Wednesday, November 7th

9:00 AM XPSWMM Workshop

XPSWMM Training: Best Practices for Floodplain Management & 2D Analysis
Anthony Kuch, Innovyze
Hardware and software advances now allow engineers to simulate Integrated 1D/2D Hydrologic and Hydraulic simulations with reasonable simulation times. XPSWMM is a nationally FEMA approved model for 1D and 2D hydraulics used extensively nationwide. Recent enhancements to XPSWMM now take advantage of multiple core processors and GPU cards in a new highly parallelized scheme.

Join this 4-hour training class to learn about the new advancements in floodplain modeling using XPSWMM. In this course, you will learn about XPSWMM, the benefits and best practices for floodplain management using XPSWMM, and have the opportunity to run the software to learn how to perform hydrology and hydraulics analysis. The hands-on portion of the training will provide an overview of 1D/2D Modeling. Sample models will be provided to explore how flood maps, hazard maps and evacuation routes can be developed in XPSWMM.

Attendees should bring their own laptop with the software pre-installed. Temporary license dongles and keys will be provided to users who do not have an active license. Administrative privileges are required for installation of the software, and attendees who plan to install the software during the training should have administrative privileges for their laptop.
Learning Objectives:

- Learn the capabilities of XPSWMM
- Leverage Global Storms to find critical duration that produces the worst flooding
- Understand best practices for Floodplain Management with 2D Surface Analysis

9:00 AM CFM Exam

Registration for the exam is handled directly through ASFPM. You must apply to ASFPM at least two weeks in advance to take the exam. Submit CFM Exam related questions to cfm@floods.org or call 608-828-3000. Register with ASFPM on their website. The CFM study guide can be found here.

2:00 PM Engineering Ethics Workshop

Does Being Ethical Make Good Visual Sense?
Dr. Gaurav Bansal, University of Wisconsin – Green Bay
The session will focus on how misrepresentation of data, bad data, and/or wrong choice of visualization could lead to incorrect perception, wrong cognition, and thus erroneous action. Poor and misleading visualizations are not only often unethical, but also inefficient and ineffective. In this session we will assess how data and design work together, including how to choose the appropriate visual representation for your data, and the difference between effective and ineffective visuals. The workshop will cover design principles and theories based on the work of eminent data visualization scientists such as William S. Cleveland and Edward R. Tufte.

4:00 PM Evening Reception and Game Night

Thursday, November 8th

9:00 AM Opening Plenary

Update from ASFPM, Bill Brown, CFM, Flood Science Center Director ASFPM

10:30 AM Breakout Sessions

The Stormwater Benefits of Creating High-Performance Urban Trees
Jeremy Bailey, Senior Consultant, GreenBlue Urban
"High-performance" urban trees offer many LID stormwater benefits to our cities. But what are high-performance trees, why should they be considered BMPs, and how are they produced in our urban areas? What are the key things that specifiers, designers, property owners – and frankly residents – want to see from an increased investment in LID stormwater management? What is the ROI of conventional stormwater management solutions compared to the ROI of LID tree pits? At what point does performance outweigh cost? This session addresses these questions in a thought-provoking presentation that analyzes and defines the factors that contribute to LID stormwater management using urban trees, and the key to realizing these benefits through design. It reviews the best practices and design techniques that successfully integrate trees into urban stormwater management, and provides examples of how high-performance trees are sustainably managing stormwater in regional and international case studies.

Calculating Stormwater Volume and Total Suspended Solids Reduction under Urban Tree Canopy in Wisconsin Using Available Research
Steve Gaffield and Dane Wudel, Montgomery Associates: Resource Solutions
Urban tree are the focus of runoff reduction and water quality research and efforts to promote regulatory stormwater credits. Urban tree canopies trees intercept rainfall and can reduce stormwater volume, but this process is not simulated by common design models. We evaluated this effect on stormwater design at a proof-of-concept level for the University of Wisconsin - Madison campus. We developed a method to simulate tree canopy interception for an annual rainfall series for input to a stormwater model. This was applied to WinSLAMM to test the effect of tree canopy cover on runoff volume and bioretention performance. The model estimated that 13% of the 1981 annual rainfall would be intercepted by trees. Inputting this reduced rainfall to a WinSLAMM model of a parking lot under a tree canopy draining to a bioretention facility, the model predicted reductions of 15% to 17% for both runoff volume and total suspended solids load, depending on the design details for the bioretention facility. Although additional work is needed to quantify the performance benefits and potential complicating issues, like nutrient loading due to leaves falling on streets, urban trees are worth considering as part of a sustainable stormwater management system.

Historic Mitchell Street Green Parking Lot
Cassandra Bence, Stormwater Solutions Engineering
Stormwater Solutions Engineering, LLC (SSE), in partnership with City of Milwaukee and the Milwaukee Metropolitan Sewerage District, re-designed a 50,000 sf municipal parking lot, incorporating green infrastructure features to transform the unremarkable asphalt-paved space into an inviting community gathering place. SSE also re-developed the adjoining alley containing the site's one storm sewer outlet.

SSE leveraged previously existing relationships to bring additional funds and expertise to the project, both of which supported significant public input and collaboration between community groups. That input, in turn, served to generate both ideas and support for the re-design.

The re-designed space, located next to the public library in the Historic Mitchell Street neighborhood, includes a 1,300 square foot porous pavement area dedicated to snow storage in the winter, 4 bioswales that collectively store approximately 82,000 gallons of water, a 6-foot wide boardwalk, an orchard full of pear and cherry trees (for picking!), a bike stand, electrical vehicle charging stations, and lots of native landscaping. Benches, picnic tables, and shady areas under trees provide spaces for children and adults to relax or read outside of the library.

The re-designed space will improve water quality in the combined sewer area, reduce the heat island effect, and enhance the neighborhood aesthetics. Detailed on-site signage will serve to educate visitors about how the new green infrastructure features help the neighborhood, City of Milwaukee as a whole, local waterways, and Lake Michigan.

Session attendees will learn how the community engagement process shaped and ultimately contributed to the overall success of the project.

Watershed Scale Underground Storage and Advanced Treatment Applications
Matt Kamenick, StormTrap
This discussion will showcase several public-sector case studies that manage stormwater runoff on a regional or drainage basin scale. Various project profiles from the upper-Midwest are often driven by the need for regional flood mitigation. In recent years, regional projects are increasingly being implemented to treat and reduce total phosphorous in runoff prior to discharge into an impaired waterbody. Each of the project examples uses a treatment train approach with a variety of underground stormwater BMP's to manage, treat, and reduce TSS and TP in urban runoff prior to discharge downstream. The goals and budgets of each stormwater improvement project is different; but investing in regional improvements can be economical and provide lasting effects for future generations.

County Hazard Mitigation Planning in Wisconsin
Angela Kowalzek-Adrians, Natural Resources Planner, Bay-Lake Regional Planning Commission
This presentation will provide a description of the process and value of hazard mitigation planning in Wisconsin and how it can help counties to be more disaster resilient. I will also discuss how climate adaptation planning is being incorporated.

National Flood Insurance Program Requirements Concerning Coastal Construction
Michelle Staff, Wisconsin Department of Natural Resources
Over the last several years, the Federal Emergency Management Agency (FEMA) has been engaged in a flood risk study for the coastal areas of the Great Lakes. Aa part of outreach and education effects related to the Great Lakes coastal mapping efforts, this presentation will provide information about the National Flood Insurance Program (NFIP) development requirements and basic flood insurance information within coastal flood hazard zones that will be incorporated in local communities Flood Insurance Rate Maps. The presentation will touch on what makes coastal flooding different from riverine flooding; reducing potential flood damage in coastal areas floodplain management standards for coastal high-hazard areas, reading coastal FIRM maps, Limit of Moderate Wave Action (LiMWA), coastal high hazard areas and the National Flood Insurance Program.

12:00 PM Lunch Plenary

Statewide Record Flooding
Katie Sommers, CFM, Wisconsin Emergency Management
The 2018 flood event in southwest and west central Wisconsin was record-breaking for several watersheds. Prior to this, events were often compared to the 2008 floods. Many communities experienced river crests as much as two to four feet higher this year. This presentation will examine the extent of the event, the impacts to individuals and communities, and how hazard mitigation measures significantly decreased those impacts in a number of locations.

1:00 PM Breakout Sessions

Navigating the floodplain study approval process with WI DNR
Chris Olds, State Floodplain Engineer WDNR
Explaining the what, how, and if a floodplain study needs to be submitted to WI DNR for approval.

Wisconsin Elevation Mapping: Statewide Completion of Lidar, Development of Hydro-enforced Products and Planning for Future Needs
Jim Giglierano, Wisconsin Dept of Administration
Last year at WAFSCM I talked about efforts by federal, state and local partners to fund and acquire new lidar elevation data for the state. By this time next year, complete coverage will have been achieved for the first time. More work remains to update older datasets, create useful products and train new users. This year we will continue the discussion and expand it to include future related projects and their implications: FEMA is committing significant resources for additional lidar elevation acquisitions in the state. USGS and other federal partners are conducting an elevation needs study that includes inland and offshore bathymetry. Largely based on that study DOA will be developing a state elevation plan that will be used to guide further elevation projects for the next several years. DOA Coastal Management Program has a NOAA coastal hazards grant that it will use to develop a Lake Superior Region community of practice around mapping topics, starting with a culvert inventory in one of the region's watersheds. The purpose of the COP and culvert project will be to develop mapping best practices and a case study for management of geospatial data that cuts across multiple jurisdictions, levels of government and applications of the data. For example, it is hoped that such an approach will help identify culverts at risk from flooding, which may assist local and state maintenance departments to be more proactive with repairs and upgrades. Within all these topics, it is hoped that members of the WAFSCM community can advise and participate in some capacity.

Building Coastal Resilience in Southeastern Wisconsin through Research, Education, and Collaboration
Adam Bechle, Wisconsin Coastal Management Program/Wisconsin Sea Grant
To help build the resilience of Southeastern Wisconsin's Lake Michigan communities, the Wisconsin Coastal Management Program and its partners are leading an effort to provide hazard data, educational resources, and technical assistance to enhance community capacity to plan and prepare for coastal hazards. The region's coastal bluffs, beaches, and waterfront infrastructure are impacted by erosion, coastal storms, and fluctuating water levels which threaten coastal properties and impair tourism and commerce. This project brings local officials, scientists, and outreach specialists together to learn about, share experiences with, and develop approaches to address coastal hazards. Updated shoreline recession rates are being mapped and evaluated to provide needed data for long-term planning for these hazards. Educational resources on options to protect coastal assets, including nature-based solutions,

are being developed for use by local officials and property owners. Using these data and resources, the project team is working with communities to assess their options to address coastal hazards, guided by a newly developed “Coastal Resilience Self-Assessment” scorecard. Partners on the project include the University of Wisconsin Sea Grant Institute, the University of Wisconsin-Madison Department of Civil and Environmental Engineering, and the Southeastern Wisconsin Regional Planning Commission.

Using Computational Fluid Dynamics (CFD) Modeling Effectively: Weighing the Advantages and Disadvantages of CFD Modeling
Brent Teske, FreshWater Engineering
Computational Fluid Dynamics (CFD) models have become increasingly common in the field of water resources with the advent of powerful computers and improved modeling software. CFD models use numerical analysis of the Navier-Stokes equations to simulate a wide range of flow scenarios, including pressurized and open-channel flows. CFD modeling is also able to significantly reduce costs and deliver results more quickly than would be possible by building and developing a scaled physical model. With all these advantages, it is no wonder that many firms are employing 3D CFD models to provide valuable information about designs in water supply, wastewater management, hydropower, and streamflow applications. They can predict three-dimensional flow patterns, estimate sediment erosion and deposition rates, and evaluate contaminant- and thermal discharge plumes in complex environments quickly, efficiently, and accurately. However, it is important for both the modeler and the client to understand when CFD modeling is an effective use of resources, and when it is more efficient to use simpler models, analytical estimates, or empirical relationships during the design process.

This presentation will analyze the many advantages of multi-dimensional CFD modeling, discuss the limitations and drawbacks associated with the models, and provide examples of when CFD models can add value to a project or when it may make sense to take a different approach. With this insight, companies can make informed decisions about using CFD models as tools to help designers understand complex flows and develop effective solutions to difficult problems across a wide range of applications.

The Community Rating System (CRS) Credits and Documentation
Lou Ann Patellaro, ISO / CRS Specialist, Insurance Services Office
The Community Rating System (CRS) is a Federal Emergency Management Agency (FEMA) program, administered by the Insurance Services Office (ISO), Inc. that recognizes communities for their floodplain management activities that go above and beyond the minimum NFIP standards. The CRS assigns credit points for each floodplain management activity a community performs and then correlates those points to classes and flood insurance premium discounts for homeowners in that community.

This session will discuss the 2017 CRS Program specifically, credit criteria and documentation needed for a cycle verification or new application visit. This session will look at state laws and common practices that communities can take advantage of to maximize credits and community discounts. There will be discussion regarding impact adjustment maps, open space and how higher regulations within the Wisconsin State Building Code can work toward CRS credit points.

2:30 PM Breakout Sessions

Using Air-Cooled Blast Furnace (ACBF) slag to Remove Ortho Phosphorus from Stormwater
Todd Weik, CBC Engineers and Associates

I.Introduction
- A. The impact of Phosphorus on our waterways
  - a. What are the sources and concentrations
  - b. Algae growth
  - c. Groundwater impacts
- B. Types of slags available to the consumers and uses

II. Manufacturing and Chemistry
- A. Slag types – BF, BOF, EAF, and Ladle
- B. Steel making process – pig iron and slag
- C. Aggregates produced
- D. ACBF Slag chemistry

III. ACBF Slag Leaching Profile
- A. Leaching – EPA 1311, 1312, and 1313
- B. TAL Suite
- C. Comparative to other site construction materials

IV. Phosphate Immobilization Experiments
- A. 1,5,10 mg/l phosphorus solutions
- B. ASHTO: #10, #67, and #3 aggregates
- C. 5, 10 minutes, 1, 4, 8, 24, and 72-hour equilibrium times
- D. Result summary

V. Life Cycle Analysis
- A. Exchange Experiments
  - a. Total number
  - b. Apparatus
  - c. Phosphorus solutions and time span
  - d. Uptake results
- B. Phosphorus and Land Use
  - a. Great Lakes cities evaluated
  - b. Land use – urban and suburban residential and industrial
  - c. WinSLAMM evaluation to determine ortho phosphorus concentrations
  - d. Summary or annual rainfall volume and Phosphorus concentrations
- C. Life Cycle computations
  - a. Aggregate size impacts
  - b. Size of system impacts

VI. Field Design Applications
- A. Urban applications
- B. Rural applications
- C. Cudahy, Wi. Green Alley and Parking Lot project case study

VII. Questions and Answer

How the "Hanging Levee" Technique in FEMA's 2018 Levee Guidance is being applied in the Milwaukee Area

Rich Klein/Stantec, Aaron Volkening/Stantec, Mark Mittag/MMSD

Traditional levee design and FEMA guidance has generally required that a levee tie into natural high ground to qualify for FEMA accreditation. Exceptions to this approach were reviewed only on a case by case basis without specific regulatory guidance. Levees designed to end in the absence of high ground were sometimes referred to colloquially as "hanging levees". In February 2018, FEMA issued updated guidance that clarifies accreditation requirements for levees that end in the absence of high ground. The Milwaukee Metropolitan Sewerage District (MMSD) is pursuing this levee design approach for a levee along the Menomonee River, portions of which are located in the cities of both Milwaukee and Wauwatosa. The hanging levee technique allows this levee system to be implementable by precluding the need to cross a railroad to tie into high ground. Upon completion, the flood management projects and levee system along the Menomonee River will have reduced flood risk to approximately 200 structures. Participants in this talk will be introduced to this updated FEMA guidance for levee accreditation, how this design approach can provide additional flexibility when high ground tie-in is not feasible, and the FEMA review process for this levee technique.

Green Infrastructure Planning on a Watershed Scale

Carrie Bristoll-Groll, Stormwater Solutions Engineering

When planning to install Green Infrastructure (GI), how does one decide where it should be located to get the best "bang for the buck"? How can you avoid installing GI so it doesn't cause leaky basement or other issues for buildings and other infrastructure? How can GI be used to facility education, higher property values and job creation?

Milwaukee Metropolitan Sewerage District (MMSD) aims to achieve its 2035 Vision for zero basement backups, zero overflows, and improved water quality, partially by incorporating GI throughout its service area. Stormwater Solutions Engineering teamed with GRAEF to create a Green Infrastructure Plan for the entire Kinnickinnic (KK) Watershed. The KK Watershed is 48% impervious, therefore GI can be helpful to naturalize the built environment in many locations, but funding is limited. We will discuss with the conference attendees, the process for best locations to install GI based upon 18 key factors, community and stakeholder engagement, engineering models and GIS.

Neighborhood Outreach and Green Infrastructure Installation: Shorewood and Greenfield Neighborhoods

Adrienne Cizek, Stormwater Solutions Engineering

In both 2016 and 2018 Stormwater Solutions Engineering (SSE) was awarded projects by the Milwaukee Metropolitan Sewerage District (MMSD) to perform neighborhood outreach and green infrastructure installations in the City of Greenfield and Village of Shorewood. MMSD provides funding and other support for green infrastructure in neighborhoods it serves in an effort to achieve its 2035 Vision for zero basement backups, zero overflows, and improved water quality. Incorporating GI into those neighborhoods reduces stormwater and combined sewer flows and pollutant discharge to district sewers, while providing education and informational opportunities for water-conscious families.
SSE worked with the MMSD Fresh Coast Intern Team to provide rain barrels, rain gardens, soil amendments and StormGUARDen stormwater management systems to interested residents. SSE also worked with Southeastern Wisconsin Watersheds Trust (Sweet Water) to educate residents about stormwater pollution prevention practices.

The Neighborhood Outreach and GI Installation project serves to inform community members about the

upcoming mandate that will require property owners to (safely) disconnect their downspouts from the sewer system. During the rain barrel and StormGuarden installations, residential downspouts connected directly to the sewer were cut, capped, and directed to the GI practice. These projects serve as pilot examples that GI can be used to manager water at the downspout after disconnection, while leveraging other funds, both from the municipality and private residences.

Midwest Urban Stream Restoration: Two Case Studies that Rehabilitate Ecological Function in a Developed Landscape
Brent Brown, Jacobs
Urban stream restoration has ranged from "correcting" streams via concrete lining, to science-only attempts using "bioengineering" and "natural channel" principles, to blending science and engineering to balance ecological needs, flood control, and the entirely unnatural conditions that accompany urban settings. The presentation will review two recent urban stream rehabilitation case studies in Historic Rockefeller Park in Cleveland, OH and a highly urban concrete creek in Omaha, NE to provide examples of how other large Midwestern cities are completing urban stream rehabilitation. The presentation will conclude with thoughts about how to improve the success of urban stream restoration through design and construction techniques and contracting considerations that are unique for urban biological systems.

Floodplain Management Plans -Arcadia, WI Case Study
Daniel Cook and Joe Waln, Davy Engineering Company
What is a Floodplain Management Plan? Why should we do it? How does it complement our Emergency Action Plan that DNR required? This provides a case study of creating the Floodplain Management Plan for the City of Arcadia. Learn about goals and objectives of the plan; strategies and tool that could be used to meet objects; and how actions were defined and prioritized.

3:45 PM Closing Plenary

Milwaukee Metropolitan Sewerage District's Integrated Watershed Management Programs
Kevin L. Shafer, PE, Milwaukee Metropolitan Sewer District
The Milwaukee Metropolitan Sewerage District (MMSD) has adopted an approach that strives to manage rainwater where it falls. Implementation of this integrated watershed management approach requires a variety of collaborative steps to be taken by local governments and individual property owners. MMSD uses financial incentives, regulatory requirements, and strong engineering to support this effort. MMSD is currently working to develop an integrated approach to coordinate its ongoing flood management projects with the municipalities' permit TMDL requirements. This water quality improvement plan will also look at enhancing MMSD's monitoring program by adding biological indicators. MMSD is also modifying its stormwater runoff rules which will require additional green infrastructure on smaller parcels.

Friday, November 9th

9:30 AM Field Tour

Susan Coyle of MMSD will lead a tour of three different Milwaukee area projects, including the South Shore Stormwater Project, Re-imagining the Kinnickinnic River from 6th Street to Pulaski Park, and the Underwood Creek rehabilitation project. Concrete removal and flood protections will be highlighted in two of the stops, and using fungi for water quality benefits will be highlighted at the South Shore Stormwater Project. A light snack and water will be provided on the bus.