EERI NYNE - GEER Mini-Symposium and Panel Discussion

Thursday February 2nd, 2017, 3:30 – 7:30 pm

2010-11 and 2016 NEW ZEALAND EARTHQUAKES

Relevance to NYC and US Critical Infrastructure

Assessment, Lessons, Planning, Reconstruction, and Code Modifications

The Mini-Symposium has 2 parts: (1) A series of four talks by the foremost seismic experts involved in the 2010-11 Canterbury earthquake sequence and the 2016 Kaikoura, NZ earthquake in the fields of infrastructure and liquefaction assessment, reconstruction planning, rebuild, and code modifications; (2) a panel of international and NYC code seismic experts will discuss with the speakers key aspects of NZ practice modifications and implementations as they relate to protection and resiliency of the critical infrastructure of our metropolis and our nation at large.

SUPPORTING ORGANIZATIONS

SPONSORS

At The General Society of Mechanics & Tradesmen
20 West 44th Street
New York, NY

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE
New York - Northeast
Dedicated to Reducing Earthquake Risk
Learning from Earthquakes

GEOTECHNICAL EXTREME EVENTS RECONNAISSANCE
Turning Disaster into Knowledge
Sponsored by the NSF

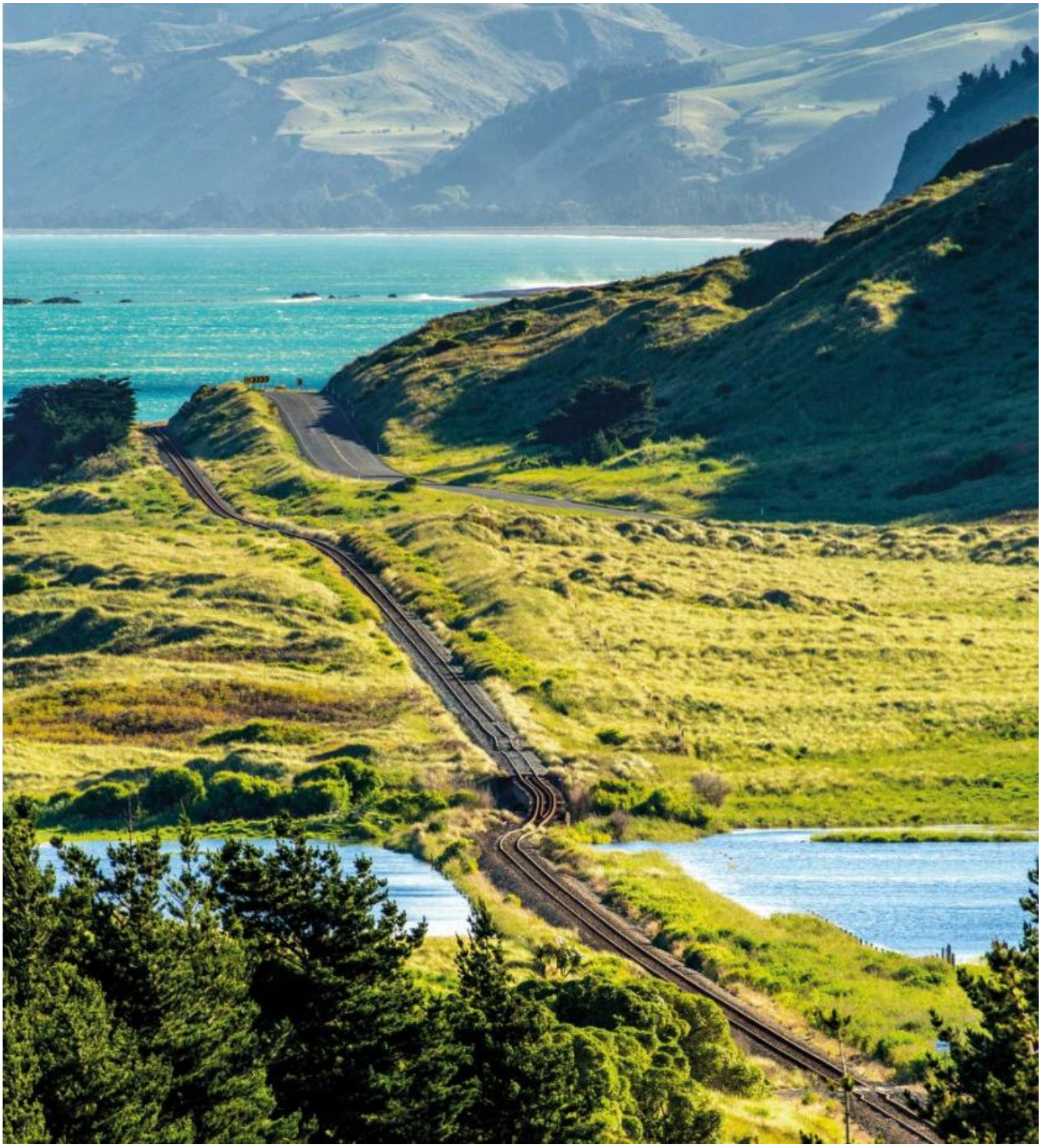


Photo from the Kaikoura, New Zealand 2016 earthquake [1]

NOTE ON OUR EVENT, CRITICAL INFRASTRUCTURE AND EXTREME EVENTS

Extreme climate and geological events occur with sufficient frequency to garner our attention. Moreover, they often occur without warning. Urban centers that rely heavily on their infrastructure are particularly vulnerable, as Hurricane Sandy in our city in 2012 and the 2010-11 and 2016 earthquakes in New Zealand reminded us. Natural disasters and climate change can cause severe damage to infrastructure with potential impacts on the quality of life, economic growth, and viability. Losses from natural and human-made disasters reached a peak in 2016 at an estimated global total of at least $158B, increased by 68% from 2015 (Swiss Re, 2016). The rapid expansion of urbanized regions will place even higher demands and hence greater consequences on our infrastructure.

There is an urgent need to find solutions to improve the performance of our infrastructure assets and minimize the risk imposed by fatigue and extreme multi-hazards to support our economy, while safeguarding the public. Engineers are facing great challenges in addressing the public's desire to incorporate resiliency and sustainability in infrastructure design and retrofit while controlling costs. Such efforts naturally require effective cross-disciplinary interactions with planners, architects, environmental scientists, owners, decision makers, agencies, and the affected public at large.

The mission of the Earthquake Engineering Research Institute (EERI) is to reduce natural hazard risk by advancing the science and practice of extreme event engineering; to improve understanding of the impact of extreme events on the physical, social, economic, political, and cultural environment; and to advocate for comprehensive and realistic measures for reducing the harmful effects of earthquakes and other extreme events. The New York-Northeast (NYNE) Chapter of EERI focuses on the same goals for its respective region, and especially for the New York metropolitan area, that is exposed to several threats due to the City's geographic location, unique geology, dense construction, population, and high monetary values.

In today's event, EERI-NYNE joins forces with the National Science Foundation (NSF)-sponsored Geotechnical Extreme Events Reconnaissance (GEER) Association, which was formed to investigate and document the geotechnical impacts of earthquakes and other extreme events. GEER is a volunteer organization of geotechnical engineers, engineering geologists, and earth scientists from academia, industry, and government organizations, which conduct detailed reconnaissance to obtain valuable perishable information that can be used to advance research and improve engineering practice.

This mini-symposium brings the experience and knowledge of some of the foremost experts involved in the 2010-11 Canterbury and 2016 Kaikoura, New Zealand earthquakes. In an effort to find common ground with the needs for protection and resiliency of critical NYC infrastructure, a panel of international and NYC seismic experts will join the speakers to discuss the NZ lessons on liquefaction reconnaissance and assessment, reconstruction planning, rebuild, code modifications and practice implementations.

We greatly appreciate the outreach support of the organizations ACECNY, AIANY-DfRR, ASCE-MetSection, ASCE-GI, ATC, DFI, LFE (Learning from Earthquakes, EERI), MCEER, NSF (sponsor of GEER), NYCEM, PEER, QuakeCore, SEAoNY, and USGS. We are grateful for all the firms that have financially supported the event through sponsorships. The General Society of Mechanics and Tradesmen once again offered their majestic library to host the event, for which we are indebted. We thank all of you, including our tireless volunteers, for contributing to this event.

With a wish for a resilient future
in New Zealand, our city, and the world…

Sissy Nikolaou
EERI NYNE Chapter President

PROGRAM

3:00 - 3:30 **REGISTRATION**

3:30 - 3:35 **OPENING REMARKS**
Victoria A. Dengel
Executive Director, The General Society of Mechanics & Tradesmen

3:30 – 4:00 **EERI NYNE / GEER EVENT INTRODUCTION**

3:30 – 3:40 **Mary Comerio**
EERI President, GEER Advisory Panel Member
Introduction of EERI

3:40 – 3:50 **Jonathan Bray**
Chair of GEER Steering Committee
Introduction of GEER

3:50 – 4:00 **Sissy Nikolaou**
EERI-NYNE President, EERI Board of Directors, GEER Advisory Panel Member
Introduction to Speakers

4:00 - 5:30 **PRESENTATIONS ON THE 2010-11 AND 2016 EARTHQUAKES IN NEW ZEALAND**

4:00 - 4:25 **Brendon Bradley**
University of Canterbury, NZ
"Engineering aspects of the 2010-2011 Canterbury, and 2016 Kaikoura, NZ earthquakes"

4:25 - 4:40 **Ellen Rathje**
University of Texas at Austin
"Using new technologies to better understand earthquake effects: Examples from the Christchurch and Kaikoura NZ earthquakes"

4:40 - 4:55 **Jonathan Bray**
University of California, Berkeley
"Liquefaction effects on buildings and facilities: Lessons from New Zealand"

4:55 - 5:10 **Thomas O'Rourke**
Cornell University, Ithaca
"Impact of Christchurch earthquakes on hazard resilient infrastructure"

5:10 - 5:30 Questions

5:30 - 5:45 **BREAK**
Light refreshments and appetizers

5:45 - 7:30 **PANEL ON RELEVANCE OF NZ LESSONS TO NYC INFRASTRUCTURE & BUILDINGS**
Douglas P. Gonzalez
Leslie E. Robertson Associates, SEAoNY President
Introduction of expert panelists:
Mary Comerio
University of California, Berkeley, EERI President
David Wald
United States Geological Survey
Andrew Whittaker
University at Buffalo
Ramon Gilsanz
Gilsanz Murray Steficek LLP, New York
Sissy Nikolaou
WSP|Parsons Brinckerhoff, New York

7:30 - 8:10 **NETWORKING**

MAIN PANEL DISCUSSION TOPICS ON RELEVANCE OF NZ LESSONS TO NYC INFRASTRUCTURE & BUILDINGS

SETTING

- What is NYC infrastructure's seismic risk exposure?
  What are the key risk parameters and uncertainties and how do they relate to other hazards?
- Could an event similar to the 2011, Mineral, Virginia earthquake happen closer to NYC within our lifetime?
  If so, what would be the economic and physical damage?
  How important is rapid reconnaissance and data collection after a NYC earthquake?
- Does NYC have liquefiable soils like Christchurch? Where?
  How big of an earthquake could cause liquefaction in NYC?
  How would potential liquefaction affect NYC infrastructure? Could we experience a repeat of Christchurch?
- What are the types of existing NYC building stock built prior to seismic code implementation in 1995?
  What are their seismic vulnerabilities?
  Are our new structures safe against earthquakes?
  Are NYC critical facilities seismically protected and able to function after an earthquake?
- What are potential seismic effects on NYC infrastructure (transportation, energy/water supply, communications)?
  How do they compare to effects from the extreme events of 9/11 and Hurricane Sandy?
  How do they compare to effects in NZ?

PREPARDNESS, RESPONSE, AND PRACTICE

- What are the available tools for immediate response to understand the amount of damage after an earthquake?
  How is immediate recovery funding amount calculated in the US and NZ?
  What is the mechanism to divert the funds to different infrastructure components?
- What tools can give a sense of vulnerability/cost/risk in NYC? (e.g., FEMA Hazus, ATC projects)
- What practice and code modifications worked/didn't work in NZ?
  How could we apply successful NZ modifications in the mega-city environment of NYC?
  Are there simple practical construction upgrades that can be applied in the vulnerable old building stock of NY?
- What were the measures of mandatory seismic upgrades on existing NZ infrastructure?
  What were the triggers for these upgrades?
- What were the challenges in applying higher seismic standards for existing and future infrastructure planning?
  Discuss all aspects of technical, physical, political, socioeconomic, outreach and messaging.

PEOPLE

- How important is the involvement of the communities in achieving resilience for extreme events, but also day-to-day use of our infrastructure?
- What have you learned about the reaction, recovery (short- and long-term) of the people?
  Can you share a personal experience?

SPEAKERS

Prof. Brendon Bradley, PhD, University of Canterbury, New Zealand
Deputy Director, QuakeCoRE: NZ Centre for Earthquake Resilience

"The 2016 Kaikoura event was an urgent reminder that the question is not whether earthquakes happen, but how prepared and resilient we are when they do. Lessons need to be implemented towards resilience, especially regarding critical infrastructure and lifeline networks." [2]

Brendon Bradley is a Professor of Earthquake Engineering in the Department of Civil and Natural Resources Engineering at the University of Canterbury, New Zealand and the Deputy Director of QuakeCoRE: The New Zealand Centre for Earthquake Resilience, which is a network of over 180 active researchers. His areas of interest include engineering seismology, strong ground motion prediction, seismic response analysis of structural and geotechnical systems, and seismic performance and loss estimation methods. He obtained his Bachelor of Engineering with Honors in 2007 and PhD in 2009. Brendon Bradley is an editorial board member for Earthquake Spectra and the Bulletin of the New Zealand Society of Earthquake Engineering. He has received several notable awards for work with collaborators, including, the 2012 Ivan Skinner EQC award for the advancement of earthquake engineering in NZ; 2013 Royal Society of New Zealand Rutherford Discovery Fellowship; 2014 Shamsher Prakash Foundation Research Award; 2014 NZ Engineering Excellence Awards Young Engineer of the Year; 2015 University of Canterbury Teaching Award; 2015 TC203 Young Researcher Award; 2015 EERI Shah Innovation Prize; and the 2016 ASCE Norman Medal.

Prof. Ellen Rathje, PhD, University of Texas at Austin
W.S. Bellows Centennial Professor, PE, F. ASCE

"We are bringing together our expertise in engineering and information technology to develop the best tools to help engineers better understand the impact of natural hazards on our cities and infrastructure. There is tremendous potential to save lives and property through better engineering, design and planning." [3]

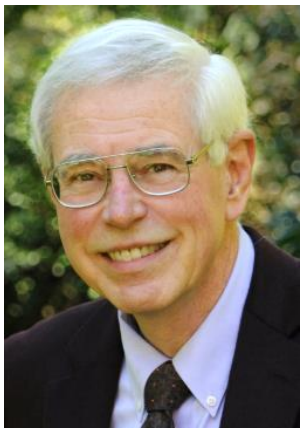
Ellen M. Rathje is the Warren S. Bellows Centennial Professor in the Department of Civil, Architectural, and Environmental Engineering at the University of Texas at Austin, and Senior Research Scientist at the Bureau of Economic Geology. She has expertise in the areas of seismic site response analysis, seismic slope stability, field reconnaissance after earthquakes, and remote sensing of geotechnical phenomena. She has published over 150 papers on these topics and has supervised the research of over 30 graduate students. Ellen Rathje is a founding member and current Co-Chair of the Geotechnical Extreme Events Reconnaissance (GEER) Association and she was a member of the Board of Directors of the Earthquake Engineering Research Institute (EERI) from 2010-2013. She is the Principal Investigator for the DesignSafe-ci.org cyberinfrastructure for the NSF-funded Natural Hazards Engineering Research Infrastructure (NHERI). She has been honored with various research awards, including the Huber Research Prize from the American Society of Civil Engineers (ASCE) in 2010, the Hogentogler Award for outstanding paper from ASTM Committee D18 in 2010, the Shamsher Prakash Research Award in 2007, and the Shah Innovation Prize from EERI in 2006. Professor Rathje is the principal investigator of DesignSafe resource-sharing platform for natural hazards engineering. She has been involved in research after the 2010-2011 Canterbury Earthquake Sequence that uses satellite imagery to measure the movements associated with liquefaction and lateral spreading. Recently, she participated in the GEER reconnaissance mission for the 2016 Kaikoura (NZ) Earthquake and focused on documenting the severe landslides induced by the earthquake.

SPEAKERS

Prof. Jonathan Bray, PhD, University of California at Berkeley
Faculty Chair in Earthquake Engineering Excellence, PE, F.ASCE, NAE

"Rarely has detailed information about lifeline and building performance been available to the degree that exists for Christchurch where liquefaction effects of several earthquakes are documented in a comprehensive way. Data on the Canterbury sequence provide a unique understanding for advancing an integrated examination of the impacts of liquefaction on critical infrastructure in the USA." [4]

Jonathan Bray is the Faculty Chair in Earthquake Engineering Excellence at the University of California, Berkeley. He is a member of the US National Academy of Engineering and a Fellow of the American Society of Civil Engineers. He earned engineering degrees from West Point, Stanford, and Berkeley. Jonathan Bray is a registered professional civil engineer and has served as consultant on several important engineering projects and peer review panels. With more than 340 research publications, his expertise includes seismic performance of earth structures, seismic site response, liquefaction and ground failure and its effects on structures, earthquake fault rupture propagation, and post-event reconnaissance. Jonathan Bray has received several honors, including the Peck Award, Joyner Lecture, Prakash Award, Huber Research Prize, Packard Foundation Fellowship, and NSF Presidential Young Investigator Award. Prof. Bray has been playing a key role advising the New Zealand government following the 2010-11 Canterbury, NZ earthquakes. He is extensively involved in providing input and reviewing local regulations with respect to liquefaction and its effects on buildings and lifelines at Christchurch. His work with his collaborators from NZ and USA on the assessment of liquefaction-induced land damage for residential Christchurch was recognized with the Outstanding Earthquake Spectra Paper by EERI in 2014.



Prof. Thomas Denis O'Rourke, PhD, Cornell University
Thomas R. Briggs Professor, Dist. M.ASCE, FREng, NAE

"In the new normal for natural disasters, we should reassess and identify critical infrastructure that is too big to fail, and the risk related to it, and subsequently form local coalitions to protect it using punctuated resilience against what is possible and beyond what is probable." [5]

Tom O'Rourke is the Thomas R. Briggs Professor of Engineering in the School of Civil and Environmental Engineering at Cornell University. He is a member of the US National Academy of Engineering, International Fellow of the Royal Academy of Engineering and Distinguished Member of ASCE. He received a number of distinctions for his research and teaching, some of which are ASTM C.A. Hogentogler Award, ASCE Collingwood, Huber Research, C. Martin Duke, Stephen D. Bechtel Pipeline Engineering, and Ralph B. Peck Awards, British ICE Trevithick Prize and EERI George M. Housner Medal. He gave the 2009 Rankine Lecture and 2016 Terzaghi Lecture. He served as President of EERI and as a member of the US NSF Engineering Advisory Committee. He authored or co-authored over 380 technical publications. His research interests cover geotechnical engineering, earthquake engineering, underground construction technologies, engineering for large, geographically distributed systems, and geographic information technologies and database management. He has served on numerous government and professional society projects, as well as the peer reviews for projects associated with highway, rapid transit, water supply, and energy distribution systems. During Hurricane Sandy in NYC, Tom O'Rourke was a member of the GEER (Geotechnical Extreme Events Reconnaissance) team that produced a technical report released shortly after the event to the engineering community. After the 2010-11 Canterbury NZ earthquakes, Professor O'Rourke has been a frequent visitor to NZ, helping in the recovery of Christchurch by providing review for rebuild plans of roads, water delivery, and wastewater conveyance. He has been a key contributor to SCIRT (Stronger Christchurch Infrastructure Rebuild Team) for restoring water and wastewater systems in Christchurch and to the Lyttelton Port. He chaired the international peer reviews of the MBIE Guidance for Repairing and Rebuilding Houses Affected by the Canterbury Earthquakes, EQC Shallow Ground Improvement Field Trials, and Increased Liquefaction Vulnerability Assessment Methodology for the NZ High Court.

PANELISTS

Prof. Mary Comerio, University of California at Berkeley
EERI President

"We need to reach out to and collaborate with other professions whose work can influence long-range policies for seismic safety and hazard assessment. We need to focus on the challenges of "resilient cities" and on technical and policy issues needed to make our cities robust, sustainable and safe. After devastating earthquakes in recent years in China, Haiti, NZ, Italy, Chile and Japan, we have much to learn from these events and from our colleagues around the globe." [6]

Mary Comerio is a Professor in the Graduate School at UC Berkeley and a faculty member in Architecture since 1978, serving at Chair from 2006 to 2009. As an architect, she has designed numerous public- and private facilities but her career focus has been on seismic safety for housing and post-disaster recovery. She is the author of numerous publications, bringing together engineering and retrofit technologies, economic impacts and policy guidance. From 1998 through 2002, Comerio led the Disaster Resistant University Initiative, funded by the Federal Emergency Management Agency and UC Berkeley. Comerio used the UC Berkeley campus as a model for a national program for evaluating hazards and developing plans for strengthening buildings and post-disaster teaching and research resumption. She conducts interdisciplinary research with colleagues at multiple universities through the Pacific Earthquake Engineering Research (PEER) Center, and led the Building Systems team with Prof. Krawinkler of Stanford University. Comerio developed the "downtime" component of loss models used in Performance Based Earthquake Engineering methods. She has recently completed work on a National Science Foundation (NSF) Grand Challenge research project to mitigate the risk of collapse in concrete buildings. Comerio has been a Visiting Fellow at the Public Policy Institute of California (2010) and an Erskine Fellow at the University of Canterbury (2003, 2013) in NZ. She has worked on post-disaster recovery for the United Nations (UN) Environment Program in China and Haiti, and the UN Development Program in Chile. In May 2011, she received the Green Star Award from the UN for her work in post-disaster reconstruction. In May 2013, she received the UC Berkeley, Chancellor's Public Service Award for Research in the Public Interest. Mary is President of the EERI Board of Directors, member of the EERI reconnaissance teams to Umbria and L'Aquila and leader of the teams to Christchurch. In addition to her EERI activities, she is currently on the GEER advisory board and the San Francisco Bay Conservation and Development Commission (BCDC) Engineering Criteria Review Board.

David Wald, PhD, USGS National Earthquake Information Center
Real-Time Earthquake Information R&D

"Earthquake information systems are critical for response, yet also for planning and resilience. The financial relief component of earthquake resilience, an ongoing discussion, often relies on such near-real-time information. Healthy mechanisms for disaster financing, arising from capital/traditional insurance markets, linked to strong provision of scientific information, can be critical resources for holistic community-wide risk-mitigation strategies." [7]

David Wald is a Seismologist with the USGS in Golden, and is on the Geophysics Faculty at the Colorado School of Mines. He earned his Ph.D. in Geophysics from Caltech in 1993. Wald is involved in research, development and operations of several real-time information systems at the USGS National Earthquake Information Center. He lead development and manages "ShakeMap", "Did You Feel it?", and is responsible for other systems for post-earthquake response and pre-earthquake mitigation, including ShakeCast and PAGER. Wald's scientific interests include the characterization of the earthquake rupture process and analyses of ground shaking hazards and earthquake losses. David Wald serves on the Earthquake Engineering Research Institute's (EERI) Board of Directors, has served as the Seismological Society of America (SSA) as well as EERI's Distinguished Lecturer, and was awarded SSA's Frank Press Public Service Award in 2009.

PANELISTS

Prof. Andrew Whittaker, PhD, University at Buffalo
MCEER Director, PE, SE, F.SEI, F.ACI, F.ASCE

"The exposure of NYC to catastrophic losses (repairs, business interruption, and casualties) in the event of a significant earthquake, such as the 2011 M5.8 Mineral, Virginia event, is high. Such an earthquake would trigger substantial damage to buildings and infrastructure. Damaged infrastructure and collapsed buildings slow response and recovery and prevent re-occupation. Much work is needed to characterize the earthquake risk in the City, and then to rehabilitate buildings and infrastructure to achieve yet-to-be determined performance goals." [8]

Andrew Whittaker is Professor in the Department of Civil, Structural and Environmental Engineering at the University at Buffalo, and serves as the Director of MCEER. He is a Fellow of the American Society of Civil Engineers and a registered civil and structural engineer in the State of California. Andrew Whittaker served as the Vice-President and President of the Consortium of Universities for Research in Earthquake Engineering (www.curee.org) from 2003 to 2011, and on the Board of Directors of the Earthquake Engineering Research Institute (www.eeri.org) and the World Seismic Safety Initiative from 2008 to 2010. Currently, he is a member of the Advisory Board for the Southern California Earthquake Center. Whittaker made significant contributions to the first generation of tools for performance based earthquake engineering (FEMA 273/274, 1992-1997) and led the structural engineering team that developed the second generation of these tools (FEMA P58, 2000-2013). Andrew Whittaker serves on a number of national committees including ASCE 4, ASCE 7, and ASCE 43, and ACI 349. He chairs the ASCE Nuclear Standards Committee. His research interests are broad and include earthquake and blast engineering of buildings, long-span bridges and nuclear structures. The US National Science Foundation, US Department of Energy, US Nuclear Regulatory Commission, US Federal Highway Administration, and Canadian Nuclear Safety Commission fund his research. He has consulted to federal agencies, regulators, consultancies, contractors, and utilities in the United States, Canada, Australia, New Zealand, Europe and Asia.

Ramon Gilsanz, Gilsanz Murray Steficek, LLP
Chair, 2014 NYC Build. Code Tech. Committee, PE, SE, F.SEI, F.ASCE

"Safety is what structural engineers should focus on, using the least minimum requirements in terms of material while also being true to helping people express their ideas - but ultimately buildings need to be safe. We're enablers, we enable things to happen by helping actualize the ideas of others." [9]

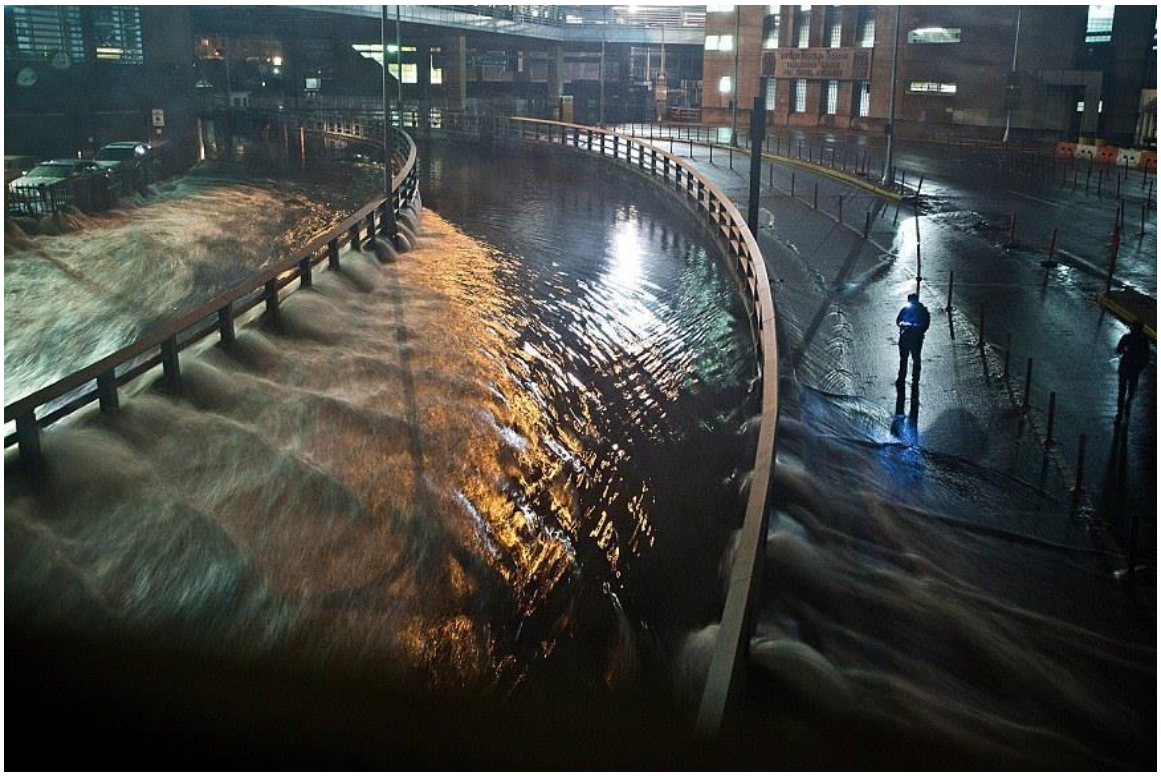
Ramon Gilsanz, PE, SE, F.SEI, is a founding Partner of Gilsanz Murray Steficek. In his 33 year career as a structural engineer, he has worked on a wide range of projects, both new construction and renovation. Ramon Gilsanz has participated on several post-disaster investigative teams, traveling to Taiwan in February 2016, Greece in February 2014, to Virginia in August 2011, and to Chile after the Maule, Chile Earthquake of February 2010 to investigate earthquake preparedness and recovery as well as seismic code issues. He has participated in the New York City DOB's post-hurricane Sandy building assessment efforts in 2012 as well as the national ASCE-FEMA building performance assessment team investigating the World Trade Center attack, leading the WTC7 collapse analysis. He currently serves as Chair of the NYC Department of Buildings' Structural Technical Committee and Chair of the American Council of Engineering Companies of NY Metropolitan Section Structural Code Committee. As an active contributor to the structural engineering industry, Ramon is currently working to help develop new building codes and serving as Past-President of the Applied Technology Council (ATC).

PANELISTS

Sissy Nikolaou, PhD, WSP| Parsons Brinckerhoff
Principal, Multi-Hazards & Geotechnical Engineering, PE, F.ASCE

"Extreme events are rare and occur when hardly anticipated with potentially disastrous impacts on our built environment and lives. Urban centers that rely heavily on their infrastructure are particularly vulnerable, as we were urgently reminded during Hurricane Sandy in NYC, the Christchurch sequence, and most recently the 2016 Muisne, Ecuador earthquake." [10]

Sissy Nikolaou is a Principal of WSP | Parsons Brinckerhoff in NYC, where she oversees the organization's multi-hazard resilience practice. Her more than 20 years of experience and technical capabilities include both structural and geotechnical engineering with emphasis on performance-based engineering, soil-structure interaction, seismic hazard analysis, liquefaction evaluation and mitigation and risk/resiliency assessment of critical facilities. Throughout her career, Sissy has been known to develop unique, creative solutions in challenging, highly collaborative infrastructure private development projects that require cross-cultural interaction of multidisciplinary teams and continuous dialogue with the clients who span the public and private sectors, large national institutions, and world-known developers and architects. She serves on the Board of Directors of the Earthquake Engineering Research Institute (EERI) and the Applied Technology Council (ATC), and on the Advisory Boards of the Geotechnical Extreme Events Reconnaissance (GEER) Association and the Dean of Engineering of the University at Buffalo. She is the chair of the 2014 NYC seismic code technical committee, and has participated as leader or co-leader in reconnaissance missions after disasters including Hurricane Sandy in NYC, Mineral-VA, Cephalonia-Greece, and Muisne-Ecuador earthquakes. She has numerous publications and recognitions such as the Prakash Prize for Excellence in Earthquake Engineering Practice and the Fellow grade of ASCE. She has been member or organizer in the Frontiers of Engineering program of the National Academy of Engineering, and was an invited participant by President Obama in the 2016 White House summit on Earthquake Resilience.



2012 Hurricane Sandy in New York City (photo from web).

SUPPORTING OUTREACH ORGANIZATIONS

New York - Northeast

The **Earthquake Engineering Research Institute (EERI)** is a national, nonprofit, technical society of engineers, geoscientists, architects, planners, public officials, and social scientists. EERI members include researchers, practicing professionals, educators, government officials, and building code regulators. The objective of the EERI is to reduce earthquake risk by (1) advancing the science and practice of earthquake engineering, (2) improving understanding of the impact of earthquakes on the physical, social, economic, political, and cultural environment, and (3) advocating comprehensive and realistic measures for reducing the harmful effects of earthquakes. In 1973, EERI formally initiated the Learning from Earthquakes (LFE) Program. This program, which has been funded in large part by the US National Science Foundation, sends out multi-disciplinary teams of researchers (e.g., earth scientists, engineers, social scientists) in the field to investigate and learn from the damaging effects of earthquakes. More information at eeri.org/ and eeri.org/ learning-from-earthquakes-lfe/

sponsored by NSF

The **Geotechnical Extreme Events Reconnaissance GEER Association** was formed as an outgrowth of grassroots efforts to investigate and document the geotechnical impacts of earthquakes and other extreme events. It is a volunteer organization of geotechnical engineers, engineering geologists, and earth scientists from academia, industry, and government organizations which conducts detailed reconnaissance to obtain valuable perishable information that can be used to advance research and improve engineering practice. Its activities are sponsored by the National Science Foundation (NSF). Additional information is available at: geerassociation.org

ACEC New York
American Council of Engineering Companies of New York

ACEC New York is a proactive coalition of 280 firms representing every discipline of engineering related to the built environment—civil, structural, mechanical, electrical, environmental, geotechnical—and affiliated companies. We are a diverse group of consulting engineering firms from across NY State, ranging from sole proprietors to multinational corporations that collectively employ over 24,000 New Yorkers and nearly ten times that number worldwide. Our shared goals are to further the business interests of our membership, enhance the quality and safety of the environment we live and work in, and help ensure the vitality of our communities. For additional information, visit our website at acecny.org.

AIANY

Founded in 1857, the **AIA New York Chapter** is the oldest and largest chapter of the American Institute of Architects. The Chapter's members include more than 5,000 practicing architects, allied professionals, students, and public members interested in architecture and design. The AIA NY Chapter is dedicated to three goals: design excellence, public outreach, and professional development. The Board of the AIA NY chapter formally established the **DfRR** Committee (Design for Risk and Reconstruction) on May 17, 2011 and sanctioned the committee name on June 21, 2011. The mission of the committee is to foster awareness within the profession and the public of the necessity to anticipate risk from the scale of a building to comprehensive regional planning. More information at main.aiany.org/ and aiany.aiany.org/committees

ASCE
American Society of Civil Engineers

The **American Society of Civil Engineers (ASCE)** represents more than 150,000 members of the civil engineering profession in 177 countries. Founded in 1852, ASCE is the nation's oldest engineering society. ASCE stands at the forefront of a profession that plans, designs, constructs, and operates society's economic and social engine (built environment) while protecting and restoring the natural environment. Through the expertise of its membership, ASCE is a leading provider of technical and professional conferences and continuing education, the world's largest publisher of civil engineering content, and an authoritative source for codes and standards that protect the public. ASCE advances civil engineering technical specialties through 9 dynamic Institutes and leads with many professional- and public-focused programs. More information at asce.org/ .

SUPPORTING OUTREACH ORGANIZATIONS

The **ASCE Metropolitan Section** is the local section of ASCE in the NYC metro area and consists of nine counties in NY State including the five boroughs of NYC (Bronx, Brooklyn, Manhattan, Queens, Staten Island), Nassau and Suffolk counties on Long Island, and Rockland, Westchester counties in Lower Hudson Valley. The Met Section is part of ASCE Region 1, the ASCE NY State Council, and is a founding member of the Metropolitan Engineering Societies Council. With 5,000 members, the Met Section is one of the largest and most active ASCE sections in the US. The section was established on February 18, 1920 and includes technical groups addressing various specialty areas (Geotechnical, Infrastructure, Structures, AirTransport, Coasts, Oceans, Ports & Rivers, Construction, Forensic, International). More information at ascemetsection.org/

The **Applied Technology Council (ATC)** is a nonprofit corporation established in 1973 through the efforts of the Structural Engineers Association of California. ATC's mission is to develop and promote state-of-the-art, user-friendly engineering resources and applications for use in mitigating the effects of natural and other hazards on the built environment. As an example, the ATC-20, Procedures for Postearthquake Safety Evaluation of Buildings, family of documents, originally published in 1989 and updated and adapted in subsequent years, serve as defacto international standards for rapid and detailed evaluation of buildings and posting the buildings with green, yellow, and red placards. ATC also identifies and encourages needed research and develops consensus opinions on structural engineering issues in a nonproprietary format. ATC is headquartered in Redwood City, CA, with offices in Georgia and Virginia. For more information please visit: atcouncil.org/

The **Deep Foundations Institute® (DFI)** is an international association of contractors, engineers, manufacturers, suppliers, academics and owners in the deep foundations industry. Our multidisciplinary membership creates a consensus voice and a common vision for continual improvement in the planning, design and construction of deep foundations and excavations. We bring together members through networking, education, communication and collaboration. With our members, we promote the advancement of the deep foundations industry through technical committees, educational programs and conferences, publication of guides and specifications, a peer-reviewed journal, a flagship magazine, research, government relations and outreach. DFI has more than 3,000 involved, knowledgeable and committed members worldwide. For additional information please visit dfi.org.

The **Geo-Institute (G-I)** of the ASCE is a membership organization focused on geoprofessionals and the geo-industry. It was created by the ASCE in October 1996 as one of ASCE's specialty Institutes. The G-I is led by a Board of Governors guided by its Long-Term Strategic Plan, and thrives on the support of numerous member volunteers at the technical and administrative levels. The G-I membership consists of more than 11,500+ individual members and 65 organizational members, including: engineers, scientists, technologists, students, and organizations who share a mutual interest in protecting the public by enhancing understanding of—and expertise in—the engineering behavior of earth materials. Our geoprofessionals work to improve the built environment; prevent the loss of life from natural and man-made hazards; and construct sound and reliable engineered facilities and structures. Career development for our geotechnical professionals is enhanced through: conferences; scientific journals and practice-oriented publications like GEOSTRATA; continuing education programs; committees and task forces; awards; networking and coalition-building; and leadership on emerging issues. Numerous opportunities are offered by the G-I to learn, grow, give back, and be recognized for their contributions to the geotechnical engineering profession both in the US and around the world. More information at: geoinstitute.org/

SUPPORTING OUTREACH ORGANIZATIONS

The **Institution of Civil Engineers (ICE)** is a learned society of civil engineers based in the United Kingdom with 91,000 members located worldwide. Founded in 1818, it is one of the world's most respected professional engineering bodies. The New York local association hosts meetings, seminars and debates on all aspects of civil engineering. Our events are open to all, and offer great networking opportunities. Our lively debates and knowledge-sharing seminars focus on topics that are particularly relevant to engineers practicing in and around New York. Membership of the ICE provides added benefits including special publications, access to almost 200 years of technical journals in our Virtual Library, and support for obtaining international professional engineering qualifications. For contact information and details of upcoming events please visit iceusa.org/

The **Multidisciplinary Center for Earthquake Engineering Research (MCEER)** is a national center of excellence dedicated to the discovery and development of new knowledge, tools and technologies that equip communities to become more disaster resilient in the face of earthquakes and other extreme events. MCEER accomplishes this through a system of multidisciplinary, multi-hazard research. Headquartered at the University at Buffalo, The State University of New York, MCEER was originally established by the National Science Foundation in 1986, as the first National Center for Earthquake Engineering Research (NCEER). In 1998, it became known as the Multidisciplinary Center for Earthquake Engineering Research, from which the current name, MCEER, evolved. For more information please visit: buffalo.edu/mceer.html

The **National Science Foundation (NSF)** is an independent federal agency created by Congress in 1950 to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense. NSF is vital because it supports basic research and people to create knowledge that transforms the future. This type of support is a primary driver of the U.S. economy, enhances the nation's security, advances knowledge to sustain global leadership. With an annual budget of $7.5 billion (FY 2016), NSF is the funding source for approximately 24 percent of all federally supported basic research conducted by America's colleges and universities. In many fields such as mathematics, computer science and the social sciences, NSF is the major source of federal backing. For additional information please visit: nsf.gov/

Established in 1996, **NYC Emergency Management (NYCEM, former OEM)** is a coordinating agency for the City of New York. The agency plans and prepares for emergencies, educates the public about preparedness, coordinates emergency response and recovery, and collects and disseminates emergency information. The agency maintains a disciplined unit of emergency management personnel — including but not limited to: responders, planners, watch commanders, logisticians, community outreach, communications, administrative and support staff — to identify and respond to various hazards. NYCEM was also responsible for developing NYC's Risk Landscape: A Guide to Hazard Mitigation, a guide focused on hazards (including earthquakes) that pose a risk to New York City and includes information on how the City approaches risk management. For more information about NYCEM please visit nyc.gov/site/em/index.page

The **Pacific Earthquake Engineering Research Center (PEER)** is a multi-institutional research and education center with headquarters at the University of California, Berkeley. Investigators from over 20 universities, several consulting companies, plus researchers at various State and Federal government agencies contribute to research programs focused on performance-based earthquake engineering in disciplines including structural and geotechnical engineering, geology/seismology, lifelines, transportation, risk management, and public policy. For additional information please visit our website: peer.berkeley.edu/

SUPPORTING OUTREACH ORGANIZATIONS

QuakeCoRE is a national network of leading New Zealand Earthquake Resilience Researchers. We leverage strengths across the country and internationally, working collaboratively on integrated multidisciplinary programs of internationally-leading research that will support the development of an earthquake-resilient NZ where thriving communities have the capacity to recover rapidly after major earthquakes through mitigation and pre-disaster preparation. For additional information please visit our website: quakecore.nz/

The **Structural Engineers Association of New York (SEAoNY)** is a member organization of the National Council of Structural Engineers Associations. Presently, 39 states and the District of Columbia have structural engineers' associations, the largest of which is SEAOC, Structural Engineers Association of California, which was founded in 1930 and presently has approximately 4000 members. The association sponsors workshops, panel discussions, lectures and seminars with the aim of addressing topics of interest and concern to structural engineers. Our membership, which is over 500 members, includes individuals from most major structural engineering design firms in New York State. SEAoNY also reaches out to other professionals, outside the engineering community, who work in related fields with common interests. Currently, 10% of our membership are affiliate members who come from a variety of disciplines such as geotechnical, civil, construction management and architecture. The purpose of SEAoNY is to advance the art of structural engineering in New York by improving the flow of ideas and building the community of colleagues. For more information please visit seaony.org/

Created by an act of Congress in 1879, **U.S. Geological Survey (USGS),** science for a changing world) has evolved over the ensuing 125 years, matching its talent and knowledge to the progress of science and technology. USGS is the sole science agency for the Department of the Interior. It is sought out by thousands of partners and customers for its natural science expertise and its vast earth and biological data holdings. We provide science about the natural hazards that threaten lives and livelihoods; the water, energy, minerals, and other natural resources we rely on; the health of our ecosystems and environment; and the impacts of climate and land-use change. For more information please visit: usgs.gov/

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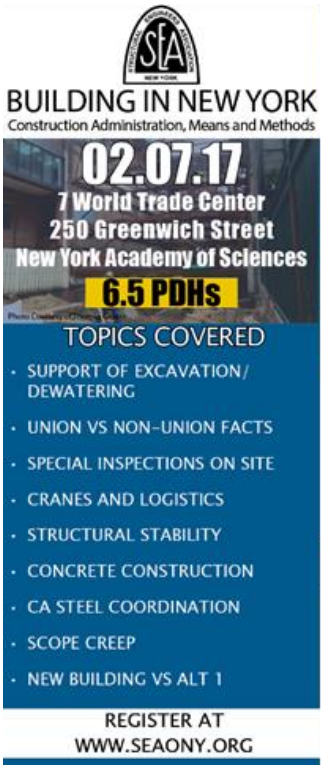

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