-on category and most had wet detention storage prior to release to the infiltration facility which provides metering of water that results in smaller required infiltration basin footprints. Results showed that whether 90% or 100% stay-on, the percent of total site area required fell between 2 and 12% with a median of 6.5 to 7% for both. The Fitchburg Catalytic Project showed only 4 to 6% of the site area was necessary to provide peak and volume control. (see http://www.capitalarearpc.org/TAC_MeetingMaterials_2016.html for hand-outs)

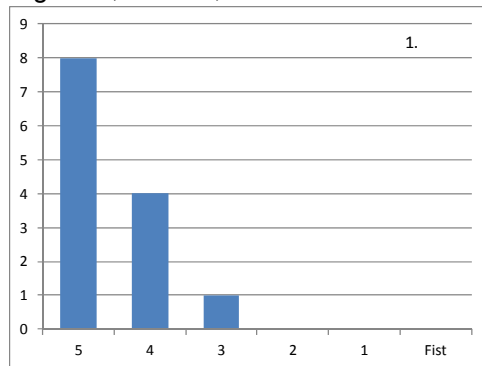
4. Noah DuFoe-Guiles presented a summary of his master's research, A Technical Review of Dane County's Stormwater Control Ordinance, which looked at 1981, 2000 and 2008 storm records to evaluate infiltration basin performance relative to Hydrologic Soil Groups. Concluded that the 1981 storm record is the most appropriate record to continue with in the ordinance for modeling.
5. David Liebl asked for reports of each Sub-Committee to identify additions or omissions from the summary provided in the September packet.
 - a. Greg Fries summarized Volume Control Standards.
 - i. Related to Items needing further discussion, Greg Fries noted that there was pretty good consensus of the group for increasing the volume standard to 100% control but additional research and discussion is necessary on moving from pre-developed to pre-settlement curve numbers.
 - ii. Jeremy Balousek added that the intent of the revisions to caps and recharge requirement and allowing volume trading is to level the playing field for sites that seek exemptions and prohibitions.
 - iii. Gary Huth asked if consideration has been given to requiring 105% stay-on to account for losses in long-term effectiveness of volume control practices. David Liebl followed stating there has been some discussion of higher requirements but 100% is a logically natural requirement as it intends to match the pre- and post-development volumes only.
 - iv. Eric Rortvedt questioned if the use of pre-settlement curve numbers for volume control would extend to peak flow control as it would create an even larger volume to be managed. David Liebl suggested this question be deferred to Items needing further discussion.
 - b. Mike Rupiper summarized Volume Trading (including fee-in-lieu).
 - i. Mike Rupiper noted the item that has the least consensus and needs the most discussion is the timeframe for when practices need to be put in place. Trading at a ratio higher than 1:1 is also in need of further consideration.
 - ii. Dave Hart asked if consideration had been given to maintaining base flow in area streams of volume trading is in a different location. Eric Rortvedt pointed out that state requirements for stay-on will still be required on the site and the only off-site portion would be the difference between the state requirements and 100%.
 - c. Rob Montgomery summarized Internally Drained Areas.
 - i. Rob Montgomery noted that while each of the topics listed in the packet were discussed, none of them necessarily are recommendations at this point. Recommendations likely will differ between rural closed basins and urban and urbanizing closed basins.
 - ii. Gary Huth noted the need to address groundwater mounding potential related to closed basins.
 - d. Nathan Lockwood summarized Policy and Procedures for Standards of Practice.
 - i. Eric Thompson noted the need to establish a clear chain-of-custody for the design and then implementation of volume control facilities. Also stressed the importance of establishing a formal requirement for monitoring and performance certification and determining the ramifications if performance standards are not met.
6. David Liebl performed a consensus check of eight topics. (see September meeting packet)

Defined "Fist-to-Five" voting metric as:

 - Fist – No support, Will work to block the proposal
 - One – No support, Will not block the proposal
 - Two – Minimal Support, Will work to move the proposal forward
 - Three – Neutral (Defined as Medium Support, Between Two and Four)
 - Four – Solid support, Clear intent to work for the proposal
 - Five – Strong support, Willing to serve as lead person for the proposal

- a. 1 - Runoff volume control is needed to prevent increases in local flooding and avoid rising lake levels.

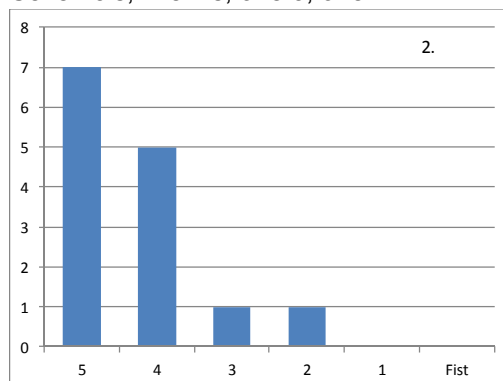
- i. Eight 5's, four 4's, one 3.



1. Nathan Lockwood stated he is still of the opinion that the runoff volume control is not going to solve the issue because we are only effecting a small percentage of the land area. David Liebl followed asking if more needed to be done than what is being proposed or should we not represent the 100% standard as the solution. In response, Nathan Lockwood stated we should not represent it as the solution. Bigger action needs to be taken, perhaps county wide. Creation of a county-wide stormwater utility is the preferred action for providing funding for larger projects.
2. Eric Thompson repeated a previous request that we look at volume control performance using single event design storms and compare it to performance achieved through annual rainfall series. Also noted a need to focus on site assessment/site design in addition to volume control practices such that achieving the standards is not solely placed on infiltration. Incorporate policy related to site assessment and site design within the ordinance language.
3. Linda Severson added a potential need to establish a maximum contributing area to minimize potential failure mechanisms.
4. David Liebl redirected the group to focus on the consensus item as stated.

- b. 2 - Both redevelopment and new development should be subject to volume control requirements.

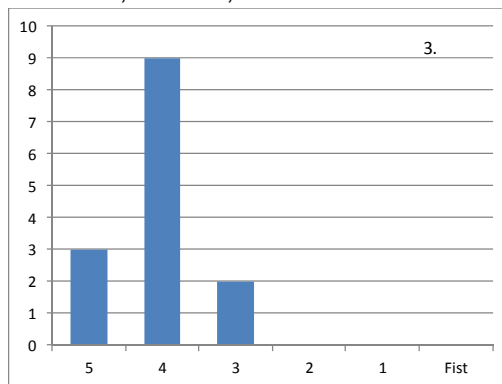
- i. Seven 5's, five 4's, one 3, one 2.



1. Greg Fries stated it is difficult to expect redevelopment to provide volume control when the site has been developed for a substantial amount of time. He expects landowners instead will look to do multiple small improvements in an attempt to avoid having to comply with a volume standard. Redevelopment should be economically incentivized so that they want to do provide infiltration so that they can then trade the volume to others. The worst flooding problems

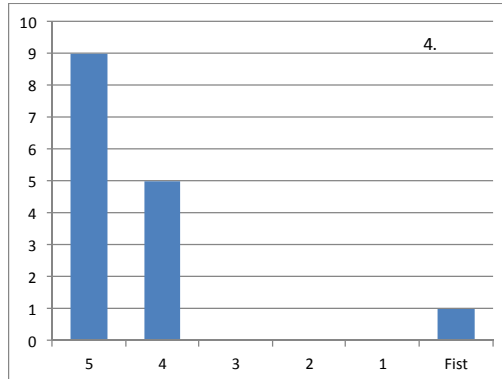
are in the areas that are fully developed and can't be mitigated from a conveyance perspective. Doesn't want a redevelopment volume standard to de-incentivize redevelopment of a brownfield.

2. Jeremy Balousek offered that he believes all sites should provide volume control and the concerns Fries stated can be addressed within modifications to the definition of redevelopment and ordinance language. Consideration should be given to reduced requirements for redevelopment or fee-in-lieu.
- c. 3 - A volume trading program will be established. The current requirements for caps, recharge, exempted areas and prohibited areas will be addressed by this program.
- i. Prior to vote Rob Montgomery asked for clarification on the statement.
 1. David Liebl and Jeremy Balousek clarified that the statement simply is looking to see if there is consensus that a volume trading program should be established and that there will be several items that will need to be addressed to achieve the requirement.
 2. Rick Eilertson asked if "will" should be changed to "should". Eric Thompson agreed.
 - ii. Voted on "A volume trading program should be established. The current requirements for caps, recharge, exempted areas and prohibited areas will be addressed by this program."
 - iii. Three 5's, nine 4's, two 3's.



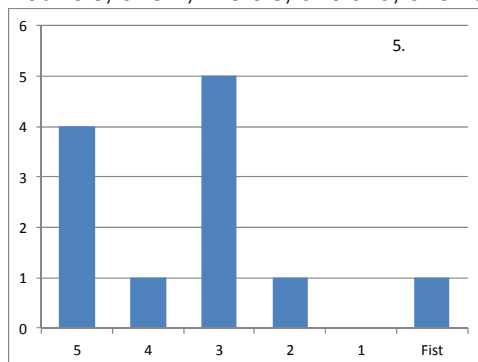
1. Nathan Lockwood stated he feels we are moving too fast, if the caps are removed...
 - a. David Liebl redirected stating we aren't saying the caps are to be removed within the consensus statement; simply it is one of the mechanisms that is to be considered.
 - b. Tony Vandermuss offered the consensus statement intent is to allow volume control to be achieved off-site should volume control not be easily achieved on-site.
 - c. Gary Huth voiced concern for the language used in the statement as he thought the first half of the statement comingled concepts with the second half.
 - i. David Liebl addressed the concern stating that the items at the end of the statement were provided as a list of items that may need to be addressed when talking about trading.
 - d. Rob Montgomery offered a philosophical point, suggesting a fairer approach may be to assess a tax to all properties within the Yahara watershed and collect a larger sum up front to implement regional volume controls as compared to assessing fees on new development which make up a much smaller fraction of the beneficiaries.

- d. 4 - Volume trading will be based on the actual volume of precipitation stay-on per parcel, and may take place between both public and private parties.
- Time was spent clarifying that 90% volume control onsite is still regulated by WDNR development requirements and the fee in lieu option would only apply to the difference in volume required to achieve 100% for qualified sites. Sites with restrictions and prohibitions would have the option to use fee in lieu to achieve the entire 100% (0% to 100%) volume reduction.
 - The word “actual” was replaced with “calculated and “parcel” was replaced with “site” such that the statement voted on was “Volume trading will be based on the calculated volume of precipitation stay-on per site, and may take place between both public and private parties.”
 - Nine 5's, five 4's, one fist.



- Eric Thompson voiced concern that a property owner would become obligated to manage all runoff including runoff contributed by adjacent sites.
 - Jeremy Balousek clarified stating that the requirement is only based on precipitation that falls onto your site and not runoff that enters your site.
 - Gary Huth noted, as it related to Thompson's point, that perhaps a different standard is needed for the land locked property at the bottom of the watershed than the uphill adjacent property.
 - David Liebl stated this point would be noted.
- e. 5 - Volume trading will be on a 1:1 basis, take place within a watershed.
- David Liebl clarified that the intent is that the volume control happen roughly within the same watershed as the site is in but the intent is not yet to define smaller subwatersheds. 1:1 was defined as for every one gallon of runoff above the 90% standard necessary to achieve the 100% standard, one gallon of runoff must be managed elsewhere.

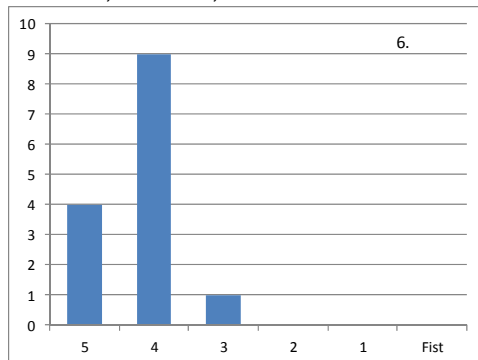
- ii. Four 5's, one 4, five 3's, one two, one fist. (Missing votes)



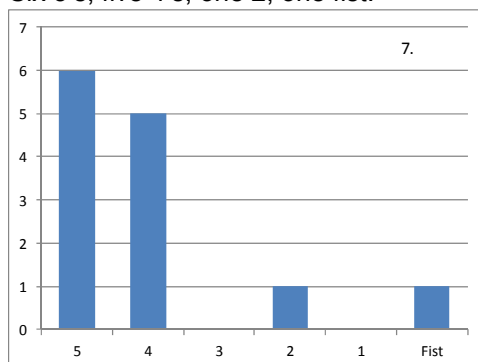
- Jeremy Balousek noted that a lot of other trading programs have ratios larger than a 1:1 to account for the fact that you aren't necessarily achieving the same benefit. He doesn't want to be locked into 1:1 based on this consensus vote.

2. Was noted that a redevelopment ratio might want to be less than 1:1 to incentivize redevelopment.
 3. Tony Vandermuss noted that volume trading could incentivize a developer to still look for site prohibitions allowing them to achieve volume control offsite on cheaper land and allowing for more developable land onsite. This is could be an issue as it relates to urban flooding should all of the volume mitigation be occurring outside of the urban area.
- f. 6 - Development of internally drained areas should maintain their hydrologic and environmental integrity.

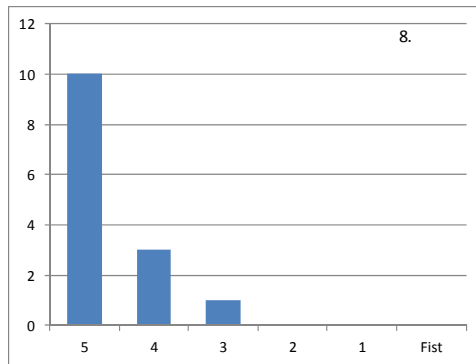
- i. Four 5's, nine 4's, one 3.



- g. 7 - Discharge from infiltration practices or internally drained areas should not contribute to downstream flooding.
- i. The word "downstream" was removed such that the statement voted on was "- Discharge from infiltration practices or internally drained areas should not contribute to flooding." Could be stated as "not causing more problems."
 - ii. Six 5's, five 4's, one 2, one fist.



1. Rob Montgomery is concerned that the statement that a closed basin will not discharge any runoff is not a good policy.
 2. Jeremy Balousek noted that the county standard has a stable outlet standard requiring outlets to be able to safely pass all storms and that this standard applies to closed depressions also.
- h. 8 - Design and installation of infiltration practices should be standardized, supervised by the engineer (or designee), and subject to maintenance inspections and performance evaluation.
- i. Ten 5's, three 4's, one 3.



7. David Liebl discussed future work to be achieved by the four subcommittees. The group agreed that additional subcommittee meetings are necessary and doodle polls were to be distributed such that all members of the Advisory Committee were welcome to attend any subcommittee meeting they were interested in.
8. Mike Rupiper reviewed the original schedule for the Advisory Committee.
 - a. October was noted as the month when a first draft of the recommendation report would be available for review and comment by the group.
 - b. November would include a public comment period.
 - c. December would provide time for revisions to be addressed and the final recommendation to be completed.
 - d. Rupiper noted that the schedule might be too aggressive given the number of unanswered questions still being discussed by the subcommittees. Rupiper and Jeremy Balousek were asked by Ken Potter to help begin writing the draft recommendation document based upon what has been agreed upon so far and any additional recommendations formed during the subcommittee meetings be incorporated thereafter.
9. Tony Vandermuss distributed the modeling results of a 10-acre commercial scenario with a wet pond followed by an infiltration facility comparing the ratio of infiltration area to total site area moving from 90% volume compliance to 100% compliance in increments of 2%. The results show that the overall site area ratio going from 90% to 100% is 1.33% to 2.01%, respectively.
10. Adjournment at 3:30 PM

Minutes prepared by Tony Vandermuss

FINAL MINUTES
of the
Stormwater Technical Advisory Committee
of the **Capital Area Regional Planning Commission**
and the **Dane County Lakes & Watershed Commission**

October 17, 2016

5201 Fen Oak Dr., Madison WI – Conference Room AB

1:30 p.m.

Committee Members Present: Jeremy Balousek, Brian Berquist, Caroline Burger, Sarah Church, Camilla Correll, Rick Eilertson, Gary Huth, Ken Potter, Linda Severson

Committee Members Absent: Roger Bannerman, Brett Emmons, Greg Fries, Dave Hart, Nathan Lockwood, Rob Montgomery, Mike Rupiper, Eric Rortvedt, Eric Thompson

Ex-officio Advisors Present: Sue Jones, David Liebl, Caryl Terrell, Tony Vandermuss

Ex-officio Advisors Absent: Rebecca Powers

Others Present: Josh Harder-Dane County, John Reimer-Dane County, Sean Higgins-CARPC

1. David Liebl welcomed everyone to the fourth meeting of the SW TAC.
 - a. Introductions of the SW TAC members present were done for the benefit of Sean Higgins in attendance for his first meeting.
 - b. Liebl reviewed the agenda.
2. Ken Potter provided a message from the Chair.
 - a. Potter began by thanking everyone for the efforts provided by the members to date.
 - b. Potter summarized the current items that appear to have significant consensus among the group, including:
 - i. Develop standards to completely manage runoff volume from all new development or ensure some form of equivalent control through volume trading.
 - ii. Develop standards to completely manage runoff volume within Internally Drained Areas while managing flooding risk.
 - iii. Develop explicit requirements to ensure adequate design, installation, and maintenance and monitoring of volume control facilities.
 - c. Potter expressed the need to identify the last remaining gaps in the TAC's recommendations and to identify how solutions to those gaps will be achieved. Likely the larger subcommittees will not be required to meet again instead favoring smaller groups concentrated on specific tasks.
 - d. Potter finished by again thanking the TAC members for their involvement.
3. Using the subcommittee reports, David Liebl summarized the remaining gaps of each of the subcommittee groups.
 - a. Volume Control Standards.
 - i. Need for modeling of differing scenarios to assess implications of moving from 90% to 100% volume control. See below for additional information.
 - ii. Assessment of the benefit of increasing the volume standard related to lake flood risk.
 1. Jeremy Balousek offered it is well accepted that there will be a benefit but the general conversation was focused more on additional benefits such as recharge and baseflow. Related to flooding, while it may not prevent flooding it would not make it worse.
 2. Ken Potter noted the incremental expectation of change and drew upon a data comparison between Black Earth Creek and the South Fork of Pheasant Branch Creek flow. Runoff flow, less base flow, was shown to almost triple

- between the more modified Pheasant Branch and the less modified Black Earth in the span of only one decade. This response is due in part to development and the opening of an internally drained basin upstream of Pheasant Branch.
- iii. Need to determine the volumetric fee that will be used for the fee-in-lieu program.
 - b. Volume Trading (including fee-in-lieu).
 - i. Need to determine the volumetric fee that will be used for the fee-in-lieu program.
 - ii. General need to determine administratively what steps need to be taken to set up the program structure within the County.
 - iii. Related to volume trading, Gary Huth questioned the equity of development needing to buy on a volumetric basis without a fixed price. He suggested ratios be applied to sites based on site suitability for infiltration such that sites with low infiltration capability would pay less than sites with highly capable sites.
 - 1. General discussion that followed noted that for the volume requirement to be truly equitable, all sites need to be accountable for the volume produced onsite. Volume trading is only one of the options for conformance and the developer is free to choose between each of the options.
 - c. Policy and Procedures for Standards of Practice.
 - i. Need to determine which, if any, of the volume control facility considerations and assumptions included within the Dane County Erosion Control and Stormwater Management Manual Appendices are desirable to be codified as county wide policy.
4. Internally Drained Areas
- a. Tony Vandermuss presented a summary of the activities of the IDAs subcommittee to date. (see attachment for presentation slides)
 - i. A summary of the all of the Urban Service Area Amendments that included an IDA that have been considered by CARPC was passed out for consideration. The table shows the progression of no protection in the early amendments to volume and flood control requirements in the most recent amendments.
 - ii. Several case studies were provided.
 - iii. Final recommendations that have general consensus include:
 - 1. Resource Protection: For new and redevelopment sites located wholly or in part within a closed watershed, practices shall be designed to control 100% of the average annual predevelopment infiltration volume, regardless of the effective area of the infiltration system.
 - 2. Property Protection: Provide adequate storage for back to back 100-yr, 24-hr storms, so that there is no increase in downstream flooding during a 100-year event due to pumped flows from the closed basin.
 - 3. Emergency Outlet: Develop an emergency draw down (pumping) plan to mitigate unanticipated flooding in the closed basin.
 - iv. The last recommendation that still needs to be determined is what definition should be used to define what an IDA is.
 - v. Future work includes an inventory and assessment of past and present IDAs in urban and rural areas.
 - 1. The inventory will be completed by cross referencing Closed Basins defined by USGS Topo Maps and rendered sinks determined from evaluation of the 1-foot resolution county Digital Elevation Model using Spatial Analyst, an ArcGIS Extension.
 - 2. Analysis will define the size of the basin prior to overflow and the drainage basin associated with each. Volumetric calculations will allow for overflow recurrence intervals to be determined.
 - 3. Final steps will be to determine if IDAs are currently closed, formerly closed, or no longer in existence due to grading/development.

5. Linda Severson provided a discussion of the scenarios to be modeled to assess the site ratio impact of going from 90% to 100% volume control using both WinSLAMM and RECARGA.
 - a. Scenario variables included three percent impervious types, three infiltration rates, and four hydrologic soil groups.
 - i. Conversation followed on what other assumptions could be considered to develop additional scenarios and what assumptions should remain consistent throughout scenarios.
 - ii. Upstream detention was determined to be beneficial related to minimizing site area requirements and it was decided that this option would be a future consideration.
 - b. Results of the modeling will be produced in approximately two weeks.
6. David Liebl went through the draft TAC Report Outline.
 - a. Ken Potter requested writing help from anyone whom deems themselves the most appropriate person to do so on any specific topic.
 - b. Rick Eilertson stressed the importance of staying consistent with terms such as using only Internally Drained Areas and not Closed Basins.
7. David Liebl reviewed the upcoming schedule and addressed the need to extend the schedule through March to allow for a public input session on the draft report in February (see October Packet).
 - a. TAC members present were all agreeable to extending the schedule.
8. Approval of Minutes of the September 19, 2016 Meeting.
 - a. David Liebl requested a motion to approve the minutes of the September 19, 2016, Meeting; Linda Severson moved to approve; Jeremy Balousek seconded. The motion passed unanimously on a voice vote.
9. Adjournment at 3:00 PM

Minutes prepared by Tony Vandermuss

FINAL MINUTES
of the
Stormwater Technical Advisory Committee
of the **Capital Area Regional Planning Commission**
and the **Dane County Lakes & Watershed Commission**

November 21, 2016

5201 Fen Oak Dr., Madison WI – Conference Room AB

1:30 p.m.

Committee Members Present: Jeremy Balousek, Caroline Burger, Sarah Church, Rick Eilertson, Greg Fries, Dave Hart, Gary Huth, Nathan Lockwood, Rob Montgomery, Ken Potter, Eric Rortvedt, Mike Rupiper, Linda Severson, Eric Thompson

Committee Members Absent: Brian Berquist, Camilla Correll, Brett Emmons

Ex-officio Advisors Present: Sue Jones, David Liebl-Acting Facilitator, Rebecca Powers, Tony Vandermuss

Ex-officio Advisors Absent: Caryl Terrell

Others Present: John Reimer-Dane County, Chad Lawler-Madison Area Builders Assoc.

1. David Liebl welcomed everyone back to the fifth meeting of the SW TAC.
 - a. Liebl asked for comments on the October 17 SW TAC meeting minutes
 - i. Gary Huth noted item 3.b.iii. from the minutes may or may not reflect his current position on applying compliance ratios related to site infiltration capability. Huth elected to move on without revision.
 - ii. Minutes were approved as written.
 - b. Liebl reviewed the agenda.
2. Ken Potter provided a message from the Chair.
 - a. Potter began by thanking everyone for the efforts provided by the members to date.
 - b. Potter confirmed he will take charge of drafting the report and will request outlines from specific members to summarize subcommittee activities and recommendations. All members will have an opportunity to review and suggest edits once the draft report is completed.
3. Policy and Procedures Subcommittee Report
 - a. Jeremy Balousek presented a summary of the recommendations of the Policy and Procedures subcommittee. (see attachment for recommendations summary).
 - i. Most of the recommendations seek to revise and codify recommendations provided within the Dane County Erosion Control and Stormwater Management Manual Infiltration Appendix such that the requirements apply county wide. Only item 2, the adjustment of runoff curve numbers (RCNs) to represent presettlement/undeveloped conditions, is a new requirement.
 - ii. Gary Huth asked for clarification on excavation of 5 feet below finish grade in the case where infrastructure is placed above near-surface infiltrative soils leaving only areas with deep infiltrative soils to site practices.
 1. Balousek clarified that this requirement is for exemptions and not prohibitions. In addition, this requirement amended the previous county requirement from 2 feet to 5 to be consistent with WDNR requirements.
 2. Eric Rortvedt added that the WDNR looks at the whole site and would require either excavating beyond 5 feet or moving the infrastructure if no other location was suitable for infiltration.
 - iii. Huth asked for clarification between in-field testing versus soil classification for design infiltration rate determination.
 1. Balousek clarified that soil classification is the preferred option.

- iv. Eric Thompson noted if the WinSLAMM side seepage rate is going to be required to specifically be 0.01, a reason should be supplied as to why the specific value is being chosen. In this case it is the inability to enter zero into WinSLAMM for this variable.
 - 1. Balousek agreed and added that the list of recommendations is abbreviated and will be accompanied by a report which provides further explanation of each item.
 - v. Thompson also noted that the combination of policy recommendations that are being carried forward creates a squeezing effect related to options available to designers and suggests that additional options be presented/allowed to accommodate a more difficult design environment.
 - 1. Balousek appreciated this effect and noted work was being done through separate county efforts to allow additional BMPs to receive credit for infiltration.
 - vi. Rick Eilertson requested clarification on the definition of presettlement vs. undeveloped vs. predevelopment.
 - 1. Balousek clarified the intent was to get away from definitions and instead simply state the post developed conditions to be matched with modeling will be RCN values for differing hydrologic soil groups (HSGs).
 - 2. Greg Fries noted using RCNs lower than the current agricultural RCNs differed from the recommendations made by the Volume Control subcommittee. This difference in subcommittee recommendations needs to be resolved by the TAC.
 - 3. Balousek also clarified that these RCNs apply to new and redevelopment conditions however, the current recommendation is 100% pre-development stay-on for new development and 50% stay-on for redevelopment.
 - b. Jeremy Balousek presented a summary of the as-built draft checklist being proposed.
 - i. Eric Thompson requested that language be added to the checklist to describe the intent of the checklist for county purposes; i.e. to certify that upon completion, at a snapshot in time, the facility was built in a manner that is consistent with the intent of the design. The more information that is provided, the more comfortable the engineer can be in the certification process.
 - ii. Balousek encouraged Thompson to supply helpful language to the county for inclusion.
4. Internally Drained Areas (IDA) Subcommittee Report
- a. Tony Vandermuss provided an update on the ongoing inventory and assessment of past and present IDAs in urban and rural areas process focusing on Fitchburg as a test case.
 - i. Four IDAs are to be identified as a final product, including: urban IDAs that are fully developed and offer no opportunity for restoration, urban fringe IDAs that are at risk of being modified due to development, rural IDAs that are closed and are hoped to remain closed, and rural IDAs that have been opened that provide opportunity to be restored/closed, to reduce volume contributions to receiving bodies and provide volume trading opportunities.
 - ii. Eric Thompson mentioned the WDNR Erosion Vulnerability Assessment for Agricultural Lands (EVAAL) tool be investigated for identifying IDAs as a way to more efficiently identify the contributing watersheds. Further information on EVAAL can be found at <http://dnr.wi.gov/topic/nonpoint/evaal.html>.
 - b. Rob Montgomery summarized of the activities of the IDAs subcommittee to date including a 2-tiered approach to identifying and managing IDAs. (see attachment for presentation slides)
 - i. Gary Huth asked for clarification on the 2-tier approach.
 - 1. Montgomery and Vandermuss stated that the first tier is to address smaller depressions that will require 100% pre-development stay-on without caps and without the option to achieve off-site. The second tier addresses larger

- depressions where flood risk management is important for adjacent property owners.
- ii. Eric Thompson questioned how prohibited infiltration sites (i.e. industrial sites, fueling stations) would be dealt with within IDAs.
 1. This item is to be further addressed by the IDA subcommittee.
 - iii. Thompson also asked how the downstream owner would be affected by upstream owners if the upstream owner was only managing the average annual storm and not the larger storms.
 1. Vandermuss clarified that it was up to the municipalities and land owners/developers to address this issue with a regional plan prior to development of any portion of the IDA. In the absence of a regional plan, infiltration and volume control would be required of each property such that the property at the lowest elevation was not left to attenuate the entire watershed volume.
5. Linda Severson and Caroline Burger provided modeling results of development scenarios to assess the site ratio impact of going from 90% to 100% volume control using both WinSLAMM and RECARGA. (see attachment for results)
- a. Scenario variables comprised a matrix of three impervious percentages (40%, 60% 80%), three infiltration rates (0.13 in/hr, 0.5 in/hr, 3.6 in/hr), and four hydrologic soil groups (A, B, C, D). RECARGA and WinSLAMM provided comparable results, as expected.
 - i. Results represent the bottom area of the facility and indicate that going from 90% to 100% pre-development stay-on required approximately twice as much on-site infiltrative area. In addition, results represent a worst case scenario (least effective design) as it was assumed there was 6 inches of above ground storage, 24 inches of below ground storage, and no detention mechanisms upstream.
 - ii. Severson generalized the results to the most common scenario seen, representing loam soils, average curve number of 68 and 60% impervious, resulting in a site area increase of 2-5% to 5-8% going from 90 to 100% pre-development stay-on.
 - iii. It was noted that modeling used existing curve numbers and not the presettlement/undeveloped curve numbers being proposed.
 - b. A discussion regarding the appropriateness of using the 1981 average annual storm occurred versus a 5-year annual storm or a prescribed storm depth to be infiltrated.
 - i. Ken Potter reminded the group that volume trading allows for effective management of the volume difference between 90% and 100% pre-development stay-on, which should alleviate concerns of additional on-site land being used for stormwater management.
 - c. Rob Montgomery questioned whether more exploration was necessary to look at the appropriateness of the average annual storm as well as the long term effect of increased infiltration leading to increased base flows and how these increased flows regionally impact lake flooding compared to current surface flow.
 - d. Rick Eilertson noted that the modeling results represent one site design scenario which does not incorporate other infiltration facilities such as pervious pavement, subsurface infiltration or rainwater harvesting. It is important to note in the report that other options do exist to reduce the site area devoted to infiltration. Some alternative approaches, like pervious pavement, have other co-benefits, such as the surface area providing parking and/or transportation access.
 - e. A discussion of additional development costs associated with increasing from the 90 to 100% pre-development stay-on requirement followed. Greg Fries offered the following scenario for a typical 100 acre development with 60% impervious and silt loam soils. If 40% of the land is devoted to right-of-way and parks, it leaves 60 acres for lots. At 5 lots per acre, there could be 300 lots. Moving to the 100% pre-development stay-on requirement and using a predevelopment curve number of 58 in place of 68, the increase in site area devoted to infiltration would go from 4.6% to 8%, an increase of ~3.5%. At \$100,000 per acre, 3.5 acres or

\$350,000 would be lost to additional infiltration practices. Applying the cost of increased infiltration to the 300 lots results in \$1,150 per lot increase, or about 5%.

- i. Fries offered that stating that the increase in cost to the development is \$350,000 might create a different impression than stating the increase per household is \$1,150. He noted the importance of providing enough information so as to not misrepresent the results.
 - ii. Tony Vandermuss noted that the site area increase to 8% for 100% pre-development stay-on assumes no peak control detention is occurring upstream of the infiltration practices, which is not typical of current development practices that employ wet ponds upstream of infiltration facilities. The likely total infiltration site area required for 100% pre-development stay-on will be more like 3% when using detention upstream.
 - f. Potter again asserted that the land requirements and costs associated with achieving the increased standard can easily be offset by the remediation of currently drained enclosed areas. He suggested identifying several areas and determining how effective they could be at volume reduction and associated cost to do so in order to prove that there will be a cost effective way for developers to achieve the new standard. He also pointed to using financial resources associated with adaptive management for wastewater treatment plant phosphorus control that would have the added benefit of volume control at little to no cost.
 - g. Vandermuss reminded the group of Brett Emmons' August TAC presentation titled Zero Discharge Stormwater Case Study, Inver Grove Heights, MN where he revealed thoughtful site design can result in very little land area being devoted to stormwater management. Results of the case study showed that to achieve 100% pre-development stay-on, only 2 percent of the site area would be devoted solely to stormwater management.
 - h. A question was asked if increasing the standard to 100% pre-development stay-on along with lowering the predevelopment curve numbers, as recommended by the Policy and Procedures subcommittee, was an appropriate recommendation.
 - i. Balousek responded stating the lowered curve numbers reflect City of Middleton ordinances and several other municipalities around the county that reference undeveloped or presettlement definitions with lower curve numbers. Assigning standard curve numbers reduces the confusion associated with picking the predevelopment land type or confusion related to multiple development activities on a single lot through time.
 - ii. The recommendation was provided based on the existence of the fee-in-lieu program which will offer a cost effective means of compliance.
 - iii. The recommendation of lower curve numbers is to apply to volume control and not rate control. Eilertson indicated a concern with having different curve numbers for different stormwater performance standards.
 - iv. This difference in subcommittee recommendations needs to be resolved by the TAC.
6. Mike Rupiper went through the draft TAC Report Outline.
 - a. Ken Potter will write with help from anyone who deems themselves the most appropriate person on any specific topic or who Potter identifies to provide outlines of committee activities.
 - b. Missing or inaccurate information should be brought to the attention of Potter, Liebl, Rupiper and Balousek.
7. Rob Montgomery asked at what point will overall TAC member consensus be established for subcommittee recommendations, specifically to go to a 100% pre-development stay-on requirement throughout the county.
 - a. General discussion surmised that there is already consensus on this point, but it was suggested that this issue should be revisited if, in fact, there has been a change in consensus. Trading should make going to 100% pre-development stay-on very efficient and the only way to achieve no net increase in flooding resulting from new and redevelopment is to go to the 100% standard. As the recommendation is intended to be written, if a volume trading / fee-in-lieu option is not established, then the 100% standard will not be recommended.

- b. Tony Vandermuss summarized the consensus votes taken during the September meeting, which reflect the groups interest in doing no net harm from development. The following votes were tallied:
 - i. On the question of "Runoff volume control is needed to prevent increases in local flooding and avoid rising lake levels," there were eight 5's, four 4's, one 3. 12 of 13 members were beyond neutral in favoring this item.
 - ii. On the question of "Discharge from infiltration practices or internally drained areas should not contribute to flooding," there were six 5's, five 4's, one 2, one fist. 11 of 13 members were beyond neutral in favoring this item.
- 8. Eric Thompson asked if there was a conflict between meeting pre-development recharge and the opt-out option to achieve the 90 to 100% volume control off-site.
 - a. Mike Rupiper responded stating the recharge requirement often is achieved by complying with the 90% infiltration requirement and therefore there is unlikely to be a conflict in achieving the 90 to 100% requirement off-site. Dave Hart concurred on this point.
- 9. Rob Montgomery asked the group if there is value to expand the modeling analysis to address presettlement curve numbers to fully articulate what the combined impact of recommending 100% pre-development stay-on and presettlement conditions versus current standards.
 - a. David Liebl suggested that the Policy and Procedures and the Volume Control Subcommittees reassess the recommendation to go to presettlement curve numbers and report out the decision and reasons prior to asking the entire group to vote on consensus of the recommendation.
- 10. Nathan Lockwood questioned if a fee-in-lieu number was being developed for the recommendation.
 - a. Ken Potter noted that there are several financial resources out there focused on wildlife preservation or phosphorus management that could have the added benefit of also reducing runoff volume leaving the site at no additional cost. This captured volume can provide the initial inventory to be used by the trading/fee-in-lieu program for future developments.
 - b. Jeremy Balousek offered that costs associated with building infiltration practices from past projects would be evaluated to determine a fee-in-lieu price that is equal to or slightly greater than past projects in order to incentivize on-site mitigation over off-site.
- 11. Rick Eilertson pointed out that Recommendation 6 for Developments outside internally drained watersheds states, "Curve numbers used in calculations should not change" and noted this seemed inconsistent with other recommendations for reduced curve numbers.
 - a. David Liebl suggested that this recommendation be revisited as the draft report is being written to address the inconsistency.
- 12. Adjournment at 3:30 PM

Minutes prepared by Tony Vandermuss

FINAL MINUTES
of the
Stormwater Technical Advisory Committee
of the **Capital Area Regional Planning Commission**
and the **Dane County Lakes & Watershed Commission**

January 23, 2017

5201 Fen Oak Dr., Madison WI – Room 121

1:30 p.m.

Committee Members Present: Jeremy Balousek, Brian Berquist, Caroline Burger, Sarah Church, Rick Eilertson, Greg Fries, Dave Hart, Gary Huth, Nathan Lockwood, Rob Montgomery, Ken Potter, Eric Rortvedt, Mike Rupiper, Linda Severson, Eric Thompson

Committee Members Absent: Camilla Correll, Brett Emmons

Ex-officio Advisors Present: Sue Jones, David Liebl-Acting Facilitator, Rebecca Powers, Caryl Terrell, Tony Vandermuss

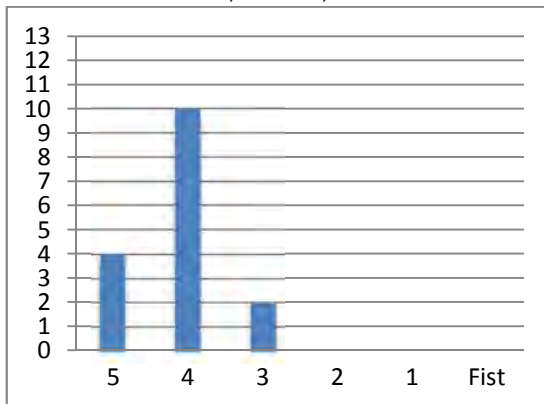
Others Present: Josh Harder-Dane County, Chad Lawler-Madison Area Builders Assoc., Forbes McIntosh-Dane County Cities and Villages Assoc., John Reimer-Dane County, Tim Roehl-Dane County Towns Assoc. & Realtors Assoc.

1. David Liebl welcomed everyone back to the sixth meeting of the SW TAC.
 - a. Began with introductions of all in attendance.
 - b. Liebl asked for comments on the November 21 SW TAC meeting minutes
 - i. Rick Eilertson and Gary Huth submitted written comments prior to the meeting.
 - ii. Minutes were approved as edited by Eilertson and Huth.
 - c. Liebl reviewed the agenda.
2. Ken Potter provided a message from the Chair.
 - a. Potter reported the draft of the report is about 95 percent complete.
 - b. Thanks were offered especially to Mike Rupiper, Jeremy Balousek and David Liebl.
3. David Liebl performed a consensus check of two topics. (see January meeting packet)
Defined "Fist-to-Five" voting metric as:
 - Fist – No support, Will work to block the proposal
 - One – No support, Will not block the proposal
 - Two – Minimal Support, Will work to move the proposal forward
 - Three – Neutral (Defined as Medium Support, Between Two and Four)
 - Four – Solid support, Clear intent to work for the proposal
 - Five – Strong support, Willing to serve as lead person for the proposal
 - a. 1 - Require 100% volume control of the pre-development runoff volume, either on or off site, for new developments (50% for redevelopment sites). 90% volume control should be met onsite where feasible. This requirement would eliminate the caps and exemptions, and should not go into effect until a volume trading/fee-in-lieu program has been implemented and the cost of a volume credit has been established.
 - i. Gary Huth noted, in Rob Montgomery's absence, that Montgomery, in a previous meeting, was not convinced that 100% stay-on was the right number compared to 98, 96, etc., as incremental increases in percentage represented higher and higher on-site costs.
 1. David Liebl responded reminding the group that 100% was chosen as it represents no net increase in off-site volume resulting from new development

- and that the volume trading and fee-in-lieu programs were being set up to address the increases in cost going from 90% to 100%.
- ii. Nathan Lockwood commented that he is concerned about the large area dedication necessary to go from 90% to 100% stay-on.
 - iii. Eric Thompson asked if the on-site target is 90% and the remainder can be addressed with the volume trading/fee-in-lieu program.
 - 1. Jeremy Balousek confirmed this is how the recommendation language is written, 90% on-site treatment is required and the remaining 10% could be paid for at the contractor's option.
 - iv. Lockwood asked for confirmation of Liebl's previous statement that the "no net increase in off-site volume from new development" was based on the average annual storm.
 - 1. Liebl confirmed this statement.
 - v. Gary Huth asked what would happen if the fee-in-lieu "bank" ran out of credits; would future development be required to achieve 100% on-site or would the standard go away?
 - 1. Balousek responded stating this issue is part of the implementation plan. He stated that the bank has to have sufficient credits in order to apply the standard. This issue will need to be worked out during the implementation phase and addressed within the ordinance language.
 - 2. Tony Vandermuss reminded the group that paying the fee-in-lieu is only one compliance option. Volume trading or off-site volume reductions are also options to a developer.
 - vi. Sarah Church asked for confirmation that the TAC is recommending a 50% stay-on requirement for redevelopment sites.
 - 1. Balousek confirmed this is a recommendation and that the redevelopment project would be allowed to achieve the entire requirement with the fee-in-lieu program. It also would not be put into place until the fee-in-lieu program was established. In addition, the definition of redevelopment would revise the impervious disturbed area threshold where stormwater management would be required from 4,000 square feet to 20,000.
 - 2. Eric Rortvedt asked to confirm if the area subject stormwater management is the pre-development condition or the existing condition. If the existing condition is the area, a 100% impervious existing site being redeveloped to 80% impervious would not require any infiltration as the existing site did not infiltrate anything either.
 - a. Balousek and Liebl noted that this is a topic that deserves further exploration.
 - vii. Rob Montgomery expressed the desire to ensure that the ordinance language that is eventually adopted by the county is not in conflict with state requirements. He feels that the work being done in the Yahara watershed to address flooding is appropriate as is the work being done in internally drain areas. However, he is not sure that work being done within the county and outside the Yahara has been substantiated thoroughly enough to resolve conflict.
 - 1. Liebl noted that while this may pertain to the overall recommendations made by the group and would need to be considered during implementation, it is not necessarily appropriate for consideration of Consensus Item #1.
 - 2. Montgomery followed up by asking two questions as it relates to him to the Consensus Item. Are we comfortable recommending 100% stay-on across the entire county and can the county actually make this a requirement across the county if it is the recommendation of the TAC.
 - 3. Balousek noted that the concern of addressing flooding is a county-wide concern and is not only a Yahara watershed concern. He also believes the

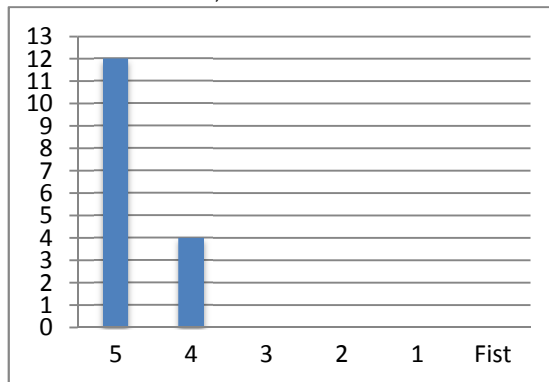
county has the authority to proceed with the recommendation county-wide as the goal is for flood control management.

- viii. Mike Rupiper clarified that the 50% stay-on requirement for redevelopment came from matching the sediment control requirement for redevelopment, which seeks to achieve about half of what new development achieves.
- ix. Huth noted the use of a 50% redevelopment standard along with using the existing land cover, as opposed to pre-development agricultural land cover, was found to be a double benefit when originally proposed in Middleton. He supports 50% stay-on and pre-development land cover.
- x. Vandermuss noted that the consensus statement specifically states that 90% stay-on is to be achieved on site. Previously, the TAC has discussed that the minimum on-site control be per the DNR ordinance, inferring 90% stay-on would be achieved. However the DNR requires 90% for residential development only (impervious less than 40%) and is 75% for 40% to 80 percent impervious and 60% for sites with over 80% impervious. Stating 90% stay-on for all development types makes it consistent with Dane County requirements.
- xi. Vandermuss questioned if raising the redevelopment threshold from 4,000 to 20,000 square feet would encourage developers to redevelop a site in small pieces (less than 20,000 sqft) under separate projects to avoid providing stormwater management. He suggested adding a cumulative impact over 5 years statement to the recommendation such that if a site goes over the threshold after considering multiple disturbances, they would trigger stormwater requirements.
 - 1. Greg Fries and Balousek did not believe this would be an issue. Both find the current 4,000 square foot threshold deters small improvements. Fries mentioned that a separate ordinance has been added in Madison for resurfacing where if 30,000 square feet of pavement is being resurfaced, stormwater management is required.
- xii. Lockwood asked, regarding Consensus Item # 2, if there is be a point where the committee makes a recommendation to evaluate the costs of implementation on site.
 - 1. Potter offered that while the costs to implement on-site are nonlinear as achievement goes from 90 to 100%, however cost is linear when using the fee-in-lieu program as the fees won't change substantially with time.
- i. Count was four 5's, ten 4's, two 3.



- b. 2 - Evaluation of pre-development runoff curve numbers is a future consideration.
 - i. Eric Thompson suggested incorporation of the "God Clause" whereby ordinance language is provided allowing the county to require alternate curve numbers in the case that research were to show that the revised standard was insufficient to provide the desired response. This would allow change without the hassle of modifying the ordinance

1. Balousek responded that while this may not be possible to be included in the ordinance it is valuable to include in the future recommendations of the TAC report.
- ii. Potter reminded the group that Consensus Item 2 seeks to keep the curve number standard the same as the current standard and the term “future” is indefinite.
- iii. Count was 12 5's, four 4's.



4. Review and Discussion of Cost Examples (see January meeting packet)
 - a. Rupiper led the TAC through a cost of implementing the increase from 90% to 100% stay-on example with the intent of putting some initial costs together for discussion purposes. The three options included were on-site management, off-site urban retrofit volume trading, and off-site rural retrofit volume trading.
 - b. The on-site management example was refined from the example provided by Greg Fries during the November TAC meeting (see November minutes).
 - i. Huth asked for confirmation that these results reflect infiltration of the streets.
 1. Rupiper confirmed the streets were a part of the modeling assumptions.
 - ii. Fries, and others, noted the sale of the lots lost to increased infiltration surface area should also be included in the costs of implementation. He suggested a per lot price of \$40,000 to \$100,000 with the lower lot cost reflecting a developer who also acts as the home builder and the higher cost reflecting a developer who builds the infrastructure and then sells the lot only. As the lot sale is not entirely profit, and there are many variables that can go into what the true lost opportunity cost is, it was stated that the full lot sale value should not be added to the other values to determine a per lot increase associated with compliance.
 - iii. It was also noted that the cost of installation of the additional infiltration basin, perhaps \$5 per square foot, and possible costs of long term maintenance should be included in the implementation cost.
 - iv. If 2.8 additional acres is required to go from 90% to 100% stay-on at \$100,000 per acre to purchase the land ($2.8 \times \$100,000 = \$280,000$), and \$5 per square foot of infiltration basin installation ($2.8 \times 43,560 \times \$5 = \$609,840$), the total additional cost could be \$889,840. Divided by the remaining lots to be sold ($300 - 14 = 286$) results in an additional cost per lot of \$3111 ($\$609,840 / 286 = 3111$). This scenario assumes no detention is provided upstream of infiltration.
 - v. Tim Roehl was asked to speak about lot sale values locally. He stated that a lot value of \$40,000 was unlikely anywhere in Dane County. He offered to provide the TAC with a list of lot costs for the area.
 - vi. Huth commented it was his interpretation that the costing example was simply trying to provide a methodology that a developer could use to come to a cost increase and that the values used were not necessarily representative of all scenarios.
 - vii. Rupiper reminded the group that part of the charge of the TAC was to provide a reasonable range of what the proposed changes would cost and this exercise was

- intended to be a start of that conversation. He surmised that most on the TAC would agree that achieving the infiltration goal on-site likely is the most expensive option.
- viii. Balousek asked if it might be more valuable simply to provide the land area requirements and avoid providing actual cost data as there are so many variables that go into the cost analysis.
 - ix. Vandermuss offered that if the point of providing a cost estimate for on-site treatment is to show that off-site treatments cost less, then a best case estimate should be prepared as it will still likely be much more than the off-site cost. If the point is to provide a developer with an expected cost because the developer is required to provide treatment on-site, then the worst case estimate should be prepared.
 - x. Liebl summarized that even knowing that values could range dramatically; there was a sense from the group that a high and low cost estimate should be provided with assumptions provided.
 - xi. Eric Thompson offered that this conversation didn't need to be completed until the point that the ordinance language is ready to be put into place and a second group had taken time to do sufficient research to determine what the costs of on-site treatment could be and what the fee-in-lieu costs are actually going to be.
- c. Volume trading through off-site urban retrofit.
 - i. Rupiper went over the expected cost to achieve 90% to 100% stay-on using off-site urban retrofit volume trading. Using a Lake Wingra retrofit study that provides estimated cost per volume reduction expected, Rupiper asked if the TAC believed the values were reasonable.
 - ii. Eric Thompson offered, to be conservative, it might be best to use the \$0.36 per cubic foot infiltrated rather than an average cost.
 - iii. Linda Severson mentioned that the Milwaukee Metropolitan Sewerage District had done a similar study and might have additional cost data to be used.
 - iv. Rupiper commented his observation that many members of the TAC are more comfortable reporting costs as a range than as an average.
 - d. Volume trading through off-site rural retrofits.
 - i. Rupiper commented that costs of this practice are relatively unknown but that most would agree that they should be less than the other 2 options. He asked if anyone had any data to share regarding potential costs.
 - ii. Linda Severson asked if the Yahara WINS pilot study could provide costs.
 - 1. Rupiper responded that these costs would reflect Phosphorus reductions, not volume.
 - iii. Asked what the cost to buy undesirable land such as wetland, Greg Fries offered the cost may be \$17,000 per acre. Someone should look into current land sales.
 - e. Rupiper summarized the conversation stating that enough information had been discussed for the cost data to be revisited and discussed at the next TAC meeting.
5. Review of the TAC Report.
- a. Eric Thompson suggested revising the definition of "100% Volume Control" on page 1 to specifically state that it is 100% of the average annual rainfall so as to not confuse the reader.
 - b. Dave Hart asked for additional information regarding the statement on page 2 stating "rainfall increases only explain about half of the observed increases in Yahara streamflow." He was asking for additional clarification to be added.
 - c. Hart also commented that the words "recharge" and "stay-on volume" were misused.
 - d. David Liebl reminded the group that if they have any comments or edits to suggest, they should send them to Potter and copy Rupiper. A word document was to be sent to the TAC for editing purposes.
6. Jeremy Balousek went over the Draft Implementation Plan handed out at the meeting. (see attached)

- a. Gary Huth asked if the revised redevelopment definition would be applied to infiltration only or to all stormwater standards.
 - i. Balousek replied the definition will apply to all standards.
 - b. Huth also asked if a caveat should be added to the redefinition of redevelopment to add a lower threshold where safe off-site conveyance is confirmed.
 - i. Balousek replied that special provisions can be applied to any development that may drain to sensitive water resources.
 - c. Liebl reminded the TAC that if at any point during the consensus checks a member voted 3 or lower, that member should consider providing a written statement to Ken Potter explaining the dissenting vote if they want their alternative position to be included in the report.
7. Preview of remaining TAC meetings
- a. Mike Rupiper reminded the group that the next meeting, February 20, will be the public comment meeting where members of the public would be allowed to provide verbal comments. After the comments had been shared, the TAC would have the opportunity to discuss these comments. Intent is to have the draft report completed and distributed by February 6th and therefore TAC comments are to be submitted by January 30.
 - b. March 20 is the final meeting where the public and TAC comments have been included in the report as well as any alternate positions provided and the TAC will be allowed one last opportunity to confirm the recommendations.
 - c. Caryl Terrell offered that the bodies of both CARPC and the Lakes and Watershed Commission are very impressed by the work that has been accomplished by the TAC. She reminded the group that both organizations will be holding their own public hearings at a joint commission meeting once the report has been completed.
 - d. Rebecca Powers also expressed her appreciation for the work of the TAC and reiterated Liebl's request to share alternate positions to ensure the report is as complete as possible.
8. Final Comments
- a. Linda Severson asked for confirmation that the Draft Implementation Plan would be included in the report.
 - i. Liebl confirmed it would.
 - b. Gary Huth asked for confirmation of whether the resurfacing requirement (30,000 sq ft requires stormwater controls) that the City of Madison follows would be included as a recommendation of the TAC.
 - c. Tony Vandermuss asked if there would be value in adding a 5-year cumulative impact clause to the definition of redevelopment, such that a property owner would be deterred from doing incremental changes over several years in an attempt to avoid stormwater retrofits.
 - d. Mike Rupiper noted that the report would be posted to the CARPC website and would be distributed to the CARPC interested parties list for comments.
9. Adjournment at 3:30 PM

Minutes prepared by Tony Vandermuss

Draft Implementation Plan

1-20-2017

Recommendations that can be adopted immediately:

1. Implement standards for developments that drain to internally drained areas.
 - a. Require 100% onsite control of the average annual predevelopment runoff volume, regardless of the effective area of the infiltration system.
 - b. Require adequate storage for back-to-back 100-yr, 24-hr storm events, so that there is no increase in downstream flood risk during a 100-year event due to pumped flows from the closed basin.
 - c. Require development of an emergency drawdown (pumping) plan to mitigate unanticipated local flooding.
2. Revise the definition of redevelopment by increasing the land disturbance trigger from 4000 square feet to 20,000 square feet.
3. Formally adopt countywide policies and procedures for the proper design, implementation, and documentation of infiltration practices.
 - a. Require use of the approved assumptions for the application of infiltration standards and modeling.
 - b. Require the use of the as-built certification checklist.

Recommendations that can be adopted once a Fee in Lieu/Bank program has been established and bank credits are available for purchase:

1. Require 100% volume control of the pre-development runoff volume for new developments. Where site conditions allow, 90% volume control would be required on-site.
2. Require 50% volume control of the pre-development runoff volume in existing urban areas.
3. Eliminate the facility area caps and exemptions. (i.e. exemptions for source areas, soil conditions, depth to groundwater, and depth to bedrock).
4. Except where noted in 1. above, bank credits may be used to meet the required volume to be infiltrated.

FINALMINUTES
of the
Stormwater Technical Advisory Committee
of the **Capital Area Regional Planning Commission**
and the **Dane County Lakes & Watershed Commission**

February 20, 2017

5201 Fen Oak Dr., Madison WI – Room 121

1:30 p.m.

Committee Members Present: Jeremy Balousek, Brian Berquist, Sarah Church, Rick Eilertson, Brett Emmons, Greg Fries, Gary Huth, Rob Montgomery, Ken Potter, Mike Rupiper, Linda Severson

Committee Members Absent: Caroline Burger, Camilla Correll, Dave Hart, Nathan Lockwood, Eric Rortvedt, Eric Thompson

Ex-officio Advisors Present: David Liebl-Acting Facilitator, Tony Vandermuss

Ex-officio Advisors Absent: Sue Jones, Rebecca Powers, Caryl Terrell

Others Present: Curt Brink-Curt Vaughn Brink LLC, Matt Brink-Smart Growth Greater Madison, Kevin Connors-Dane County Land and Water Resources Dept., Dan Day-D'Onofrio Kottke and Assoc., Don Esposito-Tim O'Brien Homes, Kevin Even-Village of Waunakee, Josh Harder-Dane County Land and Water Resources Dept., Hans Hilbert-Dane County Planning, Angela James- Dane County Cities and Villages Assoc., Dennis Jelle-Town of Blue Mounds, John Kassner-representing self, Chad Lawler-Madison Area Builders Assoc., Forbes McIntosh-Dane County Cities and Villages Assoc., Robert Procter-Realtors Assoc. of South Central WI, John Reimer-Dane County Land and Water Resources Dept., John Reindl-representing self, Tim Roehl-Dane County Towns Assoc. & Realtors Assoc., Greg Schaffer-Madison Area Builders Assoc., Tom Wilson-Town of Westport, Chad Wuebben-Encore Construction

1. David Liebl welcomed everyone to the seventh meeting of the SW TAC.
 - Began with a brief introduction of the SW TAC to the public that were in attendance. An emphasis was made that the product produced by the SW TAC is a technical document produced by engineers and hydrologist and is not a policy document. He also reminded the public that the final report intends to include documentation of alternate view points on the technical aspects.
 - Liebl discussed the ground rules for people wishing to provide public comments.
 - i. All people registered to speak would have 5 minutes.
 - ii. Comments extending past 5 minutes can be provided as written comments until Monday, February 27.
2. Ken Potter provided a brief presentation of the contents of the final report. He summarized the findings of the SW TAC as well as the resulting recommendations being made.
 - A question asking if the fee-in-lieu cost has been determined.
 - i. Potter responded that it is likely to be low but the SW TAC process did not provide sufficient time to determine what it will be. The next step in the process of going from a recommendation to an ordinance would be to determine what the volume fee will be. Potter reminded the group that the fee-in-lieu structure will need to be in place prior ordinance changes.
 - A question asking if the fee-in-lieu infiltration source would be required to be within the same watershed as the proposed project.

- i. Potter confirmed that the recommendation would be that infiltration would occur within the same major watershed.
 - A question asking if the modeling completed included scenarios that achieved less than 100% but greater than 90% for determination of diminishing return on investment.
 - i. Potter responded stating that while costs may rise for achieving the entire 100% onsite, there isn't a rising unit cost when considering the fee-in-lieu option as those practices are achieved at low cost offsite in more favorable conditions.
 - A question asking who would be economically benefited by the fee-in-lieu program as the asker assumed the per lot cost would be \$5000 to achieve it onsite or to use the fee-in-lieu program.
 - i. Potter again responded that the fee-in-lieu option would target offsite locations with favorable conditions, which means that the cost to infiltrate water would be far less than doing it on the development site.
 - ii. Liebl offered that with the fee-in-lieu program, the volume that would be traded is an absolute volume of water per unit area and that costs would be fixed regardless of a specific situation.
 - A question asking if continuing to use the 1981 rainfall record was appropriate for modeling purposes when historic rainfall has been shown to be increasing in recent years.
 - i. Potter noted that a previous graduate level student of his had compared severe rainfall records from recent years to the 1981 rainfall record, which represents an average year, and concluded there is not a significant size difference in design of stormwater management facilities. The reason for this is because when it gets really, really, wet even the natural soils are saturated and flooding will occur. It is a topic that could be looked at in the future.
 - A question asking what the desired outcome of going from 90% to 100% stay-on was as it related to the double mass curve example shown in the presentation.
 - i. Potter noted the big jump in base flow to the Pheasant Branch Creek was the result of opening a previously internally drained basin to facilitate development. The ordinance will prevent increases in flows into the lakes resulting from the fact that we don't currently control 100% of the volume.
 - ii. The question was clarified to ask if an evaluation period would be put in place where if the desired impacts were not seen the ordinance would be removed. In other words, how do you score a win?
 - iii. Potter noted that progress will be tracked over time. The SW TAC has seen that the 90% standard is not sufficient to protect the lakes from flooding. In addition, one of the recommendations is to put into place more rigid standards to ensure that BMPs that are functioning properly after they have been constructed.
 - A question asking if the establishment of the fee-in-lieu program would allow the 100% stay-on requirement to be put in place for internally drained areas only, or for all developments.
 - i. Potter responded that the recommendation is to regulate internally drained areas now and not wait for a fee-in-lieu program to be in place.
 - A question asking if the expected costs to go from 90% to 100% stay-on for the sites that were described in the report considered only the addition of treatment area or did it also consider costs associated with the other recommended changes to the stormwater manual such as more conservative infiltration rates.
 - i. Potter responded that those changes were not incorporated.
 - ii. Jeremy Balousek clarified Potter's response stating that the intent of the changes was to take the recommendations of the stormwater manual and put them into the ordinance, not to add more restrictive information. He noted many of the changes sought to match WDNR standards for consistency.
3. David Liebl opened the public comment period by reminding the public that the SW TAC is mostly interested in hearing comments regarding the technical issues of the report and recommendations as this is what the SW TAC's expertise is, and technical items are what the SW TAC is able to include or

modify in the report. After the final report is complete it will go on to the Capital Area Regional Planning Commission and the Dane County Lakes & Watershed Commission for approval and will require additional public hearings for approval prior to being recommended to the County for revision of the current ordinances. Liebl asked that each speaker state their name and who they were representing.

- a. Dan Day, D'Onofrio Kottke and Assoc., Registered Neutral – Here representing basically our firm and who we represent, and myself personally, a lot of clients across the county who consider themselves very environmentally friendly. I've been mainly focused in on the cost end of this issue looking at the minutes from the meetings and that sort of thing. I think your example shows \$3,000 cost for a single family home, which I'm not going to argue that because whatever you plug in for an example you are going to get out an answer. I have one site that I think the cost would be zero right now, I've heard of other sites that could be upward of \$10,000 a site. It just really depends on your circumstances. So, going from that 90 to 100 is a big deal and provides potentially a lot of impact for people in the process of buying a home. I think it is very simple when somebody buys a house and says ok, I'm going to spend \$3,000 to \$5,000, \$2,000, whatever it might be, what am I getting that my neighbor right across the street is not paying for and what am I getting different. So I think that's a key thing that needs to be addressed. Why is the new development paying for this versus anybody else? Buyers are very smart now days; they're going to want to know exactly what they are getting for their circumstance and for that. My other site on the west side of Madison, two of them actually, one of them, like I've said, pretty much would have no effect if it went to 100 percent, wouldn't do a whole lot of things, depends on the soils. And another site, 135 acres that right now about 5 acres is designated for stormwater management. If you had to go to 100 percent stay-on the area of the infiltration would go from about 100,000 square feet to 220,000 square feet. So that area, because of the soils and where it is at, would be a huge, huge thing. Obviously you'll, instead of digging, just have them pay the fee. Well, until we really know what the fee is, it's really hard to make a judgment as to whether this makes any sense or not. So I guess that's what I'm trying to get across is that, yes this sounds like a great idea. Two things, what's the measureable, and I think you kind of hit on that before is what is the measureable of if we do this, what is going to happen to the flooding, okay, what is going to be the benefit, number one. And then number two is just, really back to the cost impact of if I am going to spend this money, I am not going to be able to do my basement, what am I getting as a benefit for that. So, again, that's pretty simple comments of what I ask for. Thank you.
- b. John Kassner, representing self, Registered Neutral, does not wish to speak.
- c. Robert Procter, Realtors Assoc. of South Central WI, Registered Opposed – I'm Robert Procter, I'm the government affairs director for the Realtors Association of South Central Wisconsin. We have approximately 1,800 members of the housing industry in Dane County. RASCW supports the housing industry through advocacy for its members but also for the consumers. I'd first like to thank the technical advisory committee, I know that most of you do this, this isn't part of your job, this is just voluntary time. And so we really appreciate that you are out there looking at a problem and trying to solve it. However, I think you can't separate the economics from the technical advisory's recommendations. Because, as we heard earlier, we can pretend that this isn't intended to go to the Dane County Board, but it will go to the Dane County Board, it says so in there. And when it gets to the Dane County Board, it won't just apply to Dane County and the towns in the surrounding area, it will also apply to the City of Madison, City of Monona, and everybody else because it's a stormwater issue. So it will affect all housing and when it gets to Dane County, it will be political and there will be more issues than just the technical advisory recommendations on the technical aspects. There will be people there speaking about affordability like I am, and people opposing this because of the affordability issue. And so I think, if you really want this to succeed, you have to look forward to where it's going to end up and not just say 100% stay-on would be great. We have lots of reports in this county that sit on the shelf that are great ideas that never really see the light of day because they weren't feasible. And this isn't just an opinion I have. The President Obama's White House, just in September of 2016, issued a white paper. It's called the Affordability Development Toolkit, which in my written

testimony there'll be a link to it. And it basically cites to the fact that well intentioned environmental and land use regulations are one of the largest barriers to affordability in the United States and that they need to be reviewed and looked at in order to strike down the barriers of affordability. \$3,000 to \$5,000 may not sound much if you're talking about one lot being purchased in Waunakee for \$200,000 dollars. But, the point is, is that we're turning the county into a great place for lawyers, doctors, lobbyists like me, and other professionals to live. But we're pushing out millennials, we are pushing out the working class, and we're pushing out the people who do the work itself. If you look at the surrounding counties, around Dane County right now, the median sales price of a home in Dane County last year was \$245,000. The median sales price in Sauk County was \$160,000, Iowa \$149,000, Lafayette \$117,000, Green \$153,000, Rock \$137,000, Jefferson \$174,000, Dodge \$128,000, Dane is \$245,000. And obviously that's not all because of regulation, but we do it \$1,000 at a time in committees like this where we say this is a technical advisory committee and we don't worry about the fact that what's another \$2,000 from us. Well, it becomes a lot. Just for example, we just met with the Parks, Madison City Parks, a couple months ago because they increased the park fees, on average for a single family lot, from \$4,000 dollars to \$5,000 dollars. So, that means, on a certain type of single family home in the City of Madison being built next year, if these were to go into effect, the price just went up \$5,000 dollars because of two committees that brought it forward. Right now, over 40,000, according to a report between 2006 and 2010, so that's 7 years ago, its only increased since then, 40,000 commuters drive into Dane County every day to work, 2 trips back and forth. And those commuters, I can almost guarantee you, are not lawyers driving into my law firm, because I see it. There are legal secretaries, they're police fighters/police officers, fire fighters, teachers, they're the workers. And those trips are bad for obviously the environment, all the gas emissions that go in with all those trips, but they're also bad for all those families. And it is leading to the gentrification of the City of Madison. We've seen already the Atwood/Willie Street corridor, there's not, remember I grew up, its history is of being a blue collar working class area, matter of fact it's called the Settler's Historic District because it has architectural structures that were significant to the blue collar working class in Madison. I would suggest to you the blue collar working class doesn't live there. I would suggest to you on East Washington the blue collar working class will not be living there much longer, all along that housing stock. And you ask, where are they going to go, where are they going to find affordable housing as it goes up. So, obviously we oppose it. We believe that anywhere from \$3,000 to \$5,000 dollars of a fee is way too much. And we believe this is the place to address it. If you're going to come up with a solution for the stormwater issues in our County, it has to be a solution, that when it gets to the County Board, can be passed. So, we would ask that you not make the choice for so many of us, to be a binary one. It can't be flooding versus affordability; it shouldn't be flooding versus affordability. So we would like to see you, this committee as it looks at its recommendations, to go back in and see if there's a way that they can do it without taking all of the cost of the solution and putting those costs onto new development. Because new development, right now, is already paying for almost everything else that goes on in the County. But again, although I came out in opposition and critical, I do want to thank all of you and the professor for all the work you put in. And obviously it's an issue that needed to be studied and a solution that needs to be found. Thank you.

- d. Chad Lawler, Madison Area Builders Assoc., Registered Opposed – So I was going to come up with bullet points but then it became 3 pages and paragraphs and obviously with 5 minutes will not work for that. So I'll just kind of keep it a little short bouncing off a lot of what Robert said too. My name is Chad Lawler, here on behalf of Madison Area Builders Association. We too want to thank the TAC committees, Professor Potter, Mike, and the staff at CARPC we've worked with. I've attended half the meetings, the most recent ones, as well as we've met with Mike on a lot of the details trying to get an idea of the impact of this. I know and understand that this is a technical advisory committee, but I think that the one thing that its missed, if we only look at the technical, not the political side of it, is that what happens in all these committees, is whatever comes out of here, moves onto the next step and then it's going to move onto the next

step. And, I'm not saying that it's a rubber stamp, but it's about as close as you can get to it. So something leaves this office, it's going to be what will be implemented. So, for us, it's difficult to come in, see something that's going to directly affect affordability at such a high level. Robert was talking about Park fees, well I've been to, on average, about seven meetings a week and they all talk about \$1,000. In two, three weeks I go through and all of a sudden the cost of a house is \$21,000 more. Now luckily, lots of those do not get passed, that's just the type of mentality is and I'm trying to help you understand, \$1,000 here, \$1,000 there just doesn't seem like that big of deal. But, just to put it in perspective, 24.3 percent of housing costs, on the national average, is due to regulations, taxes, and delays associated with regulations. Now, a \$350,000 house, that's over \$86,000. Now we're talking about additional costs. And every meeting its additional costs and additional costs, and that's pushing people out. The National Association of Home Builders has also done a study where it talks about the number of people who are priced out of a home per \$1,000. In the state of Wisconsin, its 3,820 individuals are priced out of a home for every \$1,000 dollars that you push. Now in the City of Madison alone, just looking at population, the 250 or so thousand people, that means that \$3,000, its about 365 people who can no longer afford to buy a house for every \$1,000. If we look at the \$3,000 that's included here, and I understand that when you look at the fee-in-lieu program there is a potential of a lower cost, that might now come to, but we're talking between, around 1,200 people and families who will no longer be able to afford a home. Now, what I think we miss also is we're thinking of, this is on a high end, these are buying new houses, well what it also does is it compresses the market, so it actually affects affordable housing at the lower level. A low income starter families who are looking to actually purchase a house aren't able to do that because there's no home for those people in those homes to actually move in to or to build to. So I wanted to bring up those numbers because they're real, there in national studies, they actually talk to the fact that affordable, or that regulation actually has an effect on affordable housing. Now I think you've done a great job as far as a basis for it. The modeling at 100 percent I think was good. It gave us an idea of what that cost would be, potentially, without the fee-in-lieu program being involved. I think the next thing, and one of the paths that I would have for you is to actually look at all those different ones. Talking with Mike, he indicated that some of the issues, I think this point was kind of brought up, you know you're, that graph that was shown wasn't going to change, it just would get worse, based on the 10 percent increase. But that's still going to be there because the real issue is these older neighborhoods that don't have, that would be, needed to be retrofitted or other areas to be fixed. Well that's not getting changed by increasing new development from 90 to 100 percent. That's just maintaining the status quo. So we're looking at is, well why don't we look at different numbers. Now is it 92 percent, and then there's funding at the County level to retrofit other areas that would fix the issue. I don't think that just removing that 10 percent is going to be the key to resolving the issue, it's more of a stop gap, in our opinion. So, I wanted to just have a couple asks that I do have on here for you. One of them revolves around the 10 percent increase, so, like I said, we want additional modeling, and I think that it would be beneficial for the TAC. Obviously you guys are close to being concluded with the technical advisory committee, we would, you know, recommend extending it, do additional modeling and get additional alternatives outside of just that 10 percent increase, potentially being county funding for retrofitting of other neighborhoods. When giving your recommendations that are just giving the 90 to 100 percent increase, look at alternatives; give multiple, to provide Lakes and Watershed and CARPC an idea of what is out there and what the costs and benefit would be for each of them. So, instead of just that 100 percent, 95 plus this, 95 alone. Additionally, I'll just conclude here with a quick one. So, I also mentioned the 2 percent cap would not really something that is very effective, I guess I don't have time so I won't get into it more. But, I also want to suggest not giving this recommendation until after the fee-in-lieu program's developed. It's one thing to put in a recommendation, all of a sudden it becomes an ordinance, and I know that it won't be in effect until the fee-in-lieu program comes into play, but if all of a sudden the fee-in-lieu program comes in and it's much more expensive, well it, the ordinance is already in place. So, you're kind of putting the cart

before the horse. So, again, thank you so much for your work, we just would like to see, you know, potentially some more development before the recommendations move up the ladder. Thanks.

- e. Dennis Jelle, Town of Blue Mounds, No Opinion Registered, Requested to ask a question – We have an issue in the Town of Blue Mounds where the Village of Mount Horeb is increasing or is going to build another waste treatment plant right next to the one they already have and they're dumping it into one of the tributaries of the Sugar River. The problem we're having, its marshland all the way down through for probably a couple of miles, it's all private land, and the problem we have, the water level has come up quite a bit over the last few of years and its raising or causing problems with flooding at one of our town bridges. If they put a new sewer plant in that location, where they are now and dump more water into that tributary, we're going to have a real problem with flooding down through there. They have other tributaries over the hill that are all in the Sugar River, but how do you, I know the DNR has already approved their plan and it's a problem right now with real heavy rains it runs over the bridge and in the future it's only going to get worse as Mount Horeb grows and puts more water through that plant.

[David Liebl thanked Jelle for his question but noted that it was not on topic to the public comment period so it would be noted but not addressed at this time.]

- f. Curt Brink, Curt Vaughn Brink LLC, Registered Opposed – The role of the whole commission it to reduce increased risk of flooding, that's the title. The issue is, does this reduce increased flooding. I would disagree that the 90 percent predevelopment runoff standard has only been in effect, Mike, what about 10 years? Capital Regional Planning? [Mike Rupiper response – Yeah, I mean, probably about 2008 or so is maybe some of the first urban service areas] The reason I say that is I used to be a commissioner in Capital Regional Planning and that was not a requirement until then. I think we went back and modeled all the subdivisions that went in since basically 2005 with no less than 90 percent predevelopment runoff standard on residential. I would think would be effective because when you're doing your urban service extension and what you deal with staff of CARPC, they're looking at all the infiltration standards, the whole area, the watershed, the slopes going into the creeks, is it cold water, is it warm water, etc. So I would say, where we've been at 90 percent, that's the minimum, some go up to 100 percent, all the negotiations, I would say that that has been effective through time. Where we have a problem is before that. And where the watersheds, like Pleasant Branch, where the, in 1980, developed the land, where Pleasant Company is and UPS is. Back then there were no runoff requirements along Pleasant Branch Creek. And another subdivision I did, in 1980, was called Cedar Ridge in Middleton. Every subdivision, when you go in and get the approvals of it, there's these, the simple thing is these local HUD maps, that show where all the waters supposed to come down through, between houses, where it's all supposed to go. What we're not doing, is going back into those subdivisions to look where somebody put up a fence, put up a sandbox, or blocked something. We have to look at where is their stormwater coming from. In the Dane County Multi Hazard Mitigation Plan, of October 2009, was very detailed, most of the damage floods from '78 to 2008. Now if you look at the damage, a lot of it could be crop damage, hail damage, or wind damage. And what we need to go back into is each one of those events. A lot of it's caused by a lot of water within a short amount of time. What caused that and have we taken care of that then the existing position where it is. So what I'm trying to say is, where we've been going through 2005 forward, I would say the 90 percent to 100 percent is pretty well been effective because of the requirements we have to go with stay-on, with CARPC. The problem we have with the fee-in-lieu, we don't know who's controlling the fee-in-lieu. Where's it go and who's the board, who's controlling it. It's not going back to take care of a preexisting condition someplace else. There may be a water problem. If we did nothing, no more development for 40 years, the same flooding is going to happen. We need to go back and look at the overall, the whole County, coming all the way down through each watershed. What caused those flood incidents, to help stop it, and then work back through it, how do we some improvements with those areas that stop the flood. So, we want to stop flooding, every developer wants to stop flooding, because when we have flooding it causes a problem. Our parking lots are completely

different then we put in, than we used to. So, I'm saying, we have to look at pre-2005, all these things are a certain detail, where the damages were, what caused that flooding before. If there's flooding now, the new development didn't cause the flooding. How are we stopping that flooding, we may have a fee-in-lieu and we're still having to consider the cost of flooding, and that's what we need to look at overall. And that's why we have a problem with the fee-in-lieu, because we do not know who's controlling it, and we don't know where the money is going, and we're not talking about anything that has been built before. And that's basically it.

- g. Chad Wuebben, Encore Construction, Registered Opposed – I'll be very brief, technically I have an issue with the cost that you guys have in your study. I believe that Dan could point out, correctly, Dan Day, that depending on the site, the engineering may cost, the work may cost a little bit different. The problem that we're not looking to is the lost opportunity cost so, the acreage that we lose that turns into 6 lots or 5 lots, which effects the overall affordability. I'd be happy to help, I have a neighborhood that I did in a closed basin. I could go through, if anyone wants to see, what could have been there had we not had to do 100 percent stay-on, basically. So we got good solid numbers, 90 percent would be easy to see. But, the cost is much, much higher, and I'm talking \$30,000 to \$40,000 to \$50,000, not \$3,000 to \$4,000. Other than that, politically, everybody else has hit all my points so I'm not going to take any more time and go through that. I would like to see, however, if this fee-in-lieu program works and it makes sense, I can understand where you are coming from, but let's use everybody in the county to fix that problem. Let's not just pick on the new people coming in. I mean, we have 70,000 people supposedly coming to Dane County in the next 15 years, and I know it's easy to tax them now, but everybody has a part in this problem and if we actually want to reduce flooding, we have to go to the current residents in order to do that. Thanks.
- h. Matt Brink, Smart Growth Greater Madison, Registered Opposed, does not wish to speak.
- i. John Reindl, representing self, Registered in Support – Thanks Mike, thanks much. I also, like some of the other speakers, want to thank the technical advisory committee for all their hard work and putting this together. Also, just the foresight to develop this plan. I'm a retired professional engineer and environmental engineer, started working at University Extension having state-wide and professional development teaching responsibilities. Then went on to a state agency and finally worked for a sister county department. And I developed similar types of processes, so I understand how they work. I had 3 topics I was going to talk about. The first one was about doing education and getting the politicians involved. I think that you guys did miss an opportunity there. My experience is, you need to bring the public and politicians along. My third part was about enforcement. This is an interesting idea, it's a great idea, I don't think it's tough enough, but there's no discussion whatsoever of enforcement. I've recently got involved in helping some people out in the Town of Verona, with a 50 acre development uphill from them. And, one of the big problems that they have is that they see, first of all that the process failed them. They weren't notified about how to get involved in the process. They didn't understand the technical issues. The county agencies that were involved weren't willing to help them and they see no chance of enforcement. So, what they decided to do this last week, is to put their property up for sale rather than live downhill of this project. But from the engineering point-of-view, I don't think this plan is tough enough. I don't think there's any factor of safety, which as an engineer we always put in a safety factor, we always put in a margin of error estimation. I also think it fails to look at the changing climate of the area. Obviously our rainfall, 10 years from now, is not going to be the same as it was in 1981. The report says it is probably going to increase and I think we need to account for that. So, I will be submitting much more detailed written comments, but I thank you for your work, but I hope that you actually strengthen this report substantially.
- j. Kevin Even, Village of Waunakee, Registered Neutral, does not wish to speak.
- k. Tom Wilson, Town of Westport, Registered Neutral, does not wish to speak.
- l. Greg Schaffer, Madison Area Builders Assoc., Registered Opposed, does not wish to speak.
- m. Don Esposito, Tim O'Brien Homes, Registered Opposed – I'll make this real quick. Actually I heard that my name came up last meeting, so I've just been dying to get here to see what this is

all about. I'm not going to repeat some of the things that were said before, I think Chad brought it up, I should say this Chad brought it up, affordability. That's a common theme, you hear it all the time at city board meetings, you hear it at Madison City Council meetings. And I don't know if there's a real connection between the ordinance that you pass and the cost of subsequent housing. I am Wisconsin's State Representative to the National Association of Home Builders. I also sit on the Land Development Committee and State and Local Government Affairs Committee. And I can tell you that a common theme there is tax on the non-voters. Or, maybe I should say, tax on future voters. Because that's really what this ordinance, this proposed does, is it taxes those people who don't already live here. I think in the, from the sense of fairness, why not, and I think this Chad mentioned that, why not tax everybody across the county? Why not eliminate all caps, all exemptions, and just tie this ordinance to maybe like any expansion of impervious area. You build a deck, you put in a patio on an existing home, you have to pay into the fund, just like the new, non-voting, future home owners do. Available for questions and thank you.

- n. Angela James, Dane County Cities and Villages Assoc., No Registered Position, does not wish to speak.
- o. Tim Roehl, Dane County Towns Assoc. & Realtors Assoc., Registered Opposed – So I had an open house yesterday, I had people come in because it's a buying season here in Dane County. So Tara and David came into my open house. David works as a financial analysis down in WPX, right down the street here. Tara works at Meritor Hospital back in the budgeting department. I think that anyone in this room would say that David and Tara have pretty good jobs. They should be able to qualify for a good loan and live here in Dane County. Nope, they're buying a house and building a house in Sauk County. Affordability. I think we've hammered that nail long enough. You've picked a number that's marketable, in my opinion. 100 percent stay-on. You don't involve the realtors in your group. You don't involve infrastructure people in your group. You don't involve the people that have to implement this in your group. You've done this, to us, in the home building industry and the realtors for years. Your 30 percent track record of pushing people out, Robert's number is wrong, we have 60,000 commuters coming into Dane County every day. Madison Wisconsin ranks in the top 10, every year, for worst cities for asthmatics. You're going to do great with the water but nobody can breathe the air. Well done. So, the other issue that we have with this, is the creation of a bank. You want to create a stormwater bank for an ordinance that you want to implement. Why do you need to create a bank? Because you know the ordinance is untenable. Now, if we throw enough money at it, anybody can reach 100 percent stay-on and if your municipality wants to build a road and attain 100 percent standard, or your municipality wants to build a school and get to 100 percent stay-on, you let your tax payers do that, go right ahead. But when Chad and I, Lawler, and Chad and I, Wuebben, go to various meetings with Don Esposito, and the price of homes go up \$10,000 and \$12,000, you, in some way, shape, or form are killing the environment, okay. This bank issue is not an issue. We met with Mike [Rupiper], in a separate meeting, I talked with Jeremy [Balousek] after the last meeting, this whole plan just doesn't work, okay. My job with my realtor hat on, my job with my lobbying hat on, is to stop you, and that's what I'm going to do. I am going to do whatever I can to keep this at 90 percent and keep the DNR standard in place. Because the 100 percent and the creation of a bank to, because you are creating an ordinance, how does that make any sense to affordability? It doesn't. I do appreciate the TAC committee to a point. But again, with my realtor hat on, and sometimes my town hat on, you need to include the people that you are going to effect in your committees at the onset. Thank you.
- p. Forbes McIntosh, Dane County Cities and Villages Assoc., Registered Neutral – Good Afternoon. I'm Forbes McIntosh, I'm with the Cities and Villages Association. My, first of all, thank you for serving on the TAC committee. I'm the one usually charged with finding people to serve on committees and commissions and it's very difficult, especially when you're in controversial issues. The Cities and Villages has not taken a position so we're neutral at the moment. But, what I'm asking for is more time to give you our comments back. We're meeting as an association on March 8, in the evening, out in Middleton. We're going to be going over

this proposal and we're going to be putting together recommendations and sending it to you, probably, on March 9th or 10th, at the latest, which is a Friday. So, I'm just asking for more time on the comment. I will say, we've been doing outreach to the 27 of the 28 cities and villages we represent. I've heard some positive feedback from municipalities, also heard some negative feedback in the area of concerns. But it's been fairly balanced. That's why I want the association to come together as a membership and make its final recommendations and get those to you. But I also want you to know, while there have been concerns raised, there's also been some very positive feedback from our municipalities. But I need until March 8th, when I can have all of the city and village presidents and mayors together, to make a final recommendation of the association. Thank you.

Mike Rupiper noted that all the public comments will be written down and the TAC will produce responses that will be distributed to those in attendance as well as be included as an attachment or appendix to the final TAC report.

4. David Liebl asked for comments on the January 23 SW TAC meeting minutes.
 - Rick Eilertson asked for clarification about item 3.a.x regarding Tony Vandermuss' comment stating that the minimum 90% stay-on requirement to be achieved on-site, that is part of the TAC recommendation, is inconsistent with the DNR minimum stay-on requirement.
 - i. Vandermuss responded that the minutes reflect what was actually stated and the intent was to point out that the DNR minimum requirement has been used in past discussions as the basis for the minimum 90% stay-on requirement. But, the DNR minimum requirement is only 90% for low impervious sites; and is 75% for moderately impervious sites and 60% for highly impervious sites.
 - No other comments were provided regarding the minutes.
5. David Liebl then asked for comments regarding the future steps for the TAC to take.
 - Mike Rupiper proposed revising the remaining TAC schedule in light of the Cities and Villages Association's request to not provide comments until March 10. The proposal was to accept written comments from anyone until March 10 and then to extend the time for TAC members to provide comments to Ken Potter on the public comments to March 31. And then the TAC would meet for the last meeting in April instead of March.
 - i. By a show of hands, all agreed to the proposed schedule change.
 - Rupiper stated that all comments provided at the meeting would be documented and distributed to the TAC and any additional comments received in writing would be distributed to the TAC when received for review. We need to work out how to collectively respond to the comments and revise the report if appropriate.
 - The March meeting will be held to discuss the progress of comment review.
6. David Liebl asked if the TAC would like to take time to discuss the public comments that were provided.
 - Jeremy Balousek replied that there were a lot of good points provided but he felt it would be valuable to get all of the comments and digest them for a while before discussing.
 - The TAC was in agreement to wait until the written comments were received before discussing.
 - Liebl also noted that if any of the TAC members have written comments they would like to be included for review by the other members should also feel free to submit them to Mike Rupiper.
7. David Liebl asked if any other items needed to be discussed.
 - Brett Emmons commented, reflecting on the discussion of the larger costs of achievement, he has seen examples around the country where, if you are smart about your site design and stormwater management facilities integration, the impacts are not nearly as large as what was discussed during the previous TAC meeting and reflected in the public comments.

- i. Liebl asked that Emmons synthesize his thoughts, to which Emmons pointed to the presentation he gave at the August TAC meeting, which contained several examples. Emmons offered to present several additional examples.
- ii. Mike Rupiper asked Emmons to write up a paragraph on this topic for inclusion in the report.

8. Adjournment at 3:00 PM

Minutes prepared by Tony Vandermuss

FINAL MINUTES
of the
Stormwater Technical Advisory Committee
of the **Capital Area Regional Planning Commission**
and the **Dane County Lakes & Watershed Commission**

March 20, 2017

5201 Fen Oak Dr., Madison WI – Room 121

1:30 p.m.

Committee Members Present: Jeremy Balousek, Caroline Burger, Sarah Church, Camilla Correll, Rick Eilertson, Greg Fries, Dave Hart, Gary Huth, Jon Lefers (on behalf of Linda Severson), Nathan Lockwood, Rob Montgomery, Ken Potter, Eric Rortvedt, Mike Rupiper, Eric Thompson

Committee Members Absent: Brett Emmons, Brian Berquist

Ex-officio Advisors Present: Sue Jones, David Liebl-Acting Facilitator, Rebecca Powers, Caryl Terrell, Tony Vandermuss

Others Present: Josh Harder-Dane County, Chad Lawler-Madison Area Builders Assoc., John Reimer-Dane County, Tim Roehl-Dane County Towns Assoc. & Realtors Assoc.

1. David Liebl welcomed everyone back to the eighth meeting of the SW TAC.
 - a. Began with introductions of all in attendance.
2. David Liebl provided context for today's meeting based on the public comments received during the February 20, 2017 SW TAC meeting and submitted written comments. Referencing the meeting packet document titled "Major points from public comments to YTAC 2/29/17 draft report – 3-16-17," the intent of the meeting discussion is to review the feedback, identify any potential actions, and move forward toward finalizing the report.

Note: phases in *italics* below represent the issues gleaned from the comments received

3. Implementation cost
 - a. *Actual costs from increasing stay-on may be greater than estimated, and the per-unit-volume basis for the fee-in-lieu program is not known.*
 - i. Eric Thompson asked Jeremy Balousek if the County has any targeted sites in mind to perform retrofits to establish credits for the bank.
 1. Balousek replied they have some ideas but nothing targeted.
 - ii. David Liebl commented that there is some cost uncertainty and that this uncertainty has existed throughout the process.
 - b. *Requiring land development (either new or re-development) to bear the full cost of implementation* is one of several options for funding the increase from 90% to 100% stay-on. Alternative funding models include Dane County general revenue or assessments on existing development. Policy makers will need to determine whether one or a mix of these options is chosen.
 - i. Tony Vandermuss commented that requiring a new development to provide 100% control of the runoff created by developing a site should not be considered as charging new development to fix existing flooding issues; it is simply maintaining volumes on site to not make the problem worse.
 - ii. Caroline Burger asked if a County level stormwater utility was an option as a funding mechanism.
 1. Jeremy Balousek responded that the County does not have the authority.

- iii. Mike Rupiper recommended providing as complete a report as possible to both commissions, he was in support of fleshing out different funding options to show that there are alternatives that could be considered by the commissions.
- iv. Camilla Correll noted that in her experience in Minnesota, 100% stay-on is the trend and developers bear the entire cost, and while the cost of compliance may be greater than that presented in the draft report, they also may be less depending on the site design and use of a stormwater stacked function approach. Correll is comfortable with the full cost being provided by the developer.
- v. Sara Church agreed with Rupiper's statement that the SW TAC should look at alternative funding options such as municipal-wide or County-wide fees being applied.
- vi. Dave Hart questioned what the incremental cost of achieving 100% stay-on to the developer would look like to compared to the cost associated with repairing increased flood damage that would be passed on to all residents. This may better substantiate the reason that the developer would be responsible for bearing the full cost of achieving 100%.
- vii. Jon Lefers, on behalf of Linda Severson, built on Hart's comment stating offsetting the cost of additional flood damage is the benefit of moving to 100% and that cost has not been determined to compare to the expected cost to achieve 100%. Providing this cost comparison would go a long way in selling the concept.
- viii. Eric Thompson agreed with Lefers, what is the cost of doing nothing? He also stated that it is the development that is causing increasing flooding potential and therefore it is legitimate to tie the cost to the developer, the developer is not being asked to correct problems created by previous development. However, as the recommendation is removing exemptions there is additional hardship, and cost assistance may be appropriate in this case.
- ix. Eric Rortvedt agreed that the requirement to go to 100% is simply a requirement to not make the problem worse and therefore he supports the developer paying the full cost. He believes that it would be beneficial for buy-in of developers to provide a minimum cost for compliance that could be used for comparison purposes.
- x. Greg Fries added, from the stand point of doing no harm, this doesn't solve the problem; it simply doesn't make it worse. It is foreseeable that municipalities will have to expend resources to fix the problem that is already present. So even if developers are fully responsible for achieving 100% onsite, that doesn't mean that tax payers won't also have some responsibility in correcting the existing problems.
- xi. Nathan Lockwood fully supports the development of a regional stormwater utility and does not support putting these costs onto new development. During the 2005 SW TAC, it was concluded achieving 100% was a burden and therefore 90% was set as the standard. The caps and exemptions were put in play for several reasons, one of which was that the infiltration rates were conservative. So, the development community has a point as to why this is a burden.
- xii. Gary Huth noted that if the taxable community was asked to be a part achieving the 100% standard, we need to realize that some communities were developed with zero stay-on, some with 60% and some with 90%, how do you equitably tax the public if you want to be fair? Why should some have to pay again if they already paid for 90%? He noted that this standard would not be applied retroactively. Alternatively, if we look at the future flood that uses tax dollars for repairs, do we assume that the public that resides in new development that achieved 100% does not need to be taxed for flood damage mitigation? Leads to a complicated tax structure.
- xiii. Ken Potter noted that the 100% standard does not go into place until trading is available and if the costs are high at that point, the standard may not ever go into effect. It won't be politically supported if it is too expensive. We also need to remember that trading allows you to do things with multiple benefits such as programs for phosphorus reduction where mitigation may also reduce runoff, so you get a double benefit for the

cost. This should allow for trading to be done in a cost effective way. Finally, cities like Madison and Middleton are already putting in systems voluntarily to improve the hydrologic system so if they continue to this, it can be used for trading and is funded from a different source. Grants are also available for urban stormwater that can be used for establishing an initial inventory.

- xiv. Rob Montgomery noted subsidizing the cost of implementation for the developer could be very complex and contentious. If there is an ordinance change then the developer needs to pay it. Montgomery's main observation from previous conversations is that there are a lot of "if" statements in the language as it relates to the fee-in-lieu program and how much visibility will there be to the public if the ordinance changes are approved but the fee-in-lieu program isn't established for several years down the line. We are asking people to buy into an unknown. How will the cost implications be conveyed to the public?
 - 1. Ken Potter replied to Montgomery stating it was his understanding that the recommendation would not be issued to the commissions until the costs are known. There is going to have to be another committee looking at the trading program and there needs to be an oversight committee looking at this effort.
- xv. Liebl asked for TAC advisors Rebecca Powers, of the Lakes and Watershed Commission and Caryl Terrell, of the Capital Area Regional Planning Commission, to weigh in on what they would like the TAC to provide in terms of the character of recommendations, especially in regards to the technical aspects of what is being proposed, vis-a-vis the political aspects of what is being proposed.
 - 1. Rebecca Powers responded stating she is looking to the TAC for something that is workable in the stormwater/development field, is it balancing the cost of development, which we need, with the potential risks of doing nothing. Having additional cost scenarios would be helpful for the staff and commission as the TAC members are the experts and more able to pull this information together. Enough information is needed to sort out the public good versus private good equation. Powers addressed Montgomery's concern of this process trailing off from public visibility by saying she doesn't see that happening with this recommendation as there is going to be a need to have many people involved in the details of enacting the recommendation into an ordinance and noted that Lake and Watersheds is committed to help monitor the details from a public impact stand point.
 - 2. Caryl Terrell noted that the comments that have just been provided by the TAC will be very helpful in terms of decision making at the Commissions. Terrell also hopes that these comments are reflected in the report so that anyone reading the report can understand the pros and cons and different ways of looking at who is bearing the cost of the extra water if we don't go forward with the recommendation.
- xvi. Liebl, reflecting on all of the great feedback that has been provided, noted that nothing that has been said requires adjustment of the report as it is currently written and accepted by the TAC. Liebl did not believe that approval of the TAC was necessary for anything that had been discussed so far. All of the viewpoints shared provide a good background of decisions that have been made and will be captured in the minutes.
- xvii. Huth, responding to comments provided by Terrell and Powers, noted that the commissions may want to establish an outline for the TAC to follow to ensure that any information that may be used by the commissions for decision making purposes is not left off of the report accidentally.
 - 1. Terrell responded stating that the commissions really want the technical evaluation of the problem, a variety of ways to solve it, and fortunately the TAC has had the benefit of having multiple CARPC staff, County staff and the DNR represented on the TAC, so she doesn't feel that the report is headed in the

wrong direction, she just wants as much information to be provided as possible. Reflecting on the comments that have been received, are going to sharpen up the report and makes sure that is consistent throughout. The minutes should have as much as possible about the nature of the discussion and the points that have been made.

2. Powers, looking back at the initial charge to the TAC, noted that everything that has been asked for has been provided by the TAC, to the best of the TAC's ability, but requested that the requirements be reviewed one last time to ensure that enough detail has been provided on each item.
3. Potter asked specifically if there was enough detail provided in the statement that says 100% does not go into effect until fee-in-lieu system has been established? Is more definition required, and when the program is implemented is there going to need to be a second vote by the governing bodies, who is going to make the decision when it is time to go to the 100%?
 - a. Liebl noted these are good questions that can't be answered at this point.
 - b. Powers responded that it is up to the TAC to provide all information they see relevant so the Commissions can make an informed decision on how to address any remaining ambiguity that the TAC may have.
- xviii. Thompson, reflecting on Montgomery's points, noted that it is the County that will have to seed the project to establish the fee-in-lieu program and the fees charged to developers will be a reimbursement of a project that the County has constructed. Therefore, there could be a political aspect for the rate paid where the County could elect to pass on the entire fee to the developer or could choose to subsidize the fee, and the TAC needs to recognize that this is an option but not necessarily need to advise on whether they do it or not. Thompson also noted that the unknown effective date where 100% will be required does not bother him as ordinances that have been applied in the past also took time to come into effect such as the infiltration standard in NR 151 which established a calendar date for when it would become effective that was in the future. Finally, reflecting on Potter's statement about municipal stormwater planning, what if the policy had some ability for the County to certify a practice as an infiltration facility, and could start growing the inventory of tradeable volume bank.
- xix. Rick Eilertson asked to clarify Potter's statement regarding the 100% requirement would not take effect until the fee-in-lieu program was established. For internally drained areas, the ordinance would take effect immediately.
- c. While *the requirement for increased stay-on for redevelopment may limit business expansion* due to increased land surface allocation for stormwater practices, the fee-in-lieu program is recommend as a cost effective alternative to meeting the new requirement while allowing business expansion.
 - i. David Liebl asked if this statement is a correct interpretation of the recommendation.
 - ii. Jeremy Balousek added that the redevelopment minimum standard is being increased from 4,000 square feet of disturbance to 20,000 square feet. This reduces the number of redevelopment projects that would require infiltration.
 1. Gary Huth asked if the redevelopment minimum disturbance standard would be cumulative effect on the site over multiple years.
 2. Balousek responded that there was no cumulative requirement being proposed.
4. Fee-in-lieu program governance
 - a. *County-wide implementation could limit local control over implementation of stormwater practices.* Local units of government could be charged with enforcing the stay-on requirement while cooperating with a County managed fee-in-lieu program that would provide a uniform volume fee and regional opportunities for volume credits.

- i. Gary Huth remarked that local government likely would be happy to allow the County to administer this program as it would reduce small local government operating expenses. On the other hand, he is not opposed to the local government being certified, so-to-speak, by the County to administer by themselves.
 - ii. Greg Fries is in favor of allowing local and/or private trading/selling of credits.
 - iii. Eric Rortvedt is in favor.
 - iv. Eric Thompson believes that some form of County oversight likely would be needed to allow local government to administer their own program.
 - v. Jon Lefers, on behalf of Linda Severson, does not see any issues.
 - vi. Dave Hart noted local units of government have differing levels of capabilities, so as long as oversight is provided he has no issue.
 - vii. Mike Rupiper commented that this has the intent of the recommendation all along as long as it meets guidelines established by the County.
 - viii. Rick Eilertson noted that at the point that the County is comfortable with the recommendations of the TAC and creates the ordinance; local municipalities will be expected to revise their own ordinances to remain consistent with the County.
 - ix. Jeremy Balousek added that local units of government would still have local administration if they chose to and the credits available would be the accounting that the local government would need to manage. In addition, private entities could set up a bank as well, if a project was completed that had additional capacity, that volume could be sold to other projects.
- b. *Allow fees-in-lieu to be used to meet existing (90%) stay-on requirement.* This conflicts with existing requirements and the goal of encouraging on-site infiltration.
- i. Eric Rortvedt commented that allowing fee-in-lieu to be used for volumes less than 90% could conflict with DNR infiltration requirements. DNR require onsite infiltration of 90% stay-on for 0-40% impervious, 75% for 40-80% impervious, and 60% for over 80% impervious and caps apply to the State rule. That minimum onsite achievement needs to be maintained per State rule.
 - ii. Greg Fries noted that instead of allowing fee-in-lieu only to go from 90% to 100%, the recommendation could be structured to match the DNR minimum onsite standard and credits could be purchased for the remainder.
 - iii. David Liebl noted previous discussions which desired on-site infiltration regardless of caps or volume trading options.
 - iv. Jeremy Balousek echoed that this recommendation cannot be less than DNR standards and if it allowed for less than 90% to be achieved onsite it would be lower than the current County standard. Fee-in-lieu credits will be allowed for sites that have exemption and meet caps per DNR rules.
 - v. Rob Montgomery noted this provides an opening for getting appropriate volume reduction and not precluding development in areas with low permeability soils and is a good and defensible item in the proposal because it shows you a way out of sites that would be less developable under County regulations, if there is a fee-in-lieu alternative.
 - vi. Jon Lefers, on behalf of Linda Severson, noted he is a big advocate of large regional facilities as they are more controllable and easier to maintain. He suggested a tiered rate structure where one cost is applied to volume from 90% to 100% and a higher cost is applied if you want to mitigate volumes under the 90% requirement. The money gained at the higher cost could be applied to future projects to achieve a larger benefit.
 - vii. Eric Thompson offered to say the same thing, just a different way. Noting past discussions regarding failure rates of existing infiltration facilities, many of those failures may have been due to inappropriate site selection and the regional facilities and fee-in-lieu program offers a better condition where the owner of the BMP is a municipal entity instead of a private entity who may not provide the appropriate maintenance.
 - viii. Gary Huth, responding to Lefers' comment, regional controls from a peak control aspect are advantageous compared to a lot of little practices. However, for infiltration, one of

the benefits is if one small distributed facility fails you still are achieving a high level of success compared to if one large regional facility fails. The issue is maintenance of all of the distributed is not sufficient.

- ix. Camilla Correll reiterated the benefits of a stormwater stacked function approach which in addition to onsite infiltration improves onsite aesthetics, urban heat island effects, and wildlife habitat as compared to a rural regional facility.
- x. Montgomery, in response to Thompson's comments, stated the virtue of being able to dive deeper into 90% with this increment we just talked about, it might have benefits to the development but it has general benefits for smart growth and property tax base.
- c. *Require that a regional infiltration practice be in place before awarding fee-in lieu credits.*

Determine whether the fee-in-lieu program will be self-supporting. The report recommends establishing a board to address these issues and oversee the fee-in-lieu program.

 - i. Ken Potter noted this is consistent with the recommendations of the report.
 - ii. Greg Fries noted this program needs to be costed out before the commissions can make an intelligent decision on moving the recommendation forward to the County.
 - iii. Rick Eilertson noted issue of putting regional facilities in without it being funded so it is important to identify where the funding can come from to construct the initial facilities which will provide the initial volume credits.
 - iv. Jeremy Balousek, noting a comment from the public comment meeting, stated that maybe the bank should be set up with credits in place before the ordinance amendment occurs. Not sure if this is something to be discussed or not. Is it better to have credits available to be bought or apply the fees to building the facilities after the fact.
 - 1. Rob Montgomery offered that perhaps the land is acquired and the facility is designed but the installation of the facility is contingent on fees being collected to finance the construction.
 - 2. Balousek noted that the word that has been used is that credits are available which he assumes to mean that the facility has already been built prior to the credits being sold.
 - v. Gary Huth questioned if the intent of the comment was only about not implementing the fee-in-lieu alternative before the bank is in place or whether the ordinance itself also required onsite management to be in place; with the exception of IDAs.
 - 1. Potter confirmed yes, as it is written in the report.

5. Scope of recommendations

- a. *The recommendations are not strong enough to reduce flood risk, only to maintain current risk.*
 - i. David Liebl commented that this is exactly correct.
 - ii. Gary Huth asked if this is a statement that needs to be added to the report.
 - 1. Liebl responded stating that it likely needs to be made clearer in the report.
- b. *Limit the ordinance implementation to the Yahara Watershed.*
 - i. David Liebl commented that the group has had this discussion already and asked if the group needed to revisit it.
 - ii. Gary Huth commented potentially it could be phased where the Yahara Watershed is the implemented first and eventually implemented County-wide, but is in favor of County-wide implementation.
 - 1. Liebl pointed out that the comment reflects the concept that most of the flood damage that is trying to be mitigated is within the Yahara Watershed.
 - iii. Rob Montgomery commented that in his opinion the County-wide implementation case has not yet been made. He understands it would be more consistent and easier to administer if it was county-wide but thinks some homework needs to be done to make the case.
 - iv. Sarah Church noted that if one of the arguments is that you are keeping the land the same as before you developed it than it should be applied County-wide versus just one watershed.

- v. Mike Rupiper noted that the data from County Emergency Management that is included in the report, flooding issues extend beyond the Yahara Watershed although it certainly is where most of the problems occur.
- vi. Rick Eilertson stated it should be County wide in his opinion. Reflecting on his experience in Fitchburg, some of the more problematic flooding issues were right within the Badger Mill Creek Watershed. That's an area where there is still a lot of work to be done.
- vii. Ken Potter noted the report states that this will help base flow and pointed to Black Earth Creek as an example of a creek that would benefit from maintaining its baseflow. Additionally, just because you control peak, if you don't control volume as those hydrographs merge downstream they will create flooding and so one could make a case on Sugar River, Black Earth Creek, all the headwater streams, were causing flooding if we don't provide 100%.
 - 1. Caroline Burger inquired if the groundwater-shed has been identified and does that boundary build a case for consideration past the County limits.
 - 2. Potter responded while we'd love to go beyond the County limits but it is a whole other issue that will have to be dealt with especially as it relates to Columbia County. Part of the recommendation has to be collaboration with Columbia County to provide control.
- c. *Require fee-in-lieu practices in the same watershed as the funding source.*
 - i. Gary Huth noted it depends on how big the watershed is. He noted that previous discussions stated that the statement should be true if looking at the large watershed scale.
 - ii. Eric Rortvedt noted that as the costs are still to be determined, you could potentially have differing unit costs in different banks, and who wouldn't want to go for the least expensive option, which might be at the bottom of the basin and not effect flooding. Preferably the developer would be looking upstream if sites are available.
 - iii. Tony Vandermuss that this illustrates the importance of allowing local municipalities to have control of a banking system. If a development is occurring in an area with known flooding problems, a local municipality could require the location of the bank credits be assessed within the same area to be able to address that problem and not make it worse. In areas where there are no concerns of future flooding it may not matter as much where the bank credits are located. Local control also allows communities such as Westport to continue requiring 100% control onsite.
 - iv. David Liebl pointed out it may depend on how large a volume needs to be addressed. If it is small, it may not matter if it is upstream or downstream of the project.
 - v. Dave Hart noted he prefers the idea of acquiring credits upstream of a project site especially where the streams are dominated by baseflow and require recharge to maintain it.
 - vi. Jon Lefers, on behalf of Linda Severson, stated it is important to define what the issue is and then determine what the appropriate action is.
 - vii. Mike Rupiper recalling previous discussions stated that trading would begin within the larger watersheds and then as trading got more established and there were more practices we could take another look at it and reduce it down to smaller watershed sizes.
 - viii. Rick Eilertson noted it was important to note that we are talking about surface watershed and not subsurface watershed as they are very different. There may be times where it is fine to have a trading practice be outside the Yahara surface watershed if we know that the subsurface watershed is still feeding into the Yahara.
 - ix. Huth reminded the group that a person developing in Black Earth is not going to want to be paying fees that benefit people in Cottage Grove. So there is a property ownership aspect to trading across boundaries.

- x. Rob Montgomery noted it makes perfectly good sense to apply the credits within the major watersheds, but then are we going to have an issue implementing this if we don't have viable practices/banks established in each of the major watersheds. Would we launch on a watershed basis, which would be awkward. It is likely that to be successful that a facility would need to be established in each watershed before rolling out the ordinance.
- d. *Require retro-fitting existing development to meet the 100% stay-on standard.*
 - i. David Liebl noted this would go a long way in reducing the risk.
 - ii. Gary Huth responded that 100% might be stated as a goal but not a requirement. The local government would have to take the lead on that and determine what financial resources are available.
 - iii. Nathan Lockwood stated it is pretty easy to put these requirements on people who aren't here yet.
 - iv. Greg Fries commented he simply doesn't know how you could do that technically, regardless of cost.
 - v. Eric Rortvedt noted that one of the issues is getting things going and having the locations for this. To think that we can get right to 100% might be, as Huth noted, a great goal but we should try to show success with the 50% requirement for existing development first before going all the way to 100%. 100% might be more than we want to tackle at this point.
 - vi. David Liebl noted foreexample it might be feasible for the City of Madison to buy a large regional infiltration facility and add a little bit to everybody's stormwater bill to make that happen.
 - 1. Fries noted that he alluded to this earlier that this might be what has to happen to improve the existing condition.
 - vii. Eric Thompson noted it gets back to maintaining the existing conditions and trying to make it better. If this is a fee that is going to the development, it should only reflect how that development is affecting flooding so he does not support this change.
 - viii. Jon Lefers agreed with Fries where if this was an attempt to make the situation better, it should be evaluated against a whole host of other betterments to conclude that this is the best option.
 - ix. Rob Montgomery agreed with Lefers and remarked that this is where a stormwater utility comes in as there is nothing to preclude them from going after good regional ideas.
 - 1. Liebl remarked that this is not a technical issue in terms of the TAC's charge.
 - x. Camilla Correll agreed that a stormwater utility is a better structure for these types of retrofits but there also needs to be a strategic watershed plan to prioritize retrofits.
 - xi. Mike Rupiper supports the goal of trying to address some of the historic issues created by historic development but believes that local municipalities are better suited to address where the priority problems are and how best to retrofit for them.
 - xii. Rick Eilertson noted he doesn't know how this could work in an ordinance. He doesn't know if Dane County or other communities have done something like that for regulating existing development, forcing them to redevelop even if they don't have any need to redevelop. Certainly there are opportunities for incentive to municipalities for this fee-in-lieu program where they could look for beneficial projects within their limits and make them available to the fee-in-lieu program.
 - xiii. Caroline Burger also noted she doesn't know how the County could work this into their ordinance as the State is the one that requires municipalities to retrofit existing development to comply with MS4 permits for TS and TP. Can the County then require MS4s do this for reducing volume? Even if we wanted to she doesn't think we could.
 - xiv. Ken Potter agreed with Eilertson, he envisioned retrofitting in developed areas as a way to develop trading opportunities.

- xv. Huth noted that by law, in order to establish a stormwater utility a referendum needs to take place in the community. So if a utility is already established they are in good shape, if they don't, they have to gamble on the referendum passing. Second, a utility has to apply rates uniformly to all customers and that means that new developments that have already put in 100% controls has to pay in the same to retrofit sites that had lower or no controls.
 - 1. Fries noted that this is the case now for TSS control so this is not without precedent.
 - e. *Require any addition of impervious areas to pay into the system, not just new development and redevelopment over 20,000 square feet.*
 - i. Greg Fries noted that goal was to increase the minimum disturbance area to eliminate some of the problems associated with smaller projects triggering stormwater management. It could result in people intentionally or unintentionally avoiding getting permits to avoid paying stormwater fees.
 - ii. Jeremy Balousek noted that we can't assess a fee for something that doesn't require a permit; they wouldn't even know disturbance was happening.
 - iii. Eric Thompson also noted that not all impervious surface is equal, it depends on if it is connected or disconnected.
6. Implementation
- a. *Add a safety factor (i.e. greater than 100%) to the stay-on requirement.*
 - i. David Liebl asked if anyone was comfortable going above 100% to which no one responded yes.
 - ii. Jeremy Balousek commented that the report should state that the conservative infiltration rates are a defacto safety factor.
 - b. *Require: Record drawing certification by a professional engineer after construction completion; Soil evaluations performed by licensed soil scientist, certified soil tester or equal; Maintenance agreements signed and recorded.*
 - i. David Liebl noted that all of this has been discussed in terms of the stormwater manual aspects would be incorporated into the recommendations.
 - ii. Jeremy Balousek responded it will be in the policy. The erosion control and stormwater management manual will address this. A draft as-built certification checklist that goes over all of the items will be included as an appendix to the report.
7. Better definitions/criteria needed
- a. "Feasible"
 - i. no comments
 - b. "Existing urban area"
 - i. no comments
 - c. "Proposed land use conditions"
 - i. no comments
 - d. "Emergency drawdown for IDAs"
 - i. no comments
 - e. "Timing of 72 hour ponding period for IDAs"
 - i. Gary Huth asked when the 72 hour period begins, at the cessation of rainfall?
 - ii. Eric Rortvedt commented that the DNR Technical standard refer to the cessation of rainfall.
 - iii. Eric Thompson commented that the 72 hour period should be linked to a single event. Modeling in SLAMM, there are concurrent storms in the series, meaning there are few designs that actually achieve full draw down if the 72 hours applies to when the rain starts.
8. Other Issues identified by TAC members during discussion

- a. David Liebl noted that members of the TAC still have the opportunity to submit written comments until March 31 in response to the public comments.
 - b. Rick Eilertson asked if we are still on track to present a map of the internally drained areas within the County so we can address the issues and opportunities
 - i. Mike Rupiper noted that we are going to have a map but it won't be available for the report as it is a pretty substantial effort.
 - ii. Liebl noted that we do have the map produced by Eric Booth to get an idea of this.
 - iii. Rob Montgomery commented that, as this is the portion of the ordinance that will go into effect right away, a person on the board will want to know where the internally drained area ordinances will apply and the map of internally drained areas is critical for consideration prior to being reviewed by either of the commissions.
 - iv. Tony Vandermuss commented that the map is a tool that communities can use to help identify where IDAs are. An IDA that is not mapped does not preclude a development from having to comply with the IDA ordinances should, at the point that a survey has been performed, an IDA be identified that fits the definition.
 - v. Montgomery responded what if half of the County is within internally drained areas versus if 5 percent is. It will shape politically how this portion of the ordinance is received by the board.
 - vi. Vandermuss asked if our recommendations would change if the County was 50 or 5 percent IDAs to which Montgomery responded yes, as politically it would be a bigger deal for a larger percentage of the County to be within IDAs and you need the map to show this.
 - vii. Liebl summarized stating the writing team would look at what could be added to the report to identify as many of the IDAs as possible.
 - viii. Huth asked if a minimum IDA was identified
 - 1. Vandermuss responded the minimum area is 20,000 square feet and the minimum depth at any point is 1 foot, which is based on a 1 foot contour resolution.
 - ix. Ken Potter noted that additional conversations would need to occur regarding trading outside of the watershed as it may be very difficult to establish multiple facilities in multiple watershed and could delay the ordinance implementation. This could take some thinking and likely will require a follow-up committee to come to resolution.
9. The next meeting will be Monday, April 17 and the final report, which reflects comments received by March 31 from TAC members, will be provided by April 10.
10. David Liebl asked for comments on the February 20 SW TAC meeting minutes.
- i. Minutes were approved as written.
11. Adjournment at 3:15 PM

Minutes prepared by Tony Vandermuss

DRAFT MINUTES
of the
Stormwater Technical Advisory Committee
of the Capital Area Regional Planning Commission
and the Dane County Lakes & Watershed Commission

April 17, 2017

5201 Fen Oak Dr., Madison WI – Room 121

1:30 p.m.

Committee Members Present: Jeremy Balousek, Caroline Burger, Sarah Church, Camilla Correll, Brett Emmons, Dave Hart, Gary Huth, Linda Severson, Nathan Lockwood, Rob Montgomery, Ken Potter, Mike Rupiper

Committee Members Absent: Brian Berquist, Rick Eilertson, Greg Fries, Eric Rortvedt, Eric Thompson

Ex-officio Advisors Present: Sue Jones, David Liebl-Acting Facilitator, Rebecca Powers, Caryl Terrell-by phone, Tony Vandermuss

Others Present: Forbes McIntosh-Dane County Cities and Villages Assoc., John Reimer-Dane County

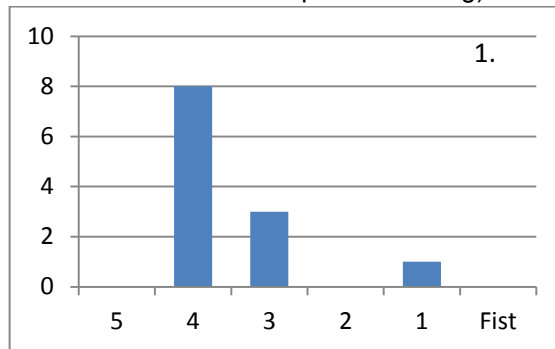
1. David Liebl welcomed everyone back to the ninth meeting of the SW TAC and reviewed the agenda.
 - a. David Liebl asked for comments on the March 20 SW TAC meeting minutes.
 - i. Minutes were approved as written.
2. Tony Vandermuss provided an updated presentation on the process of mapping Internally Drained Areas. (see <http://www.capitalarearpc.org/april-2017-stormwater-technical-advisory-committee-meeting/> for presentation)
 - a. Reviewed past efforts using USGS Topo Map evaluation of closed depressions and ArcGIS Spatial Analyst Fill tools.
 - b. Provided an introduction to EVAAL, the Erosion Vulnerability Assessment for Agricultural Lands tool, developed by the WDNR as a tool to target erosion control interventions within a target watershed. One of the internal steps of the evaluation process is the determination of internally drained areas with the purpose of removing these areas as erosion contributors provided the area does not overtop for a given rainfall.
 - c. Summarized the many obstacles that have been addressed to translate the intended output to results we can use to map all of the county internally drained areas, including rainfall recurrence, curve number determination, buffer width, stream crossings, culvert placement.
 - d. Results applying the analysis for the Fitchburg township suggest:
 - i. There are 2.5 million internally drained area depressions with a contributing drainage area representing 54% of the township area when drainage culverts aren't used.
 - ii. There are only 640 internally drained area depressions greater than 15,000 square feet and the contributing drainage area representing 49.9% of the township area when drainage culverts aren't used.
 - iii. Evaluating the 640 internally drained area depressions greater than 15,000 square feet with drainage culverts used results in a contributing drainage area representing 41% of the township area.
 - e. Results provided are preliminary and still require an accuracy review of drainage culvert placement, field investigation of unclear conditions, as well as, and most importantly, coordination with local community members who are familiar with the drainage patterns of the land.
 - f. Future efforts may include determinations of subsurface field drainage practices to confirm internally drained area locations.
 - g. Discussion followed

- i. Regarding slide 24 of the presentation clarification was provided that green depression areas surrounded by pink contributing drainage basin areas signify that the area is currently considered internally drained. Green depression areas not surrounded by pink contributing drainage basin areas signified that the area is able to drain either through a culvert or stream and therefore is not internally drained.
 - ii. Ken Potter suggested using historic aerial photos for confirmation of internally drained areas. Vandermuss responded that this method has been considered and may be particularly valuable when determining if an agricultural field has subsurface drainage tiles.
 - iii. Rob Montgomery observed that the Fitchburg Township, as it currently is mapped from the presentation, contains a large percentage of internally drained area that, under the current recommendation, would be regulated with no caps, no exemptions, and 100 percent control. Montgomery is concerned that this large percentage may be too burdensome to be dealt with from a planning perspective.
 - 1. Jeremy Balousek points out that it is well known that the Fitchburg and Verona area have a lot of internally drained areas and these results are not representative of the entire county.
 - 2. Montgomery followed that it would be beneficial to create a map showing what portion of the Fitchburg internally drained areas are underlain by low permeability soils to help assess the level of hardship that may be experienced. This may inform if certain exemptions should be considered for these areas.
 - 3. Potter noted that the portion of internally drained areas that have low permeability soils represents higher vulnerability to increase flooding and hazards against allowing exemptions. Potter also observed that the entire area is not going to be developed immediately and it would be valuable to focus on the urban fringe that may see development in the next 10 years, knowing that modifications to this ordinance language may shift over time.
 - iv. The group concluded that the EVAAL process is not yet complete and additional questions need answering before the results can be defensible. As such, there was concern about moving forward with the 100% stay-on with no caps or exemptions for internally drained areas without a more complete understanding and implication of the results.
 - v. Mike Rupiper noted that the only major difference between the recommendations to apply to the whole county and those for internally drained areas is that off-site trading is not allowed in internally drained areas. Perhaps allow trading within the internally drained area?
 - vi. Ken Potter brought up the example of Esser Pond where the contributing area did not provide infiltration due to poor soils and has caused the small pond to transition into a large pond, which provides habitat and human use advantages. The point is that planning would need to be involved to allow enough space at the bottom of the landscape to accommodate the additional volume if exemptions are to be allowed higher in the landscape.
3. Reviewed and Discussed the Report Draft dated April 2017.
- a. David Liebl walked through the changes that have been made to the February 2017 draft report. Liebl then performed a consensus check of the updated Draft Report as it is currently written (see April meeting packet), followed by an opportunity for TAC members to comment on their level of support.
 - Defined "Fist-to-Five" voting metric as:
 - Fist – No support, Will work to block the proposal
 - One – No support, Will not block the proposal
 - Two – Minimal Support, Will work to move the proposal forward
 - Three – Neutral (Defined as Medium Support, Between Two and Four)

Four – Solid support, Clear intent to work for the proposal

Five – Strong support, Willing to serve as lead person for the proposal

- i. Count was eight 4's, three 3's, one 1. (see: endnotes for level of support from TAC members absent the April 17 meeting)



- ii. Gary Huth noted a map of watersheds defining the limits of where trading would be allowed should be added to the draft. Huth added that a note could be added to allow trading across watersheds for low hazard locations.
- iii. Nathan Lockwood stated he has concerns about the internally drained areas and the unknown fee-in-lieu costs as well as a concern that once the recommendations have been approved - how transparent will the process of resolving these items be.
- iv. Dave Hart has concern over the definition of internally drained areas.
- v. Rob Montgomery noted his concern over how exemptions can be handled in internally drained areas and a process not being laid out on how to address this concern.
- vi. Linda Severson sees volume control as a good thing but is unsure if the burden to new development has been adequately addressed based on the public comments.
- vii. Ken Potter noted he feels that public concern over the trading program has been adequately addressed and believes that the fee-in-lieu option will prove to be agreeable to developers. Potter also stated the report should include provisions to better understand the implications of internally drained area recommendations.
- viii. Liebl concluded that the comments provided are not in objection to the edits on the draft report, but the internally drained area language is not yet settled in the draft. Liebl asked how many individuals votes would improve if steps were taken to address the conversation had so far regarding internally drained areas.
1. A majority of TAC members raised their hands in support of strengthening the internally drained areas portion of the report.
- b. The follow-up question asked by Liebl is how to move forward with addressing the internally drained area concerns. A) should the report indicate that the internally drained area recommendations are preliminary and will require additional investigation, and that analysis is needed prior to being final? B) or, are the recommendations sound, but more needs to be known about the implications of the recommendations as part of the process of adopting the recommendations by the governing body.
- i. Mike Rupiper asked what the TAC members opinion on the recommendations would be if the internally drained areas were allowed to participate in the volume trading program giving developers another option for meeting the stay-on requirement. Flood stage protection would still be required.
- ii. Rob Montgomery commented that Rupiper's revision was a break-through idea as it provides the flexibility needed to developers while still providing the protection needed within the internally drained area. Still, Montgomery believes it is important for the communities to come up with a comprehensive development plan for the internally drained area.
- iii. Ken Potter agreed that it is a big improvement though he is concerned that developers might all gravitate towards the volume trading option but would want to include

assurances that other options are considered first. This language could be developed prior to the ordinance being put in place.

- iv. Rupiper noted that there would be a level of responsibility for the entity that is managing the fee-in-lieu credits to ensure that if fees are being paid within the internally drained area; those fees should be used to site other practices within that watershed.
- v. The edit proposed is to delete the last sentence of item 2.B. on page 9.

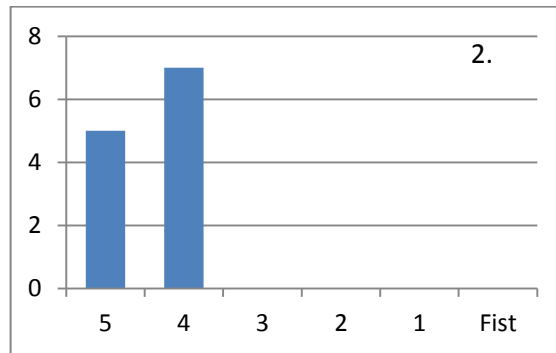
2. To protect local properties and aquatic resources located wholly or partly in an internally drained area Dane County should:

b. Require 100% on-site control of the average pre-development runoff volume based on average annual rainfall, regardless of the required effective area needed for the infiltration system. ~~Use of fee-in-lieu of credits would not be allowed in these areas.~~

- vi. Tony Vandermuss noted with this change, the 90% requirement would still be required to be achieved onsite. If so, even with well-draining soils, a developer could choose to pay the fee-in-lieu for a stay-on increment greater than 10%. Vandermuss also noted that additional water could be pumped out of the system, as compared to predevelopment, and might this cause additional flooding issues if the volume was not held back long enough.
 - 1. Jeremy Balousek suggested adding language similar to exemptions and prohibitions criteria where the fee-in-lieu option would only be made available if all other options had been considered. The last sentence of item 2.B. on page 9 should not be deleted; it should be revised to state that fee-in-lieu is only an option if 100% is not attainable.
 - 2. Vandermuss agreed and stated that the recommendation is too weak if the fee-in-lieu option is allowed in internally drained areas and additional volume is allowed to leave the system without attempting to comply in more favorable location within the system first.
 - 3. Rupiper summarized to take the page 9 last sentence in 1.A and replace it with the last sentence in 2.B.

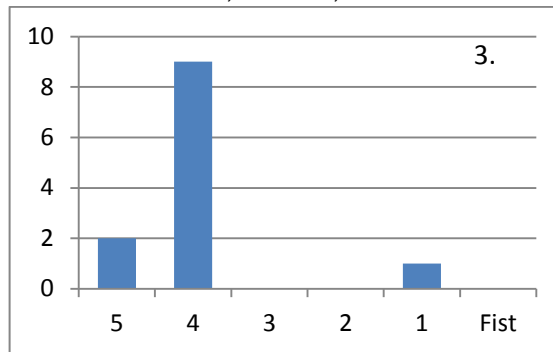
1. a. "For a site exempted by WDNR standards, the fee-in-lieu credit would be allowed to exceed the 10% gap between 90% and 100%."

- vii. Gary Huth made the observation that the concerns that have been voiced so far regarding internally drained areas stem from the large percentage of internally drained area in the Township of Fitchburg and asked the question if only 10% of the township was internally drained would the group have been happy to keep the recommendation as it was. Or, is the concern coming more from the uncertainty of what the final map might show. Huth believes that the concept should be confirmed irrelevant of the mapping results and ordinance can be adjusted as needed should it need to be in time.
 - 1. Montgomery noted that his concern is not the amount of the township that is covered and more a concern for select areas that may be entirely without permeable soils, where do they send their water.
- viii. Liebl summarized the revision proposed to be on page 9, the last sentence of 2.B would read "Use of fee-in-lieu credits would not be allowed in these areas except for sites exempted by WDNR standards, where the fee-in-lieu credit would be allowed to exceed the 10% gap between 90 and 100 percent." A consensus check was taken on this revision alone.
 - 1. Count was five 5's, seven 4's.



- c. David Liebl asked for a consensus check of the edited draft report along with the revision made to page 9 section 2.B.

- i. Count was two 5's, nine 4's, 1 one.



- ii. Brett Emmons provided commentary based on his experience establishing new buffer rules for wetlands and streambanks and the internally drained work they have done in MN, that having a map up front is key so that everyone knows what they are getting into.

- d. Caroline Burger discussed several comments she made in an email sent to Mike Rupiper and distributed to the SW TAC on Monday, April 17. The comments address three topic areas where the TAC felt the draft report required further content to strengthen the report, and Burger's opinion of how the most recent draft addresses these topic areas. The comments were provided during the March 20, 2017 SWTAC meeting.

- i. The first topic area addressed multiple comments provided by the public concerning undue financial burden on new development without a clear understanding of the costs associated with flooding. Reading the draft report, Burger believes that the costs caused by flooding is well represented and doesn't believe additional substantiation is required. Not knowing who made the comment, Burger requested if anyone still believes there is insufficient information on the cost of flooding to provide further detail of the concern and/or language to be added.
1. David Liebl noted that this comment has been made by several people over time. Liebl also noted that the risk-benefit analysis for flood impact and what the recommendations of the SW TAC will do to modify that impact may be outside the scope of the committee. The philosophy is to come up with good principles for managing flooding and stormwater and move those forward, with the assumption that anything we do to provide "no net impact" to flooding is beneficial.
 2. Gary Huth agreed with Liebl, stating the effort associated with determining incremental changes in flooding is a very difficult task to undertake.
- ii. The second area addressed the request to add language about the additional benefits of infiltration practices beyond volume control. Language discussing aesthetics, urban open space, flora and fauna habitat, reduced thermal impacts

1. David Liebl noted a comment by Camilla Correll in February addressed this need and he doesn't believe this language made its way into the draft report. Liebl asked for the additional language proposed by Burger to read aloud for the group.
 2. Addition to Section 3.1, as written "Additionally, volume control practices have benefits above controlling volume and increasing streamflow. The vegetation typically included in the practices provides additional habitat for animals and adds aesthetically pleasing landscape features to an urban environment. They also provide opportunities for information and education; signs can be placed to educate the public on the benefits of stormwater management practices. Infiltrating stormwater runoff instead of storing it and releasing it also increases thermal control."
 3. Liebl asked the group to show hands in support of adding the paragraph, with a majority showing.
- iii. The last area addressed was implementation of the recommendations county-wide as there were many comments both from the committee and the public suggesting flooding is only an issue within the Yahara watershed. Addition to Section 4.1.d, as written, "Although the Yahara Lakes are a focus of this effort, the volume control should be applied County-wide. Flood damage is experienced County-wide and will only increase unless a 'no net change' is enacted."
 1. Liebl asked the group to show hands in support of adding the paragraph, with a majority showing.
- e. Rob Montgomery noted that the TAC has heard the comment many times that the cost of the fee-in-lieu program needs to be known before going forward, and strongly encouraged an initial estimate be determined and provided in the final report.
 - i. Ken Potter responded saying the ordinance will state that it will not be enforced until the fee-in-lieu program is established and the costs are acceptable. If the costs are not acceptable, the ordinance never becomes enforceable. There is too much to consider for the TAC to come up with a cost in the time that was provided to create recommendations.
 - ii. Montgomery responded asking what level of scrutiny will be provided prior to adoption of the ordinance. What is the public process that has to occur to ensure that the recommendations are carried forward as the TAC intends them to be?
 - iii. Jeremy Balousek, asked for ideas of where to locate facilities, responded that there are only ideas, but nothing confirmed.
 - iv. Gary Huth suggested we provide an estimate of the fee being upfront about every assumption that is used so that the exact value can't be assumed to apply to all conditions.
 - v. Carolyn Burger noted that the TAC's charge was to determine the technical aspects of the issue, which is to increase stay-on volume with the use of a fee-in-lieu program. It is beyond the charge to determine the administrative portions of the program.
 - vi. Tony Vandermuss noted that the previous intent of the recommendations was to phase the ordinance adoption such that the internally drained area ordinance would be enacted first and the remaining area would not be enacted until the fee-in-lieu program was established. With the revision of internally drained areas being able to use the fee-in-lieu program, the internally drained area portion of the ordinance must now also be delayed until establishment of the fee-in-lieu program.
4. Closing Comments were provided by:
 - a. Ken Potter, TAC Chair
 - b. Rebecca Powers, TAC Advisor and Dane County Lakes & Watershed Commission
 - c. Mike Rupiper, TAC and CARPC

5. Next Steps include updating the draft report with the discussion had today. The TAC members not present at the meeting will have an opportunity to also vote on the consensus vote items. Once completed, the final report will be completed and presented at a joint commission meeting of the Capital Area Regional Planning Commission and the Dane County Lakes & Watershed Commission on Thursday, May 11, 2017 at 6:00 pm at the Madison Water Utility Building on Olin Avenue. The commissions will discuss it and decide how to proceed with the recommendations.
6. Adjournment at 3:15 PM

Minutes prepared by Tony Vandermuss

Endnote:

Absent TAC members (Berquist, Eilertson, Fries, Rortvedt, Thompson) were contacted and asked to provide their level of consensus with the report draft, as revised during the April 17 meeting. Results: two 4's, two 3's, one abstained.

APPENDIX VIII

Stakeholder Comments on the 2/6/17 Report Draft

The following issues were gleaned from both the written and oral public comments, and were organized here to facilitate discussion during the 3/20/17 TAC meeting. A transcript of the verbal comments are found in the minutes of the 3/30 meeting, and written stakeholder comments are appended below.

Implementation cost

Actual costs from increasing stay-on may be greater than estimated, and the per-unit-volume basis for the fee-in-lieu program is not known.

Requiring land development (either new or re-development) to bear the full cost of implementation is one of several options for funding the increase from 90% to 100% stay-on. Alternative funding models include Dane County general revenue or assessments on existing development. Policy makers will need to determine whether one or a mix of these options is chosen.

While the requirement for increased stay-on for redevelopment may limit business expansion due to increased land surface allocation for stormwater practices, the fee-in-lieu program is recommend as a cost effective alternative to meeting the new requirement while allowing business expansion.

Fee-in lieu program governance

County-wide implementation could limit local control over implementation of stormwater practices. Local units of government could be charged with enforcing the stay-on requirement while cooperating with a County managed fee-in-lieu program that would provide a uniform volume fee and regional opportunities for volume credits.

Allow fees-in-lieu to be used to meet existing (90%) stay-on requirement. This conflicts with existing requirements and the goal of encouraging on-site infiltration.

Require that a regional infiltration practice be in place before awarding fee-in lieu credits. Determine whether the fee-in-lieu program will be self-supporting. The report recommends establishing a board to address these issues and oversee the fee-in-lieu program.

Scope of recommendations

The recommendations are not strong enough to reduce flood risk, only to maintain current risk.

Limit the ordinance implementation to the Yahara Watershed.

Require fee in lieu eligible practices in the same watershed as funding source.

Require retro-fitting existing development to meet the 100% stay-on standard.

Require any addition of impervious areas to pay into the system, not just new development and redevelopment over 20,000 square feet.

Implementation

Add a safety factor (i.e. greater than 100%) to the stay-on requirement.

Require: Record drawing certification by a professional engineer after construction completion; Soil evaluations performed by licensed soil scientist, certified soil tester or equal; Maintenance agreements signed and recorded.

Better definitions/criteria needed

- “Feasible”
- “Existing urban area”
- “Proposed land use conditions”
- “Emergency drawdown for IDAs”
- “Timing of 72 hour ponding period for IDAs”

Written Comments Submitted to the TAC

From: Brian Koll <BKoll@marshall-wi.com>
Sent: Tuesday, February 21, 2017 6:48 AM
To: Rupiper, Mike
Cc: Susan Peck; Marlin Hensler Jr.
Subject: comments on proposed stormwater regs

Mr. Rupiper: Could you please pass the following comments on the the Stormwater Technical Advisory Committee:

My name is Brian Koll. I am the director of public works for the Village of Marshall. Recently it has come to my attention that your committee is considering proposing changes to Dane County's Storm Water Regulation Ordinance to require more stringent storm water discharge controls than currently required. Briefly, the new regulations would increase requirements for volume control of storm water discharge from new developments, and would eliminate current exemptions from meeting the requirements based on soil infiltration rates and the amount of land needed to meet the requirements.

As I understand, these new regulations were initiated based on a study that was done modeling the effects if a storm similar to the one that hit Lake Delton in 2008 were to occur in the Yahara River drainage basin.

I do have some serious concerns relating to the proposal. First, as you know, the Village of Marshall is not located in the Yahara River drainage basin, so discharge from developments in Marshall have no effect on resolving the problem which these regulations are proposed to mitigate. Secondly, the regulations may have a greater impact on the Marshall area than other parts of Dane County due to the prevalence of heavier clay soils in our area. In the last two years, Marshall developed property it owned to promote commercial development. Under the existing ordinance, we were able to take advantage of exemptions to avoid what would be excessive costs of compliance under this proposal. Also, I am concerned that since Marshall is close to the eastern boundary of Dane County, prospective developers may opt to locate their developments in one of the nearby counties to avoid the costs of compliance with the proposed rules. This would result in loss of new tax base not just for our village, but for Dane County as well.

At the very least, I would encourage you to make the new regulations applicable in the Yahara basin only. I have been in the public works field for 38 years, and have experienced a few floods, so I understand the importance of storm water controls, but let's make the solution fit the problem.

At this point, these comments are only made on my behalf, but I would not be surprised if a majority of our village board would be in agreement with my position. Thank you for your consideration.

Brian P. Koll

Director of Public Works
Village of Marshall
(608)655-3814

Date: February 21, 2017

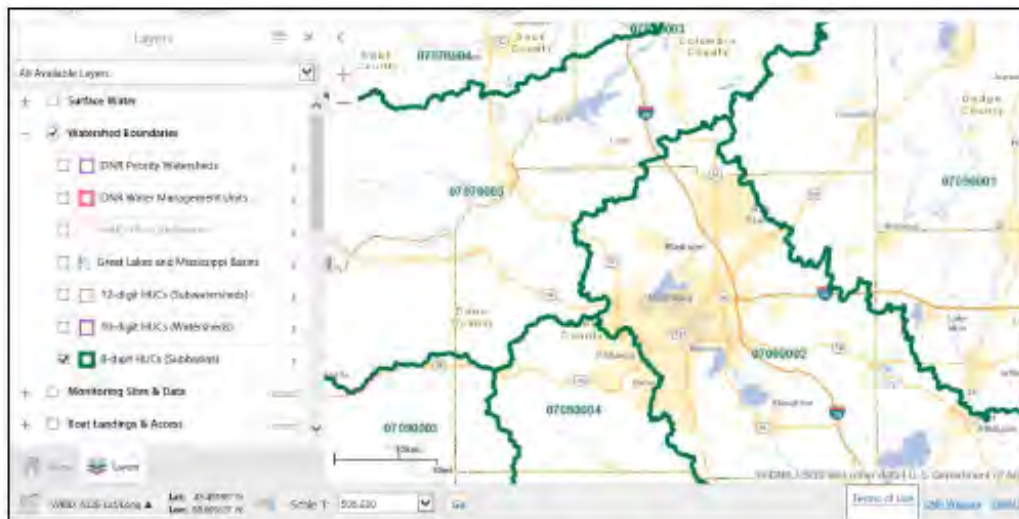
Review Comments From: Strand Associates, Inc. on behalf of the Town of Westport and Village of Waunakee

Document Reviewed:

Reducing Increased Risk of Flooding - Recommendations of the Stormwater Technical Advisory Committee of the Dane County Lakes & Watershed Commission and the Capital Area Regional Planning Commission - Draft - February 3, 2017

Review Comments:

1. Executive Summary Page 7, Section 4. 1. a.: Consider changing "90% volume control **should** be met onsite where feasible." to "90% volume control **shall** be met onsite where feasible."
2. Executive Summary Page 8, Section 4. 1. a.: Does the last sentence mean that if a site is exempted from WDNR standards then all of the infiltration required to be met by the County ordinance could be purchased through fee-in-lieu program?
3. Executive Summary Page 8, Section 4. 1. b.: A definition of what an existing urban area would be a good idea. What if a redevelopment is in an existing rural area that has a developed parcel? Consider revising this sentence to read: "Require 50% volume control of the pre-development runoff volume based on average annual rainfall..."
4. Executive Summary Page 8, Section 4. 2. a.: Define that this should be under an existing or pre-developed land use condition.
5. Executive Summary Page 8, Section 4. 2. c.: Define that this should be under a proposed conditions landuse condition. Should this analysis/calculation be completed with the assumption that the infiltration rate of the internally drained area is zero due to frozen ground conditions?
6. Executive Summary Page 8, Section 4. 2. d.: Considering adding some minimum criteria on what an emergency drawdown plan would consist of. (ie: no pumping until 72 hours after the start of an event...this would be 24 hours after back to back 24 hour storm events.....or 48 hours after a single 24 hour event).
7. Executive Summary Page 9, Section 5.: To get this program off the ground, consider having a minimum of one infiltration bank constructed (planned for?) that will be payed for by the fee-in-lieu of program prior to the ordinance change going into effect. Will there be a requirement that a fee-in-lieu of contribution be used within a certain radius of the development paying in or within the same watershed as the development paying in? Perhaps there should be a minimum of 5 infiltration bank sites, one in each 8-digit HUC subbasin with a minimum of 2 upstream of the Yahara Lakes system. It is our understanding that the County or CARPC will be identifying existing internally drained areas within Dane County that may be candidates for infiltration banks. Would development be allowed in watersheds draining to these facilities?



8. Executive Summary Page 9, Section 5. 1. c.: Given the restrictions to when and the amount of infiltration that may be purchased through the trading program, is there enough capacity (ie: do new development and re-development trends indicate a viable market?) to make this a self-supporting program?

9. Executive Summary Page 9, Section 5. 2.: It should be indicated clearly that these projects would be discretionary (basically watershed retrofits) and not related to meeting development requirements.

10. Executive Summary Page 10, Section 5.: Consider adding item e. Long-term maintenance provisions.

11. Appendix V. 3.: Consider defining when the 72 hour period starts. Is it at the start or end of a 24-hour storm event. We would suggest that it starts at the end, allowing for the facility to be drained down within 48 hours after a 24-hour storm event. Need to define in this sentence that this is a 24-hour storm event, if that is what is intended.

12. Appendix V. 4.: Same comment as 11. above.

From: Tom Wilson <twilson@townofwestport.org>
Sent: Tuesday, February 21, 2017 2:47 PM
To: Rupiper, Mike
Cc: Firestone, Linda
Subject: RE: Public Comment Period for Reducing Increased Risk of Flooding Has Been Extended; Wilson/Westport preliminary staff comments

Mike,

Thanks for the opportunity to comment on the proposal noted here. Initially I do want to thank the TAC for their good work and thought provoking recommendations. I am sure the final report will lead to interesting deliberation on some options for flood prevention in the County. Thanks for your work as well to assist in bringing this forward.

Also please note that these are my initial thoughts on the TAC report, and not Westport's. Our Board has not reviewed the draft report as a Board and will probably do so after some type of action is requested by either the Lakes & Watershed Commission or CARPC. I guess you could view these as simply my preliminary staff comments for now.

Just in general of course, we here do thank the TAC for the strong stormwater standard it is recommending to utilize on a County-wide basis for new development and redevelopment. We here in Westport have used a similar standard for years and have found that it has not been difficult to obtain, and that the additional costs have certainly outweighed the costs of flooding and stormwater runoff issues that we experienced in the past.

However I do have concerns as follows that perhaps the TAC will consider addressing before it presents its report, or may be considered at the commission level.

1. I do have a concern with Dane County and the LWC potentially foisting this on all of the local governments in the County. I am not sure any effort was made to attempt to export or recommend a standard for use by the various local governments, and then perhaps work to adopt it on a County level when either it got close to full coverage, or was rejected for some reason. It seems that a middle road effort may have worked to obtain more buy in for the actions desired, rather than an initial County-wide hammer.
2. I am surprised there was not more attention paid to retro-fitting those structures or areas which do not meet the currently used standard. Even if we all start to use the 100% stay on for new development, we will still see the current level of runoff, and combined with what is described as more rainfall events in the future. So without addressing the mistakes of the past we will still get behind in flows. There has to be some program that could have been used or discussed or recommended to solve this issue. I know perhaps the TAC felt that something for new construction was needed, but that is only part of the equation, and the other part is still looming.
3. It seems as was stated that this TAC was perhaps not worried about political fallout from a recommendation, but I believe they needed to be. I really don't want to see the policy part of this report mean that the Town of Westport becomes limited in some way in its desire to address flooding and stormwater issues. That could happen here, if some State wide legislation is sought to head this movement off at the pass. As soon as I saw the report, that possibility concerned me. And indeed it was raised at the TAC hearing. I am hoping that perhaps the TAC will work with those groups that do not necessarily think the recommendations are good for the County to come up with something that might work and might be adoptable.

These are just some of my thoughts for now, and I hope the TAC will continue to work on its report and present something that will aid the County in addressing flooding and stormwater issues in a workable and adoptable form. Thank you.

Tom

Thomas G. Wilson

Attorney/Administrator/Clerk-Treasurer
Town of Westport (Dane County, WI)
Population 4,000

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Robert C. Procter
Government Affairs Director
Axley Brynson, LLP
rprocter@axley.com
(608) 283-6762

Re: DRAFT (FEBRUARY 3, 2017) RECOMMENDATIONS OF THE STORMWATER TECHNICAL ADVISORY COMMITTEE OF THE DANE COUNTY LAKES & WATERSHED COMMISSION AND THE CAPITAL AREA REGIONAL PLANNING COMMISSION

TO: Stormwater Technical Advisory Committee

FROM: Realtors® Association of South Central Wisconsin

DATE: March 9, 2017

The Realtors® Association of South Central Wisconsin (RASCW) represents more than 1,800 members of the housing industry in Dane County. RASCW supports the housing industry through advocacy for its members and consumers.

RASCW's membership opposes the current draft recommendation of the TAC to revise the Dane County Stormwater Ordinance to require 100% volume control of pre-development runoff for new developments because it passes the significant costs to implement these new standards on homebuyers.

- **The TAC's Draft Recommendation Would Add to the Significant Barriers to Affordable Housing in Dane County.**

By the TAC's estimate, the cost of its recommendations would add approximately 3 to 5% or approximately \$3,000 to the cost of a typical vacant lot. Based on discussions with members of the housing industry, the average, approximate cost could be significantly more. This cost will exacerbate Dane County's existing affordability problem.

Affordability is one of the most significant issues facing Dane County. Well intentioned land use regulations have reduced Dane County's housing market's ability to respond to the growing demand of housing.ⁱ Land use regulations significantly increase housing costs in Dane County compared to its surrounding counties.

The median sales price in 2016 for a single family home in Dane County is significantly higher compared to the surrounding countiesⁱⁱ:

2016 Median Sales Price By County		
Sauk \$160,950	Columbia \$170,000	Dodge \$128,250
Iowa \$149,000	Dane \$245,000	Jefferson \$174,750
Lafayette \$117,500	Green \$153,250	Rock \$137,700

The National Association of Home Builders / Wells Fargo Housing Opportunity Index ranks the Madison metro area 30th out of 32 metro areas in the Midwest behind Minneapolis-St. Paul at 29th and just ahead of Chicago at 32 in affordability.ⁱⁱⁱ

The disparity in housing costs push workers further and further from the Madison job center. At least 40,000 workers commute into Dane County from seven adjacent counties, according to the 2006-2010 American Community Survey (ACS) data. The excessively long commutes are bad for working families and further contribute to greenhouse gas emissions.^{iv}

- **The TAC Should Seek Solutions To The Stormwater Problem That Do Not Significantly Increase The Problems Of Affordability.**

The choice for Dane County is not and cannot be between flooding and affordability. RASCW appreciates the time that the TAC members have put into the study of the flooding issues facing Dane County; however, the process has revealed that the perceived simplest solution – 100% volume control on new development carries with it too great of a negative impact on affordability.

RASCW encourages the TAC to not leave the issue of affordability to other policy makers, but to embrace it and to find solutions to the issue that do not directly and substantially increase the affordability of housing in Dane County. This will likely require some improvements to onsite stormwater practices, but will also require regional stormwater practices with different funding sources other than directly charging fees on new development that are passed onto the consumer.

ⁱ President Obama's White House white paper titled the Housing Development Toolkit, September 2016, recognizes that well intentioned environmental and land use regulations are a significant cause of the lack of affordability in housing. The White House Toolkit can be found at https://www.whitehouse.gov/sites/whitehouse.gov/files/images/Housing_Development_Toolkit%20f.2.pdf

ⁱⁱ Wisconsin Monthly Housing Statistics Report derived from the South Central Multi-Listing Service. This information can be obtained from Kevin King at kevin@wisre.com.

ⁱⁱⁱ The Housing Opportunity Index for a given area is defined as the share of homes sold in that area that would have been affordable to a family earning the local median income, based on standard mortgage underwriting criteria. The HOI can be found at: <http://www.nahb.org/en/research/housing-economics/housing-indexes/housing-opportunity-index.aspx>

^{iv} White House White Paper at p.9.



From: Neil Pfaff
Vierbicher Associates, Inc.

To: Mike Rupiper
Stormwater Technical Advisory Committee Member
Capital Area Regional Planning Commission
210 Martin Luther King Jr. Blvd. Room 362
Madison, WI 53703
Phone: 608-266-9283

Date: March 10, 2017

RE: Reducing the Risk of Flooding – Recommendations of the Technical Advisory Committee of the Dane County Lakes & Watershed Commission and the Capital Area Regional Planning Commission – February 6, 2017.

The following is being provided for public comment related to the above referenced recommendations resulting from the TAC.

Review Comments:
Executive Summary 4.1.

1. *Require 100% volume control of the pre-development runoff volume based on average annual rainfall (either on or off site) for new developments that are not in internally drained areas and are not at redevelopment sites. 90% volume control should be met onsite where feasible. This requirement would eliminate the caps and exemptions, and should not go into effect until a volume trading/fee-in-lieu program has been implemented and the cost of a volume credit has been established.*

For a site exempted by WDNR standards, the "purchased" credit would be allowed to exceed the 10% gap between 90% & 100%.

2. *Require 50% volume control of the pre-development runoff volume, either on or off site for redevelopment in existing urban areas. Redevelopment areas would be allowed to meet this requirement through the purchase of fee-in-lieu credits.*
- A. *It would be beneficial to have clear definition on "feasible. "Eliminated caps and exemptions" doesn't seem to fall in line with a feasibility determination. Current process often leads to infiltration practices being forced into locations on sites where less than ideal soil conditions exist. This often results in practices that are ineffective and fail. The fee-in-lieu of, is a good practice to avoid systems that fail by providing more suitable locations to meet this requirement. Not only should this be available to meet the 100% requirement, but possibly the 90% requirement as well. A cost structure would need to be understood before committing to this. Would practices other than infiltration be considered to meet the stay-on requirement?*

- B. Requiring volume control on redevelopment sites may present significant challenges for existing businesses to grow within their current boundaries. It is important to understand the financial implications of such requirements before imposing them. Consideration of this new standard should be accompanied with a financial analysis. The fee-in-lieu of may be a practical solution so long as it is not overly burdensome to the redevelopment.

Executive Summary, Section 5.1. *The County should establish a county-managed volume trading/fee-in-lieu program to facilitate off-site control where on site control would be inefficient or prohibited. This program should:*

1. *Be administered by the Dane County Land and Water Resources Department, with oversight provided by an external board. This external board should be convened as soon as possible to assist the County in designing the trading program.*
 2. *Be based on calculated site-based stay-on volumes and one-to-one volume trades.*
 3. *Cannot be used to meet the current 90% standard.*
 4. *Allow trading for re-development, exempted sites and sites requiring more than 2% of the land area.*
 5. *Require trading for sites where on-site controls are prohibited.*
 6. *Allow trading involving both public and private parties, with county oversight.*
 7. *Promote trading in locations with the greatest need for volume control, such as the Yahara Lakes watershed.*
 8. *Set an initial unit cost for volume control before the proposed ordinance changes are presented for approval.*
- A. Individual communities should be able to implement and manage their own trading/fee-in-lieu program.
- B. Will the calculated site-based stay-on volumes be calculated based upon actual soil conditions or NRCS soil mapping?
- C. Will the 90% Standard be based upon actual soil conditions or NRCS soil mapping? How will sites that have portions of the site with soils that meet the WDNR exemptions be addressed? Consideration should be given to allowing the program to address the 90% requirement as well; to avoid sites that have limiting soils and to prevent practices that ultimately fail. The program should encourage the regional facilities that are best suited to meet these goals rather than forcing them onto a site with limiting soils.
- D. Will fee in-lieu of be allowed for redevelopments? Include financial analysis.
- E. This should include an analysis on the impact of on-site versus off site practices and an order of magnitude for varying site conditions. Will a fee-in-lieu of be available for sites where on-site controls are prohibited?

Executive Summary, Section 5.3. *The County should develop policies and procedures to facilitate the standardization of the design and installation of infiltration practices. These policies and procedures should recommend:*

March 10, 2017

Page 3 of 3

1. *Use of WDNR technical standards for maximum area contributing to an infiltration practice.*
2. *Use of test pits to determine on site soil characteristics.*
3. *Engineering supervision during the construction of infiltration facilities.*
4. *Post-construction performance evaluation of infiltration facilities.*

Consider adding:

Require record drawing certification by a professional engineer after construction completion.
Soil evaluations performed by licensed soil scientist, certified soil tester or equal and evaluated in accordance with SPS 382.365 SPS 385, Wisconsin Administrative Code.
Required maintenance agreements signed and recorded.

Sincerely,



Neil J. Pfaff, PE, PH, CST

From: Nathan Lockwood <nlockwood@donofrio.cc>
Sent: Friday, March 31, 2017 4:07 PM
To: Rupiper, Mike
Subject: Comments on the Draft Report

To my Fellow Committee Members

I was struck by the conversation at the last meeting with regard to the “charge to the committee”. After reviewing the charge, I think what has been worked on to date, with regard to simply codifying the infiltration standard for CARPC reviewed projects, is at least now a quantifiable known. Everyone has heard my concern, from the previous studies based on soil types, that changing from 90% to 100% stay-on for the average annual storm will be painful for developments in poor soils. What is important to note is the charge says nothing about lake flooding.

What I am writing to caution, or at least consider as too lofty an achievement, is using lake flooding as justification for pushing the ordinance change from 90% to 100%. There is very little science behind what we are proposing yet we claim in the report “reduce risk of flood damage... through adoption of a no net increase approach” for catching an extra 3” of water in a year, especially when we offer the opportunity to not do this and pay into a bank. The storms I’ve watched make floodways flow in the last 18 years of being on the regulated side are not the type of storms in the 1981 rainfile.

I wonder if this should be worded something closer to “developments control small storm volume on site or contribute financially to regional volume control efforts needed for historically non-existent volume control standards”. More of a Take Care of Your Own Water instead of solving a regional problem that will be there whether new development happens or not.

If someone were to ask me right now how this ordinance helps Yahara watershed lake flooding, the only answer I could give is with certainty is “well, shouldn’t hurt, plus we’ll raise money to do *something*”. I guess this doesn’t make me feel very confident in recommending that developments in sandy soils won’t even notice this ordinance change but that somebody in a clayey soil should hurry up and develop or else pass on that Option to Purchase.

Just my big picture thought.

Nathan Lockwood, P.E.

Rob Montgomery, Stormwater Technical Advisory Committee

My biggest comment is on the internally drained areas – I think the area/volume/size criteria may be too tight considering the very significant constraint this will prove to be if we are in poor soils – as I mentioned in the comments in the PDF, it's not so much going from 90% to 100% that wreaks havoc, it's the removal of the exemption for low permeability soils – if they happen to be in and internally drained area it will be a big deal. This from direct experience working currently in the Northeast neighborhood. I suggest sticking to the two-year overflow definition. Or maybe better yet removing the details of the definition altogether because we really haven't worked through the exercise of how many areas will be defined as internally drained using various criteria and how significant those areas are.

Rob Montgomery, PE, D WRE
Montgomery Associates: Resource Solutions LLC

David S. Liebl, Stormwater Technical Advisory Committee Ex-Officio

In my opinion, the strident opposition of the builders is unacceptable and likely jeopardizes the recommendations of the TAC. There are several opportunities to further develop the recommendations in such a way that this opposition might be muted:

- 1) Propose that the cost of increasing stay-on for new and re-development be shared between new development and existing development. For example, the cost of a unit volume of stay-on might be divide proportionately based on the land area in the county attributable to municipal, private and (foreseeably) developable impervious area, such that an acre-foot of storage would be billed 33% to municipal stormwater utility(roads public spaces), 33% to general county revenue (homes and businesses), 33% land development an re-development.
- 2) Describe the expected reduction in runoff to the Yahara Lakes (in acre-feet) from increasing the stay-on requirement to 100% for new and re-development. Compare that with the future risk of flooding on Mendota and Monona if no action is taken. Use the Mendota stage rise from the 2008 storm to illustrate the impact of increased stay-on (i.e. stage rise at 90% vs 100% for existing impervious, and for foreseeable development).
- 3) Use data from #2 to assess the effectiveness of controlling runoff using internally drained areas in the watershed (i.e how many acre-feet of storage is needed to provide “no net increase “ or to roll back runoff to pre-development volumes).
- 4) Estimate the cost of acquiring and implementing the IDA storage needed. Use that \$ as a proxy for the cost per unit volume of stay-on.
- 5) Recommend that the County purchase land for storage prior to instituting the fee-in-lieu program.

ATTACHMENT I
2005 Dane County Stormwater Infiltration Task Force Report

Report of the Dane County Stormwater Infiltration Task Force

Executive Summary

Dane County's Chapter 14 infiltration standards are aimed at protecting surface water and groundwater resources and must comply with Wisconsin NR 151. These standards require, to the maximum extent practicable, a high percentage of predevelopment average annual infiltration during development. Like the state-wide NR 151 standards, the County Ch 14 ordinance provides "caps" on the land required for infiltration devices (1% of site for residential developments, 2% for non-residential). The County ordinance, however, provides a one-year sunset clause for these caps, in order to allow time for further study of their usefulness. On one hand, there are concerns about the potential impact of the absence of caps on the economic viability of high density development; on the other hand, there are concerns that caps can result in suboptimal infiltration practices, as there is not a way to ensure that infiltration practices done within the minimal (1-2%) land area reflect best management options.

The Dane County Stormwater Infiltration Task Force (SITF) was created to further evaluate stormwater infiltration requirements, including caps on the area required to be devoted to infiltration as well as other approaches, and to make recommendations for possible changes in these standards. The 16-member SITF met 10 times between September 2005 and May 2006. In addition, subgroups met several times to focus on specific issues and conduct technical analyses. As a result of this work, the SITF agreed unanimously on a number of recommendations for improving infiltration standards and practices in Dane County. These recommendations fall under five categories:

1. **Chapter 14 infiltration standards:** amend ordinance language to provide an option for developers to meet specific groundwater recharge goals in lieu of exceeding caps on the percentage of land required for infiltration devices. If a development would require more than 1% (residential) or 2% (non-residential) of the site to meet NR 151 infiltration standards, developers may choose to satisfy the Dane County infiltration standard by designing infiltration practices that (in addition to meeting minimum NR 151 standards) meet a recharge rate of 7.6 inches/year, which is the estimated county-wide predevelopment groundwater annual recharge rate. This option also requires mitigation of the effects of compaction on disturbed open areas.
2. **Information and enforcement:** provide guidelines for the use of computer models for infiltration calculations that are part of the approval process; work with stakeholders to provide short courses, workshops, and other programs for installers of infiltration devices, to ensure effective practices; require and enforce "as-built certification" of installed infiltration devices.
3. **Monitoring effectiveness of infiltration practices:** place a high priority on testing the effectiveness of installed infiltration practices to determine what works and what does not work, and why.
4. **Hydrological research and management:** establish appropriate groups to make recommendations about the status of, and future needs for, hydrological research and management in Dane County.
5. **Resource needs:** provide funds for research and for additional staff for training, permit review, monitoring effectiveness of installations, and on-going review of infiltration standards.

Report of the Dane County Stormwater Infiltration Task Force

July 6, 2006

Background

In November 2005, Dane County amended its Chapter 14 stormwater ordinance in order to comply with Wisconsin NR 151 state-wide infiltration standards. Both Wisconsin and Dane County standards are aimed at maintaining, to the maximum extent practicable, a high percentage of predevelopment average annual infiltration (90% of for residential sites, 60% for non-residential) during developments and redevelopments that meet particular criteria (of size, etc.).

Like the state-wide NR 151 standards, the amended County Ch 14 ordinance provides “caps” on the land required for infiltration devices. The County ordinance, however, provides a one-year sunset clause for these caps, in order to allow time for further study of their usefulness. The caps provide for a maximum area of developments (1% of disturbed land for residential sites, 2% for commercial) that are required to be set aside for engineered infiltration devices.

In addition to the sunset provision on the caps, Dane County infiltration standards are different than required by NR 151 in that the County standards: 1) do not contain an exception for infill developments, 2) apply to developments with greater than 20,000 sq ft of cumulative impervious surface since Aug 2001 (compared to 1 acre of disturbed land, or 43,500 sq ft, under NR 151), 3) rely on a more restrictive Dane County definition of “redevelopment” that reduces exemptions, 4) excludes the use of the TR-55 model for estimating infiltration, and 5) consider the entire site, rather than just impervious area, for effective infiltration area calculation on non-residential sites.

The present Dane County Stormwater Infiltration Task Force was created in response to concerns about the implications of not retaining the land area caps that are part of NR 151. In particular, the City of Madison and area developers expressed concern about the potential impact of any infiltration standards that would not include caps on the economic viability of high density development, where it is often more difficult to allocate sufficient land area to meet the required percentage of predevelopment infiltration. On the other hand, support for the lack of caps arises largely from the concern that such caps can result in suboptimal infiltration practices, as there is not a way to ensure that infiltration practices done within the minimal (1-2%) land area reflect best management options.

Charge to Task Force

The Task Force is charged with evaluating the current approach to stormwater infiltration requirements found in Dane County ordinances, which reflect the state runoff rule requirements of NR 151, and include a cap on the land area that can be devoted to infiltration practices. The Task Force is to evaluate and compare the merits of the infiltration cap and other approaches (including no caps), and recommend possible changes to the county infiltration standards.

Approach

Identification of Issues

As a first step in addressing its charge, the Task Force identified the scope of issues that we considered relevant. These issues (listed fully in Attachment 3) can be grouped in four categories: 1) infiltration standards in the context of larger development planning, 2) resource protection goals of infiltration standards, 3) interpretation of infiltration standards, and 4) research needs.

Site Analysis Subgroup (Details in Attachment 4)

This subgroup used computer modeling to analyze the impact of different standards on specific development site scenarios. Initial modeling focused on infiltration predictions from two different models (SLAMM and RECARGA), where “infiltration” is actually calculated as the amount of water that does not run off the site. Since this calculation includes evaporation and evapotranspiration as well as groundwater recharge (water that soaks into the soil and helps replenish groundwater), it might more accurately be called “stay-on” water. During discussion of initial results brought by the Site Analysis Subgroup to the entire Task Force, it became apparent that while the NR 151 focuses on runoff retention to meet water quality goals, groundwater recharge is also of specific concern in Dane County. In fact, “infiltration” practices designed to minimize run-off (maximize stay-on) can actually encourage evaporation and evapotranspiration at the expense of recharge. Subsequent computer modeling by the Site Analysis Subgroup, therefore, focused on estimating recharge rates instead of stay-on.

Resource Approach Subgroup

This subgroup approached long-term infiltration issues from a "resource-based" perspective, starting with the following questions:

- What would it take for us to develop infiltration standards based on solid understanding of resource needs (groundwater and surface water quality and quantity) under various projected development scenarios?
- What is the status of research efforts that can help with the above question?
- Can we and should we support refinements of the current Dane County Regional Groundwater Model, or other modeling efforts, to help address this?
- What needs are there for on-going data collection as part of new development that will allow us to revise and improve infiltration standards?
- Besides the question of the appropriateness of “caps” on land required to be devoted to infiltration, are there other issues that should be considered for addition or revision to the infiltration standards?

Discussion of these questions by the Resource Approach Subgroup led to recommendations from the entire Task Force.

Consideration of Recommendations

The Infiltration Task Force met as a whole to consider information and potential recommendations that came out of the two subgroups. Several categories of recommendations (see below) were discussed and approved besides the ordinance language dealing with “caps,” including education and enforcement, monitoring of effectiveness of infiltration practices, hydrological research and management, staffing needs, and considerations for possible future revisions to standards. The recommendations included in this report were accepted unanimously by the Task Force members at its final meeting of May 18, 2006.

Findings

- Computer modeling showed that the infiltration requirement for non-residential sites (60% of pre-development infiltration volume) can normally be met with less than 2% of land devoted to infiltration practices, even on poor soil. (Attachment 4 contains detailed results and analyses.)

- For high density (4 - 5,000 sq ft lots) residential sites, modeling shows that they often cannot meet NR 151 infiltration requirements within a 1% cap on land area devoted to effective infiltration areas on poorer (silt loam) soils.
- Published scientific studies indicate that the average recharge rate for Dane County is in the range of approximately 5 – 8 in/yr (see memo, Attachment 5). An average recharge estimate of 7.6 in/yr was derived using the 1981 rainfall record, which is typically prescribed for use in design analyses submitted for DNR and County approval (Attachment 4). The committee agreed that 7.6 in/yr is a reasonable target for site stormwater design because it falls within the range of existing recharge rates indicated by the literature. A value near the upper end of the range is appropriate as a recharge target for developing designs intended to restore recharge rates to those nearer pre-development conditions.
- Modeling indicates that effective infiltration practices will generally provide 7.6 in/yr recharge using considerably less land area than would be required to meet the percentage “stay-on” (water not leaving the site by runoff) stipulated in NR 151.

Recommendations

Infiltration Standards

- Proposed approach: require that developers first prepare a plan to attempt to meet NR 151 infiltration requirements by creating effective infiltration areas (practices) that require up to the 1% (residential) and 2% (non-residential) caps. This would use the DNR “stay-on” approach (stay-on here refers to any water that does not run off the site, and includes evaporation and evapotranspiration as well as recharge).
- If when designing infiltration systems, developers would need to devote more than 1% (residential) or 2% (non-residential) of the site to meet NR 151 infiltration standards, they would have the option of going through a recharge calculation. If they can demonstrate that infiltration practices meet the estimated average county recharge rate goal (7.6 inches/year), then that would satisfy the county infiltration standard, provided that land area devoted to infiltration facilities is at least 1% (residential) or 2% (non-residential) of the site.
- If developers pursue the option of going through the recharge calculation, they would be required to mitigate the effects of compaction on disturbed open areas.
- Because the recharge approach results in meeting or exceeding the NR 151 requirement of a 1% or 2% cap on land area devoted to infiltration practices, this proposed Dane County approach complies with state requirements.

Proposed Ordinance Language:

1. *Residential development.* For residential developments, design practices to infiltrate sufficient runoff volume so that post-development infiltration volume shall be at least 90% of the pre-development infiltration volume, based upon average annual rainfall. If when designing appropriate infiltration systems, more than one percent (1%) of the site is required to be used as effective infiltration area, the applicant may alternatively design infiltration systems and pervious surfaces to meet or exceed the estimated average predevelopment annual recharge rate (7.6 inches per year). If this alternative design approach is taken, at least 1% of the site must be used for infiltration.

2. *Nonresidential development.* For nonresidential development, including commercial, industrial and institutional development, design practices to infiltrate sufficient runoff volume so that post development infiltration volume shall be at least 60% of the pre-development infiltration volume, based on average annual rainfall. If when designing appropriate infiltration systems, more than two percent (2%) of the site is required to be used as effective infiltration area, the applicant may alternatively design infiltration systems and pervious surfaces to meet or exceed the estimated average predevelopment annual recharge rate (7.6 inches per year). If this alternative design approach is taken, at least 2% of the site must be used for infiltration.

Information and Enforcement

1. Included with this report (Attachment 6, “Infiltration Modeling Guidance”) are standard guidelines for the use of computer models (SLAMM, RECARGA) for infiltration calculations that are part of the approval process. The Infiltration Task Force recommends that these guidelines be included in the Dane County Erosion Control and Stormwater Management Manual, and that training be provided for designers of systems.
2. Dane County, working with Madison Area Builders Association, City of Madison, and other municipalities should provide short courses, workshops, and other programs for installers of infiltration devices, to ensure effective practices. Audiences should include landscapers and installers. Note that this cannot be done without additional staff.
3. Require and enforce “as-built certification” of installed infiltration devices (e.g., letters of credit cannot be released until certification is provided).

Monitoring Effectiveness of Infiltration Practices

1. Place a high priority on testing the effectiveness of installed infiltration practices to determine what works and what does not work, and why. As a first step, the County should establish a system for inventorying installations using a simple observational monitoring protocol aimed at acquiring information useful for adaptive management (Attachment 7). (Implementing this system will require additional County staff resources.) Municipalities should also encouraged to conduct such inventories.

Hydrological Research and Management

The County should establish appropriate groups to make recommendations about the status of, and future needs for, hydrological research and management in Dane County. Among the potential needs which these groups should consider are:

1. Maintenance and updating of existing Dane County hydrologic models.
2. Protocols for testing the infiltration effectiveness of different practices (infiltration trenches, bioretention, etc.).
3. Coordination of a database (using well logs) of shallow wells, to provide important data (e.g., depth to bedrock) for locating retrofit infiltration devices and for refining existing hydrological models.
4. Identification of exceptional resources (e.g., cold water fisheries; springs) that may require “sustainable standards” different from those applied more generally.
5. Piloting a rigorous “resource-based” approach on a particular sub-watershed. This would mean establishing new wells and refining the current county-wide groundwater model based on new data at a more detailed local level. One possible area is the Odana Pond subwatershed of the Lake Wingra watershed. Such a pilot might support studies associated with the MG&E

infiltration project (and associated concerns about possible road salt contamination of groundwater) and a possible pilot of road salt reduction practices by the City of Madison.

6. Evaluation of the impact of possible future designation of Dane County as a regional groundwater management unit under the Wisconsin groundwater management legislation.

Resource Needs

1. Additional county staff to provide training, permit review, monitoring effectiveness of installations, and on-going review of infiltration standards. Recommend municipalities also assess staffing needs and adjust as needed.
2. Up-front costs for data-gathering, modeling, and other research needed to ensure our future natural resource needs are being met by infiltration standards and practices (thus preventing costly future failures of infiltration devices), and for maintaining and updating existing Dane County hydrologic models. Explore finding these funds through a uniform fee that does not unfairly burden developers.

Attachment 1

Dane County Lakes and Watershed Commission Stormwater Infiltration Task Force Members September 2005 - ____ 2006

Members
Jeremy Balousek Dane County Land & Water Resources Department
Randy Christianson Caldwell Banker Sveum
Ann Dansart (Scott Taylor represented this group until April) Friends of Starkweather Creek
Kent Disch Madison Area Builders Association
Don Esposito Veridian Homes
Steve Fix Upper Sugar River Watershed Association
Greg Fries City of Madison Engineering
Deb Hatfield Mayo Corporation
Ken Johnson Wisconsin Department of Natural Resources
Nathan Lockwood D'Onofrio Kottke
Jim Lorman, Chair Dane County Lakes & Watershed Commission
Birl Lowery UW-Madison Soils
Kamran Mesbah Dane County Community Analysis & Planning Division
Rob Montgomery Montgomery & Associates
Ken Potter UW-Madison Civil & Environmental Engineering
Jon Radloff Vierbicher Associates

Staff
Sue Jones Dane County Department of Land and Water Resources
Josh Harder Dane County Department of Land and Water Resources

Attachment 2

Schedule of Meetings

Entire Task Force: Sept 29, 2005; Oct 14, 2005; Jan 20, 2006; Feb 10, 2006; Feb 23, 2006; March 7, 2006; April 7, 2006; April 14, 2006; April 28, 2006; May 18, 2006

Resource Subgroup: Nov 17, 2005; Dec 19, 2005

Site Analysis Subgroup: Nov 8, 2005, Nov 28, 2005; Dec 3, 2005; Dec 22, 2005; March 3, 2006

Attachment 3

List of Identified Issues

1. Infiltration standards in the context of larger development planning
 - a. How does infiltration fit into all of the stormwater management considerations that need to be addressed during development planning? Projects also need to consider controls on peak runoff, sediment erosion, thermal pollution, wetland loss, floodplain impact, etc. In addition, developers need to plan for density, open space, lot sizes, connectivity, topography, zoning, and economic factors.
 - b. Municipalities have specific community standards (e.g., widths for sidewalk, curb & gutter, and terraces; building densities; new urbanism with alleys) that may limit stormwater management options. How should these standards affect requirements for infiltration in developments?
 - c. How do we best deal with the perception that a lack of “caps” on the area required for infiltration conflicts with the economic needs of development, and to what extent is that perception based on solid information?
2. Resource protection goals of infiltration standards
 - a. To what extent are standards based on what is needed to protect specific resource qualities (water quality, groundwater supply, flood protection, etc.)? To what extent are such resource-based standards possible given the current state of research?
 - b. To the extent neither NR 151 nor Dane County standards are “resource based,” what criteria should be used to establish standards?
 - c. Should infiltration goals (and standards) be different in watersheds that have different resource quality needs (e.g., cold water streams that are heavily dependent on groundwater to sustain their value)?
 - d. To what extent can we document that the resource/environmental benefits resulting from the implementation of infiltration standards exceed any additional costs incurred?
3. Interpretation of infiltration standards
 - a. How might the application of standards to a particular development be made simpler? Developers are faced with different standards developed at different governmental levels, differences between guidelines and technical design standards even at a single governmental level, and different interpretations of standards by different reviewing agencies. This complicates the design process and tends to encourage developers to choose simpler “cap” approaches.
 - b. How can creative designs by developers be encouraged within the complex and changing regulatory environment? Since infiltration standards and design guidelines are fairly new and complex, the design community has not had time to become comfortable with appropriate modeling methods to produce creative designs.
 - c. Do SOC (Standards Oversight Council, <http://www.socwisconsin.org/>) standards apply if Dane County’s infiltration standards exceed those of NR 151?

4. Research needs

- a. What additional information do we need to do a reasonable cost/benefit analysis of infiltration standards?
- b. To what extent can existing models, or extensions of existing models, provide additional information that would allow us to better understand i) the effectiveness of particular development practices with respect to infiltration, and ii) the long-term impact of particular standards on resource quality?
- c. Do we need to plan for on-site monitoring of infiltration devices to learn how different devices actually perform under specific conditions of soil, etc.?

Attachment 4

Infiltration Task Force Site Analysis Subgroup Summary Draft 5/18/06

The Site Analysis Subcommittee of the Infiltration Task Force was formed to analyze and model the potential effects of modifying or removing the caps on the maximum size of infiltration practices. The subcommittee was comprised of six engineers that were also members of the full task force. Subcommittee members included:

Jeremy Balousek, Dane County Land and Water Resources Department
Greg Fries, City of Madison Engineering Division
Jon Radloff, Vierbicher Associates, Inc.
Nathan Lockwood, D'Onofrio Kottke and Associates, Inc.
Deborah Hatfield, Mayo Corporation
Rob Montgomery, Montgomery Associates: Resource Solutions, LLC

The subcommittee met four times to discuss findings and make recommendations to the full task force.

The first analysis the task force completed was evaluating the difference in modeling results between the two available infiltration models, SLAMM and RECARGA. In order to complete the analysis, several model inputs were examined, including the following:

1. Disconnection of impervious surfaces (connected vs. disconnected)
2. Soil texture class (sandy loam vs. silt loam)
3. Pervious runoff curve number (58 vs. 68)

Each subcommittee member independently modeled the same commercial development using both infiltration models and varied model inputs with each run. The initial goal of the analysis was to produce a side-by-side comparison of the of the two models' outputs. When the group convened to discuss their individual results, it was quickly evident that due to the complexity and required assumptions of the infiltration models, each member had run the models differently. The disparity in model inputs and assumptions made it difficult to compare the two models. The group then concentrated on developing a set of uniform criteria to be used when performing infiltration calculations. By using the same set of assumptions and variables, it was hoped that meaningful results could be obtained. The following assumptions were agreed upon:

1. For an area to be disconnected, it must be separated by at least 30 feet of pervious surface from any treatment device or conveyance system.
2. No side discharge from infiltration or bioretention basins. [Need to add additional clarification based on 5/18 discussion.]
3. The maximum depressional depth for an infiltration basin is 24-inches and the maximum depressional depth for a bioretention basin is 12-inches.

4. The pervious area runoff curve number should be 68, unless justified by existing or proposed vegetation (i.e. 58 for prairie vegetation).
5. All treatment areas must be removed from the tributary areas for calculation purposes and not double counted as pervious surfaces.
6. The SOC standard “*Site Evaluation for Stormwater Infiltration*” will be used for determining design infiltration rates.
7. For RECARGA, the maximum ponded time is 96 hours. (Note: Other requirements may apply in specific situations such as airports.)

The subcommittee then decided to model several different types of development to determine which land uses would have difficulty in meeting the infiltration goals without exceeding the 1% cap for residential land uses and the 2% cap for non-residential land uses, using bioretention devices. In addition, results of the two infiltration models would then be compared to see if large discrepancies exist. The results of the analysis are shown in the table below.

Rock Depth (ft.)	Root Depth (ft.)	Pond Depth (ft.)	Land Use	Analysis Program	Connectivity	Regulatory Cap		Area Required to Meet Goal		Infiltration Rate (in./hr.)	Project Impervious Percentage	
0	3	1	MDR	SLAMM	NO	1%	6,300	6,000	<1%	0.13	40%	
0	3	1		SLAMM	YES	1%	6,300	32,000	5.1%	0.13	40%	
2.5	3.5	0.5	HDR	SLAMM	YES	1%	16,770	55,000	3.2%	0.13	65%	(Perv. + Imp.)
2.5	3.5	0.5		SLAMM	YES	1%	16,770	12,500	0.7%	3.6	65%	(Perv. + Imp.)
2.5	3.5	0.5		SLAMM	YES	1%	16,770	28,000	1.7%	0.5	65%	(Perv. + Imp.)
3	3	1	LARGE COMMERCIAL	SLAMM / REC.	YES	2%	3,120	624	0.4%	0.5	37%	(Imp. Only)
3	3	0.5		SLAMM / REC.	YES	2%	3,120	2,340	1.5%	0.13	37%	(Imp. Only)
3	2	0.5	MIXED (FITCHBURG CENTER)	RECARGA	YES	2%	2,082	2,675	2.6%	0.13	60%	(Imp. Only)
3	2	0.5		SLAMM	YES	2%	2,082	3,275	3.2%	0.13	60%	(Imp. Only)
3	2	0.5		SLAMM	YES	2%	2,082	450	0.3%	0.13	60%	(Perv. + Imp.)
2	3	1	LDR	SLAMM	NO	1%	8,700	0	0%	0.5		(Perv. + Imp.)
2	3	1		SLAMM	YES	1%	8,700	2,000	0.2%	0.5		(Perv. + Imp.)
2	3	1		RECARGA	YES	1%	8,700	4,000	0.5%	0.5		(Perv. + Imp.)
2	3	1	COMM (OFFICE)	SLAMM	YES	2%	3,020	630	0.4%	0.5	84%	(Imp. Only)
				RECARGA	YES	2%	3,020	1,300	0.9%	0.5	84%	(Imp. Only)
2	3	0.25		SLAMM	YES	2%	3,020	1,812	1.2%	0.13	84%	(Imp. Only)
				RECARGA	YES	2%	3,020	2,500	1.7%	0.13	84%	(Imp. Only)

The following conclusions were reached as part of this analysis:

1. RECARGA generally requires larger infiltration facilities than SLAMM to meet infiltration stay on goals.
2. Bioretention subsurface storage volume greatly influences the required facility area. As underground storage increases (“Rock Depth” in the above table), the required facility area decreases.
3. Medium and high-density residential (MDR and HDR) land uses generally exceed the cap for silt loam soils. This is partially due to not being able to feasibly disconnect impervious areas.

4. Commercial developments do not need to exceed the cap due to a lower goal and a higher cap percentage (2%).

Since it is generally accepted that infiltration basins designed for the same requirements would have to be larger, but less expensive to construct, the subcommittee decided that future model runs should also include infiltration basin calculations.

The question of what the maximum allowable design ponding depth should be was discussed. The issue is complicated by “multiple use” or “hybrid” stormwater practices that combine detention with infiltration. It was noted that the DNR standards state the maximum allowable depth for specific practices, but it was recognized that the maximum depth would be greater for the hybrid devices.

Other issues that were raised included density classifications and the total dedicated area for stormwater management. The group agreed that the definitions of “high” and “medium” density varied greatly amongst municipalities and that a term such as “higher density” should be used. The total area being dedicated to stormwater management is also an issue since infiltration areas are only part of the total area that must be dedicated. The group recognized that the use of hybrid devices would play an important role in total area required.

It was concluded that more modeling was needed to determine why the HDR & MDR sites were exceeding the cap with silt loam soils. The subcommittee chose to estimate the incremental increase in area dedicated to stormwater management when infiltration requirements were added, not just area dedicated to infiltration. The group decided that “pre-October, 2004” developments (not originally subject to NR151 infiltration requirements) would be reevaluated with the addition of infiltration devices (both bioretention and infiltration basins).

The modeling of the infiltration basins with RECARGA used the following criteria: the storage layer will be zero and the root zone will be one inch thick with an infiltration rate of 0.13 inches per hour (native silt loam). The group decided that the terms MDR and HDR were not appropriate due to the wide range of interpretation. Instead, sites with lots greater than 6,500 square feet were analyzed as one group and sites with lots less than 6,500 square feet were analyzed as another group.

Four of the “smaller” lot size developments and three of the “larger” lot size developments were modeled. An issue that was encountered was the depth of depressions in bioretention devices (due to its effect on the maximum hours ponded). One member used six inches and kept the pond retention time under 96 hours in the model results. Others used three inches based on draw down calculations using the soil type and the 24-hour draw down time. The group agreed that the draw down calculation approach (rate = 0.13in/hr and 24hr max = 3in) was appropriate for the infiltration basins, but did not reach a consensus on this approach for bioretention devices. The other significant result was the difference between the models. SLAMM required much more of the site to meet the goals. One reason for the discrepancy might be the hydrology that each model uses to determine the predevelopment runoff/stay-on (“small storm” vs. CN).

The infiltration basins required between 2 and 3 times more area than the hybrid bioretention devices for “smaller lot” higher density developments. It was pointed out that this is good evidence why many hybrid devices are being proposed. One drawback to this approach is that using hybrid devices eliminates the inclusion of a permanently wet pond, which many developers like for aesthetic reasons and is also results in better sediment trapping. Several group members questioned whether hybrid bioretention devices are a long-term, sustainable practice. The group also concluded that the modeling

results indicate that the nonresidential goals were met quite easily without dedicating additional area to stormwater management.

The SLAMM analysis of a “larger lot” high-density residential development (6,500-10,000 square feet) did not require any additional infiltration practices to be installed due to the amount of pervious area present in the drainage area and the impervious area being modeled as “disconnected”. There was some debate as to the validity of modeling the impervious as disconnected. The group felt that at least a portion of the site should have been connected. RECARGA modeling, which doesn’t allow for disconnecting impervious surfaces, showed that a bioretention device with a facility area of about 5% of the site would be necessary, while the infiltration basin would need to be about three times that size. It was also noted that the practice of curve number “bumping” for detention had effected the change in total area dedicated to stormwater management.

The subcommittee discussed the question of how often the scenario modeled (small lot, high density residential, entirely contained on silt loam soils) would occur in practice. The group strongly doubted there was a reliable way of determining how often this scenario would occur. The general consensus was that this type of “worst case” scenario would occur infrequently, however the group did concur that it was a real possibility that merited consideration.

The site analysis subcommittee did not formally meet again, but additional modeling was performed based on questions from the full task force. The task force suggested that instead of targeting “stay on” as NR151 does for infiltration calculations, it might be worthwhile to analyze recharge as well. “Stay on” is made up of several components including evaporation, transpiration, and groundwater recharge. Since the group was most interested in infiltrating runoff back into the ground, it was suggested that modeling goals that address recharge might be a better option. In addition, since higher density developments produce more runoff, there is more runoff available to overcome evapotranspiration (ET) in the infiltration facilities. Ken Potter noted that through his research the optimum size to achieve recharge in an infiltration basin was found to be 15% of the impervious area. As facilities begin to exceed this size, more of the runoff becomes ET than recharge.

Jon Radloff performed an analysis of recharge rates using SLAMM and RECARGA for both bioretention devices and infiltration basins by modeling a 40-acre residential site. Model runs were completed varying the impervious area from 40 to 65 percent and included calculations for 1% and 2% of the site area along with 15% of the impervious area.

It was quickly apparent that results from the two models varied significantly. RECARGA had much lower recharge rates than SLAMM. The main reason for this discrepancy is that SLAMM does not account for ET in the facility, but simply assumes that runoff into the basin is infiltrated, while RECARGA attempts to model the effects of ET. It was difficult to draw any significant conclusions from the model results as neither model accurately predicts the recharge that occurs on the pervious areas in the pre and post development conditions.

Through discussions with Ken Potter (Civil and Environmental Engineering) and John Norman (Soil Science) at the University of Wisconsin, an approach to calculating recharge rates on pervious surfaces was derived. Included below are the assumptions and proposed calculation techniques.

Assumptions/Notes:

1. Detailed and accurate models exist to calculate recharge rates on pervious surfaces, however these models are complicated, require numerous variable inputs, and lack intuitive user interfaces. There are current projects at the University to simplify these models, but the time scale is such that they won't be available in time for the task force to utilize them.
2. It is possible to estimate recharge rates without the use of models. Variables such as soil and vegetation type may be assumed to be negligible, while precipitation during periods of the year with high recharge rates must be considered.
3. It should be assumed no recharge occurs in the fall even though there is very little ET. The soil moisture levels are typically so low from summer heat that all infiltration goes to filling soil pore space.
4. An assumption may be made that all frozen precipitation and rainfall that occurs from December 2nd to May 31st becomes 100% recharge due to the lack of ET and moist soil conditions. Using the 1981 Madison rainfall file, precipitation during this period equals 7.6 inches.
5. Predevelopment infiltration rates on pervious surfaces would then be assumed to be 7.6 inches per year.
6. At this time, the only model that has the ability to calculate recharge rates in an infiltration facility is RECARGA.

Calculation of Recharge for Post Development Conditions:

post development recharge (inches) = calculated facility recharge + (% pervious x 7.6)

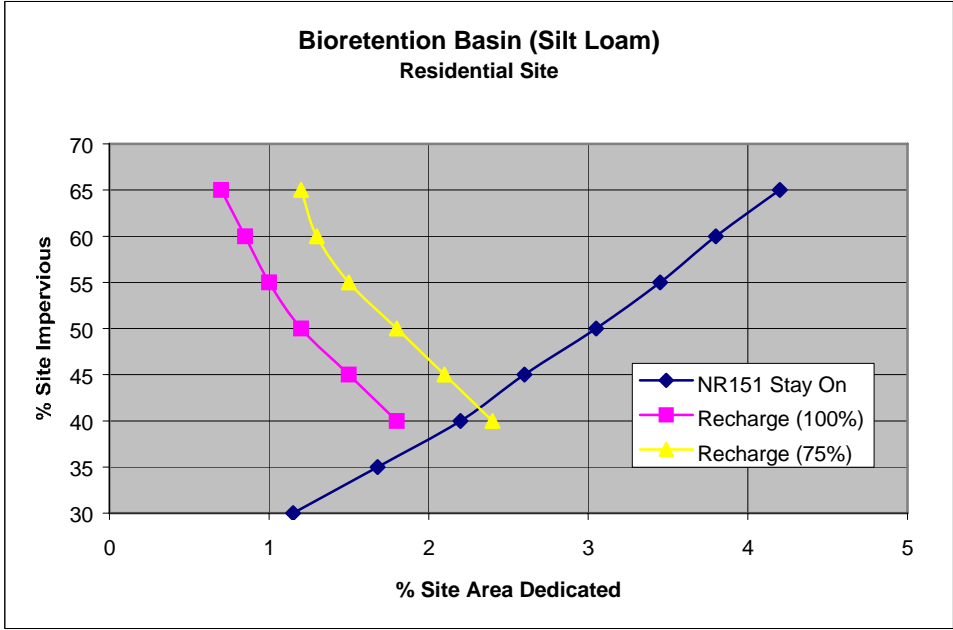
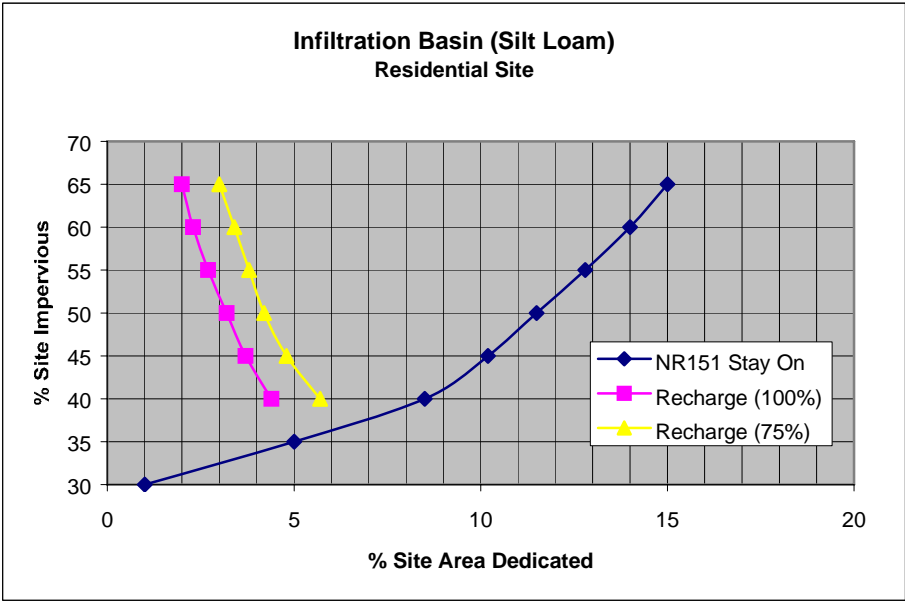
Note: This assumes that entire area drains to the facility. This rate would need to be prorated if only a portion of the site drains to the infiltration practice.

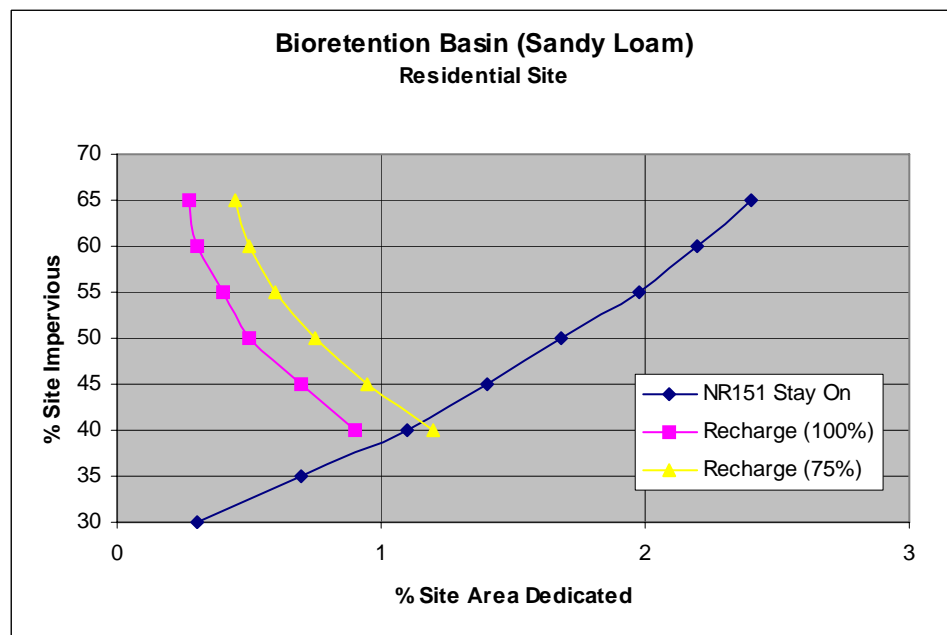
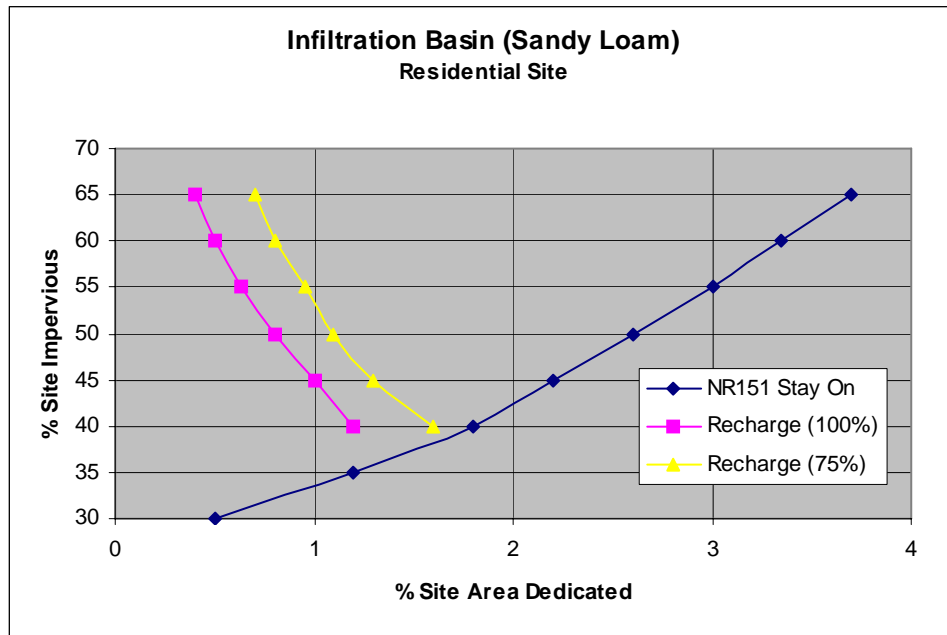
Example:

1-acre residential development, 50% impervious, entire site drains to a bioretention device. RECARGA gives a recharge depth of 5.0 inches. Then:

$$5.0 + (.50 \times 7.6) = 8.8 \text{ inches of recharge}$$

The task force questioned whether or not developers should get full credit for pervious areas in a post development condition. Some members suggested reducing the post development recharge rate and giving only 75% of the predevelopment value, while others suggested requiring developers to mitigate the effects of compaction on their sites and using 100% of the predevelopment recharge rate. In the end it was decided to repeat the recharge calculations that were previously conducted, incorporating the calculation of pervious area recharge both for 100% and 75% of the predevelopment rate. Results of this analysis are shown in the charts below.





This analysis shows that the maximum required size of an infiltration basin on silt loam soil is approximately 5% of the site area and 2% for a bioretention facility. With other soils, such as sandy loam, the site area required is significantly less.

The site analysis subcommittee did not make formal recommendations to the full task force, but rather made suggestions and recommendations for consideration during the task force meetings. This allowed the entire task force to be involved in the decision making process. A document was also prepared entitled “*Infiltration Modeling Guidance*” that can be found in Attachment 6. This document provides guidance for selection of appropriate variable inputs and model schematics for SLAMM and RECARGA and serves to summarize the consensus that has been reached in the subcommittee on these model inputs.

Attachment 5

Memorandum

To: Dane Co Infiltration Task Force Members
From: Rob Montgomery, Steve Gaffield and Linda Severson
Date: June 30, 2006
Re: Review of estimates of groundwater recharge in Dane County

Purpose

Dane County is in the process of revising its stormwater ordinance (Ch 14) to replace the caps on maximum land area required for infiltration devices with a new approach focusing on maintaining the predevelopment groundwater recharge. This requires identifying a target recharge rate (or rates) for application in the ordinance. Groundwater recharge rates are very difficult to measure directly or to estimate accurately. Furthermore, recharge rates vary spatially with geologic conditions and land use, and they change through time in response to changes in precipitation. The purpose of this memo is to summarize and compare estimates of groundwater recharge rates in Dane County from a variety of sources.

Dane County Recharge Estimates

Groundwater recharge can be estimated by several methods, including analysis of data representing indirect measurements of recharge (i.e. streamflow), recharge values determined from the calibration of computer models of groundwater or watershed hydrology, and analytical calculations that rely upon simplifying assumptions. In general, we believe the most reliable estimates to be those based upon direct analysis of data and the least reliable to be the simple analytical calculations.

Direct Analysis of Data

- 1) A study of streamflow in Wisconsin by the USGS¹ uses gaging station records throughout Wisconsin to estimate groundwater recharge in the contributing watersheds and to develop empirical relationships between watershed properties and groundwater recharge. The period analyzed was from 1970 – 1999. At the river basin scale, recharge estimates for the Upper Rock River Basin, the Lower Rock River Basin, and the Lower Wisconsin River Basin are **5.4 in/yr**, **5.9 in/yr**, and **7.6 in/yr**, respectively. The study also analyzed data from smaller river basins, several of which are partially or entirely in Dane County. For the larger basins that cover substantial parts of Dane County, recharge rates range from **2.7 – 9.5 in/yr**. The results presented do not show obvious trends in recharge rates from one part of the county to another.

A disadvantage to this study is that it covers only parts of Dane County. In addition, some uncertainty in the results arises from the possibility that groundwater divides are not in the same location as the

¹ Gebert, WA and MJ Lange, EJ Considine and JL Kennedy, in press. Use of Streamflow Data to Estimate Baseflow/Ground-Water Recharge for Wisconsin. Journal of the American Water Resources Association.

surface drainage basin divides. This is especially true for very small basins; however it is less likely to be a major source of error at the scale of the larger basins discussed above. The USGS has measured stream baseflow at many more sites in Dane County than are presented in this study, and these measurements could be used in the future to refine recharge estimates for the county.

Calibrated Models

- 2) The Dane County Regional Groundwater Model² uses recharge rate as an input parameter that is calibrated to match water levels measured in wells and observed streamflows. The authors note that different values for recharge are obtained depending on which set of targets – water levels or streamflows – are given more importance in the calibration process. We consider streamflow to be the more relevant target for estimating recharge. The model produced the best match to measured streamflows with an average recharge rate of **5 in/yr**. (The average recharge rate obtained by matching the model to water level records is considerably lower.) It is important to note that this recharge rate is an average over the entire county and includes areas with little or no recharge, such as groundwater discharge areas and heavily urbanized areas (Ken Bradbury, personal communication, June, 2006).
- 3) In a UW-Madison dissertation project, Sue Swanson constructed a groundwater model of the Nine Springs area by refining the regional groundwater model for that part of the county³. The model uses a uniform recharge rate, and it is calibrated to both water levels in wells and measured streamflows. The best fit between the model and the observations was produced with a recharge rate of **8 in/yr**.
- 4) The USGS has conducted detailed studies of the Pheasant Branch Creek watershed using both a groundwater model and a watershed hydrologic model. The groundwater model is another refinement of the regional model, and it includes the Pheasant Branch watershed and some of the surrounding area.⁴ The calibrated model uses spatially variable recharge ranging from **2.2 – 9.5 in/yr**, with an average of **8.0 in/yr**. In a related study, the Precipitation Runoff Modeling System (PRMS) was used to simulate surface water flows in the watershed, and it was calibrated with recharge rates ranging from 2.3 in/yr in a highly impervious subwatershed to **9.7 in/yr** in the undeveloped North Fork basins, with a watershed-wide average of **8.1 in/yr**.
- 5) Kristin Anderson refined the Pheasant Branch groundwater model in a UW-Madison graduate thesis⁵. This model also uses **8.1 in/yr** for recharge, with the exception of an urbanized area in Middleton, which was assigned a recharge of **6.2 in/yr**.
- 6) The USGS has constructed a groundwater model for northwestern Dane County for a study of Fish, Mud and Crystal Lakes⁶. The model, also based upon the regional model, was run in transient mode for the

² Krohelski, JT, KR Bradbury, RJ Hunt and SK Swanson, 2000. Numerical Simulation of Groundwater Flow in Dane County, Wisconsin. Wisconsin Geological and Natural History Survey Bulletin 98.

³ Swanson, SK, 2000. Hydrogeologic Controls on Spring Flow near Madison, Wisconsin. University of Wisconsin-Madison Ph.D. Dissertation (Geology).

⁴ Hunt, RJ and JJ Steuer, 2000. Simulation of the Recharge Area for Frederick Springs, Dane County, Wisconsin. United States Geological Survey Water-Resources Investigations Report 00-4172.

⁵ Anderson, KM, 2002. Hydrogeologic Controls on Flow to Frederick Springs in the Pheasant Branch Watershed, Middleton, Wisconsin. University of Wisconsin-Madison M.S. Thesis (Geology).

period from 1966-1998. The calibrated recharge rate varies from year to year reflecting climatic variations, ranging from **4.6 - 9.7 in/yr.**

Analytical Estimate

- 7) At the April 7, 2007 Infiltration Task Force meeting, Jeremy Balousek of the Dane County Land and Water Resources Department presented a simple calculation to estimate local groundwater recharge. This estimate makes the assumptions that all frozen precipitation and all rainfall between December 2 and May 31 becomes recharge, and that no recharge occurs during other times of year due to either evapotranspiration losses or infiltrated water filling pore spaces in very dry soil in the fall. In 1981, rainfall in Madison during this period was 7.6 in, yielding a recharge estimate of **7.6 in/yr.** As noted by Jeremy, the assumptions required by this method reflect broad generalizations. It is widely accepted that recharge events are common during the fall, and runoff from snowmelt and rainfalls before May 31 are very common. While this method provides a useful check on the estimates developed in other studies, it should be regarded as a very approximate estimate of recharge rate.

Conclusions and Recommendations

These studies indicate that the average recharge rate for Dane County is in the range of approximately 5 – 8 in/yr. Given the intent to promote recharge and the likelihood that the lower values reported in the literature are influenced by human impacts, such as development and poor agricultural practices, specifying a value near the upper end of this range as the recharge goal in the revised County ordinance is appropriate.

The Infiltration Task Force gave some consideration to developing different target recharge rates for different parts of the county. Although there are sound reasons for considering this approach, it appears that available scientific information is insufficient to justify applying different standards in different areas at this time. The USGS streamflow study has potential for this purpose, however not all parts of the county are included, and the issue is complicated by the possibility of interbasin groundwater transfers. It may eventually be possible to accurately estimate recharge rates at a site-specific scale based upon soil, topographic and climatic data, however current methods are probably better suited for estimating relative differences in recharge potential from one location to another than they are for predicting a precise recharge rate.

⁶ Krohelski, JT, YF Lin, WJ Rose and RJ Hunt, 2002. Simulation of Fish, Mud, and Crystal Lakes and the Shallow Ground-Water System, Dane County, Wisconsin. United States Geological Survey Water-Resources Investigations Report 02-4014.

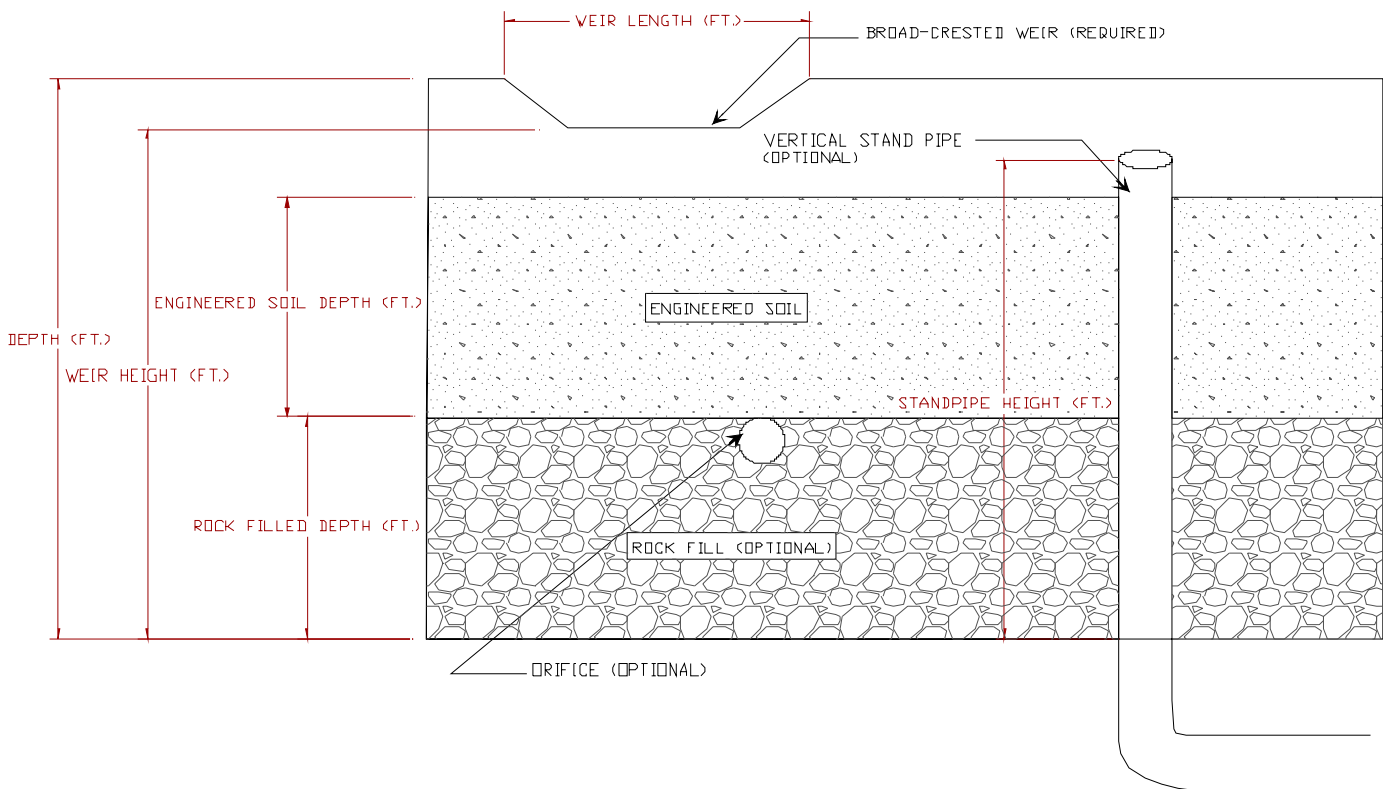
Attachment 6

Infiltration Modeling Guidance

(later version will include introductory paragraph on why and who developed, and intended use)

SLAMM:

Bioretention Dimension Diagram (for use with SLAMM)



1. The Datum (Elevation Zero) is the bottom of the facility (bottom of rock fill in diagram above).
2. Depth is the entire vertical dimension of the facility, including to the top of the overflow weir.
3. The fraction as voids for engineered soil is 0.27 and the fraction as voids for the rock fill is 0.33.
4. WinSLAMM versions 9.1 and earlier....Depth of BioFilter that is Rock Filled = both the depth of engineered soil and stone storage. In addition, the fraction as voids is a combination of the two materials.
5. No seepage rate out the side is allowed (must be set to 0).

Additional Guidance for Using WinSLAMM:

1. Winter precipitation must be removed from the calculations. According to NR151, precipitation from 12/2 to 3/12 should not be included when using the Madison 1981 rain file. These dates are entered on the current file data page.
2. In order for an area to be considered “disconnected”, it must sheet drain over at least 30 feet of pervious surface. Concentrated flow areas, conveyances, and stormwater management facilities are not considered sheet flow.

RECARGA:

1. The infiltration rate for engineered soil is 3.94 in./hr.
2. The maximum ponded time must not exceed 96 hours.
3. The pervious area runoff curve number should be 68, unless justified by existing or proposed vegetation (i.e. 58 for prairie vegetation).
4. When using RECARGA for modeling an infiltration basin, the rooting zone depth should be assumed to be 1-inch and the storage zone should be set to zero.

Other Modeling Notes:

8. The maximum depressional depth for an infiltration basin is 24-inches and the maximum depressional depth for a bioretention basin is 12-inches.
9. All treatment areas must be removed from the tributary areas for calculation purposes and not double counted as pervious surfaces.
10. The SOC standard “*Site Evaluation for Stormwater Infiltration*” must be used for determining design infiltration rates.

Attachment 7: Draft Inspection Form

Inspected By: _____

Date _____

Affiliation: _____

Time: _____

Location

Postal Address

PLSS

Township (N): _____ Range (E): _____

Section: _____ Quarter/Quarter: _____

Weather Conditions

Recent Precipitation (in)

7 days _____ 72 hr _____ 48 hr _____ 24 hr _____

Site/Practice Characteristics

Practice Type: ☐ *Basin* ☐ *Rain Garden* ☐ *Bioretention* Design Standard: _____

Tributary Area (acres) _____ Tributary land use ☐ *Residential* ☐ *Non Residential*

Tributary Land Cover Percentage: *Pavement* _____ *Roof* _____ *Pervious* _____

Pretreatment: ☐ *Basin* ☐ *Buffer* ☐ *None*; Calculated sediment trapping efficiency _____

Practice Conditions

Condition of Pretreatment Device: ☐ *Good* ☐ *Fair* ☐ *Poor* ☐ *Not Applicable*

☐ *Ponded Water* - Percent ponded _____ Average depth _____ Depth in observation well _____

☐ *Dead Vegetation* - Type: _____ ☐ *Side slope* (_____%) ☐ *Bottom* (_____%)

☐ *Sedimentation* - Percent of bottom covered _____ Average depth of sediment _____

☐ *Scour* – Location: ☐ *Inlet*: mild / severe ☐ *Outlet*: mild / severe

Comments: _____

Attachment 8

Possible Future Revisions to Standards Identified by Task Force Members

Below are ideas for potential changes in infiltration standards that members of the Task Force suggested for possible future consideration. They were not discussed at length by the entire Task Force, and therefore do not represent group agreements. Some members, however, felt these are ideas that merit recording here for possible consideration at some later time.

1. Develop site-specific sustainable, resource-based standards in instances where hydrological information is adequate to establish them.
2. Reduce or remove exceptions for sites with poor soils, since these areas may be critical as recharge areas despite low infiltration rates. (The reduction in exceptions could be accompanied by additional language in the standards aimed at preserving the viability of high density development.)
3. Increase the required percentage of predevelopment average annual infiltration for commercial sites.
4. Consider requirements for infiltrating wastewater and/or greywater.
5. Provide an option for “fees in lieu of” meeting infiltration standards, with the fees used for mitigation in other appropriate sites (as long as such fees are in response to a standard that exceeds standards established by the Dane County Stormwater Ordinance.)

ATTACHMENT II
2009 Capital Area Regional Planning Commission
Environmental Resources Technical Advisory Committee Report

**Environmental Resources Technical Advisory Committee
Recommendations to the
Capital Area Regional Planning Commission**

Background

On October 8, 2009, the Capital Area Regional Planning Commission (CARPC) requested that its Environmental Resources Technical Advisory Committee (TAC) convene to provide technical recommendations on a more stringent stormwater runoff volume control standard than the one currently required under NR 151 and Dane County Chapter 14.

The TAC met on November 12, 2009 to review and discuss some of the relevant literature on stormwater volume control as well as some of the volume control standards currently in use around the country. On December 16, 2009 the TAC met to review and discuss modeling results of the runoff volumes resulting from different volume control standards. On January 25, 2010 the TAC met to review and discuss the analysis approach used by Montgomery Associates for the standards recommended in the Badger Mill Creek – Sugar River Study and prepare draft recommendations. On February 22, 2010 the TAC met to finalize their volume control standard recommendations.

Discussion

The TAC agrees that without controls, increased volumes of stormwater runoff from impervious surfaces have an adverse effect on receiving waters. The TAC further agrees that the current infiltration (stay-on) standards in NR 151 and Dane County Chapter 14 do not completely mitigate the impacts of increased volumes of stormwater runoff in all cases. The TAC recognizes the potential benefits of a runoff volume control standard to 100% of pre-development volumes, however it has several concerns related to the achievability and the cost versus benefit of adopting a standard of no increase in pre-development runoff volumes. Therefore, the TAC proposes that the CARPC adopt the following volume control standard and that the standard be reevaluated 5 years from the date of adopting this standard.

Recommendations

The TAC proposes that the CARPC adopt a runoff volume control standard for all new Urban Service Area Amendments based on the infiltration standard in Chapter 14 of the Dane County Ordinances [14.51(2)(e)], including prohibitions, with the following revisions:

1. For both residential and nonresidential developments, design practices to control sufficient runoff volume so that post-development stay-on volume shall be at least 90% of the pre-development stay-on volume, based upon average annual rainfall.
2. The runoff curve numbers used in calculating pre-development conditions shall be based on the pre-development land uses. For agricultural land, the maximum runoff curve number (RCN) used in calculating pre-development conditions shall be 51 for hydrologic soil group (HSG) A, 68 for HSG B, 78 for HSG C, and 83 for HSG D.
3. If when designing appropriate volume control systems, more than two percent (2%) of the site is required to be used as effective infiltration area, the applicant may alternately design infiltration systems and pervious surfaces to meet or exceed the annual pre-

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development recharge rate. The annual pre-development recharge rate shall be determined from the Wisconsin Geological and Natural History Survey's 2009 report, *Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model* or subsequent updates to this report, or by a site specific analysis using other appropriate techniques. If this alternative design approach is taken, at least two percent (2%) of the site must be used for infiltration.

4. The standard should be applied on a subwatershed basis and allow credit for best management practices (BMPs) located within the subwatershed of concern and upstream of the point of discharge, including the option of retrofit practices in existing developed areas. The standard can be met with a combination of infiltration, evapotranspiration, and/or reuse BMPs.

The TAC also recommends that CARPC include a public hearing process as part of the adoption of this standard.

The TAC also recommends that the Dane County Board also adopt this volume control standard, so that it is applied to all new development within Dane County and not only to new urban service areas.

The TAC also recommends that CARPC encourage watershed wide standards and inter-municipal cooperation in meeting the standards.

The TAC also recommends that the following additional research efforts, data collection, and modeling be conducted to provide the information needed to further evaluate this issue:

- Use of the SWAT (Soil and Water Assessment Tool) model or other continuous hydraulic/hydrologic/water quality model to evaluate the impacts of runoff volume on the Yahara Lakes watershed This should be a high priority
- Improvements to the SLAMM model to better account for the split between recharge and evapotranspiration that occurs in infiltration / biofiltration practices
- Improvements to RECARGA, SLAMM, or other models to better predict performance during early season and late season infiltration, including frozen ground conditions.
- Information on the performance and life expectancy of infiltration practices currently in place and an assessment of contributing factors if failures occur
- Case studies demonstrating that volume control to 100% of predevelopment volumes can be met by constructed best management practices
- Biological monitoring, such as pre-development and post-development Indexes of Biotic Integrity (IBI)
- An economic analysis of the costs and water quality benefits of runoff volume control