



**TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION**  
**30<sup>th</sup> Annual Conference – March 6 – 9, 2018**  
**Horseshoe Bay Resort & Spa**



**CONFERENCE ABSTRACTS**

**TUESDAY – MARCH 6, 2018**

**WORKSHOPS**

**8:00 am – 5:00 pm**

***WORKSHOP 1: BASIC FLOODPLAIN MANAGEMENT 101***

***Instructors:*** Michael Segner, MBA, CFM; Texas Water Development Board  
Josh Oyer, CFM; Texas Water Development Board

***Topic:*** This workshop will cover the following:

- Texas and Federal laws and the National Flood Insurance Program (NFIP)
- Flood Mitigation Grant Programs
- Local Communities & the NFIP
- Flood Damage Prevention Ordinance
- Variances and NFIP Requirements
- Community Assistance Visits & Contacts
- Elevation Certificates
- FEMA Map Amendments
- Substantial Improvements/Damage

**8:00 am – 5:00 pm**

***WORKSHOP 2: NFIP 201: INTERMEDIATE FLOODPLAIN MANAGEMENT***

***Instructor:*** Jack Graham, CFM; Federal Emergency Management Agency

***Topic:*** This workshop will focus on what the local floodplain administrator should know and do during the day-to-day conduct of the community's flood damage prevention program. The importance of the local ordinance will be emphasized. The majority of the course will involve the permitting process, how to establish an effective system, permitting requirements, inspections, and follow-up to ensure development has met the provisions of the community's ordinance. Letters of Map Change (LOMCs) will be discussed. At the end of the course, we will briefly cover other aspects of floodplain management, to include post flood activities, the elevation certificate, etc.

**8:00 am – 5:00 pm**

***WORKSHOP 3: INTRODUCTION TO HEC-RAS 2-D WORKSHOP***

***Instructors:*** Garrett Johnston, P.E., CFM; Freese and Nichols, Inc.  
Patrick Miles, P.E.; Freese and Nichols, Inc.

***Topic:*** This hands-on workshop will provide an overview of the new capabilities of HEC-RAS 5. For over two decades, the US Army Corps of Engineers' free HEC-RAS software has been the industry-leading standard for hydraulic river modeling and channel design. Version 5, released in 2016, is a major update that allows engineers to model two-dimensional surface flow.

Class time will alternate between brief lectures and instructor-led hands-on practice with HEC-RAS at individual computers. Participants are expected to bring their own laptops to run HEC-RAS, and should have some familiarity with HEC-RAS 1D modeling. All participants will be provided with printed handouts of the lecture materials and worksheets, along with flash drives containing example datasets and a copy of HEC-RAS 5.0.3 (or newest version at the time of the training).

- Importing terrains and land cover
- Generating 2D flow areas
- Running a standalone 2D model
- Running a combined 1D/2D model
- Reviewing and processing results with RAS Mapper



**TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION**  
**30<sup>th</sup> Annual Conference – March 6 – 9, 2018**  
**Horseshoe Bay Resort & Spa**



**CONFERENCE ABSTRACTS**

**TUESDAY – MARCH 6, 2018 (continued)**

**8:00 am – 5:00 pm**

***WORKSHOP 4: WHAT'S WRONG: COMMON NON-COMPLIANCE ISSUES***

***Instructor:*** Shawn Snyder, CFM; Texas Water Development Board

***Topic:*** This workshop will review the most common types of noncompliance with floodplain management regulations, and suggested ways that communities can avoid noncompliance to begin with and effectively resolve problems when they arise.

**WEDNESDAY – MARCH 7, 2018**

**WORKSHOPS**

**8:00 am to noon**

***WORKSHOP 5: POST DISASTER DAMAGE ASSESSMENT – LESSONS LEARNED FROM TEXAS DISASTERS***

***Instructors:*** Michael Olson, CFM; City of McGregor / Building Officials of Texas (BOAT)  
Jim Olk, City of Garland / BOAT

***Topic:*** This workshop will provide the basics on what occurs during and immediately following a disaster and what the local official should know. The course will provide information as to what needs to be done to protect the public regarding damage assessment and what will be expected regarding documentation of damage assessment. This course will focus on real world examples of disasters that have occurred in Texas in recent years.

**8:00 am to noon**

***WORKSHOP 6: PREPARING/REVIEWING A GOOD, BAD OR UGLY LOMC SUBMITTAL***

***Instructors:*** Vamshi Konduru, PE, PhD, CFM, GISP; Pape-Dawson Engineers  
Noah Parsons, PE, PMP, CFM; City of San Antonio

***Topic:*** This workshop highlights the various (important) stages involved in the lifecycle of CLOMR/LOMR application package, from preparation to approval. The two-part workshop is presented by a consulting engineer and co-presented by a City reviewer/Floodplain Administrator. Part 1 of the workshop will focus on various components and systematic steps followed by the engineer to prepare a submittal package. Part 2 of the workshop emphasizes on reviewer requirements and focuses on the steps involved in performing a technical accuracy and completeness review. The workshop will also provide tips and tricks and ways to identify typical red flags in a submittal. The two parts will be followed by an interactive conversation that discusses various FEMA and higher standards set forth by local government agencies. The workshop will conclude with some typical and some unique case studies, which will discuss both applicant challenges and reviewer expectations.

**8:00 am to noon**

***WORKSHOP 7: REVIEWING HEC-RAS 2D MODELS***

***Instructors:*** Brandon Hilbrich, P.E., CFM; HDR Engineering  
Sunit Deo, P.E., CFM; HDR Engineering  
Kelley Rich, CFM; HDR Engineering

***Topic:*** For past two years, the H&H community is delighted to see and use the official release of HEC-RAS 5.0 and its subsequent versions, which are public domain, free, trusted, and meticulously tested software from HEC and include fully 2-dimensional (2-D) and combined 1-dimensional (1-D) and 2-D unsteady flow

## CONFERENCE ABSTRACTS

modeling in addition to its traditional 1-D modeling capabilities. In this period, use of HEC-RAS for 2-D modeling has increased exponentially. There are many advantages of using a 2-D RAS model, including the ease with which a 2-D model can be set up. Does that mean all 2-D models that run and provide results are justified and correct? That is the most important question when tasked with reviewing a 2-D model. This workshop will discuss good modeling practices and identify common mistakes that are overlooked in creating a 2-D RAS model. The workshop will include a live interactive demonstration of HEC-RAS 2-D during which all participants will play a reviewer's role in finding problems with the models. This workshop is not intended to teach attendees how to use HEC-RAS 5.0 and its 2-D capabilities; instead it will focus on providing information for those who review HEC-RAS 2-D models.

**8:00 am to noon**

### ***WORKSHOP 8: MULTI-HAZARD TOURNAMENT***

**Instructor:** Aarin Teague, PhD, PE, CFM, ENV SP / San Antonio River Authority

**Topic:** This workshop is intended to create a non-traditional learning environment for attendees to learn about pro-actively planning for and managing risk to their communities. Through a competitive tournament structure, attendees work in teams to evaluate different strategies for mitigating flood, drought, and water quality risks while at the same time understanding the impacts on a variety of community metrics such as flood damages, water quality impacts, habitat preservation, water resource resilience, and recreation opportunities. Attendees will develop a community strategy for risk mitigation and then negotiate tradeoffs within their teams. Attendees will practice their public interaction skills to promote community buy in for their strategies. This table-top exercise demonstrates the importance of planning for hazard mitigation while at the same time allowing participants to explore the interaction of different policies and community investment strategies.

## CONFERENCE OPENING PLENARY SESSION

**1:00 pm – 1:15 pm**

### ***CONFERENCE WELCOME***

Joe Fernandez, CFM; TFMA President (San Antonio River Authority)  
Roy Sedwick, CFM; TFMA Executive Director

**1:15 pm – 2:00 pm**

### ***5<sup>th</sup> ANNUAL MIKE HOWARD LECTURESHIP***

#### ***Hurricane Harvey's Impact on Harris County***

**Speaker:** Jeffrey Lindner; Harris County Flood Control District

**Topic:** By the end of this presentation, attendees should be able to discuss the formation, landfall and rainfall impacts associated with Hurricane Harvey; understand the operations of emergency managers and HCFCD staff during the resulting Harvey flooding; develop an awareness of the rainfall magnitude and spatial coverage across the area; and identify and relate any lessons learned from this event.



**TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION**  
**30<sup>th</sup> Annual Conference – March 6 – 9, 2018**  
**Horseshoe Bay Resort & Spa**



**CONFERENCE ABSTRACTS**

**2:00 pm – 2:30 pm**

***UPDATE ON EFFORTS TO CREATE THE FIRST STATE FLOOD PLAN FOR TEXAS***

**Presenters:** Mindy Conyers, PhD; Texas Water Development Board  
Carla Guthrie, PhD; Texas Water Development Board

**Objectives:** To provide attendees with an overview of the state flood plan effort, updates on progress made to date, and information on how TFMA members can contribute their expertise.

**Topic:** In 2017 the 85th Texas Legislature passed an exceptional item which, among other activities, enables the Texas Water Development Board to create the first ever statewide flood plan. The flood plan will be completed prior to the start of the 2019 legislative session and will provide comprehensive information about flooding impacts and programs in Texas as well as policy recommendations to reduce flood risk. Three goals guide this first step toward developing comprehensive flood planning for the state: (1) to assess flood risk and catalogue the roles and responsibilities of relevant entities, (2) to estimate the statewide cost to mitigate flood risk, and (3) to envision the future of flood planning in Texas.

The vital importance of this opportunity to ensure adequate flood planning and risk mitigation to communities and citizens throughout Texas hinges on stakeholder input. Our efforts cannot and will not succeed without input and guidance from stakeholders—most importantly the 1,200+ floodplain managers in Texas.

This effort is not seeking to fund specific strategies or projects related to flood planning, mitigation, warning, or recovery. Instead, the state flood plan seeks to obtain and communicate, via a concise report, the information that will determine the need for and benefits of statewide flood planning and financial investment. We welcome your input and look forward to collaborating on the state flood plan effort with TFMA members and stakeholders across the state.

**2:30 pm – 3:00 pm**

***FLOOD EVENT IN HARRIS COUNTY AND DAMAGES AVOIDED DUE TO VARIOUS PROJECTS***

**Presenter:** Ataul Hannan, PE, CFM; Harris County Flood Control District

**Topic:** 2015-2017 our community experienced one of the most active periods of rainfall and flooding across Harris County in recent history. Within just three years, Harris County saw five major floods, four minor floods, Hurricane Harvey, a tropical storm, several other significant rainfall events, and even a near miss. In 2015 Brays Bayou, the most intense rainfall occurred in the upper reaches which resulted in flooding and property damage. In 2016 the most intense rainfall occurred in the west side of the county. Hurricane Harvey in 2017 happened all over the county. In the aftermath of each event, Harris County Flood Control District (HCFCD) used flood data and several techniques to estimate the location and severity of flooding. Additionally, HCFCD attempted to quantify the benefit of the ongoing flood improvement projects along Brays and White Oak. Also quantify the benefit of our recently completed Sims Bayou project. This presentation shows progress made by the HCFCD and its Federal partners in reducing flood risks in each event. At the same time also emphasize the importance of work left to be done.

The HCFCD in partnership with FEMA has purchased and removed approximately 2,600 houses since 1989. All the houses had previously flooded several times or were severally damaged during a flood. Removing homes from high risk flood areas is the only way to reduce the chance of flooding to zero. This presentation will also provide an overview of the District's Voluntary Home Buyout program with a focus on the associated avoided flood damages resulting from flood events.

**3:00 pm – 3:30 pm**  
**BREAK**



**TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION**  
**30<sup>th</sup> Annual Conference – March 6 – 9, 2018**  
**Horseshoe Bay Resort & Spa**



**CONFERENCE ABSTRACTS**

**3:30 pm – 4:00 pm**

***INFRMED FLOOD INUNDATION MAPPING***

***Presenter:*** Kristine Blickenstaff, PE; U.S. Geological Survey

***Topic:*** The objectives of this project are to develop the best available flood inundation mapping libraries for the State of Texas and to make those libraries readily available to Emergency Managers and the public via web application.

Rather than generate inundation maps during an event when every second is critical to emergency responders, this project will produce a family of inundation maps for various river stages/flows beginning at minor flooding stage and continuing at regular intervals to a stage that exceeds the magnitude of the most extreme flood expected for a given river reach.

During an actual flood event, each time the NWS-RFC issues a forecast for this reach, the local emergency responders, as well as others charged with the responsibility of managing infrastructure and protecting life, would be issued the inundation map corresponding to the forecast issued by the NWS-RFC. Since this forecast can change as frequently as every 12 hours, the family of inundation maps would be prepositioned to identify the inundation footprint for any range of forecast issued by the NWS-RFC.

This effort will include the creation of a web based inundation map viewer to serve the inundation mapping products to emergency responders and infrastructure managers. The viewer will be housed on a U.S. Geological Survey (USGS) server and will be maintained by the USGS. The inundation map viewer will allow emergency managers to have immediate access to real-time inundation mapping for areas not presently available through the NWS or other entities.

This effort will be accomplished by an interagency coalition comprised of the NWS, the Federal Emergency Management Agency (FEMA), the USGS and the USACE. These agencies are currently in partnership through the group known as Interagency Flood Risk Management (InFRM) and this effort will be undertaken by this group. The InFRM team will also reach out to state and local government organizations as well as private industry to aid in moving this monumental effort forward.

**4:00 pm – 5:00 pm**

***30 YEARS OF TEXAS FLOODS AND THE TFMA – 1998 TO 2018***

***Presenters:*** Roy Sedwick, CFM; TFMA Executive Director  
John Ivey, PE, CFM; Halff Associates  
Lynn Lovell, PE, CFM, D.WRE; Halff Associates

***Topic:*** The objectives of this presentation are:

1. To record and preserve a general, informative year-by-year timeline and history of the first 30 years of the TFMA.
2. Supplement its history and timeline with Texas flood photos for each of those years.
3. Bring newer TFMA members up to date on the significant events and colorful history of the TFMA and remind older members of their TFMA heritage.

**CONFERENCE ABSTRACTS****THURSDAY – MARCH 8, 2018****8:00 am – 11:30 am****MORNING TECHNICAL CONCURRENT SESSIONS – TRACKS A, B, C, D, E, AND F****TRACK A – HYDROLOGY & HYDRAULICS (PART 1)****8:00 am – 8:30 am*****A1 APPLICATION OF THE NEW HEC-RAS 5.0 FOR IDENTIFICATION OF HAZARDOUS AREAS IN LOUISVILLE, KENTUCKY***

**Presenters:** S. Laughlin; Louisville & Jefferson County Metropolitan Sewer District  
Mark Forest, PE, CFM; HDR Engineering  
Rachel Sills; HDR Engineering

**Objectives:** How to effectively use the precipitation function in HEC-RAS 2D to identify locally specific flooding issues not identified in a standard HEC-HMS combined with HEC-RAS 1D application, data requirements needed obtain a reasonable result (terrain and precipitation) and how the future release of HEC-RAS 5.1 will greatly improve upon those capabilities.

**Topic:** Climate change influences in Kentucky have resulted in higher frequency and greater intensity rainfall events over the last 10 years which have caused significant damages. Two storms occurred in 2015 that caused substantial flooding in Louisville. Roughly 4-inches of rain fell in six hours during April and 5-inches of rain fell in three hours during July, flooding structures, cars, and required several water rescues. In 2017, remnants of several hurricanes such as Harvey, pushed north as well but fortunately missed the Louisville area. Due, in part, to these storms, MSD began evaluating solutions to solve these flooding problems. As an initial step, MSD is identifying flood prone areas to establish measures that will mitigate flooding hazards. Different areas of the county were analysed based on topography and number of stormwater projects constructed in the area.

To identify hazardous areas, six areas were evaluated for this study. High intensity storms were compared, and the storm event which occurred in August 2009, roughly 7.5 inches of rain fell in 75 minutes, was modelled to determine the potential extents of flooding. HEC-RAS 5.0 was used to efficiently and accurately create a 2D analysis to simulate the rainfall runoff response from the watershed. Once the model was created using HEC-RAS 5.0, the project areas were evaluated to determine the locations of the hazardous areas. The use of RAS Mapper was extremely important in this analysis for developing maps of depth and velocity, animations of the runoff response, identification of deeper ponding area in various parts of the watershed, and for determining the duration of flooding in key areas. In addition, the 100-year storm was modeled to simulate the runoff response from rainfall excess. This was compared to the FEMA floodplain limits and 100-year peak flow estimates for model validation. Once the analysis and model validation was complete, solutions were found to reduce flooding that ranged from adding detention areas to increasing pipe sizes.

**8:30 am – 9:00 am*****A2 CLASH OF THE ZONES – EFFECTIVE VS. INEFFECTIVE: CASE STUDIES TO REVIEW THE USAGE OF INEFFECTIVE ZONES IN HYDRAULIC MODELS***

**Presenter:** Vamshi Konduru, PE, PhD, CFM, GISP; Pape-Dawson Engineer, Inc.

**Topic:** Setting ineffective areas for cross sections has been a point of discussion since the advent of hydraulic modeling. Although specific guidelines have been established by USACE, FEMA, and various State or local entities regarding their proper usage; one size does not fit all. This presentation covers the basic concepts of ineffective flow assignments, required to model stream crossings and backwater. Case studies of various stream crossings have been analyzed and will be presented in this session. Some of these studies demonstrate a typical bridge or culvert, but some are more unique or atypical scenarios, that exhibit complex flow patterns around the openings. The intent of this presentation is to expand our knowledge of ineffective flow areas and to better understand its relationship with bridge or culvert modeling.

## CONFERENCE ABSTRACTS

**9:00 am – 9:30 am**

**A3 LARGE RIVER MODELING USING HEC-RAS 2D – A CASE STUDY**

**Presenter:** Hector Olmos, PE, CFM; Freese and Nichols, Inc.

**Objectives:**

1. Attendees will learn how a traditional 1-Dimensional model is insufficient to evaluate certain situations
2. Attendees will learn about the differences between shallow overland and riverine flow modeling
3. Attendees will see how the modeling tools currently available, if used properly, can represent the behavior of a very complex river system
4. Attendees will see the above presented in the context of a case study on the Brazos River in Fort Bend County, Texas

**Topic:** The Brazos River has experienced 4 major floods over the last 3 years that have resulted in severe damages across Fort Bend and Brazoria Counties. Some of the flow measurements during these floods have resulted in large discrepancies compared to data collected during earlier floods. This has been a matter of discussion over the last few years, and has resulted in several revisions to the discharge rating curves at key streamflow gages along the Brazos River.

As a result of these unknowns and with the purpose of explaining the “behavior” of the Brazos River during the -at the time - flood of record of Memorial Day 2016, FNI decided to create a HEC-RAS model using only two-dimensional elements. The model extends from Hempstead (US 290) to Sugar Land (US 59), approximately 125 miles. This model was calibrated to match the observed water levels at the Richmond gage, obtaining a close match to recorded stages. Results of the model were presented merely 3 days ahead of Hurricane Harvey arriving to the greater Houston area.

This brand-new model was used by FNI during Hurricane Harvey to estimate water levels and discharges along the Brazos River. The model also matched the recorded stages and flows during this record event.

**9:30 am – 10:00 am**

**BREAK**

**10:00 am – 10:30 am**

**A4 REMOVING PROPERTIES FROM THE FLOODZONE THROUGH 1-DIMENSIONAL AND 2-DIMENSIONAL HYDRAULIC MODELING**

**Presenters:** Gonzalo Cedillos, PE, CFM; El Paso Water  
Mark Medina, P.E., CFM; Moreno Cardenas, Inc.  
Gustavo Sosa, P.E., CFM; Moreno Cardenas, Inc.

**Topic:** The recent construction and completion of the Flow Path No. 14 (FP 14) stormwater channel project, prompted El Paso Water (EPW) to prepare and submit a Letter of Map Revision (LOMR) to FEMA to determine the beneficial impacts to properties in the floodzone located in Northeast El Paso, TX. The watershed analyzed located to the east of the Franklin Mountains drains approximately 80.5 square miles (51,520 acres), which resulted in the preparation of a Physical Map Revision (PMR) in lieu of a LOMR. Most of the watershed is comprised of residential and commercial developments.

EPW hired Moreno Cardenas In. (MCi) a local El Paso Civil Engineering firm to prepare the PMR. In addition to the FP 14 improvements, FP 13, FP 15, the Northeast Pond and Fort Bliss Sump were also included in the hydraulic model, since a LOMR was not prepared for any of these major existing stormwater improvement projects. All of these projects work collectively and result in reducing flooding in the Northeast El Paso area. The PMR resulted in revision of five entire Flood Insurance Rate Map (FIRM) panels and a partial of a sixth.

The Northeast Pond is a retention basin that was improved in the early 1990s to increase the capacity to approximately 5,300 acre-feet of volume. Stormwater generated from the foothills of the eastern slopes of Franklin Mountains is captured and conveyed by concrete lined channels FP 13 & FP 14. FP 13 is a 3-mile channel that was improved in the early 1990s consisting of channel widening and reinforced concrete lining. FP 13 provides 100-year storm capacity conveyance from the Franklin Mountain foothills to the Northeast Pond. FP 14 is a 3-mile channel that was improved in 2010 consisting of seven new multi-barrel box culvert street crossings, channel widening and reinforced concrete lining,



**TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION**  
**30<sup>th</sup> Annual Conference – March 6 – 9, 2018**  
**Horseshoe Bay Resort & Spa**



**CONFERENCE ABSTRACTS**

and connects with FP 13 approximately 0.5-miles upstream of the Northeast Pond. FP 14 provides 100-year storm capacity conveyance for the upper 1.3-mile section and lower 0.7-mile section, and a 25-year storm capacity conveyance for the middle 1-mile section.

The Fort Bliss Sump is a detention basin developed in the 1950s that is located within Fort Bliss Army Military Reservation property with a capacity of approximately 2,200 acre-feet of volume. Stormwater from the overspill of the middle section of FP 14 is conveyed south through FP 15. FP 15 is a 4.96-mile natural topographic depression through streets along residential and commercial properties that begins at FP 14 and discharges 1.4-miles upstream of the Fort Bliss Sump.

FP 13 & FP 14 were analyzed using 1-Dimensional hydraulic modeling using HEC-RAS software. FP 15 was analyzed using 2-Dimensional hydraulic modeling using FLO-2D software due to the complexity of urban modeling. As a result of stormwater improvements in the last 30 years, and the hydrologic and hydraulic analysis completed as part of the PMR application, approximately 4,900 parcels will be removed from Flooding Zone A and be placed in Flooding Zone C. The PMR application was approved by FEMA in April 2016 with on-going revised FIRM mapping. Revised FIRMs are expected to become effective by mid-2018.

This project demonstrated the importance and resulting economic benefits of submitting an application to FEMA for updating/revising the FIRM after the completion of major stormwater infrastructure projects.

**10:30 am – 11:00 am**

**A5 1D/2D OVERFLOW MODELING FOR PROPOSED DEVELOPMENT IN ADDICKS WATERSHED, HARRIS COUNTY, TEXAS**

**Presenters:** Trent M. Ford, P.E., CFM; Jones Carter  
Z. Gao Lee, P.E., CFM; Jones Carter

**Objectives:**

1. Overview of the Cypress Creek overflow zone, its history of flooding, and how it impacts Harris County.
2. Discuss the newest regulatory criteria and guidelines for development in the Cypress Creek overflow zone.
3. Introduction to new HCFCD Retention volume requirement in Cypress Creek overflow zone
4. Overview of the 1D/2D modeling performed for the Katy Lakes tract, including both preliminary HEC-RAS 5.0 and the final XPSWMM
5. Discussion of other flood reduction projects/programs within the area.

**Topic:** As part of the Harris County Flood Control District's (HCFCD) Cypress Creek Overflow Management Plan, all new development within the Cypress Creek Overflow Zone in the Cypress Creek Watershed, Addicks Reservoir Watershed, and Barker Watershed are required to perform 1D/2D modeling of the overflow from Cypress Creek to ensure any fill placed will not cause adverse impacts to adjacent properties. As a result of the plan, new Supplemental Guidelines and Criteria and Modeling Guidelines were developed by HCFCD for Overflow areas within the Cypress Creek, Addicks Reservoir, and Barker Reservoir watersheds. HCFCD along with their consultant Michael Baker International (MB) developed a 1D/2D model using the software XPSWMM v. 2012. This model developed by HCFCD and MB encompasses approximately one-sixth of the area of Harris County, and allows engineers to analyze how a proposed development would perform under the various overflow scenarios required by HCFCD.

The engineering consultant is Jones & Carter for a 400-acre proposed development in the Katy Prairie area of northwestern Harris County. The tract is within the Addicks Reservoir Watershed, located along South Mayde Creek. JC performed preliminary 1D/2D modeling for the tract using HEC-RAS 5.0 to analyze existing flow paths and sheet flow patterns from the overflow zone. For the final overflow study, JC utilized the HCFCD XPSWMM 1D/2D model to analyze the existing and proposed developed conditions of the 400-acre tract under the scenarios required by HCFCD. The report was approved by HCFCD in July 2017 and the first phase of the drainage facilities is currently under construction. This project was the second private development within the overflow zone to be approved by HCFCD under the new overflow criteria.

## CONFERENCE ABSTRACTS

11:00 am – 11:30 am

**A6 USING TWO-DIMENSIONAL MODELING TO OPTIMIZE A GREEN FIELD URBAN (RESIDENTIAL SUBDIVISION) DRAINAGE DESIGN**

**Presenters:** Hrusikesh Sandhe, P.E., LEED AP; Jacobs Engineering  
Bradley Pierce, P.E; Jacobs Engineering  
Thomas Davies, P.E.; Jacobs Engineering

**Topic:** With the preponderance of advanced hydraulic modeling in use today it is relatively understood that there are inherently better solutions available for storm water network and urban drainage system design than older methods like those that feature spreadsheets using Manning Equations. This presentation will demonstrate the differences using an actual case study and compare preliminary cost estimates to current post two dimensional modeling results to highlight the differences in cost and design. All City requirements were met with both approaches. Precise flood depths and flood spreading across the right-of-ways was observed in detail, allowing for accurate sizing of the new development's proposed improvements.

The combination of one-dimensional (1D) and two dimensional (2D) hydraulic models for drainage studies provides good understanding of key flood mechanisms and design options to mitigate flood risk. Innovyze® developed InfoWorks® ICM (integrated catchment model) modeling software which is an advance tool commonly used for 1D-2D hydraulic modeling. The objective of this presentation is to showcase residential subdivision 2D storm drainage modeling using InfoWorks® ICM.

The audience will learn how in the model the 1D pipe network is represented with nodes and links, how inlets are represented, and how 2D overland surface flow dynamically interacts with the 1D network. The presentation will also share challenges of 2D model building, verification and pipe optimization as part of the design process.

## TRACK B – HAZARD RISK ASSESSMENT & MAPPING - MASTER PLANNING

8:00 am – 8:30 am

**B1 USING MASTER PLAN MODELING TO GUIDE DOWNSTREAM ASSESSMENTS AND FUTURE DEVELOPMENT**

**Presenters:** Matt Dubois, P.E., CFM; City of Frisco  
Steven Galloway, P.E., CFM, LEED AP; Kimley-Horn

**Objectives:**

1. Explore XPSWMM modeling capabilities for storm sewer and floodplain modeling
2. Provide means of analysis of modeling output to evaluate detention and mitigation requirements
3. Discuss application of an evolving model by the City and using the model as a tool for cooperation between City and developers through build out of watershed
4. Provide more detailed information for emergency managers and first responders

**Topic:** The City of Frisco, over the past 5 years, has implemented a program to develop modeling and master plans for all of the watersheds throughout the City. Typically, the master plans have focused on floodplain mapping, identifying erosive conditions in channels, locating undersized channel structures, and identifying habitable structures within the floodplain. These models are provided to developers and engineers as a tool to use to prepare downstream assessments and floodplain impact analyses. While helpful, the master plans have not addressed the capability of storm sewer systems to convey developed flows to the floodplains, and the quality of the downstream assessment and/or floodplain impact analysis submittals has varied greatly from project to project.

For the White Rock Creek watershed, a new approach was utilized. XPSWMM modeling was prepared for the channels, ponds, and storm sewer systems throughout the watershed. The modeling was prepared using GIS information and record drawings collected by the City. The modeling provided Hydraulic Grade Line (HGL) elevations in the storm sewer system, identified properties that were currently at greater risk of flooding, and determined the potential impact of future development on the flood risk throughout the watershed.

## CONFERENCE ABSTRACTS

The resulting modeling allows the City to narrow the focus of downstream assessments to the most critical needs, as well as identifying the locations where storm water improvements can provide the most value. A majority of future development in the watershed can now be assigned their detention and hydraulic grade requirements at a predevelopment meeting with no additional downstream assessment required. This provides a trusted planning resource for the City and a level of confidence for the developer that costs for storm water infrastructure are known at the outset of the project. Additionally, understating where high risk flooding areas may be outside of the traditional Special Flood Hazard Areas (SFHA) mapped by FEMA will help emergency managers and first responders should the City experience more intense rain events.

**8:30 am – 9:00 am**

**B2 AN OVERVIEW OF THE LITTLE CYPRESS CREEK FRONTIER PROGRAM AND WATERSHED MASTER PLAN, HARRIS COUNTY, TEXAS**

**Presenters:** Matt Manges, P.E., CFM; Lockwood, Andrews & Newnam, Inc.  
Jacob M. Torres, Ph.D., P.E., CFM; Lockwood, Andrews & Newnam  
Erwin Burden, P.E.; Harris County Flood Control District  
Alem Gebriel, Ph.D., P.E.; Harris County Flood Control District

**Objectives:**

1. Highlight the uniqueness of how this program is providing flood relief and planning for future development.
2. Illustrate the unique development conditions within the Little Cypress Watershed.

**Topic:** This talk will cover an overview of the Frontier Program and Watershed Master Plan for the Little Cypress Creek Watershed in Harris County. Little Cypress Creek is one of the few mostly undeveloped watersheds in the county and is expected to experience significant growth in the near future. The Frontier Program takes a holistic approach to solving existing flooding problems while planning for future development. This unique approach will enable HCFCD to develop significant regional detention storage and large-scale conveyance within the watershed while minimizing onsite detention and leaving more overall property for development. This presentation will highlight the overall benefits of the Frontier Program, implementation plan, and proposed Watershed Master Plan for the watershed.

**9:00 am – 9:30 am**

**B3 SAN MARCOS STORM WATER MASTER PLAN CHALLENGING & CHANGING PROTECTION OF PEOPLE & ENVIRONMENT**

**Presenters:** Thomas Mountz, P.E., D.WRE, CFM; RPS  
Brian Reis, P.E., CFM; Lockwood, Andrews, & Newnam, Inc.  
Laurie Moyer, P.E.; City of San Marcos  
Rey Garcia, P.E.; City of San Marcos

**Topic:** This presentation will discuss the overview of the SWMP development as part of the overall planning and development services functions of the City of San Marcos alongside of the recently adopted Comprehensive Master Plan and implementation of Code SMTX. The database of potential projects developed in the SWMP provides the framework for drainage/flooding improvement projects included in the 10-Year Capital Improvements Plan approved in 2017.

The City of San Marcos is a rapidly growing community in central Texas located along Interstate Highway 35 (IH 35) between San Antonio and Austin. The San Marcos and Blanco Rivers and their respective creeks and tributaries run through the city, providing a source of drinking water, recreational opportunities, and miles of unique riparian corridor habitat. In April of 2013 the City officially adopted “*Vision San Marcos: A River Runs Through Us*” as the comprehensive master plan to guide the growth and development of the City. The goal of Storm Water Master Plan project begun in 2013, was to take a comprehensive look at the stormwater and flooding issues facing the City of San Marcos. The final report summarizes the findings and recommendations of the overall assessment of localized drainage and regional flooding issues, as well as creek and river erosion areas.

A comprehensive analysis of known localized flood prone areas throughout the City of San Marcos was conducted. A total of 58 areas identified by City staff through general observation and/or citizen complaints were reviewed. The primary

## CONFERENCE ABSTRACTS

purpose of this task was to assess flooding issues at each site, propose potential corrective measures, identify related or joint projects, create hydraulic models for storm sewer networks where appropriate, and develop preliminary cost estimates for proposed solutions.

Creeks and rivers are dynamic and naturally shift in location over time. However, in the built environment, bank erosion can threaten property, structures, and utilities. The purpose of this section of the Comprehensive Watershed Master Plan was to conduct a creek erosion assessment to identify potential problems early, develop potential project solutions, and avoid future large project costs. In addition to identifying issues in the rivers and creeks, the assessment includes a search for opportunities to integrate corrective measures with localized drainage problem areas and water quality solutions to develop a comprehensive capital improvement program plan.

Nestled against the Balcones Escarpment, San Marcos also lies in a region known as “Flash Flood Alley”. This area of central Texas is prone to intense rainfall events that have been known to deposit enormous volumes of water in relatively short timeframes. Coupled with steep-gradient topography and hard surface geology, runoff from intense storms frequently causes flash floods. These flooding problems are further exacerbated by urbanization. While flash flooding can be simply a nuisance in some smaller storms, since 1998, the San Marcos area has been hit with several major storm and flood events, including the 2013 Halloween Flood and the 2015 Memorial Day Floods, which devastated the region and caused extensive damage to property and infrastructure.

**9:30 am – 10:00 am**

***BREAK***

**10:00 am – 10:30 am**

***B4 YEARS OF PLANNING TO PROTECT THE CITY OF BUNKER HILL VILLAGE, TEXAS FROM FLOODING***

***Presenters:*** Ali Keyvani, Ph.D., P.E.; RPS Group  
William Conlan, P.E., CFM; RPS Group

***Objectives:***

1. Address the current adequacy of the drainage system of City of Bunker Hill Village using a comprehensive hydrologic and hydraulic model.
2. Finding the drainage patterns and sheetflow corridors within the City.
3. Recommending the improvements for the areas with low Level of Services combined with poor sheetflow patterns resulting in structural flooding.

***Topic:*** Harris County has experienced several extreme rainfall events in recent years. These extreme events were in May 2015 (Memorial Day event), April 2016 (Tax Day event), and August 2017 (Harvey event). The magnitudes of these events around City of Bunker Hill Village (City) located in west Harris County have been measured to be over 200-year event (0.5% occurrence probability). Over the last 10 years, the City has invested over \$20M in Drainage Infrastructure with the desire to address drainage concerns and maintain the capacity achieved as a result of this investment. This has reduced the number of flooded structures from nearly 80 houses after a 100-year event in 2009 to 37 homes in 2015, 16 houses in 2016, and 1 house after Harvey in 2017.

The City Council appointed a Drainage Committee in 2014 to focus specifically on the City’s drainage needs. Our firm helped the Drainage Committee develop the City’s Drainage Criteria manual and update the Development Ordinances in January 2015. This was a significant step in maintaining the City’s current drainage system’s function and capacity as residential redevelopment is now required to detain any increase in stormwater runoff on site. In addition, property owners are responsible to survey adjacent areas to ensure offsite sheetflow will be incorporated during the new construction.

A 2D-XPSWMM model was developed and the results of the model for the extreme rainfall event revealed interesting information about the City. Due to the undulating and complex nature of the topography of the City, there are areas where drainage is isolated into low spots identified as “bowls” of excess water which can vary in size and depth, some of which cannot be drained efficiently and effectively by the current drainage system. These bowls fill and when overloaded with

## CONFERENCE ABSTRACTS

the excess water, eventually cascade to a lower point downstream. Interestingly, most of the flooded structures were located around these bowls.

Our model was able to identify the Level of Service (LOS) of the storm sewer pipes and/or roadside ditches for each part of the City. The LOS specifies the rainfall event at which the systems reach full capacity before water “bubbles out” into the adjacent streets and yards. Furthermore, the sheetflow patterns and overflow paths were determined in problematic areas where majority of the flooded structures exist. This helped in defining the potential improvements that optimizes the City drainage needs with the allocated cost.

The City is built out and land locked. Downstream outfalls could not take additional flow. The land acquisition is very expensive and constructing a detention pond is not economical. The water needs to be stored, so a project was designed that included the installation of 46,600 cubic feet of underground storage volume in precast concrete modules under several cul-de-sacs. The construction was completed in 2015. The areas near the new project did not have any structural flooding during Hurricane Harvey, and the streets were passable. Detaining water underground through concrete vaults seems to be a viable option in other problematic areas of the City.

**10:30 am – 11:00 am**

**B5 CITY OF PEARLAND – BRAZORIA DRAINAGE DISTRICT 4 MASTER DRAINAGE PLAN  
LEVERAGING GIS TOOLS TO MANAGE, COMMUNICATE AND IMPLEMENT**

**Presenters:** Rajendra Shrestha, P.E., CFM; City of Pearland  
Andrea Broughton, P.E., CFM; Brazoria Drainage District 4  
Terry M. Barr, P.E., CFM; Halff Associates  
Marshall Settegast; Halff Associates

**Objectives:** This concurrent session will provide an overview of the Pearland/BDD4 Master Drainage Plan update, including its overall goals and objectives. The objectives of the presentation will be:

1. Discuss different ways in which GIS was utilized for more effective data gathering and organization, including data inventory development, field reconnaissance information, and model development and results data sharing. The field data gathering and sharing will be discussed, including custom tools utilized during the collection process.
2. Demonstrate how GIS will be utilized for plan implementation. The tools and capabilities discussed will serve as an endorsement for increased transition to electronic methods in future projects. We will discuss the development of a digital model inventory to assist the City and BDD4 in managing model updates. An overview of the proposed master plan implementation using GIS will conclude the presentation.

**Topic:** Over the last several decades, the City of Pearland (City) and Brazoria Drainage District No. 4 (BDD4) have experienced significant growth and development. In order to better identify the risk of flooding from bayous and streams, the City and BDD4 are currently engaged in a multi-phase update to the master drainage plan (MDP) for their combined area, which encompasses nearly 100 sq. miles. The purpose is to evaluate the existing drainage system and recommend a roadmap for future drainage improvement to reduce the loss of life and property. The update focuses on updating the modeling, mapping, and flood reduction recommendations for more than 85 stream miles as well as capacity analysis and small project identification for an additional 90 miles of local ditches. One of the primary goals of the master drainage plan is to facilitate drainage modeling and data to a digital environment for the City and BDD4. To achieve that goal, Halff leveraged GIS customized tools to Manage, Communicate, and Implement the MDP.

One of the initial components of the MDP was the development of a digital data inventory, which includes a digital record of all available drainage reports and drainage design plan sets linked to a GIS database. This inventory will be utilized and expanded as future studies and projects are conducted. In addition, a similar inventory for updated models will be developed as updated models are completed during the Phase II portion of the study. This is the first step toward a local model management system that can be used by both BDD4 and the City. GIS tools were used for efficient data collection

## CONFERENCE ABSTRACTS

during the early phase of the master plan. Over 900 field data points (comprised of feature types, notes, and attached photos) were collected with the help of Halff's in house developed mobile app. Both the data inventory and the field reconnaissance data were shared through a project web map, developed and hosted by Halff Associates. The web map was also used by Halff to share modeling data as the existing conditions modeling was developed and will continue to be used as flood reduction alternatives are explored. Finally, the implementation plan will utilize GIS to ensure that the MDP is a living document, which is easily accessible by multiple departments across both agencies, as well as the public if desired. The use of GIS, linked to individual project fact sheets will allow for better communication of specific flood reduction project goals, project locations, expected costs, and proposed scheduling when planning or design for other types of CIP projects occurs.

**11:00 am – 11:30 am**

**B6 MASTER DRAINAGE PLAN AND CREATIVE SOLUTIONS FOR HISTORIC FLOODING  
ISSUES WITHIN THE COVINGTON WOODS AREA OF SUGAR LAND**

**Presenters:** Matt Manges, P.E., CFM; Lockwood Andrews & Newnam, Inc.  
Chris Steubing, P.E., CFM; City of Sugar Land

**Objectives:**

1. Highlight the uniqueness of retrofitting and reusing existing stormwater facilities for improved usage.
2. Demonstrate the beneficial use of detailed, dynamic 2D modeling when developing proposed improvement projects.

**Topic:** This presentation will cover the master drainage plan and improvement projects developed for the Covington Woods Watershed of Sugar Land, Texas. Covington Woods is an area that developed prior to current development criteria leading to issues like insufficient storm sewer capacity and lack of defined overland sheet flow paths. First identified by the City's Integrated Storm Water Management Modeling efforts, the City of Sugar Land and LAN took the information to the next level by developing an all-inclusive study and master drainage plan of the area's open channels and storm sewer systems to better understand the source and type of flood risk in the area. From the study, a combination of detention and conveyance improvements were developed that bring the area up to current development criteria while preventing downstream impacts on the receiving channels and watersheds. Improvement options were challenging to develop in that the watershed was highly developed without significant open property to devote to new stormwater facilities. With a dynamic 2D model, the study team recommended the conversion of an existing flow-through detention basin into an offline detention basin in order to mitigate the improvements necessary within the watershed. This creative solution enables the entire watershed to be fully self-mitigating and allow for project construction in an expedited time frame.

### TRACK C – STRATEGIC ISSUES / PUBLIC POLICY

**8:00 am – 9:00 am**

**C1 IMPORTANT STUFF YOU NEED TO KNOW ABOUT FEMA, TCEQ AND THE CORPS OF  
ENGINEERS TO STAY OUT OF TROUBLE**

**Presenter:** Ron Morrison, P.E., CFM/ BSP Engineering

**Topic:** Violation of FEMA regulations as defined in the Combined Federal Register Title 44 Part 60 can result in your community being removed from the Flood Insurance Program resulting in the loss of Federal- backed Flood Insurance, and Federal Grants.

Violation of the TCEQ Texas Administrative Code Chapter 299 Dams can result in Criminal Actions.

Violation of the TCEQ Water Appropriation requirements can result in Administration and Civil Penalties.

Violation of Section 404 of the Clean Water Act (Federal Water Pollution Control Amendments of 1972 P.L 92-500) can result in administrative penalties of up to \$16,000 per day of violation with a maximum cap of \$177,500 in any single enforcement action.

All of this sounds very scary, so know how to avoid them.

## CONFERENCE ABSTRACTS

9:00 am – 9:30 am

**C3 IS THE COMMUNITY WORTH SAVING?****Presenter:** Robert Beduhn, P.E.; HDR Engineering

**Topic:** Across the country, communities face tough decisions. In an era of decreased federal funding, climate change, sea level rise, and increasing disaster costs, many major flood control programs are caught in a financing quandary that is jeopardizing long-term community resiliency and viability. Resiliency is the ability for social, economic, and infrastructure systems to experience an extreme climatic, seismic, or human-made event (shock) and either perform through such an event or return to normal function rapidly following the event. Designing for resiliency is a fundamentally different design paradigm than designing for a specified return interval, such as using statistical analysis of weather or earthquake data. In the United States, entire communities and societies have been built on the premise of a static climate and environment and the predictability of future floods and droughts. Now is the time to begin discussing what our country will look like given that the original assumptions—those that formed the basis of our water-based infrastructure such as dams, levees, and waterways—are not static; they are changing and make our infrastructure prone to failure. Bold leadership is needed to reformulate our infrastructure planning paradigms into a more adaptable and resilient approach that anticipates a greater range of loads and incorporates the ability to adapt and change.

This leadership needs to consider the impacts of a global economy, that business activity may not stay in the United States, and that much of our water-based infrastructure was designed on a false premise of climate stationarity.

9:30 am – 10:00 am

**BREAK**

10:00 am – 10:30 am

**C4 EMERGENCY PREPAREDNESS AND PETS: AUSTIN ANIMAL CENTER RESPONSE TO HURRICANE HARVEY AND OTHER EMERGENCIES****Presenters:** April Moore, Engagement Manager; City of Austin – Austin Animal Center  
Katina Bohrer, P.E., CFM; City of Austin – Watershed Protection**Objectives:**

1. Learn how the City of Austin runs co-sheltering shelters and bringing strays from the area impacted by Hurricane Harvey
2. Learn about the planning and coordination between agencies and between departments within the City on running large evacuation shelters
3. Learn about the differences in preparing, planning, and running the shelters through different disasters (Bastrop fire; Hurricanes Ike, Rita, and Gustave; Halloween Floods in Austin; Hurricane Harvey) and lessons learned from disasters to help with future disaster preparedness

**Topic:** Hurricane Katrina brought the question “what do we do about pets in emergencies?” to the forefront of the nation’s collective mind and subsequently animal shelters and municipalities around the nation have implemented preparedness plans for when natural disasters strike close to home, regionally, and even nationally. When people evacuate their homes, they want to bring their pets with them which determines where they will evacuate to and whether they will be allowed to enter with their pets or if the pets will be taken to a different facility. This presentation explains how the City of Austin handled the influx of stray animals brought from Hurricane Harvey areas as well as how the evacuation centers in Austin accommodated evacuees arriving with their pets. Learn about the necessary coordination between other animal rescue facilities and the amount of coordination required with other departments within the City which goes into a large-scale disaster response. Through the disasters, the Austin Animal Center has refined their list of “must haves” and “would be nice to haves” as well as refined the ways to get people involved with volunteering and donating needed items during the disaster.

## CONFERENCE ABSTRACTS

10:30 am – 11:30 am

### **C5 FLOOD PLAIN ADMINISTRATORS PANEL DISCUSSION**

**Panel:** Pat Brawner; Medina County  
Kevin Shunk, PE, CFM; City of Austin  
John Johnston, PE, CFM; City of Victoria  
John Espinoza, PE, CFM; City of San Marcos / TFMA Conference Committee Chair

**Topic:** This session will include open discussions with floodplain administrators and managers regarding various floodplain management topics. The initial topic for discussion will be “what can we do to notify the public and co-workers regarding an upcoming flooding event.” Audience participation will be encouraged.

## TRACK D – HURRICANE HARVEY

8:00 am – 8:30 am

### **D1 RISK ASSESSMENT & HURRICANE RESILIENCY**

**Presenters:** Robert Armstrong, P.E., CFM; Huitt Zollars  
Allison Wood, E.I.T.; Huitt Zollars

**Objectives:**

1. Gain a general understanding of the history of hurricanes and tropical storms in the Gulf and the rainfall magnitudes associated with those events.
2. Gain an understanding of what data is used to determine 1% AEP rainfall events.
3. Contemplate the suitability of current design criteria with respect to risk & resiliency for hurricane events.

**Topic:** Infrastructure is designed to a specified storm event based on probability of future rainfall events and level of risk. Currently, these design standards are established using historical geographically-specific rainfall data. However, hurricane events have the ability to bring levels of rainfall much higher than the expected 1% or 0.2% AEP storm event, as exemplified recently by Hurricane Harvey. The magnitude of devastation caused by these events should prompt us to take another look at our role as engineers, floodplain managers, policy makers, planners, etc. and how we assess risk and determine design standards. All coastal areas are at risk of high rainfall depths from hurricane and tropical storm events. Along the Gulf Coast, hurricanes are frequent enough that their impact should inform decision-making related to large infrastructure projects.

How are we currently evaluating the risk of hurricane events when we set design standards? How can we analyze rainfall data differently to develop design standards that lower risk and promote resiliency for hurricane events?

8:30 am – 9:00 am

### **D2 IMPACTS OF HURRICANE HARVEY ON SAN ANTONIO**

**Presenters:** Brandon Hilbrich, P.E., CFM; HDR Engineering, Inc.  
Anthony Henry, HDR Engineering, Inc.  
Wayne Tschirhart, P.E., PMP, San Antonio River Authority

**Objectives:**

1. Highlight SARA’s current flood warning system.
2. Discuss modeling approaches used to determine Hurricane Harvey impacts.
3. Present floodplain impact findings.
4. Status on flood warning system improvements and uses.

**Topic:** Hurricane Harvey hit the Texas Coast and devastated portions of Houston and Southeast Texas with historic rainfall depths of up to 52”. So the question on everyones mind locally is what would have happened to our city (San Antonio, TX) if Hurrucane Harvey would have moved west? The San Antonio River Authority (SARA) in conjunction with the City of San Antonio have been asked this question by their respective leaders and they are seeking answers utilizing a system that was set in place a few years ago.

## CONFERENCE ABSTRACTS

In 2013 SARA’s Watershed Engineering Staff with support from HDR Engineering (HDR) developed a real time flood warning system using the Innovyze FloodWorks software utilizing the InfoWorks RS hydrologic and hydraulic models. **Infoworks RS** models were created for the Upper San Antonio River Basin, the Leon Creek Basin and parts of the Medina Basin and an update to the Salado Creek Basin model. Then in December 2014 Innovyze announced that some InfoWorks products were being retired and getting replaced by the InfoWorks Integrated Catchment Model (**ICM**). **ICMLive** was also introduced as the next generation real-time modeling tool from Innovyze, and is the successor to FloodWorks. HDR has assisted SARA with this transition and has performed a pilot project on streams within the Upper San Antonio River basin to determine the effort required to convert the entire flood warning system.

With the support of HDR, SARA has expanded the ICM model within the Upper San Antonio River Watershed to determine the impacts a storm of Hurricane Harvey’s magnitude would have on the heart of our city. The model used the actual rainfall data recorded over the 7 day storm duration of Hurricane Harvey. This rainfall data was shifted to Bexar County such that the most intense rainfall depths were centered over the Upper San Antonio River, particularly the Olmos Basin to mimic the record storm occurring in San Antonio. The ICM model was refined to include the latest approved LOMRs and include 2D areas to simulate complex urban overland flows. The resulting ICM model of the Upper San Antonio River Basin is a dynamic fully integrated and interconnected 1D-2D model covering about 127 square miles with 14.5 miles of the SAR, over 70 miles of tributary creeks and upwards of 30 miles of storm sewer.

**9:00 am – 9:30 am**

**D3 TAX-DAY AND HURRICANE HARVEY FLOODS VALIDATE THE DESIGN AND DEVELOPMENT INFRASTRUCTURE IN THE CYPRESS CREEK/ADDICKS OVERFLOW ZONE – A STUDY IN 1D/2D MODELING**

**Presenters:** Steven Golz, P.E., CFM; BGE, Inc.  
Chris Doherty, P.E.; BGE, Inc.

**Objectives:**

1. The coordination, modeling, and infrastructure that went in to the design and implementation of the development.  
The 3,600-acre Elyson development is the first Master Planned community to develop in the Cypress Creek/Addicks overflow zone. Design engineers spent significant coordination time with HCFCD (Harris County Flood Control District), as they developed regulatory guidelines and an efficient review process. A combination of unsteady HEC-RAS and 1D/2D XPSWMM 2D were used to model and design the improvements for the 692-acre Elyson Phase 1 Development. A system of collection and conveyance channels, floodplain storage and detention basins were designed to show no impact to the surrounding community as a result of the 692-acre development placing fill in the overflow zone.

As land development for the metropolitan Houston area progresses into the Cypress/Addicks overflow area, much greater detail is needed to adequately plan for and design systems to maintain existing conveyance and floodplain storage. New development projects will require appropriate conveyance channels, mitigation basins, and detention basins in order to develop in the overflow area without causing an impact to adjacent and downstream property. HCFCD established guidelines that require any development in the overflow area utilize a 1D/2D model to show no impacts to surrounding communities as a result of proposed development.

2. Performance of the development during the Tax-Day and Hurricane Harvey historical storm events.

The April 2016 “Tax-Day” flood was a short-duration, high intensity storm (16 inches in 12 hours), resulting in record flood levels on nearby Bear Creek. The 2017 Hurricane Harvey storm included several high-intensity storm waves, with a total four-day rainfall of 33 inches, which resulted in record overflows from Cypress Creek to Bear and South Mayde Creeks. In both storms, which exceeded the 100-year, 24-hour design storm of 12.4 inches, the drainage infrastructure for the Elyson development performed well, stayed within its high banks, and resulted in no structural flooding.

## CONFERENCE ABSTRACTS

9:30 am – 10:00 am

**BREAK**

10:00 am – 10:30 am

**D4 INTEGRATING ARCGIS WITH FLOOD MODELING APPLICATION PROGRAMMING INTERFACES: A RAPID FLOOD RISK MITIGATION ASSESSMENT TOOL FOR HARRIS COUNTY, TEXAS POST-HARVEY**

**Presenters:** Jacob Torres, Ph.D., P.E., CFM; Lockwood Andrews, & Newnam, Inc.  
Matt Manges, P.E., CFM; Lockwood Andrews, & Newnam, Inc.  
Wayne Crull, PE; Harris County Flood Control District  
Robert Henry; Lockwood Andrews, & Newnam, Inc.  
Alex Govea, EIT; Lockwood Andrews, & Newnam, Inc.  
David Coburn, EIT; Lockwood Andrews, & Newnam, Inc.

**Objectives:**

1. Highlight the uniqueness of how this model was conceptualized, developed, and evaluated – and challenges related thereto.
2. Inform how this tool has been tested on pilot watersheds within Harris County to inform the feasibility of capital improvement projects and help establish a new rapid feasibility assessment methodology.

**Topic:** In the wake of Hurricane Harvey (2017), Houston policy makers need reliable information producing tools to prioritize areas in need of critical re-investments as part of the disaster recovery process. Moreover, the need for rapid feasibility assessments for major flood risk mitigation projects in Harris County, Texas is more vital than ever, given the county's complex system of bayous, channels, and ditches. The authors have successfully developed a novel watershed planning tool that coalesces an ArcGIS front-end with a riverine API back-end that analyzes floods and optimizes a recommended solution at the planning-level. The authors will demonstrate the utility of this tool with discussions on conceptual framework and numerical its implementation.

10:30 am – 11:00 am

**D5 ZERO LIVES LOST & 100% EVACUATION: A HURRICANE HARVEY AND COLORADO RIVER FLOODING SUCCESS STORY**

**Presenters:** Jared Allen; NOAA/National Weather Service-Austin/San Antonio, TX  
Janet Carrigan; Fayette County

**Objectives:**

1. Showcase the enhanced impact-based decision support and GIS services provided by the National Weather Service to Fayette County OEM during Hurricane Harvey through ensemble river forecasts and river flood extent maps to identify vulnerable locations near La Grange, TX
2. Highlight Fayette County OEM preparation, procedures, and evacuation timeline.
3. Emphasize the value of communication and the relationship between NWS and Emergency Managers that lead to a successful mission of saving lives and property.

**Topic:** Tropical Storm Harvey developed early on 24 August and quickly became a strong category 4 hurricane as it made landfall north of Corpus Christi, TX on 26 August. Given the expected slow to nearly stalled storm motion, rainfall projections for the Texas Coastal Plains (including Fayette County) were forecast to be 25 to 30 inches with isolated amounts near 40 inches for the 26-29 August timeframe. As a result, major- to record-river flooding was expected. On 25 August, Janet Carrigan, emergency manager of Fayette County, called the NWS Austin/San Antonio Weather Forecast Office requesting projected Colorado River heights to begin a county-wide flood impact mitigation plan. An ensemble river forecast showing (at the time) a worst-case scenario crest height near 50.5 feet on 28 August was provided to Carrigan. This projected height was five feet higher than the most recent memory-definable major flood of 45.5 feet in 1998 at La Grange, TX and only six feet below the all-time record of 56.7 feet set in 1869.

## CONFERENCE ABSTRACTS

Upon receiving the river forecast, Carrigan disseminated it to all elected county officials and first responders. Being a rural county with limited resources, personnel and equipment wise, any and all information to prepare for a potential historic flood was needed. With population and infrastructure increasing since the 1998 flood, the potential for loss of life and property was of paramount concern for the Fayette County OEM. Despite some uncertainty but through continued direct communication with the NWS of the high-confidence rainfall and river height forecast, a reverse 9-1-1 “Code Red” was issued on 25 August (when river was at only 4.67 feet). This alert was sent to warn all residences whose homes were with the 100-year floodplain, plus a 5% buffer, to be ready to leave their homes at a moment’s notice.

Early on 28 August, the NWS provided Fayette OEM with experimental GIS river flooding extent maps near La Grange for the expected maximum crest. The river crested at 54.18 feet, the third highest since 1869 and 1913 on the afternoon of 28 August. The NWS and its partners accurately predicted where the water would reach, despite having no historical data to show what areas would be inundated. This information gave Fayette County OEM sufficient time to develop, enact, and ensure evacuation orders were followed. The scientific data and GIS mapping allowed for the Fayette County OEM to better allocate resources and convince other county jurisdictions of the flood’s severity. Ultimately, the early ensemble river forecasts, GIS river flood extent maps, and the proactive OEM of Fayette County directly resulted in 100 percent evacuation of the flooded area with no lives lost, no injuries, and hundreds of thousands of dollars in saved property assets.

**11:00 am – 11:30 am**

### ***D6 IT RAINED 50 INCHES! – A VIEW FROM THE BAYOU***

**Presenter:** Andy Yung, P.E., CFM; Walter P Moore and Associates, Inc.

#### ***Objectives:***

1. Define the causes and results of flooding from Hurricane Harvey
2. Discern, identify, and address the misinformation that surrounds a catastrophic event
3. Identify innovative ways to rapidly provide support to emergency managers during similar events.

**Topic:** On August 25<sup>th</sup>, 2017 at about 10:00pm, a Category 4 hurricane by the name of “Harvey” roared ashore at Rockport, Texas. The storm moved inland and then stalled, bringing moisture up from the Gulf of Mexico and dropping it onto the coastal areas of Texas. The rain bands repeatedly buffeted the Houston Metropolitan Area, home to 6.5 million people. As one witness said, “The rain just kept coming!” After the first few hours, the ground became saturated, detention basins became full, and the successive rains resulted in significant flooding.

What caused so much widespread flooding? What can we learn from this experience? How did the engineering community respond during and after the event? This presentation will cover activities and observations of one engineering firm at “ground zero” for the resulting flood, providing support to emergency managers in the form of forecasted peak flood inundation, storm-related information used to update the public through various agencies, and post-flood data collection.

## **TRACK E – NATURAL & BENEFICIAL FUNCTIONS - INFRASTRUCTURE**

**8:00 am – 8:30 am**

### ***E1 KEE BRANCH TRIBUTARY STREAM STABILIZATION, ARLINGTON, TEXAS***

**Presenters:** Ramesh Chintala, P.E., CFM, D.WRE; Atkins  
Tami Norton, P.E., CFM, PMP; Ecosystem Planning & Restoration, Inc.  
Lee Jeffrey, P.E.; City of Arlington

**Topic:** Stream channel erosion in Kee Branch Tributary 1 has degraded stream habitat and is threatening public and private property. The channel instability is caused by increased runoff due to watershed urbanization (residential and commercial development) in the last four decades. Traditional concrete grade control structures installed to maintain the vertical stream bed profile have failed due to severe incision (up to six feet). Stream stabilization measures are being designed for approximately 3,000 feet of channel using natural channel design principles with consideration of site space

## CONFERENCE ABSTRACTS

constraints. This presentation will discuss the design approach and challenges of restoring natural stream functions in an incised urban creek within a confined stream corridor.

**8:30 am – 9:00 am**

***E2 SAN PEDRO CREEK – PHASE 1 COMPLETION TO CELEBRATE 300 YEARS***

**Presenters:** Steven Dean, P.E., CFM; Pape-Dawson Engineers, Inc.  
Abigail Bush, P.E., CFM; San Antonio River Authority  
Ron Branyon, P.E., CFM, CSM; HDR Engineering, Inc.

**Objectives:** By attending this session, participants will be better able to:

1. Understand issues dealing with areas with over 300-years of human activity.
2. Learn to make a drainage project into an internationally known linear park.
3. Developing a plan for utility coordination for complicated projects.

**Topic:** The San Pedro Creek Stream Restoration project is landmark project for Bexar County, San Antonio River Authority and the City of San Antonio. This project is taking a drainage improvement/flood control project and leveraging it to become a linear park, a focal point for activity for the San Antonio Residents and an opportunity to share the history of the San Antonio, which celebrates its 300<sup>th</sup> anniversary in May 2018.

There were several challenges for this project. One was the things you can't see from the surface. There are numerous challenges implicit with dealing with a site with 300 years of human activity (cultural resources and contaminated soils). Combine this with over 100-years for utility installations, the need to maintain service while having to complete underground conversions and you have a serious coordination effort on your hands. Another challenge was transforming a benign flood control widening project into an internationally recognized linear park, complete with art from well-known local and international artists while completing the job in time for the May 5, 2018 birthday.

Through this presentation, we will review and expand on all these challenges and how they were mitigated. These include extensive utility coordination along with coordination with USCOE, Texas Historic Commission, FEMA, TCEQ, San Antonio River Authority, Bexar County, City of San Antonio and others.

**9:00 am – 9:30 am**

***E3 THINKING OUTSIDE THE GABION – CHANNEL MAINTENANCE APPROACHES THAT WORK WITH NATURAL STREAM FUNCTIONS***

**Presenters:** Tami Norton, P.E., CFM, PMP; EPR  
LeeAnne Lutz, P.E., CFM; EPR

**Objectives:**

1. Correlate stream condition and behavior with natural stream processes.
2. Identify where maintenance practices could be modified to improve stream functions.
3. Manage impacts to streams through practices that require less maintenance.

**Topic:** Pristine rivers and streams are valued by communities as recreational and economic development opportunities, especially large perennial systems that are highly visible. Natural stream systems are also valuable natural resources in terms of floodwater storage, water quality filters, and habitat for numerous species, both in channel and in the floodplain. They also serve as conveyors of storm water and floods that often results in erosion of stream bed and banks, property and infrastructure damage, impaired water quality, and require regular, sometimes costly maintenance. This session will present an overview of natural stream functions and processes, and demonstrate how stream restoration techniques and maintenance practices can benefit the community.

## CONFERENCE ABSTRACTS

9:30 am – 10:00 am

**BREAK**

10:00 am – 10:30 am

**E4 ELIZA SPRING DAYLIGHTING PROJECT AT BARTON CREEK, AUSTIN, TEXAS**

**Presenters:** Eric Stewart, P.E., CPM, ENV SP; HDR Engineering, Inc.  
Donelle Robinson, Ph.D.; City of Austin Watershed Protection Department  
George Doubleday, P.E., CFM; HDR Engineering, Inc.

**Objectives:**

1. With construction of this project now complete, this presentation will provide before and after comparisons, discuss design considerations and lessons learned, as well as corrective actions taken for this project located in an active floodplain and sensitive aquatic ecosystem.

**Topic:** Eliza Spring is one of the four springs in Zilker Park in Austin that are collectively known as Barton Springs. The spring, adjacent to Barton Springs Pool, is home to the largest known population of Austin's unique and endangered Barton Springs Salamander. In the 1920s, flow from the Eliza Spring was enclosed in a pipe. To help protect the endangered Barton Springs and Austin Blind Salamanders, we recreated the stream that once flowed from Eliza Spring returning the run to a more natural state to enhance the salamander habitat and improve the potential for long term recovery of the species. This project also gives the community a highly visible place to view a more natural salamander habitat and to learn about Austin's unique environment and two of our iconic endangered species.

The daylighting project is located in the lower end of the Barton Creek watershed within the special flood hazard area and is frequently inundated. The permitting, design, and construction phase of this project faced several challenges due to the floodplain, groundwater/spring flows, endangered species, and the existing registered historical structure. Hydraulic modeling was performed to design water control gates and an open channel to meet velocity requirements for aquatic organism passage. Removable fencing was designed to facilitate no adverse floodplain impacts. Selection of natural materials while also providing resistance to erosive floodplain flows and stabilize high alluvial banks was critical. Phasing of the project to redirect spring flows via gravity and pumped bypass flow required strict specifications to avoid impacts to endangered species habitat and also integrate with the function of the existing Barton Creek bypass tunnel and storm drain lines. Real-time flood and stream flow monitoring during construction was required to implement the proposed measures and initiate mobilization and demobilization. The project also had specific water quality requirements which necessitated robust BMPs during construction. Several design elements were modified during construction to address and adapt to in-situ conditions.

10:30 am – 11:00 am

**E5 GAINES TRIBUTARY OF BARTON CREEK AN URBAN DRAINAGE ODYSSEY**

**Presenters:** Thomas W. Mountz, P.E., D.WRE, CFM; RPS  
John Middleton, P.E., CFM; City of Austin  
Rupali Sabnis, M.S., P.E., CFM; City of Austin

**Topic:** The City of Austin is planning a project to reduce flood risk for nearly 100 homes and several roadways in the Oak Park and Oak Acres neighborhoods in southwest Austin. The neighborhoods were platted in the county in the 1940's with only limited drainage improvements and were then annexed by the City of Austin in the 1980's. The extent of the drainage issues were not understood until severe flooding occurred in October 2013 and again in May 2015. The neighborhoods are located along a tributary of Barton Creek known as the Gaines Tributary and both are located over the Edwards Aquifer recharge zone. The flooding in these neighborhoods occurs from overland flow within the watershed, water from the creek that spills its banks, and also from a spillover into the Gaines Tributary watershed from the adjacent Williamson Creek watershed.

Since 2011, the City has worked with RPS to perform a comprehensive hydrologic and hydraulic study of the Gaines Tributary, including a detailed floodplain study and preliminary engineering study for improvements to the Oak Park

## CONFERENCE ABSTRACTS

and Oak Acres neighborhoods to address localized and stream flooding issues. The PER, which was completed in 2017 included:

- A 2D model of overflow/spill from Williamson Creek compounding the flooding issues in these neighborhoods bordering U.S. 290.
- An evaluation of improvements to alleviate the flood risks posed by creek overflows and localized flooding from upstream undeveloped properties.
- An evaluation of stream channel improvements to safely convey flood flows through the 2 neighborhoods.

Structural flood control option such as detention ponds, flood diversion improvements, conveyance improvements, etc., were all considered to alter the flood condition of the watershed. Each of these options had a high variability in complexity and cost. The final PER outlined 2 very different options with varying constraints and permitting issues, in part due to the project's location within the Barton Creek Watershed and Edwards Aquifer Recharge Contributing Zone.

This presentation discusses the complexity of issues faced in developing solutions and selecting the preferred alternative for design and construction. It will also discuss the City and Consultant coordination and concerns for a "conventional" structural solution and an alternative solution that provides flood risk reduction while integrating goals from the City of Austin Watershed Protection Department's water quality and erosion missions.

**11:00 am – 11:30 am**

### ***E6 LEBOW CREEK MASTER PLAN***

**Presenter:** Steven E. Eubanks, P.E., PMP, CFM; City of Fort Worth

**Objectives:**

1. Recognize the need to adopt various flood mitigation strategies and community enhancements to address different conditions in a single master plan.
2. Understand the importance of project phasing as part of a master plan solution.
3. Apply prioritization principles to developing individual projects for implementation.

**Topic:** Lebow Creek flows through economically disadvantaged Fort Worth neighborhoods with home and roadway flooding occurring frequently and flood fatalities in the past. Beginning with tax maps taped together on an engineer's wall in 1999, the Lebow Creek Master Plan was developed over several years to address these problems with a holistic solution encouraging economic revitalization and enhanced recreational opportunities. This presentation will provide an overview of the watershed and its problem areas, as well as the range of solutions developed, including crossing improvements, property buy-outs, stream restoration, multi-use detention facilities, channel improvements and walking trails. It will also examine several aspects of master planning for addressing what may appear to be "unsolvable" flooding, as well as strategies for making flood mitigation a positive community objective and not just necessary evil to be endured.

## **TRACK F – HAZARD RISK ASSESSMENT & MAPPING –FLOODPLAIN MANAGEMENT CONCEPTS**

**8:00 am – 8:30 am**

### ***F1 THE STORMWATER BENEFITS OF HIGH-PERFORMANCE URBAN TREES***

**Presenter:** Matthew Werle; GreenBlue Urban

**Objectives:**

1. Review projects that have successfully integrated LID tree pits, including how they were designed and installed, and examine the quantity reduction and quality improvement results
2. Understand why "Low Impact Development" is only a buzzword unless sustainable practices are being used and performance is realized
3. Learn how the implementation of sustainable BMPs can become common practice without compromising return-on-investment

## CONFERENCE ABSTRACTS

**Topic:** “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.

**8:30 am – 9:00 am**

**F2 TAKING THE NEXT STEP IN STRATEGIC PROGRAM MANAGEMENT: THE BIRTH AND GROWTH OF THE CITY OF FORT WORTH'S STORMWATER MANAGEMENT PROGRAM**

**Presenters:** Greg Simmons, P.E., CFM; City of Fort Worth  
Jennifer Dyke, CFM; City of Fort Worth

**Objectives:**

1. Assess the current state of a stormwater management program
2. Define and execute a thorough and effective process for developing a strategic program direction
3. Transition from a strategic direction into an achievable action plan to advance the strategy

**Topic:** The City of Fort Worth established a Stormwater Utility in 2006, to provide a consistent revenue stream to support a Stormwater Management program. Prior to that time, City efforts relative to stormwater management were almost exclusively reactionary and the City had little information to adequately understand the nature and magnitude of stormwater issues throughout the City, much less take steps to mitigate them. Consequently, the first 10 years of the program were focused on obtaining fundamental asset management information while also trying to mitigate some of the most chronic and obvious stormwater management problems facing the City. By 2016, the program had:

1. Acquired a great deal of key program management data
2. Learned much about the disposition/priorities of the community and elected officials toward stormwater management
3. Gained a much greater understanding about the feasibility of mitigating the range of stormwater needs within program resources
4. Clearly identified several needs for fully-vetted, City Council endorsed policies to facilitate a consistent and strategic approach to several recurring, sensitive issues

Stormwater Management staff realized that, in order to optimize the use of program resources to best meet the needs and goals of the community, significant effort was needed to assimilate and understand the information and lessons learned during the first 10 years of the program to develop a strategic direction that is realistic, well-prioritized, and responsive to the needs of the broader community.

This presentation will describe the process developed and executed by the City of Fort Worth Stormwater Management staff and consultants to: assimilate and interpret the key data already acquired to help define the current state of the program; supplement existing data with the perspectives of key internal and community stakeholders/partners and benchmark communities; distill all of the input to inform a strategic program direction; gain institutional endorsement of the strategic plan; and develop an actionable tactical approach to using the strategic plan to effectively manage the program, monitor progress toward strategic goals, and make course corrections in response to changing circumstances and priorities. Additionally, the brief will touch on the key policy issues that were discussed and advanced as a part of the process: local (non-FEMA) floodplains, severe private property channel erosion, buyouts for flood and erosion mitigation, and level of oversight of private development.

## CONFERENCE ABSTRACTS

9:00 am – 9:30 am

### **F3 CITY OF AUSTIN GUADALUPE STREET STORM DRAIN IMPROVEMENTS**

**Presenters:** Reem Zoun, PE, CFM; City of Austin Watershed Protection  
Rebeka McKay, PE, CFM; City of Austin Watershed Protection  
Chad Cormack, PE, CFM; K Friese + Associates

**Topic:** The Guadalupe Street Storm Drain Improvements project is ranked as the 5<sup>th</sup> highest on the FY17 Local Flood Risk Reduction storm drain improvements projects priorities list. The project is located in central Austin within the Waller Creek watershed and has formal records of 16 building flooding complaints, 14 yard complaints, and 13 streets complaints. Initial City studies indicate that most of the over 5-miles of existing storm drain pipe does not have capacity to adequately convey even the 2-year design event; which has resulted in frequent flooding to the area.

K Friese + Associates is working with the City to develop optimized solutions to reduce flooding to the area. A detailed Infoworks ICM 2-dimensional (2D) hydraulic model was developed to simulate existing conditions including multiple recent historical rainfall events used to validate/calibrate the models. The project has presented an opportunity to explore various topics related to current 2D modeling themes such as: 2D modeling terrain development, rain-on-mesh vs. detailed catchment modeling, H&H design software transformations, and simulation of inlet capacity for 2D modeling. These topics, as well as the optimized alternatives development will be discussed during this presentation.

9:30 am – 10:00 am

**BREAK**

10:00 am – 10:30 am

### **F4 AN ALTERNATIVE TO INCREASING STORM SEWER SIZE – INCREASING INLET CAPACITY?**

**Presenters:** Martin Cristofaro, P.E., RPLS, CFM; Stuart Consulting Group  
Kelly Humphreys, P.E.; 5Engineering

**Objectives:**

1. Consider all perspectives to accurately capture the source of the problem.
2. Out of the study came a novel solution to generate inlet capacity.

**Topic:** A low-lying area in an established subdivision in western City of Houston has experienced structural flooding 6 times since construction in the 60s. Several attempts to alleviate the problem have done little to prevent stormwater from damaging homes during short storms of high intensity. The City of Houston requested a detailed analysis of the existing system to determine the source of the problem: tailwater conditions, storm sewer capacity, or inlet capacity. The conclusion was that although there are significant inlets in the neighborhood, they are not efficiently placed due to the grades in the streets. A low area needed to be created and inlets placed in it to generate the capacity needed to capture stormwater before it turned into the low-lying area and damaged homes. This presentation will discuss the approach to the modeling and the results.

10:30 am – 11:00 am

### **F5 RISKMAP FLOOD RISK ANALYSES IN DALLAS DFW METROPLEX FOR NEARLY 850,000 PROPERTIES**

**Presenters:** Jennifer Knecht, CFM; FEMA Region 6 Mitigation- Risk Analysis  
Barrett Goodwin, GISP, CFM, HzP; Dewberry

**Objectives:**

1. Demonstrate comparative differences between various Hazus analyses with progressive parcel-based inventory improvements.
2. Indicate challenges, solutions and implications of creating Hazus building inventory data from parcel/address data.

## CONFERENCE ABSTRACTS

3. Indicate usefulness of parcel/address-based data and define needs for future work.

**Topic:** FEMA Region VI contracted two adjacent HUC-8 watershed projects in the DFW Metroplex. In combination, both watersheds include over 5,000 miles of regulatory streams for which 1,600 miles were updated in the FEMA Flood Insurance Study (FIS). In addition to the regulatory data products, Flood Risk Products were developed for both watersheds to include parcel-based analyses of the building stock. The primary goal of the Flood Risk Assessment efforts was to assess the potential risk at the address, building or parcel-level per data availability. Combined, the watersheds include nearly 850,000 parcels.

Primary project goals included updated baseline damage and loss estimates, updated Hazus General Building Stock (GBS), individual structure-like analyses, Changes Since Last FIRM (CSLF) and Areas of Mitigation Interest (AOMI) to provide comparative flood risk data with Refined Depth Grids. Data were processed into final FEMA deliverables to include the standard creation of a Flood Risk Report (FRR), Flood Risk Map (FRM) and Flood Risk Database (FRD) in which the FRD is richly populated with the full variety of Hazus-based inputs and outputs of:

- Stock GBS (within S\_CenBlk\_Ar)
- Updated Baseline Risk Assessment (within L\_RA\_AAL)
- Newly created User-Defined Facilities (within S\_UDF\_Pt)
- Parcel-based Risk Assessment (within L\_RA\_UDF\_Refined)
- Updated GBS based on User-Defined Facilities (within L\_Local\_GBS)
- Newly Refined Risk Assessment (within L\_RA\_Refined)

In order to meet the variety of goals associated with the project, multiple HAZUS-MH Flood Model scenarios were completed to show the relative risk that can exist with improvements to the building stock.

**11:00 am – 11:30 am**

**F6 FLOODFEED: YOU WON'T BELIEVE THESE 3 NOMOGRAPHS THAT PREDICT YOUR FLOOD ELEVATION**

**Presenters:** Jim Keith, P.E., CFM; Walter P. Moore and Associates  
Stephanie Griffin, PE, CFM; City of Grand Prairie, TFMA Treasurer

**Topic:** The City of Grand Prairie is centrally located in the Dallas-Fort Worth Metroplex, encompassing approximately 81 square miles with a population of nearly 185,000. The City participates in both the National Flood Insurance Program (NFIP) and the Community Rating System (CRS), with a current CRS ranking of 5. The West Fork Trinity River, along with several major tributaries to the West Fork, generally flow from west to east across the City. The orientation of the City boundaries relative to the geography of the watersheds has presented challenges relative to storm water and floodplain management, particularly in regards to effective flood warning systems.

Walter P Moore and Associates (WPM), in partnership with the University of Texas at Arlington (UTA), has recently completed Phase 1 of a web-based Flood Warning & Forecasting System which will enable City Emergency Managers to identify areas of inundation based on real-time rainfall information and allow the timely dispatch of first responders to close roads, evacuate, shelter-in-place, and/or begin rescue operations. WPM / UTA is utilizing a phased approach that began with a simplified Flood Warning System focused on 5 critical locations within the City where concerns are greatest during flood events. The system is scalable, allowing for the incorporation of additional existing and future gaging sites, and is planned to include additional flood forecasting enhancements in future phases.

This presentation will discuss the development of nomographs for determining peak stage, time to peak, and time to critical elevation, along with a storm transposition analysis to identify critical storm centers with the most severe hydrologic impacts. The authors will then demonstrate the web-based features of the operational Flood Warning System, which can be tailored to the specific needs of individual communities and discuss future enhancements and additional 5 sites planned for Phase 2.

## CONFERENCE ABSTRACTS

2:00 pm – 5:00 pm

AFTERNOON TECHNICAL CONCURRENT SESSIONS – TRACKS G, H, I, J, K AND L

TRACK G – HYDROLOGY & HYDRAULICS (PART 2)

2:00 pm – 2:30 pm

**G1 ENGINEERING BEYOND TYPICAL COMPUTER FLOODPLAIN MODELING**

**Presenters:** Wade Barnes, PE, CFM; Parkhill Smith & Cooper  
Gonzalo Cedillos, PE, CFM; El Paso Water

**Topic:** The El Paso area has mountain terrain, desert alluvial fans, and flatlands that lead into the Rio Grande Valley – a hydrologist’s nightmare. Then, too, as the city has expanded into the mountainous areas, many natural arroyos have been transformed into concrete channels.

Arroyo 1 is located in the rapidly developing west side of the Franklin Mountains. This arroyo is a great concern to El Paso Water. FEMA issued a LOMR for Arroyo 1 in 2005 showing the 100-year storm event within the concrete lined channel banks. The current effective Hydrologic Engineering Center’s River Analysis System suggests the Bear Ridge Channel should contain a 4.3-inch 24-hour 100-year storm event within the channel banks. The FEMA effective flow is 1580 cfs for the upper region of Arroyo 1.

However, on July 10, 2015, an intense storm event occurred, causing water to jump the banks of Arroyo 1 at a 90-degree curve and damage adjacent rock wall structures and the concrete channel in a 35-foot radius located in Arroyo 1. PSC analyzed NOAA radar images, estimating rainfall intensity at 2.5 in/hour - equating to approximately 1.25 inches over the 30 minute storm event. A flow rate was estimated at 330 CFS with a velocity of 25 ft/s. Rain gauges reported only 1.29 inches of precipitation depth for this storm event over 24 hours.

Parkhill, Smith, & Cooper, Inc (PSC) used hand calculations for superelevation, minimum curve radius, channel developed length and culvert inlet control equations in a detailed analysis, which revealed deficiencies in the geometric and hydraulic design of the existing constructed channel. PSC’s engineering calculations demonstrated how a 6- to 7 - foot superelevation of the water surface in the sharp bend exceeded the channel banks in the recorded rainfall. The superelevation in the 100-year storm event was estimated at 15-17 feet. Typical 1D hydraulic models do not account for superelevation.

Just downstream of the bend are two 6’x 4’ drainage culverts underneath a roadway. PSC’s additional hydraulic analysis, which included sediment and debris loading, showed the FEMA 100-year effective flow rate will not pass through the culverts without overtopping, and indicated wave interaction between the bend the roadway embankment, leading to damage of the concrete lining. The analysis showed the usual 1D HEC-RAS model under-predicted the limits of the flood boundary.

PSC proposed two alternatives to reduce velocities of floodwaters approaching the 90-degree bend and the culvert from 30 fps to less than 3 fps in the 100-year event, and recommended an upstream sediment/detention basin to reduce debris loads and peak flow in the concrete-lined channel. Reduction of peak flow in the channel avoids the need to replace the Contessa Ridge culverts. El Paso Water selected a stilling basin alternate and requested PSC add design of the suggested upstream sediment/detention basin to the project.

Sometimes when you deal with structures with challenging bends, careful analysis supersedes the previous computer modeling. Since reviewers, including FEMA, accepted the HEC-RAS model of the channel at face value, the mapped floodplain did not reflect the actual flood risk. An in-depth engineering assessment of all factors, going beyond typical computer modeling, revealed the need to reduce flow velocity and quantity as a solution to this situation.

## CONFERENCE ABSTRACTS

2:30 pm – 3:00 pm

### **G2 LAUDER ROAD STORMWATER DETENTION BASIN H&H MODELING AND DETAILED DESIGN**

**Presenters:** Isabel S. Fung, P.E., PMP; Harris County Flood Control District  
Alem Gebriel, Ph.D., P.E.; Harris County Flood Control District  
Yu-Chun Su, Ph.D.; P.E., CFM, CPESC, CPSWQ; Lockwood, Andrews & Newman, Inc.

**Topic:** The Lauder Road Stormwater Detention Basin (HCFCD P500-06-00) is located in Harris County Precinct 2 south of the IAH Airport. The project will address repetitive flooding in the Greens Bayou watershed and is one of several flood damage reduction projects making up a larger program known as Progress Greens.

**Objectives:**

1. Multidiscipline Team Effort in Developing Conceptual Layout Design:
  - a. The project involved HCFCD working together with the engineering prime consultant (LAN), landscape architect (Asakura Robinson), geotechnical (HVJ), environmental (Crouch), and survey (Cobb, Fendley) firms to develop conceptual layout design of the extended detention basin. The conceptual design included wet-bottom permanent pools, bottom and vegetated shelves, all-weather maintenance access, and tree preservation areas. Jurisdictional wetlands and OHWM areas were also identified to support the design and permitting purpose.
  - b. Grading plans were then prepared on top of the landscape conceptual layout design to yield the stage-storage relationships for the basin. The relationships were entered into the Post-Project Conditions unsteady HEC-RAS models to support the design of the lateral structures, evaluate the performance of the basin, and adverse impacts of the project on studied streams. Following HCFCD guidelines and criteria, detention basin outlet pipe sizing and water quality volume methodologies and spreadsheets were also developed to support the modeling and design efforts.
2. Unique Hydrologic and Hydraulic Modeling to Support Conceptual and Detailed Design:
  - a. The acquisition and construction schedule of the P500-06-00 basin requires the division of the basin into three phases, with a total detention volume of over 1,200 acre-feet. The H&H modeling and studies included pre-project one- and two-dimensional (1D and 2D) unsteady modeling using HEC-RAS, and post-project conditions analyses. The modeled alternatives included Phase 1 Basin only, Phases 1 and 2 online together, and Phases 1, 2, and 3, online together.
  - b. The conceptual layout design by the landscape architect was first used to conduct alternative H&H modeling. The modeling results were then used to refine the conceptual design and finalize alternative selection. The final basin layout was then carried into detailed basin design, which then produced the final stage-storage relationship of the basin for use in the final H&H models.

3:00 pm – 3:30 pm

### **G3 CULVERT OPERATION: MISSION POSSIBLE AT FORT HOOD**

**Presenters:** Lynn Schaub, CPESC; DPW Engineering  
Keith Byrne, P.E., CFM; Freese and Nichols, Inc.  
Jorge Gallosa, E.I.T., CFM; Freese and Nichols, Inc.

**Objectives:**

1. Provide the benefits of leveraging the initial modeling investments from the masterplan to provide local improvements.
2. Outline the steps to convert a stormwater masterplan 2D model from an informational tool to an implementation tool.

**Topic:** Fort Hood has an estimated population of over 60,000 which includes military, families, and employees and is comprised of approximately 218,823 acres (342 square miles) making it the largest military base in the United States.

## CONFERENCE ABSTRACTS

Fort Hood has numerous drainage and erosion issues throughout the Army base. For years they have reacted to drainage concerns, resulting in on-site solutions attempting to address a specific problem by treating the symptoms. After spending money on projects that don't fully address the problems, they decided to proactively look at areas holistically. The North Fort Hood (NFH) Regional Drainage Masterplan took a broader look at the drainage issues to discover the cause of common drainage problems, various alternatives to resolve those problems, and formulated a CIP list.

A regional drainage plan begins with good data. Fort Hood began their plan with a base-wide inventory of their utilities and storm drain system and found hundreds of deficiencies. With this detailed inventory, the entire network of drainage systems within NFH was modeled using XP-SWMM 2D. The 2D model allowed Fort Hood to see where runoff would spill between basins and how downstream issues affect upstream systems, and vice versa. Alternatives were analyzed for the entire NFH base and a phasing plan for the improvements was developed for budgeting and drainage purposes.

After completion of the NFH Drainage Masterplan, the Fort Hood Storm Water Champion Program was created to manage future drainage projects. The program plans and manages the Fort Hood stormwater conveyance system by overseeing engineering projects, programs, and operations to ensure planning, development, and construction are in compliance with all applicable rules and regulations and results from the NFH Drainage Masterplan.

Approximately 30,000 LF of channel repair and 110 culvert crossings from the Stormwater Masterplan for North Fort Hood have been bid and are designated for construction during the fiscal year of 2018. The 2D modeling software XP-Storm was used to develop the recommendations outlined in the stormwater masterplan. The model was updated using survey topographic data and the alternatives outlined in the masterplan were reevaluated. Hydraulic characteristics were evaluated for merit using 1D modeling before an extensive 2D model was run which streamlined the design process and allowed for multiple changes to the model during design while minimizing downtime.

**3:30 pm – 4:00 pm**  
**BREAK**

**4:00 pm – 4:30 pm**

### **G4 THE CHALLENGE OF URBAN FLOODING**

**Presenter:** Steven E. Eubanks, P.E., PMP, CFM; City of Fort Worth

**Objectives:**

1. Recognize the complexities of addressing local flooding in highly developed urban areas.
2. Understand the concept of “managing flooding in place” and its relationship to “No Adverse Impact” policies.
3. Apply economic and risk principles to developing solutions to flooding.

**Topic:** Numerous communities have older, highly developed areas built along streams, rivers and undersized storm drain systems where frequent flooding is a problem. Extensive buyouts to restore floodplain in these heavily developed areas are not a viable option, and neither are capital improvements to enlarge the system to convey the 100-year storm without flooding. This presentation will explore a broad range of community flooding issues, from understanding urban hydrology, evaluating the challenge of implementing traditional solutions, and examining potential solutions. It will also examine the planning process for addressing what may appear to be “unsolvable” flooding, as well as strategies for making flood mitigation a positive community objective and not just necessary evil to be endured.

**4:30 pm – 5:00 pm**

### **G5 WHERE'S THE STORM DRAIN? FROM 2D STUDY TO DESIGN: MODELLING, COST BENEFIT ANALYSIS AND DESIGN TO UNDERSTAND AND ADDRESS RESIDENTIAL FLOODING IN DOWNTOWN MCKINNEY**

**Presenters:** Katie Hogan, P.E., CFM; Freese and Nichols, Inc.  
Danny Still, P.E., CFM; City of McKinney

**Objectives:**

1. Tell the story of a storm drain improvements project from concept to reality.

## CONFERENCE ABSTRACTS

2. Using cost-benefit analyses to choose alternatives and obtain support from Council or stakeholders
3. Lessons learned and what to think about during the study phase for smooth transition to design

**Topic:** The downtown McKinney neighborhood located south of University Drive and west of McDonald Street experiences road, structure, and property flooding during storm events. The neighborhood was developed prior to current City standards, so flooding occurs due to undersized storm drain infrastructure and, in some cases, lack of storm drain infrastructure. The area was particularly impacted by the May 2015 events in North Texas as evidenced by resident photos and testimony. This presentation will discuss the study phase, why 2D modelling was chosen, the cost benefit analysis to choose an alternative, and design phases of the project to alleviate flooding in an older downtown McKinney neighborhood. It will include lessons learned in bringing a model from conceptual to design.

The first step was a detailed existing conditions XP-STORM 1D/2D study to identify the sources and extent of flooding in the neighborhood for each of five storm events (1-, 5-, 25-, 50-, and 100-year). The 2D analysis was used to determine if runoff spilled between sub-basins causing local flooding issues. Alternative solutions were then analyzed to address flooding concerns. Proposed improvements included storm drain construction, additional inlet capacity, and swale grading. An opinion of probable construction cost (OPCC) was provided for each alternative.

A FEMA benefit-cost analysis was completed as part of the study to compare the OPCCs for each alternative versus the estimated flood damage to the structures. The tool assisted in differentiating the alternatives to find a cost-effective solution while still providing flood relief in the area. The options were then brought before City Council who decided to implement the 25-year storm improvements. The project is currently in the design phase based on the results of the study. Coordination with other departments in the City lead to a collaborative effort to provide roadway and sanitary sewer improvements along with the drainage improvements.

### TRACK H – PROFESSIONAL DEVELOPMENT

**2:00 pm – 3:00 pm**

#### **HI PROFESSIONAL ETHICS FOR ENGINEERS**

**Presenters:** Kelly Dillard, P.E., CFM, ENV SP; Freese and Nichols, Inc., TFMA Secretary  
Regina Smith, SPHR, SHRM-SCP, CFM; Freese and Nichols, Inc.

**Objectives:** By attending this session, participants will be better able to:

1. Recognize ethical situations faced by engineers
2. Analyze the issues of an ethical situation
3. Resolve the situation in a creative and professional manner

**Topic:** During the session's lecture, participants will discuss definitions of Ethics and reflect on which one best fits their personal code of conduct. The NSPE Code of Ethics will be introduced and it's six fundamental cannons reviewed.

The remainder of the workshop is highly interactive, during which participants will review pertinent case studies published by the Board of Ethical Review. Small group discussions of each case will enable dialogue about ethical behavior in each situation. The facilitator will ask groups to report their opinion of the case and cite supporting sections in the NSPE Code of Ethics. Finally, the groups will review the BER's decision on the cases.

## CONFERENCE ABSTRACTS

**3:00 pm – 3:30 pm**

**H3 AVOID THE BEAR TRAP OF FLOODPLAIN MANAGEMENT – MANAGING YOUR RISK AS A FLOODPLAIN MANAGER & ENGINEERING CONSULTANT**

**Presenter:** Jeremy Blevins, P.E., CFM; HDR

**Objectives:**

1. Understand the risks of local governments as it relates to floodplain management.
2. Understand ways that you can reduce your risk as the local floodplain manager.
3. Understand the risks of consultants as they relate to floodplain management.
4. Understand ways that you can reduce your risk as a consultant on floodplain management projects.

**Topic:** Many local governments have undertaken significant capital improvement projects to reduce the risk of flooding in their communities. They have also adopted regulations, building codes, and ordinances and instituted flood warning forecasts and warning systems to reduce the risk of flood losses in their communities. However, in an increasingly litigious society, these measures have resulted in lawsuits across the country when flood losses occur. Additionally, private landowners have sued local governments for an unconstitutional taking of their property for implementing floodplain regulations or for issuing permits to build on properties which have increased flooding on their properties. The facts of the matter are that as floodplain managers, you undertake risks by doing the work you do.

This presentation will examine the risks associated with local governments constructing structural measures to reduce flooding, discuss the risks associated with implementing non-structural measures to reduce flood losses, and present the risks associated with adopting, implementing, and enforcing floodplain regulations. This presentation will also present ways in which a local floodplain manager can manage his/her risk on the job.

Engineering consultants also undertake risk while working on floodplain management projects. Engineers are typically held to a “standard of care” for our industry; however, engineers have also been faced with claims of adversely impacting property owners due to their work on floodplain projects. Engineers should also manage those risks while working as a consultant on floodplain projects. This presentation will also discuss the risks associated with being an engineering consultant on a floodplain project. This presentation will also describe ways to manage those risks as a floodplain consultant.

As engineering consultants and floodplain managers, we have the obligation and duty to protect the health, safety, and welfare of the general public. And as such, we should know and fully understand the risks associated with flood risk reduction projects and ways that we can manage those risks.

**3:30 pm – 4:00 pm**

**BREAK**

**4:00 pm – 4:30 pm**

**H4 BRIDGING THE GAPS: HAZARD HISTORY DATA AND HAZARD MITIGATION PLANNING**

**Presenters:** Paloma Alaniz, CFM; Halff Associates, Inc.  
Paul Yura; National Weather Service  
Aaron Treadway; National Weather Service

**Topic:** The Halff Planning Team shares insight on experiences with analyzing risk for hazard mitigation planning. Through recent planning experiences, the team faced deficiencies in data that impacted planning operations and community satisfaction with historical data. Halff sought to assist local communities with improving the quality of disaster data available for future planning endeavors. As Risk Assessment processes associated with the Hazard Mitigation Planning process are initiated, planning committees often faced local community frustration with the lack of impact data recorded in databases depended upon for referencing past disaster occurrences and impacts. Instances of missing event dates and missing dollar amounts for property damage left planners questioning the validity of their risk analyses.

## CONFERENCE ABSTRACTS

Research revealed that Federal and State level databases for disaster event tracking rely heavily on local self-reporting. With this insight, local mitigation planners can begin creating data entries that will better serve future planning efforts. Coordinating with the National Weather Service, Halff sought to help communities improve the quality of their hazard data through communicating the disaster reporting process for recording impact and damages.

The National Weather Service also provides a case study outlining a success story related to the use of local level data for calculating risk. After Hurricane Harvey, the DeWitt County Emergency Management office teamed up with the NWS and local citizens to better understand the impact from the Guadalupe River flooding in Cuero. Meetings with the citizens and most importantly, input and data from the citizens and other agencies, allowed for a thorough review of river impact statements and resulted in several adjustments/improvements based on the feedback.

**4:30 pm – 5:00 pm**

### ***H5 WATERSHED TIMING: TO DETAIN OR NOT TO DETAIN***

**Presenters:** Colin Slagle, PE, CFM; Scheibe Consulting  
Eric Scheibe, PE, CFM; Scheibe Consulting

**Topic:** In keeping with the Texas Water Code Section 11.086, flow control requirements are essential to the prevention of adverse impacts for any project altering the hydrologic characteristics of a watershed. However, traditional hydrologic modeling methods may not always indicate that detention is the answer. In the case where a project discharges to a higher order stream with a significantly larger watershed, modeling of detention facilities may reveal apparent impacts in the receiving stream. This is due to the difference in peak timing between the watersheds, where the smaller contributing watershed may peak long before the larger receiving watershed, and detention would bring these peaks closer together and result in a greater superimposed peak flow. This may put the designer in a “Catch 22” predicament, since traditional hydrologic modeling methods will reveal either 1) impacts immediately downstream of the project and none within the receiving stream, or 2) impacts within the receiving stream and none immediately downstream of a project, depending on the inclusion of detention. What is the right answer? To detain or not to detain?

This presentation provides a discussion of traditional modeling methods including unit hydrograph theory; local and regional detention regulations; and a watershed timing “Catch 22” case study of a dam reconstruction project, including hydrologic analyses using SCS design storms vs. gage data from a recent extreme rainfall event. An open discussion will be encouraged including floodplain administrators, regulators, modelers, and the engineering community.

## **TRACK I – NATURAL & MANMADE HAZARDS & MITIGATION** **FLOODPLAIN ADMINISTRATOR’S TOPICS**

**2:00 pm – 3:00 pm**

### ***II ELEVATION CERTIFICATES: A SURVEYOR’S POINT OF VIEW (AKA PITA FORMS)***

**Presenters:** Martin Cristofaro, P.E., RPLS, CFM; Stuart Consulting Group  
Debbie Vascik, CFM; Cahoon Consulting

**Objectives:**

1. Overview of surveying - past and present
2. Tasks associated with using the right “elevation monument”
3. Submitting the PITA form
4. Organizing and maintaining elevation certificates
5. Correcting elevation certificates for the CRS

**Topic:** Elevation certificates are a PITA, but they’re a necessary part of the National Flood Insurance Program (NFIP). Floodplain Managers have to deal with them on a daily basis. But do they really know what goes into filling one out? How do the surveyors (or architects or engineers) get the elevations, datum, and other information necessary to complete an elevation certificate? Rarely do we get the opportunity to hear from an actual surveyor on what goes into preparing an

## CONFERENCE ABSTRACTS

elevation certificate, and it is important to understand what a surveyor does to prepare, complete, and submit an elevation certificate. This presentation will provide the Floodplain Manager insight into what goes into filling out an elevation certificate, tips on maintaining elevation certificates for efficient floodplain management, the importance of elevation certificates in the Community Rating System (CRS), and what floodplain managers can do to correct the forms when the surveyors get them wrong.

**3:00 pm – 3:30 pm**

### ***I3 TEXAS STRATEGIC PHASED WATERSHED STUDY***

**Presenter:** Diane Cooper, CFM; FEMA – DR4332TX – Branch II, Houston

**Topic:** FEMA (Mitigation Branch, Hazard Performance Analysis Group, under disaster 4332-TX) has underway a study supporting 21 HUC-8 watersheds that were affected by Harvey. These watersheds cover over 94% of the individual assistance applicants that were affected by flooding. As results of frequent flooding, this watershed study is used to expand the regional mitigation strategies instead of local projects. It is intended to promote cross agencies collaborations at both Federal and State level and provide much needed data to the local communities.

**3:30 pm – 4:00 pm**

***BREAK***

**4:00 pm – 5:00 pm**

### ***I4 INFORMING THE TEXAS COMMISSION TO REBUILD AFTER HURRICANE HARVEY***

**Presenter:** Dr. Samuel Brody; Texas A&M University, Galveston Campus

**Topic:** The session will provide an overview flood mitigation framework being developed for the state and the potential recommendations for reducing losses before the next major storm. Session leaders will ask for feedback and input from the audience on what specific recommendations, projects, and mitigation activities they would like the state to pursue. The session will provide an opportunity for local flood managers to provide guidance on activities undertaken at the state level.

## **TRACK J – NATURAL & MAN-MADE HAZARDS & MITIGATION**

**2:00 pm – 2:30 pm**

### ***J1 WE'VE GOT A DAM PROBLEM***

**Presenters:** Joe Trammel, PE, CFM; Tarrant County  
Chad Gartner; Transystems  
Mike Hobbs; Transystems  
Russell Brown; ACE Pipe

**Topic:** Tarrant County's Echo Lake, located in the City of Fort Worth, received a TCEQ inspection in 2012. This indicated some concerns for potential erosion on the outlet of the spillway pipes and potential infiltration of the concrete apron on the inlet of the spillway pipes. This initiated the process which led to where we are today... where Transystems has provided a full set of construction plans for not only the addressing the original concerns of TCEQ, but also addressing several issues which have risen during the process.

Phase I identified which spillway pipes were problematic and which could likely remain. In addition, repair alternatives were provided indicating various methods to repair and/or replace problematic spillway pipes and improve the structural integrity of the remaining pipes.

Phase II identified the hydrologic and hydraulic elements of the project. Various agreements were in place identifying responsibility of the different portion of the dams for both the railroad and Tarrant County. In addition to hydrologic and hydraulic elements with agreements, various elements had to be considered for keeping the water surface elevations within

## CONFERENCE ABSTRACTS

check and coordination efforts had to be considered between the owner of the track, the leasing railroad of the rails and the responsibilities of the two parties operation of the dam.

Phase III was originally intended to provide construction plans for the repairs of the spillway pipes and their associated headwalls, wingwalls, etc. Unfortunately, this was preceded by a sinkhole that occurred prior to the repairs being made. Two steps back to modify the H&H to reflect the new existing conditions (one pipe now) and how to restore the original conveyance along with the original construction plans. Another addition included the cementitious lining of the existing pipe to ensure the structural integrity remained as we work on improving the area around the sinkhole.

It was at this point that coordination efforts were identified between Tarrant County, the Union Pacific Railroad, TCEQ, and the City of Fort Worth. After an eleven month review process finally approved by the railroad, a major change order is being addressed (as the bids have already been received and awarded) for infiltration concerns around both the existing pipe and the proposed pipe. Once this is complete, another round of review by the railroad will be required prior to construction commencing.

As if having this dam problem wasn't enough, now an ownership transfer of the entire property had occurred between Tarrant County and the City of Fort Worth. Tarrant County's commitment and resolve to finish what we started is still moving forward as we speak. We are attempting to not only address the original concerns of the TCEQ, but also to address additional concerns of conveyance, adequate sinkhole repair methods, and a filtration system to satisfy infiltration concerns. The ultimate end goal is to provide CFW a product that will remain in place for many years to come. In addition, this project will be a portion of the backdrop for a future park that will be completely renovated for economic development within the area.

The presenters for this paper will be Chad Gartner and Mike Hobbs with Transystems, Joe Trammel with Tarrant County, and Russell Brown with ACE pipe. Chad and Mike will provide the research and H&H methodology for the project as well as construction plan preparations. Joe will provide a history of the park, a history of the sinkhole that occurred, thus the caption – We've got a dam problem. Russell will provide general information on methods available when structural integrity are in question due to outside unknowns (such as a sinkhole for this project).

**2:30 pm – 3:00 pm**

### ***J2 DAM IF YOU DO, DAM IF YOU DON'T***

**Presenters:** Levi Hein, P.E., CFM; Halff Associates  
Benjamin Pylant, P.E., CFM; Halff Associates  
Rebekah Franz, E.I.T.; Halff Associates

**Topic:** What steps are communities taking to help manage the risks associated with dams? This presentation will discuss hazard creep associated with dams and how communities are communicating the risk to the public. A conversation between Floodplain Managers, Emergency Responders, and Planners is the starting point for identifying dam risk and development of community preparedness, response, and mitigation strategies. Under the NFIP, FEMA's Flood Insurance Rate Maps are intended for insurance identifying the 1% annual chance exceedance as the base flood elevation. How do existing impoundments affect existing hydrology in determining base flood elevation? While dams can provide flood reduction benefits, dams can also increase risk due to potential failure. Dam failure flood inundation potentially exceeds the 1% ACE Flood Hazard mapping identified on a FIRM map. Due to hazard creep, a dam originally designed, constructed and operated as a TCEQ defined lower hazard dam can be reclassified as a higher potential hazard dam due to new downstream infrastructure or development. Local Emergency Managers are tasked with understanding the risk and implications of dam breach in their communities and communicating that risk to the public. Texas alone has over 7,000 dams of which 4,000 are regulated by TCEQ Dam Safety Program. Given the consequences of dam failure this should be a topic relevant to all floodplain managers.

## CONFERENCE ABSTRACTS

**3:00 pm – 3:30 pm**

**J3 DREDGING – BRINGING NEW LIFE TO OLD PONDS, LAKES AND DETENTION AREAS**

**Presenter:** Trent Lewis, FPC; PondMedics, Inc.

**Topic:** Just like a stream's natural tendency is to want to run straight, a pond or lake's natural tendency is to want to fill in over time. As floodplain managers, this decreased storage capability increases flooding risk. Sediment load measurement and monitoring is key to determining if dredging is necessary or not.

Dredging is important to maintaining the designed stormwater storage capacities to reduce flooding risk. Dredging can be an expensive endeavor, but by learning the process and having the quantitative data, the owner can remain in control and reduce unnecessary expense.

In this concurrent session, attendees will learn how to assess sediment loading risks, measure, quantify and locate sediment loads and determine whether dredging is imminent. Additionally, session attendees will learn the most important questions to ask when planning a dredging project – what methodology can I use? How should I dewater sediment? Where can I dispose of the sediment, etc.? Attendees will leave with a toolbox full of helpful knowledge for their next dredging project.

**3:30 pm – 4:00 pm**

**BREAK**

**4:00 pm – 4:30 pm**

**J4 INNOVATIVE OUTREACH – CREATING A 3D TOPOGRAPHIC PHYSICAL MODEL OBJECTIVES**

**Presenters:** Gillian Roos, CFM; AECOM  
Dan Zell, P.E., CFM, PMP, D.WRE; AECOM

**Objectives:** Demonstrate how to create, print and use a 3D physical model of terrain.

**Topic:** Advances in 3D printing accessibility and cost are an opportunity to create physical models for outreach. A physical model can be used to demonstrate complex concepts to a general audience as well as to enhance the technical credibility of a study. This presentation will walk the audience through a step by step process to create, print and use a 3D physical model of terrain.

**4:30 pm – 5:00 pm**

**J5 MORE FUN WITH TCEQ'S NEW PMP TOOL! NEW CASE STUDIES OF SMALL AND LARGE DAM WATERSHEDS, COMPARISONS TO HMR 52**

**Presenters:** Cris Parker, P.E., CFM; HDR Engineering, Inc.  
Sunit Deo, P.E., CFM; HDR Engineering, Inc.  
Kelley Rich, E.I.T., CFM; HDR Engineering, Inc.

**Topic:** The Texas Commission on Environmental Quality (TCEQ) released the new Probable Maximum Precipitation (PMP) Study for Texas and associated GIS tool to calculate site specific PMP values. The study produced gridded PMP values at a resolution of about 2.5 square miles. The PMP estimation is based on updated historical storm data and takes into account variation in topography, climate, and storm types across the region. The PMP Evaluation Tool is designed to run in an ArcGIS environment. It extracts gridded PMP depth values developed in the Study, applies localized adjustment factors, and compiles site specific values of area averaged PMP for three rainfall scenarios (tropical, local, and general) for storm durations ranging from 1-hour up to 120-hours. These PMP values are required to be used in H&H analyses of dams that fall under jurisdiction of the TCEQ Dam Safety Program.

Traditionally, PMP values were estimated using HMR 51/52 guidance. HMR 52 software calculates spatially averaged PMP for a given subbasin by optimizing critical storm-area size, shape, orientation, and spatial variability that produced maximum precipitation. It also calculates elliptical isohyets with progressively larger area representing decreased total



TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION  
30<sup>th</sup> Annual Conference – March 6 – 9, 2018  
Horseshoe Bay Resort & Spa



CONFERENCE ABSTRACTS

rainfall with increasing distance from the storm center. This approach was useful to estimate rainfall depth for downstream receiving and/or intervening basins.

This presentation will focus on recent applications of the new PMP tool on both small and very large watersheds including comparison of PMP results compared to previous HMR 52 results, and some of the limitations faced while using the new tool for dam breach inundation modeling and mapping. Small watershed case studies include multiple flood control dams (~2-4 square miles each) within the Upper Brushy Creek watershed. The large watershed case study involves the 4,356 square-mile contributing watershed of Red Bluff Dam on the Pecos River in West Texas.

**TRACK K – FLOODPLAIN MANAGEMENT TOOLS**

**2:00 pm – 2:30 pm**

***K1 PROGRESSION OF REGRESSION: GUIDELINES FOR USING REGIONAL REGRESSION ANALYSIS***

***Presenter:*** Alan Stanton, E.I.T.; Halff Associates, Inc.

***Objectives:*** By attending this session, participants will acquire an improved understanding of regional regression analysis and be given guidance on how and when to use appropriately.

***Topic:*** Accurate streamflow predictions are critical for the establishment of flood risk. Obstacles in determining flood risk include high costs and time to complete detailed hydrologic and hydraulic studies and unreliable or insufficient streamflow records. In response, regional regression equations have become widely used to predict flood risk in rural areas of Texas as simple, cost-effective hydrology. However, comparisons of the methodologies are not well documented leaving floodplain managers uninformed of the potential consequences of using these simpler methods.

As part of an effort to map the flood risk of the Llano River and its tributaries for FEMA, Halff computed the hydrology using 1996 & 2009 USGS regression equations and compared the resulting flood risk of more than 1,000 sub-basins. Halff compared these hydrologic results with detailed studies and gauged tributaries within the watershed. Significant flood risk differences were observed and will be presented with recommendations to establish simple criteria to guide communities in their hydrologic methodology selection process.

**2:30 pm – 3:00 pm**

***K2 WHO MOVED MY DESIGN RAINFALL? NON-STATIONARITY OF RAINFALL RETURN FREQUENCY ESTIMATES***

***Presenters:*** Curtis Beitel, P.E., CFM; HDR Engineering, Inc.  
Nate Clements; HDR Engineering, Inc.

***Objectives:*** This presentation will compare the currently available rainfall analyses of Technical Paper 40, the USGS SIR 2004-5041 and the new NOAA Atlas 14 for Texas, and discuss how engineers can take non-stationarity into account in our flood protection designs for a design life of the next 50 to 100 years.

***Topic:*** Over the past decade Texas has continued to experience significant rainfall events on a more frequent basis. To estimate the design rainfall for flood protection projects, engineers rely on statistical analyses of rainfall observations, such as Technical Paper 40, the USGS SIR 2004-5041 or the new NOAA Atlas 14. This method of design is based on a fundamental assumption that future rainfall events over the next 20 to 50 years will be statistically similar to what we have observed during the past 20 to 50 years – or that rainfall has statistical stationarity. However, recent experience seems to suggest that the climate across Texas is changing (for whatever reason), introducing non-stationarity to our statistical analyses of rainfall. This means the 1% annual chance exceedance event rainfall used for design 30 years from now might not be the same as the estimates today.

## CONFERENCE ABSTRACTS

3:00 pm – 3:30 pm

**K3 OFF WITH THE RULE OF THUMBS: RETHINKING HYDROLOGIC IMPACTS ON STORMWATER INFRASTRUCTURE**

**Presenter:** Matthew Anderson, P.E., CFM; Innovyze

**Objectives:**

1. Understanding rainfall information
2. Learn how temporal distributions effect stormwater infrastructure
3. Leverage the latest tools to assist in quickly evaluate critical durations

**Topic:** Rainfall events do not obey our theoretical nested intensity distributions, despite decades of continual use and the codification of these methods. Extreme events continue to stress local and regional civil infrastructure; our techniques and tools must change. It is no longer a matter of if, but rather when will next extreme event occur. We must challenge the general assumptions, our rules of thumb when it comes to rainfall, and the surrounding infrastructure's response to these events. In this session, we will look at a typical stormwater workflow using the XPSWMM Model. We'll investigate the general trends toward rainfall distributions using Atlas 14 as well as the hydrologic response methods and trends globally and how they apply to you today, saving your thumbs, and making you smarter & more productive.

**Conclusion:**

Stormwater standards need to evolve beyond the static singularity codified in many communities' stormwater standards. If there is a key lesson associated with the storms of 2017, the capacity of stormwater infrastructure is not limited to a peak conveyance issue, but rather is a function of conveyance limits over time which by definition is a volumetric problem. The root cause of flooding can be found in the application of rainfall over time, and the proper identification of when rain occurs is key properly identifying the impact to infrastructure.

3:30 pm – 4:00 pm

**BREAK**

4:00 pm – 4:30 pm

**K4 WEIGHING THE ALTERNATIVES FOR ONION CREEK MITIGATION**

**Presenters:** Cindy Engelhardt, P.E., CFM; Halff Associates, Inc.  
Ashley Lowrie, E.I.T.; Halff Associates, Inc.  
Pamela Kearfott, P.E., CFM; City of Austin, Watershed Protection Department

**Topic:** In response to the October 2013 flood along Onion Creek, the City of Austin initiated a re-evaluation of Onion Creek with the goal of updating flood risk information as well as the identification of potential flood mitigation alternatives. The Onion Creek watershed encompasses approximately 344 square miles. Onion Creek generally flows easterly, from the headwaters in Blanco County, through Hays County, to the confluence with the Colorado River in Travis County. In response to the October 2013 flood along Onion Creek, the City of Austin initiated a multi-phase study of the Onion Creek Watershed. The initial phase of this study included hydrologic and hydraulic analyses redefining flows, water surface elevations, and the floodplain along the Onion Creek and tributaries in Travis County. The second phase of this study resulted in flood mitigation concepts to mitigate flooding along the portion of Onion Creek between Interstate Highway 35 to East Slaughter Lane. In October 2015, Onion Creek once again experienced a significant flooding event which further demonstrated the importance of this evaluation.

The redefined existing condition 1% ACE from phase 1 of this study was used as the baseline for the flood mitigation analysis. The flood mitigation analysis consists of the development and evaluation of alternatives, both structural and non-structural, to reduce flood levels along Onion Creek. Potential flood mitigation alternatives were evaluated based upon a high-level feasibility of each proposed alternative, its cost effectiveness, and the potential for implementation. Specifically, the analysis focused on the identification of flood mitigation alternatives along Lower Onion Creek, within City of Austin's jurisdiction, between IH-35 and East Slaughter Lane. This includes portions of the Onion Creek subdivision adjacent to Pinehurst Drive, River Plantation Drive, and Wild Dunes Drive. The overall flood mitigation



**TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION**  
**30<sup>th</sup> Annual Conference – March 6 – 9, 2018**  
**Horseshoe Bay Resort & Spa**



**CONFERENCE ABSTRACTS**

objective is to eliminate the risk of interior flooding of structures during the 1% ACE and to reduce the extent of roadway flooding to meet the City's drainage criteria regulations. Each of the flood mitigation alternatives were compared based on a set project scoring criteria. The scoring criteria cover a wide range of issues and were established in partnership with the City of Austin.

**4:30 pm – 5:00 pm**

***K5 USE OF WET AND DRY PONDS FOR FLOODPLAIN RECLAMATION***

**Presenter:** Gabriel Novak P.E. CFM; Dowdey, Anderson, & Associates

**Topic:** As part of the Domain at Firewheel Project Dowdey, Anderson, & Associates designed two wet detention basins and two dry overflow basins to enable reclamation of area from the floodplain. The 130 acre site is located on Rowlett Creek in Garland Texas. The site originally had 10 acres outside of the floodplain. Most of the site was located in the floodway of Rowlett Creek. Previous reclamation in the area had filled up to floodway line. The design of the project could not increase the 100yr WSEL, increase stream velocity by more than 5%, and could not decrease the valley storage of Rowlett Creek.

Through an analysis of compensatory grading a design was achieved that maximized the reclamation area. At each cross-section the area being filled below the 100yr WSEL was matched to an equivalent area being excavated. This methodology allowed a more efficient design for the reclamation area. Rock at a depth of 10feet and a tributary stream splitting the site provided design challenges for the site.

By excavating the ponds fill was able to be placed to raise 30 acres of ground above the 100yr floodplain and to allow these areas to be developed. Currently a portion of the site is being developed as a multi-family residential complex.

The presentation will look at

- Guidelines for designing reclamation areas
- Design of overflow areas and drainage outlets.
- Using wet ponds to provide amenities and fill material.

**TRACK L – US ARMY CORPS OF ENGINEERS UPDATE**

**2:00 pm – 2:20 pm**

***L1 NOAA ATLAS 14 UPDATE = 100-YEAR RAINFALL ESTIMATES IN TEXAS***

**Presenter:** Max Strickler, CFM; US Army Corps of Engineers Fort Worth District

**Topic:** The Hydrometeorological Design Studies Center (HDSC) within the Office of Hydrologic Development of National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) is updating precipitation frequency estimates. Updated precipitation frequency estimates, accompanied by additional relevant information, are published in NOAA Atlas 14 "Precipitation-Frequency Atlas of the United States". Updates for Texas has been funded through a mix of federal and local organizations, including the U.S. Army Corps of Engineers, Fort Worth District. The update for the state of Texas will be published as Volume 11 of NOAA Atlas 14.

**2:20 pm – 2:40 pm**

***L2 WHAT'S NEW IN THE TEXAS CHAPTER OF SILVER JACKETS***

**Presenter:** Marie Vanderpool, CFM; US Army Corps of Engineers Fort Worth District

**Topic:** Silver Jackets is a state-level implementation of USACE National Flood Risk Management Program coordinating with state and local flood risk management community to identify flood risks and coordinate methods to address them. Presentation will provide an overview of the Corps' Flood Risk Management Program and how this program can support local efforts to reduce flood risks.

## CONFERENCE ABSTRACTS

**2:40 pm – 3:05 pm**

**L3 GALVESTON DISTRICT'S TEXAS COASTAL STUDY UPDATE**

**Presenter:** Himangshu Das, Ph.D, P.E.; US Army Corps of Engineers Galveston District

**Topic:** The United States Gulf Coast cities including Houston, Corpus Christie, New Orleans, and many other coastal cities are vulnerable to periodic storm surges and rainfall extremes. Since 1900, hurricanes striking in this region have killed more than 9,000 people and caused tremendous economic damage to infrastructure. The socio-economic risk from these extreme events is projected to grow even more in the coming decades due to urban development and climate changes. In 2015, the U.S. Army Corps of Engineers (USACE), in partnership with the Texas General Land Office (GLO), began to explore viable solutions for coastal storm risk, management, and ecosystem restoration along the Texas coast. The study is known as the comprehensive Coastal Texas Study (<http://coastalstudy.texas.gov>).

The Texas Gulf coast is a complex system with numerous narrow inlets and broad back bays with intricate river and bayou networks. Due to its complex settings, the Texas coast is susceptible to localized water levels and ponding during hurricanes and tropical storms. The Texas coast is also one of the most dynamic regions in terms of population and economic growth. According to the Bureau of Economic Geology, twenty five percent of the population and thirty three percent of the economic resources of Texas are located along the 360 mile long coast. The Coastal Texas Study will explore long-term approach to improve our capabilities to prepare for, resist, recover and adapt to extreme events.

**3:05 pm – 3:30 pm**

**L4 CONFIGURING THE 100-YEAR STORM - TESTING ELLIPTICAL DESIGN STORMS IN THE GUADALUPE BASIN**

**Presenter:** Simeon Benson, P.E.; US Army Corps of Engineers Fort Worth District

**Topic:** The standard that is commonly used in regulating development and in publishing flood insurance rate maps is the 1% annual chance (100-yr) flood. While there are many methods for estimating the 1% annual chance (100-yr) peak flow, producing a reliable flow estimate can be difficult, especially on large, complex river basins. One method the U.S. Army Corps of Engineers – Fort Worth District has been developing is the use of an elliptical design storm integrated with a rainfall-runoff HEC-HMS model. By using published storm parameters such as TP-40 precipitation frequency estimates, Soil Conservation Service Storm Distributions, and HMR52 elliptical storm patterns, the Corps has developed a design storm method that consistently produces viable frequency discharges on large river basins for specific frequency events. Through hydraulic and hydrologic modelling, these elliptical design storms can be transformed into river discharge estimates and finally river stage estimates for floodplain mapping.

**3:30 pm – 4:00 pm**

**BREAK**

**4:00 pm – 4:30 pm**

**L5 ESTIMATING THE 100-YEAR LAKE POOL ELEVATION – AN OVERVIEW OF USACE RESERVOIR STUDY METHODS**

**Presenter:** Alessandro Parola, EIT; US Army Corps of Engineers Fort Worth District

**Topic:** The U.S. Army Corps of Engineers (USACE) Fort Worth District owns and operates 25 reservoirs and has interest in predicting stage-frequency relationships in support of USACE Dam Safety Program and FEMA's National Flood Insurance Program (NFIP). The 1% annual chance exceedance (ACE), or 100-yr, reservoir stage is the reservoir stage that has a 1% chance of being equaled or exceeded in any given year. The 1% ACE reservoir stage can be used to predict the pool of inundation upstream and releases downstream from the dam. The 1% ACE reservoir stage can be determined empirically by plotting annual maxima reservoir stages from the observed record. However, observed reservoir stage data is usually insufficient to directly estimate stage-frequency relationships for determining the 1% ACE. Computer models can be used to extrapolate reservoir stage frequency estimates beyond the observed stage data. The USACE Risk

## CONFERENCE ABSTRACTS

Management Center (RMC) developed Reservoir Frequency Analysis software (RMC-RFA), an inflow volume-based stochastic model, to facilitate stage-frequency analysis within the USACE Dam Safety Program. RMC-RFA produces a reservoir stage-frequency curve by utilizing a deterministic flood routing model while treating the seasonal occurrence of the flood event, the antecedent reservoir stage, inflow volume, and the inflow flood hydrograph shape as variables rather than fixed values. A stage-frequency curve developed using RMC-RFA for Stillhouse Hollow Dam in the Brazos River Basin will be presented. The RMC-RFA model results fit the observed stage data demonstrating that the extrapolated stage-frequency curve with uncertainty bounds is reasonable.

**4:30 pm – 5:00 pm**

### ***L6 FEDERAL RESPONSE TO HURRICANE HARVEY***

**Presenters:** Coraggio Maglio, PE, CFM; US Army Corps of Engineers Galveston District  
Jerry Cotter, US Army Corps of Engineers Fort Worth District

**Topic:** How Hurricane Harvey affected the state of Texas, the rainfall associated with the event, the state and federal response around the region, in terms of rescues, temporary housing, port closures, hydrographic surveying, and the flooding of the greater Houston area and the remainder of the state. He has presented similar information to numerous stakeholders in the Houston area and throughout Texas.

## **FRIDAY – MARCH 9, 2018**

**8:00 am - noon**

### ***CONFERENCE CLOSING PLENARY SESSION***

**8:00 am – 8:45 am**

### ***DEVELOPMENT OF A FLOOD WARNING TOOL SET FOR BANDERA, TEXAS***

**Presenter:** Dave Mauk, CFM; Bandera County River Authority & Groundwater District

**Topic:** Floods are the leading cause of natural-disaster losses in the United States. Although loss of life to floods during the past half-century has declined, in part because of improved warning systems, economic losses have continued to rise with increased urbanization in flood-hazard areas throughout the Nation. The U.S. Geological Survey (USGS), in cooperation with Bandera County River Authority and Groundwater District, is developing a flood warning tool set for Bandera, Texas. The project will include new stage-only streamflow gages, high intensity rainfall stations, a HEC-RAS riverine hydraulic model, and creation of a flood atlas for the USGS Flood Inundation Mapping Program (FIMP) website. This flood warning tool set will provide a system wide approach for Bandera County River Authority and Ground Water District to better forecast and respond to floods in their area by combining new equipment with modeling.

**8:45 am – 9:30 am**

### ***THE COMMISSION TO REBUILD TEXAS WORK FOR HURRICANE HARVEY***

**Presenter:** Samuel D. Brody, PhD – Inaugural J. Michael Howard Lectureship Honoree

**9:30 am – 10:00 am**

### ***BREAK***

**10:00 am – 10:30 am**

### ***EXTREME EVENTS IN TEXAS – ALIGNING FLOOD RISK PERCEPTION IN TEXAS***

**Presenters:** Justin Baker; AECOM  
Dan Zell, P.E., CFM, PMP, D.WRE; AECOM

## CONFERENCE ABSTRACTS

**Objectives:** Relate general low probability events people are familiar with (winning the lottery, a lightning strike, a perfect game in baseball, a stunning upset/comeback in football) to low probability rainfall events (Memorial Day 2015, Tax Day, Harvey, etc..). Goal is to explain why low probability events can, do, and will happen in Texas.

Texas has endured many major flood events over the past few years (e.g. Halloween flooding [2013], Memorial Day flooding [2015], Tax Day flooding [2016], and most recently Hurricane Harvey). Engineers and floodplain managers are able to quantify the relative magnitude of these events, and therefore assign probabilities to future flood events (i.e. using statistical analysis to assign annual exceedance probabilities, and further hydrologic and hydraulic analysis to model and map related floodplains). Policymakers and the public also have methods of assessing chance events (e.g. probability of a car accident or winning the lottery); however, their ways of perceiving and assigning risk may be very different to those used by technical professionals. This presentation will explore (i) how floodplain managers and engineers currently relate flood risk information to the public, (ii) how these methods have changed over time, and (iii) ways in which the same information might be conveyed to correspond more closely to the flood risk perceptions of policymakers and the public, in order to increase cooperation and public safety in communities vulnerable to flooding in Texas.

**10:30 am – 11:00 am**

### ***HURRICANE HARVEY FLOOD RECOVERY – PUBLIC/PRIVATE DAMAGE AND DEBRIS REMOVAL OPERATIONS***

**Presenter:** Jonathan Steiber, P.E., CFM; Harris County Engineering Department

**Objectives:**

1. Utilizing organic resources to plan and execute recovery operations following a natural disaster.
2. Implementing electronic resources in planning and execution of private/public damage assessment operations and debris removal operations
3. Responding with the correct scale of support in order to deliver rapid service to constituents.

**Topic:** The Harris County Engineering Department (Harris County, TX) conducted post-Hurricane Harvey Flood Recovery from September to November 2017. Three primary areas of recovery to discuss are Public Damage (10 min), Private Damage (10 min), and Debris Removal (10 min) for a 30-minute presentation with a few minutes of question/discussion following each of the three primary areas. The Public Damage discussion will cover the operations leading to prompt inspection/evaluation and design/repair of damaged public facilities. The Private Damage discussion will cover the operations required to identify substantially damaged structures in the 100-year floodplain. The Debris Removal discussion will cover implementation and funding of a debris removal plan and monitoring debris removal. The purpose of each discussion is to cover the engineering department's use of organic personnel and equipment to plan and conduct flood recovery operations.

**11:00 am – noon**

### ***DAM OPERATIONS DURING FLOODING CONDITIONS – PANEL DISCUSSION***

**Panel:** Jerry Cotter, Chief Water Resources, US Army Corps of Engineers Fort Worth District  
Coraggio Maglio, PE, CFM, Hydraulic and Hydrology Branch Chief, US Army Corps of Engineers Galveston District

Ronnie Skala, PE, CFM; Hydraulic Engineer, Natural Resources Conservation Service, Temple

**Topic:** During recent storm events has caused some of our dams in Texas to be filled to capacity. TFMA has invited representatives from various agencies who operate dams to participate in a panel discussion. The topic will be their agency's dam operation procedures during flooding conditions. The panel will also accept questions from the audience.

**CLOSING REMARKS**

**CONFERENCE ADJOURN**