



THE SINKHOLE CONFERENCE

Multidisciplinary Conference on Sinkholes and the
Engineering and Environmental Impacts of Karst

April 20-24, 2020

San Juan, Puerto Rico

Sheraton Old San Juan Hotel

www.sinkholeconference.com



CONFERENCE HIGHLIGHTS

The 16th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst (aka, The Sinkhole Conference) will be held in beautiful and historic San Juan, Puerto Rico. Unlike some of our previous conference locations, this is someplace your family will love and where you'll want to stay longer beyond the conference. Puerto Rico offers fabulously vibrant cultural scenes and spectacular karst landscapes unseen in the continental part of the US. As for the conference, here is a preview of the following pages:

- Monday, April 20, a full day field trip through the heart of Puerto Rico's world famous mogote karst.
- Tuesday, April 21, 4 expert-taught short courses on geotechnical and hydrogeologic aspects of karst.
- Wednesday, April 22 through Friday, April 24, technical paper sessions, kicked-off by a thought-provoking keynote address.
- Thursday, April 23, the Conference Banquet with a special invited speaker.
- Friday, April 24, a half-day field trip to a karst Superfund site.
- Breakfast and lunch are included in the price of registration, plus a welcoming reception, social breaks between sessions, and a poster-viewing reception.
- The widely sought proceedings will be given in digital form to all conference registrants.



PROGRAM AT-A-GLANCE

April 20, 2020 MONDAY	April 21, 2020 TUESDAY	April 22, 2020 WEDNESDAY	April 23, 2020 THURSDAY	April 24, 2020 FRIDAY
Registration	Registration	Registration	Registration	Registration
Optional Field Trip: Karst of Rio Camuy Cave Park and Arecibo Observatory 8:00 am – 6:00 pm	Short Courses 1 & 2 8:00 am – 12:00 pm	Keynote Speaker and Session	Sessions	Sessions
	Lunch	Lunch	Lunch	Lunch
	Short Courses 3 & 4 1:00 pm – 5:00 pm	Sessions	Sessions	Optional Field Trip: Karst of Superfund sites in Vega Alta and Vega Baja
	Welcome Reception	Beck Memorial Reception & Poster Session Planning meeting for 17th Sinkhole Conference	Banquet and Guest Speaker	

SUBMIT YOUR ABSTRACT TODAY!

Authorship or co-authorship of a full technical paper (approximately 8-10 pages in length) is encouraged of all conference registrants. Abstracts of proposed paper submissions will be accepted through July 15, 2019. Draft paper submissions will be due October 14, 2019. Please check www.sinkholeconference.com for further details and updates.



SHORT COURSES, Tuesday, April 21, 2020 (optional)

SHORT COURSE 1: Conducting Geotechnical Investigations in Karst

Instructor:

Michael J. Byle, D. GE, F. ASCE
(National Discipline Lead,
Civil/Geotechnical Engineering, Tetra Tech, Inc.)

Course length – 4 hours
8:00 am –12:00 pm

Carbonate and evaporite geologic formations underlie a large portion of the world. These formations contain soluble compounds that result in portions of the formations dissolving over time to produce cavities, conduits, enlarged joints, caves, etc. The landforms resulting from these features are referred to as karst. Karst poses many geotechnical concerns such as subsidence, sinkholes, uneven structural support, high groundwater production, and groundwater sensitivity to contamination.

Locating and characterizing karst features at depth is a challenging task. Even large features can be easily missed by conventional borings and may not be detectable by some geophysical methods. This makes it necessary to employ a specially focused investigation that incorporates geological, geotechnical, statistical, and geophysical approaches to evaluate risks and determine the appropriate level of investigation.

This short course will include a brief introduction to karst and the associated geotechnical issues. A discussion of karst factors to various land use, construction, and development will be presented. Methods and strategies for investigating and characterizing various aspects of karst will be covered and examples provided. Methods of investigation including, geologic data review, borings, test excavations, and aerial and terrestrial geophysics will be considered with particular focus on developing an integrated approach to characterizing karst conditions.

SHORT COURSE 2: Stormwater Management in Karst

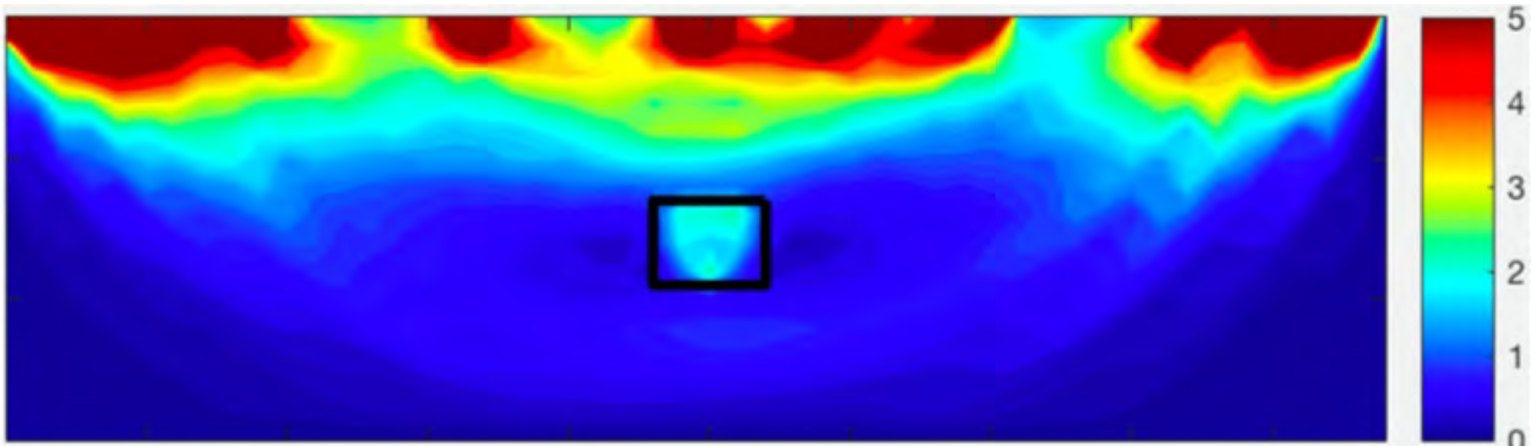
Instructor:

Robert K. Denton Jr., CPG, LPSS
(GeoConcepts Engineering Inc.,
a Terracon Company)

Course length – 4 hours
8:00 am –12:00 pm

The short course will detail general principles of karst characterization used for the siting and design of stormwater best management practices (BMPs) in karst. Topics to be covered will include:

- 1) Using terrain, hydrogeological, and subsurface investigation analyses (borings, electrical resistivity, etc.) to properly characterize and design stormwater BMPs in karst.
- 2) Environmental issues including the mitigation of the transport and migration of soil-adsorbed contaminants into the karst aquifer.
- 3) Design of stormwater BMPs for internally drained sites (onsite absorption, dry ponds, Class V injection wells, etc.)
- 4) The impact of limestone saprolite on pond design and failure.
- 5) Understanding and utilization of the Karst Reduction Factor.
- 6) A review of regional guidelines and regulations governing karst stormwater BMPs.



SHORT COURSES, Tuesday, April 21, 2020 (optional)

SHORT COURSE 3: Designing and Conducting Tracer Studies in Karst – With Emphasis on Sites with Actual or Potential Contaminant Releases

Instructors:

Ralph O. Ewers, Ph.D.
(President, EWC - Ewers Water Consultants, Inc.)

Keith A. White, CPG
(Vice President/Principal Geologist, Arcadis, Inc.)

Course length – 4 hours
1:00 – 5:00 pm

Tracer investigations, particularly those conducted with fluorescent dyes, provide essential information regarding the fate and transport of contaminants in karst aquifers. They do this quickly, reliably, and inexpensively in most karst terranes. Modern spectrofluorometric analytical techniques provide part-per-trillion sensitivity and identify each dye by its characteristic wavelength, allowing several dyes to be used simultaneously.

Test Design Essentials – The four essential steps in conducting a tracer test: 1-reconnaissance, 2-tracer background assessment, 3-tracer introduction, and 4-tracer monitoring, will be explored, and the rationale for each will be given.

Tracer Dyes – This short course will provide details on the usefulness of each of the common fluorescent tracer dyes and their individual characteristics. We will discuss the means by which the tracers can be introduced and how, where, and when to monitor for them. The pros and cons for each of the analytical methods will be examined.

Example Tests – Recent and historical tracing examples will be examined in detail, offering a wide range of karst settings in which tracing has been successfully used. In these examples the hydrogeology demonstrated by the tracing will be compared to the hydrogeology inferred by traditional well data.

Qualifications – The presenters have a combined experience of 70 years in karst studies and have been involved in nearly 1,000 tracer tests.

SHORT COURSE 4: Geologic Site Characterization in a Karst Setting

Instructor:

Lynn Yuhr, P.G.,
President of Technos, Inc.,
Miami, Florida (retired)

Course length – 4 hours
1:00 – 5:00 pm

Geologic site characterization is the technical foundation for all geotechnical and environmental projects. The objective of a geologic site characterization is to gain an accurate and complete understanding of subsurface conditions that will impact the engineering or environmental decisions made at a site. If the site characterization is done right, these decisions will be made with a high degree of confidence and be supported by reliable technical data.

This 4-hour course is based upon an integrated approach to site characterization. Therefore, we will cover a wide range of topics ranging from a discussion of the problem, a strategy, appropriate levels of site characterization, the impact of scale, the methods available and case histories to illustrate the process.

This topic is covered in detail in the recent book titled *Geologic Site Characterization in Karst and Pseudokarst Terrains* authored by the presenter and Richard C. Benson, PG, CPG (founder and Senior Engineering Geologist of Technos, Inc.) The book is based upon their combined and diverse experience specializing in site characterization with an emphasis on karst.



CONFERENCE FIELD TRIPS (optional)

Karst of Rio Camuy Cave Park and Arecibo Observatory

Monday, April 20, 2020

All Day Trip: 8:00 am to 5:30 pm

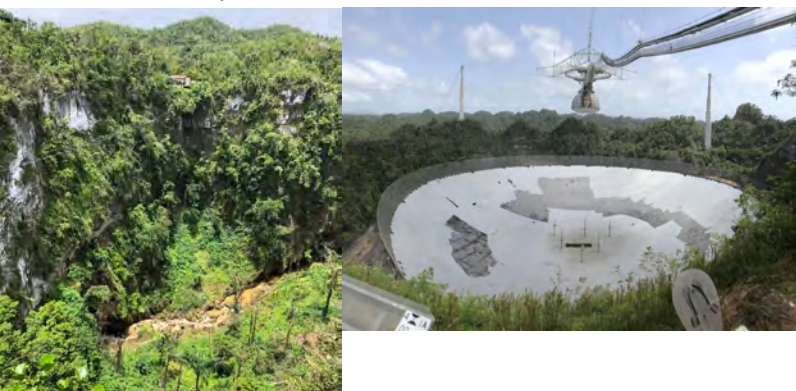
Trip Co-leaders:

Ingrid Padilla- University of Puerto Rico, Mayaguez

Brian Smith- Barton Springs/Edwards Aquifer Conservation District, Austin, Texas

The Rio Camuy Cave System is an underground river in the northern karst belt of Puerto Rico. The cave system consists of about 16 km of river and tributary passages and considerably more side passages. This field trip will follow the traditional tourist trip that includes a walk through the Cueva Clara passage to a wide ledge with views of the Rio Camuy below and the large opening of the Empalme Sinkhole above. Another stop on the trip will be a view of the large Tres Pueblos Sinkhole (see image below) with a view of the Rio Camuy flowing across the bottom of the sinkhole about 120 m below the surface. In addition to discussion of the system's hydrology, the impact of record flooding from Hurricane Maria in 2017 will also be examined.

The Arecibo Observatory is a radio telescope with a 300-m diameter dish set into a large sinkhole adjacent to the Tanama River (see image below). The visit will include views of the dish and antenna and the surrounding karst hills. The exhibit area has photographs of the modification of the sinkhole and construction of the dish along with how the radio telescope functions and some of the findings of the telescope.



Karst of Superfund sites in Vega Alta and Vega Baja

Friday, April 23

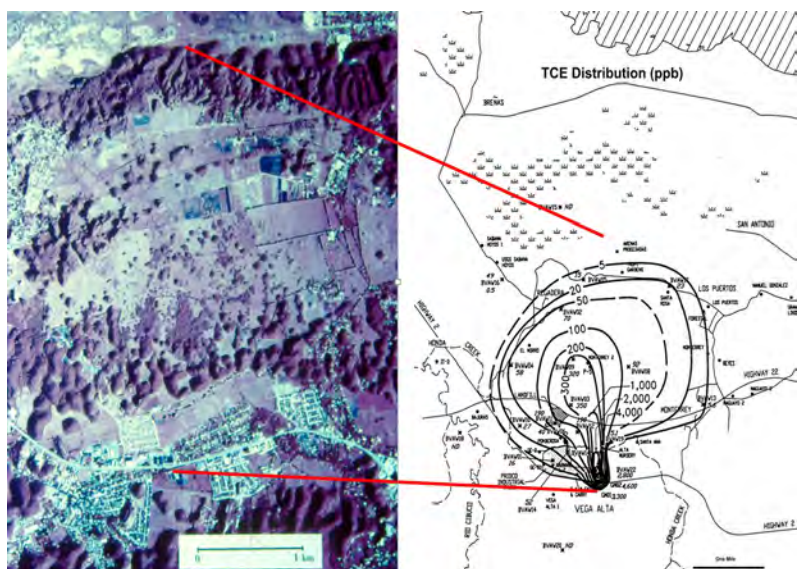
Half Day Trip: 1:30 pm to 6:00 pm

Trip Co-leaders:

Brian Smith- Barton Springs/Edwards Aquifer Conservation District, Austin, Texas

Ingrid Padilla- University of Puerto Rico, Mayaguez

The northern karst belt of Puerto Rico is heavily dependent on the karst aquifers for much of its water supply. It is also home to many industrial sites from which industrial contaminants have entered the karst aquifers. Studies have been made of these aquifers for close to 40 years and attempts have been made to clean up the industrial sites and the aquifers, some of which are Superfund sites. The image below shows a plume of TCE at the Vega Alta Superfund Site as it was interpreted in 1993. This trip will include visits to some of the sources of contamination and the surrounding karst landscape. Plumes of contaminants generally move north toward the Atlantic Ocean, although the plumes spread to the east and west where the gradients of the potentiometric surfaces of the aquifers become nearly flat. Pumping from water-supply wells also induces flow of contaminants toward these wells.



NOTE: Participants on either field trip should be prepared for warm to hot, humid, tropical weather. Rain is likely so participants should bring an umbrella or rain parka. Between rain events the tropical sun is intense, so participants should bring a strong sunscreen. Walking will be on paved trails with minor elevation changes. Comfortable shoes, such as tennis shoes or sandals, are encouraged. Caving equipment will not be necessary for the visit to the Camuy cave. Lunch and drinks will be provided for the all-day field trip. Drinks will be provided for the half-day field trip.

THE BARRY F. BECK SINKHOLE CONFERENCE STUDENT SCHOLARSHIP

The Barry F. Beck Sinkhole Conference Student Scholarship (Beck Scholarship) is a competitive grant that is awarded to one or more students who are presenting the results of their research at the Sinkhole Conference. The award was established in 2013 in memory of the late Dr. Barry Beck, a pioneer in the scientific study of sinkholes who founded the Sinkhole Conferences, and who died in 2011. At least one Beck Scholarship will be awarded for each conference. Additional scholarships may be awarded if funded from donors for the conference. Please consider donating to the scholarship fund at the time of registration. See www.sinkholeconference.com/how-to-sponsor-the-scholarship if you are interested in sponsoring a scholarship.

Beck Scholarship recipients will receive:

- One free Sinkhole Conference registration.
- One free registration to one Sinkhole Conference field trip
- One Sinkhole Conference short course (pending space availability).
- An award certificate.

Recognition through name badge ribbon, mention in the Sinkhole Conference program and website, and announcements at the opening ceremony and banquet.

Reimbursement for up to \$1000 of personal individual travel, food, and lodging expenses associated with attending the Sinkhole Conference.

To apply for the Beck Scholarship the applicant must:

1. be a graduate or undergraduate student at an academic institution at the time of application;
2. present his or her research at The Sinkhole Conference (see abstract and paper submission requirements);
3. submit a 500-word maximum statement describing the applicant's career biography and interests;
4. provide a photograph of the applicant for promotional use if the applicant receives the scholarship;
5. submit two letters of reference (one from the student's advisor, if a graduate student, or at least one from a faculty member if an undergraduate), and the letter from the advisor or faculty member must confirm the student is currently enrolled at the stated institution;
6. submit a completed application form. You can complete an [APPLICATION FORM](http://www.sinkholeconference.com/how-to-apply-for-the-beck-scholarship) found at www.sinkholeconference.com/how-to-apply-for-the-beck-scholarship

All information (application form, abstract, and letters of reference) must be received by the Beck Scholarship Committee by a deadline of October 14, 2019. The Scholarship recipient(s) will be notified by February 1, 2020.

Below: Beck Scholars at the 15th Sinkhole conference joined other authors to present their research at the poster and oral sessions



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Please complete this registration form, including signature and payment information. Use one registration form per person. Registrations will not be processed without full payment and the registrant's full name. Please note: If someone else is registering for you, the name of the actual registrant must be filled out and not the name of the person paying.

Full Registration and Full Student Registration includes evening reception, poster session, and evening banquet. If you are not registering for the full conference you must purchase a Day Pass in addition to other registration activities for that day.

Contact Information (*Indicates required information)

*First Name _____ MI _____ *Family Name _____ Badge Nickname _____

*Company/Organization/University _____

*Street Address/PO Box _____

*City _____ *State _____ *Zip/Postal Code _____ *Country _____

*Work Tel _____ *Home Tel _____ *Cell _____ *Email _____

Full Registration

Day Pass Registration, Hats and T-Shirts on second page

	<i>Before Nov. 15, 2019</i>	<i>Starting Nov. 15, 2019</i>
Full Registration	<input type="checkbox"/> \$600	<input type="checkbox"/> \$700
Student Registration**	<input type="checkbox"/> \$300	<input type="checkbox"/> \$350

**Copy of student ID must accompany registration form

Special Events- *The following three items are included in Full, Student and certain Day Pass registrations. These items apply only to guests of Full or Student registrants, and if the guests attend only these events and/or the field trips (such guests must complete their own registration form and identify their Full or Student registrant).*

Tuesday, April 21

Guest Evening Reception ☐ \$30

Wednesday, April 22

Guest Poster Session Reception ☐ \$30

Thursday, April 23

Guest Banquet ☐ \$60

Field Trips (Not included in Conference Registration)

Before Nov. 15, 2019

Starting Nov. 15, 2019

Monday, April 20 (Price with full or student registration only)

Full Day Field Trip – Arecibo Observatory & Rio Camuy Cave ☐ \$120 ☐ \$140

Friday, April 24 (Price with full or student registration only)

Half Day Field Trip – Superfund sites in Vega Alta and Vega ☐ \$50 ☐ \$70

Short Courses, Tuesday, April 21 (Not included in Conference Registration)

Morning Short Courses—select no more than one morning

Short Course 1 – Conducting Geotechnical Investigations ☐ \$120 ☐ \$140
Course Length: 4 Hours

Short Course 2 – Stormwater Management in Karst ☐ \$120 ☐ \$140
Course Length: 4 Hours

Afternoon Short Courses—select no more than one

Short Course 3 – Designing & Conducting Tracer Studies ☐ \$120 ☐ \$140
Course Length: 4 Hours

Short Course 4 – Geologic Site Characterization in Karst ☐ \$120 ☐ \$140
Course Length: 4 Hours

Day Pass Options (if you did not register for the full conference)

Before Nov. 15, 2019 Starting Nov. 15, 2019

Monday, April 20

Full Day Field Trip – Arecibo Observatory & Rio Camuy Cave Park ☐ \$120 ☐ \$140

Tuesday, April 21

Morning Short Courses—select no more than one morning course

Short Course 1 – Morning Half Day Pass Conducting Geotechnical Investigations ☐ \$260 ☐ \$280
Course Length: 4 Hours (Evening Reception Included)

Short Course 2 – Morning Half Day Pass Stormwater Management in Karst ☐ \$260 ☐ \$280
Course Length: 4 Hours (Evening Reception Included)

Afternoon Short Courses—select no more than one afternoon course

Short Course 3 – Afternoon Half Day Pass Designing & Conducting Tracer Studies Course Length: 4 Hours (Evening Reception Included) ☐ \$260 ☐ \$280

Short Course 4 – Afternoon Half Day Pass Geologic Site Characterization in Karst ☐ \$260 ☐ \$280
Course Length: 4 Hours (Evening Reception Included)

Wednesday, April 22

Day Pass to sessions with evening poster session reception ☐ \$305 ☐ \$305

Thursday, April 23

Day Pass to sessions with evening banquet ☐ \$335 ☐ \$335

Friday, April 24

Day Pass to sessions & field trip (trip ticket sold separately below) ☐ \$190 ☐ \$210

Half Day Field Trip only – Superfund sites in Vega Alta and Vega Baja ☐ \$50 ☐ \$70

Day Pass total amount \$ _____ \$ _____

T-Shirts and Hats (not included in Full, Student, or Day Pass registration)

	SIZE	QUANTITY	AMOUNT
T-Shirt	<input type="checkbox"/> S	_____	_____
	<input type="checkbox"/> M	_____	_____
	<input type="checkbox"/> L	_____	_____
	<input type="checkbox"/> XL	_____	_____
	<input type="checkbox"/> XXL	_____	_____
Hat: Sinkhole Conf. Logo	<input type="checkbox"/> \$20 One size fits all	_____	_____

Please tally all of your registration choices:

Full Registration \$ _____

Day Pass total \$ _____

Field Trips \$ _____

Special Events \$ _____

Short Courses \$ _____

T-shirts \$ _____

Hats \$ _____

GRAND TOTAL
(pay this amount) \$ _____

*Proceeds from the T-Shirts and Hats go to the
Beck Student Scholarship Fund*

Credit Card:

☐ AMEX ☐ VISA ☐ MC ☐ DISC

PAYMENT: Full payment must accompany this registration form.

REFUND POLICY: 80% by September 1, 2019; 50% by December 1, 2019 (no refunds after this date).

For online credit card payment, register at: <http://sinkholeconference.com>

Card Number	
Exp. Date (MM/YY)	
CVC (three digit #)	
Cardholder Name	
Billing address	
Total to be Charged	\$