

# **14th Water Distribution Systems Analysis Conference 2012**

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**Volume 1 of 2**

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## Keynote — Kevin Lansey

*Venue Napier N102, Time 09:30 - 10:30, Tuesday 25 September 2012*

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*Kevin Lansey, University of Arizona, USA*
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## Keynote — Darryl Day

*Venue Napier N102, Time 09:00 - 10:00, Wednesday 26 September 2012*

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- (NA)        **Closing the Gap on Indigenous Disadvantage — Challenges and Opportunities for the  
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*Chair: Prof Maria Cunha, University of Coimbra*

*Venue Napier N102, Time 11:00 - 12:40, Tuesday 25 September 2012*

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*<sup>1</sup>University of Exeter, UK; <sup>2</sup>Pennsylvania State University, USA*
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Chair: Dr Olivier Piller, IRSTEA

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*<sup>1</sup>GLS Consulting, South Africa; <sup>2</sup>GLS Software, South Africa; <sup>3</sup>City of Tshwane, South Africa*

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Chair: Dr Robert Clark

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<sup>1</sup>Technische Universiteit Delft, The Netherlands; <sup>2</sup>Oasen Drinking Water Company, The Netherlands
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<sup>1</sup>Technische Universiteit Delft, The Netherlands; <sup>2</sup>DHV B.V., The Netherlands; <sup>3</sup>Vitens N.V., The Netherlands

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Chair: Dr Tom Walski, Bentley Systems

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<sup>1</sup>Sydney Catchment Authority, Australia; <sup>2</sup>University of Newcastle, Australia
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Chair: Prof Marco Franchini, University of Ferrara

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*<sup>1</sup>Los Alamos National Laboratory, USA; <sup>2</sup>NICTA, Australia*
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Chair: Dr Jakobus van Zyl, University of Cape Town

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*<sup>1</sup>3S Consult GmbH, Germany; <sup>2</sup>University of Adelaide, Australia*
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*<sup>1</sup>IRSTEA, France; <sup>2</sup>ENSEIRB-MATMECA, France; <sup>3</sup>University of Cape Town, South Africa*
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*<sup>1</sup>AS Tallinna Vesi, Estonia; <sup>2</sup>Tallinn University of Technology, Estonia*

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Chair: A/Prof Jan Vreeburg, KWR Watercycle Research

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*<sup>1</sup>PWN, The Netherlands; <sup>2</sup>KWR Watercycle Research Institute, The Netherlands*
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*<sup>1</sup>University of Sheffield, UK; <sup>2</sup>University of Hull, UK*

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Chair: Dr Kevin Lansey, University of Arizona

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*<sup>1</sup>Aurecon, South Africa; <sup>2</sup>University of Cape Town, South Africa*

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Chair: Dr Bryan Tolson, University of Waterloo

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*<sup>1</sup>University of Exeter, UK; <sup>2</sup>Università di Cassino e del Lazio Meridionale, Italy*

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Chair: Prof Orazio Giustolisi, Technical University of Bari

Venue Napier G04, Time 15:50 – 17:10, Tuesday 25 September 2012

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*<sup>1</sup>IRSTEA, France; <sup>2</sup>ENSEIRB-MATMECA, France; <sup>3</sup>University of Cape Town, South Africa*
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*<sup>1</sup>UNESCO-IHE, The Netherlands; <sup>2</sup>Luapula Water and Sewerage Company Ltd., Zambia; <sup>3</sup>University of South Florida, USA*
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Chair: Prof Bogumil Ulanicki, De Montford University

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*<sup>1</sup>Yorkshire Water Services, UK; <sup>2</sup>University of Leeds, UK*
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*<sup>1</sup>Korea University, Korea; <sup>2</sup>Seoul National University of Science and Technology, Korea*

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Chair: Prof Angus Simpson, University of Adelaide

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*<sup>1</sup>Harbin Institute of Technology, China; <sup>2</sup>Staffordshire University, UK*
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*<sup>1</sup>Shanghai Water Engineering Design and Research Institute, China; <sup>2</sup>Tongji University, China*

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Chair: Prof Holger R. Maier, University of Adelaide

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<sup>1</sup>KWR Watercycle Research Institute, The Netherlands; <sup>2</sup>PWN, The Netherlands;  
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<sup>1</sup>KWR Watercycle Research Institute, The Netherlands; <sup>2</sup>DYKA B.V., The Netherlands;  
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Chair: Dr Ian Pepper, University of Arizona

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<sup>1</sup>BG&E Pty. Ltd., Australia; <sup>2</sup>University of Western Sydney, Australia

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Chair: Alana Duncker, Montgomery Watson Harza

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Chair: Prof Zoran Kapelan, University of Exeter

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*<sup>1</sup>Environmental Engineering and Public Health Consultant, USA; <sup>2</sup>Eastern Research Group, USA*
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*<sup>1</sup>Technische Universiteit Delft, The Netherlands; <sup>2</sup>KWR Watercycle Research Institute, The Netherlands; <sup>3</sup>Dunea, The Netherlands*
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*<sup>1</sup>Jeffares & Green, South Africa; <sup>2</sup>University of Cape Town, South Africa*
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*<sup>1</sup>KWR Watercycle Research Institute, The Netherlands; <sup>2</sup>Dunea, The Netherlands*

## Session 18 — Network Optimization

Chair: Prof Dragan Savic, University of Exeter

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<sup>1</sup>University of Adelaide, Australia; <sup>2</sup>University of Canterbury, New Zealand
- 966      **Non-Probabilistic Approach for the Optimal Design of Water Distribution Systems Under Demand Uncertainty**  
*Lina Perelman<sup>1</sup>, Mashor Housh<sup>2</sup>, Nurit Olikier<sup>1</sup>, Avi Ostfeld<sup>1</sup>*  
<sup>1</sup>Technion, Israel; <sup>2</sup>University of Illinois at Urbana-Champaign, USA
- 975      **Optimization Model for Identifying Unknown Valve Statuses and Settings**  
*Zheng Yi Wu<sup>1</sup>, Yuan Song<sup>2</sup>, Juned Laiq Syed<sup>3</sup>*  
<sup>1</sup>Bentley Systems, USA; <sup>2</sup>University of Connecticut, USA; <sup>3</sup>Al Ain Distribution Company, UAE
- 984      **Sufficiency of Data Loggers for Optimized Model Calibration of Water Distribution Networks**  
*Juned Laiq Syed<sup>1</sup>, Zheng Yi Wu<sup>2</sup>, Hind Saif Al Nuaimi<sup>1</sup>*  
<sup>1</sup>Al Ain Distribution Company, UAE; <sup>2</sup>Bentley Systems, USA

## Session 19 — Network Water Quality

Chair: Joshua Cantone, Wallbridge & Gilbert

Venue Napier G03, Time 15:40 - 17:00, Wednesday 26 September 2012

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- 993      **Water Treatment Plant Generation of Rapid Monochloramine Decay**  
*David Cook, Jim Morran, Werner Mobius, South Australian Water Corporation, Australia*
- 1003      **Laboratory Study of the Water Quality in WDS Using Biological Reactors**  
*Yuebin Wu<sup>1</sup>, Ying Xu<sup>2</sup>, Wei Wang<sup>1</sup>, Yang Yao<sup>1</sup>*  
<sup>1</sup>Harbin Institute of Technology, China; <sup>2</sup>Harbin University of Commerce, China
- 1009      **Optimized Water Quality for the Reduction of Distribution System Problems**  
*Rolando Fabris, K. Braun, Jim Morran, Mary Drikas, South Australian Water Corporation, Australia*
- 1018      **Analysis of Multi-Parameter Water Quality Data Using Event Detection Software on Laboratory Simulated Events**  
*Ant Leeder, Stephen R. Mounce, Joby B. Boxall, University of Sheffield, UK*

## Session 20 — Network Vulnerability

Chair: Dr Vanessa Speight, Latis Associates

Venue Napier G04, Time 15:40 - 17:00, Wednesday 26 September 2012

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- 1034      **Hydraulic Modelling Approaches for Risk Management of Water Supply in Emergencies**  
*James Innes<sup>1</sup>, Cath Fernando<sup>2</sup>, Patrick Tunnah<sup>2</sup>, Ben Davis<sup>3</sup>*  
*<sup>1</sup>Queensland Urban Utilities, Australia; <sup>2</sup>MWH, Australia; <sup>3</sup>MWH, New Zealand*
- 1045      **Application of Web-Based Tools for Infrastructure Protection, Water Security and Consequence Assessment**  
*William B. Samuels, Rakesh Bahadur, Christopher Ziemniak, Science Applications International Corporation, USA*
- 1055      **Multiple-Criteria Decision Analysis for Proactive Management of Risk of Water Distribution Systems**  
*Rodrigo Freitas Lopes, David Antunes, Maria da Conceição Cunha, Universidade de Coimbra, Portugal*
- 1072      **Reliability Analysis of the Water Distribution Network of Oslo Using WNetXL**  
*R. Ugarelli<sup>1</sup>, J. Røstum<sup>1</sup>, Orazio Giustolisi<sup>2</sup>*  
*<sup>1</sup>SINTEF, Norway; <sup>2</sup>Politecnico di Bari, Italy*

## Session 21 — Network Real Time and Predictive Operations

Chair: A/Prof Avi Ostfeld, Technion - Israel Institute

Venue Napier N102, Time 09:00 - 10:20, Thursday 27 September 2012

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- 1088      **Real-Time Pump Scheduling Using Genetic Algorithm and Artificial Neural Network Based on Graphics Processing Unit**  
*Zheng Yi Wu<sup>1</sup>, Morad Behandish<sup>2</sup>*  
*<sup>1</sup>Bentley Systems, USA; <sup>2</sup>University of Connecticut, USA*
- 1100      **A Management Strategy for Water Supply Systems**  
*Michael Cresswell, Gholamreza Naser, University of British Columbia, Canada*
- 1109      **Testing of the System for Detection of Pipe Bursts and Other Events in a UK Water Distribution System**  
*Michele Romano, Zoran Kapelan, Dragan A. Savić, University of Exeter, UK*
- 1127      **Optimal Pressure Meters Placement for Bursts Detection Based on SOM**  
*Haidong Huang, Tao Tao, Kunlun Xin, Tongji University, China*

## Session 22 — Water Usage

Chair: Prof Joonghoon Kim, Korea University

Venue Napier G03, Time 09:00 – 10:20, Thursday 27 September 2012

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- 1138 **Estimating Peak Water Demands in Hydraulic Systems II — Future Trends**  
*Mirjam Blokker<sup>1</sup>, Irene Vloerbergh<sup>1</sup>, Steven Buchberger<sup>2</sup>*  
<sup>1</sup>KWR Watercycle Research Institute, The Netherlands; <sup>2</sup>University of Cincinnati, USA
- 1148 **The Use of an Adaptive Water Demand Prediction Model**  
*M. Bakker<sup>1</sup>, Jan Vreeburg<sup>2</sup>, L.C. Rietveld<sup>1</sup>, T. Blom<sup>3</sup>, Maurice van de Roer<sup>4</sup>*  
<sup>1</sup>Technische Universiteit Delft, The Netherlands; <sup>2</sup>KWR Watercycle Research Institute, The Netherlands; <sup>3</sup>Vitens N.V., The Netherlands; <sup>4</sup>Dunea, The Netherlands
- 1165 **Estimating Peak Water Demands in Hydraulic Systems I — Current Practice**  
*Steven Buchberger<sup>1</sup>, Mirjam Blokker<sup>2</sup>, Daniel P. Cole<sup>3</sup>*  
<sup>1</sup>University of Cincinnati, USA; <sup>2</sup>KWR Watercycle Research Institute, The Netherlands; <sup>3</sup>IAPMO, USA
- 1177 **A Flow Demand Model for Residential Users**  
*Federico Di Palma, Rudy Gargano, Università di Cassino e del Lazio Meridionale, Italy*

## Session 23 — Sustainable Water Distribution Systems

Chair: Dr Walter Grayman, W M Grayman Consulting Engineer

Venue Napier G04, Time 09:00 – 10:20, Thursday 27 September 2012

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- 1184 **Life Cycle Energy Analysis for Sustainable Pipe Replacement Scheduling**  
*Monica Prosser<sup>1</sup>, Vanessa Speight<sup>2</sup>, Yves Filion<sup>1</sup>*  
<sup>1</sup>Queen's University, Canada; <sup>2</sup>Latis Associates, USA
- 1196 **Water Conservation Planning for Reduced System Energy Use Based on Land-Use and Geographic Location**  
*Alexandra Oldford, Yves Filion, Queen's University, Canada*
- 1207 **Green Infrastructures as a Potential Strategy for Balancing Supply and Demand in Water Stressed Regions**  
*Raziyeh Farmani<sup>1</sup>, S. Atkinson<sup>1</sup>, D. Butler<sup>1</sup>, V. Cheng<sup>2</sup>, M. Echenique<sup>2</sup>, V. Grinevich<sup>2</sup>, A. Hargreaves<sup>2</sup>, S. Ward<sup>1</sup>, V. Zachariadis<sup>2</sup>*  
<sup>1</sup>University of Exeter, UK; <sup>2</sup>University of Cambridge, UK
- 1214 **Refurbishment of Large Diameter Pre-Stressed Concrete Pipelines: B7 Pipeline, a Case in Point**  
*Khathutshelo Godfrey Maumela, Kirk Canary, Rand Water, South Africa*

## Session 24 — Contaminant Intrusion and Water Security

Chair: Prof Joby Boxall, University of Sheffield

Venue Napier N102, Time 10:50 - 12:10, Thursday 27 September 2012

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- 1232      **Comparison Between Fixed Thresholds and Genetic Algorithm Methods for Water Quality Event Detection**  
*Jonathan Arad<sup>1</sup>, Mashor Housh<sup>2</sup>, Lina Perelman<sup>1</sup>, Avi Ostfeld<sup>1</sup>*  
*<sup>1</sup>Technion, Israel; <sup>2</sup>University of Illinois at Urbana-Champaign, USA*
- 1245      **A Lagrangian-Transient Water Quality Model for Contaminant Intrusion in Water Distribution Systems**  
*Saheb Mansour-Rezaei, Gholamreza Naser, University of British Columbia, Canada*
- 1255      **Real-Time Event Detection: A Model-Based Approach**  
*Xueyao Yang, Dominic L. Boccelli, University of Cincinnati, USA*
- 1265      **A Weighted Support Vector Machine Classifier for Contamination Event Detection in Water Distribution Systems**  
*Nurit Olikier, Avi Ostfeld, Technion, Israel*

## Session 25 — Network Water Quality

Chair: Prof Graeme Dandy, University of Adelaide

Venue Napier G03, Time 10:50 - 12:10, Thursday 27 September 2012

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- 1273      **Ensuring Safe Water Through Advanced Oxidation and Real-Time Sensors**  
*Ian L. Pepper<sup>1</sup>, Samendra P. Sherchan<sup>1</sup>, Syreeta L. Miles<sup>2</sup>, Bradley O. Clarke<sup>1</sup>, Shane A. Snyder<sup>1</sup>*  
*<sup>1</sup>University of Arizona, USA; <sup>2</sup>Los Angeles Department of Public Health, USA*
- 1279      **Modeling of Free Chlorine Decay Rate in the Rand Water Distribution System**  
*Mosa Mongalo, Muzi Sibiyi, Given Skosana, Rand Water, South Africa*
- 1294      **Standard Plate Counts in Distribution Systems and Drinking Water Safety**  
*E.J. Ncube, M. Mohotsi, Rand Water, South Africa*
- 1301      **The Effect of Velocity on the Maintenance of Chlorine and Chloramine Residuals**  
*Robert M. Clark<sup>1</sup>, Christopher A. Impellitteri<sup>2</sup>, Donald A. Schupp<sup>3</sup>, Srinivas Panguluri<sup>3</sup>*  
*<sup>1</sup>Environmental Engineering and Public Health Consultant, USA; <sup>2</sup>U.S. Environmental Protection Agency, USA; <sup>3</sup>Shaw Environmental and Infrastructure Inc., USA*

## Session 26 — Asset Management

Chair: Dr Zheng Yi Wu, Bentley Systems

Venue Napier G04, Time 10:50 – 12:10, Thursday 27 September 2012

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- 1316      **The Optimal Leakage Detection Model for Water Distribution Systems Considering Uncertainties in Roughness Coefficient**  
*Jung Soo Yoon<sup>1</sup>, Do Guen Yoo<sup>1</sup>, Doo Sun Kang<sup>2</sup>, Joong Hoon Kim<sup>1</sup>*  
*<sup>1</sup>Korea University, Korea; <sup>2</sup>Suwon University, Korea*
- 1324      **Water Distribution Networks Rehabilitation Based on a Small Information Dataset**  
*Antonino Fortunato, Claudio Arena, Mario Rosario Mazzola, Università di Palermo, Italy*
- 1336      **Replacement of AC Mains: Combining Several Sources of Information on the Condition**  
*Ralph Beuken<sup>1</sup>, Roel Diemel<sup>2</sup>, George Mesman<sup>1</sup>, Kim van Daal<sup>1</sup>*  
*<sup>1</sup>KWR Watercycle Research Institute, The Netherlands; <sup>2</sup>Brabant Water, The Netherlands*
- 1347      **A Practical Scheme for Building and Assessment of Water Pipe Renewal Policies**  
*Y. Tlili<sup>1</sup>, A. Nafi<sup>2</sup>*  
*<sup>1</sup>Politecnico di Bari, Italy; <sup>2</sup>UMR GESTE, France*

## Session 27 — Network Real Time and Predictive Operations

Chair: Prof Martin Lambert, University of Adelaide

Venue Napier N102, Time 13:10 – 14:10, Thursday 27 September 2012

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- 1362      **Control System Modelling for a Large Scale Pumping Station**  
*Eelko Van Der Vaart<sup>1</sup>, Chengchao Xu<sup>2</sup>, Faris Hernich<sup>2</sup>*  
*<sup>1</sup>One Stone Consulting Pty. Ltd., Australia; <sup>2</sup>Water Corporation of Western Australia, Australia*
- 1374      **Real-Time Demand Estimation in Water Distribution Systems Under Uncertainty**  
*C.J. Hutton, Zoran Kapelan, L. Vamvakieridou-Lyroudia, Dragan A. Savić, University of Exeter, UK*
- 1386      **Real-Time Hydraulic Modelling of a Water Distribution System in Singapore**  
*Ami Preis, Talha Obaid, Michael Allen, Mudasser Iqbal, Andrew J. Whittle, SMART, Singapore*



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## Session 28 — Water Usage

Chair: Dr Steven Buchberger, University of Cincinnati

Venue Napier G03, Time 13:10 – 14:10, Thursday 27 September 2012

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- 1392      **An Overview of Water Demand: Volume vs Pressure Based Demands**  
*Thomas Walski<sup>1</sup>, Orazio Giustolisi<sup>2</sup>*  
<sup>1</sup>Bentley Systems, USA; <sup>2</sup>Politecnico di Bari, Italy
- 1400      **Simplified Emitter Based Approach for Pressure-Driven Demand Calculations of Networks with Extreme Topography**  
*N. Trifunović<sup>1</sup>, K. Vairavamoorthy<sup>2</sup>*  
<sup>1</sup>UNESCO-IHE, The Netherlands; <sup>2</sup>University of South Florida, USA
- 1418      **Development of Water Demand Forecasting Simulator and its Performance Assessment**  
*Juhwan Kim, Gangwook Shin, Dooyong Choi, Korea Water Resources Corporation, Korea*

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## Session 29 — Sustainable Water Distribution Systems

Chair: Dr Dominic Boccelli, University of Cincinnati

Venue Napier G04, Time 13:10 – 14:10, Thursday 27 September 2012

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- 1424      **Developing Scenarios for Future Utility Provision**  
*Bogumil Ulanicki, Anna Strzelecka, Piotr Skworcow, Tomasz Janus, De Montfort University, UK*
- 1431      **Water, Fire and Safety: A Strong Relation with Water Quality**  
*Jan Vreeburg<sup>1</sup>, Ljiljana Zlatanovic<sup>2</sup>, Ivars Poznakovs<sup>2</sup>*  
<sup>1</sup>KWR Watercycle Research Institute, The Netherlands; <sup>2</sup>Technische Universiteit Delft, The Netherlands
- 1441      **Use of a Physical Water Network Competition for Outreach and Teaching**  
*Jakobus E. van Zyl, University of Cape Town, South Africa*
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