

BUILDING PARTNERSHIPS

PROCEEDINGS OF THE 2000 JOINT CONFERENCE
ON WATER RESOURCES ENGINEERING
AND WATER RESOURCES PLANNING & MANAGEMENT

July 30 – August 2, 2000
Hyatt Regency Minneapolis
Minneapolis, Minnesota

SPONSORED BY
Environmental and Water Resources Institute of ASCE

COOPERATING ORGANIZATIONS
American Institute of Hydrology
American Water Resources Association
Association of State Dam Safety Officials
Canadian Society for Civil Engineering
International Erosion Control Association
International Association of Hydraulic Engineering Research
Sustainable Fisheries Association
Water Environment Federation

EDITED BY
Rollin H. Hotchkiss
Michael Glade



ASCE *American Society
of Civil Engineers*
1801 ALEXANDER BELL DRIVE
RESTON, VIRGINIA 20191-4400

Notices

ISBN 0-7844-0517-4

Any statements expressed in these materials are those of the individual authors and do not necessarily represent the views of ASCE, which takes no responsibility for any statement made herein. No reference made in this publication to any specific method, product, process or service constitutes or implies an endorsement, recommendation, or warranty thereof by ASCE. The materials are for general information only and do not represent a standard of ASCE, nor are they intended as a reference in purchase specifications, contracts, regulations, statutes, or any other legal document.

ASCE makes no representation or warranty of any kind, whether express or implied, concerning the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed in this publication, and assumes no liability therefore. This information should not be used without first securing competent advice with respect to its suitability for any general or specific application. Anyone utilizing this information assumes all liability arising from such use, including but not limited to infringement of any patent or patents.

Copyright © 2000 by the American Society of Civil Engineers,
All Rights Reserved.

ISBN 0-7844-0517-4

Manufactured in the United States of America.

American Society of Civil Engineers
ASCE International Headquarters
1801 Alexander Bell Drive
Reston, VA 20191-4400 USA

Call Toll-Free in the U.S.: 1-800-548-2723 (ASCE)

Call from anywhere in the world: 1-703-295-6300

Internet: <http://www.pubs.asce.org>

Foreword

The Proceedings on this CD-ROM represent papers submitted to the 2000 Joint Conference on Water Resources Engineering and Water Resources Planning and Management as of April 15, 2000. By the time the Conference was held in Minneapolis, Minnesota at the end of July, neither of the two sponsoring Divisions of ASCE were in existence. The Conference will be known as one of the inaugural events of the Environmental and Water Resources Institute, resulting from the merger of the two named Divisions and the Environmental Engineering Division.

The Proceedings are organized into five Symposia and a General Conference. The Symposia include:

1. Vito Vanoni Millennium Symposium on Sedimentation Engineering: Organized by Marcelo Garcia, the Symposium honors the late Vito Vanoni by relating the latest developments in sedimentation engineering, from field studies to environmental concerns and computer modeling.
2. Symposium on Modern Velocity Measurement Techniques and Applications: This symposium, organized by Edwin Cowen, highlights the latest developments in the rapidly changing world of flow field measurement theory and techniques.
3. Symposium on River Restoration: Peter Klingeman organized a follow-up symposium to one held in 1999 in Seattle to continue discussion in this multi-disciplinary and evolving field. Papers range from basic principles of fluid-solid interaction to reports on successful case studies.
4. Symposium on Well Hydraulics: Nazeer Ahmed headed up this symposium to examine many issues regarding well hydraulics and groundwater issues, from well-screen problems to computer modeling.
5. Poster Symposium: Several of our participants, recognizing many advantages of a poster presentation format, chose to deliver their papers in poster sessions. The papers upon which the posters are based are full

length and identical in format and requirement as any other paper presented at the Conference.

6. General Conference: The largest segment of the Conference and CD-ROM contains papers presented in the more than 60 sessions of the General Conference. The papers reflect both the breadth and depth expected by practicing professionals searching for more basic knowledge and understanding on topics important to them. From education to public participation, from theory to practice, the papers contained in this segment of the CD-ROM represent contributions from a truly multidisciplinary audience.

On behalf of Rick Voigt and David Merritt, Program Co-Chairs, we would like to thank all those who submitted papers to this Conference, making it one of the strongest technical programs in recent history.

Rollin Hotchkiss and Michael Glade, Technical Program Co-Chairs

About the Cover

The photograph on the cover of these proceedings is the winner of the tenth annual water resources photography contest, now sponsored by the Environmental and Water Resources Institute (EWRI), a semi-autonomous entity of the American Society of Civil Engineers. Members of all ASCE Student Chapters and Clubs were invited to submit original work photographs consistent with the theme of the conference. Judging was arranged by the sponsoring EWRI Student Activities Council and EWRI/ASCE Headquarters staff.

The winning photograph is of Keller Memorial Bridge spanning the Tennessee River in Decatur, Alabama, taken by **Shane K. McNeill**, a civil engineering graduate student at the University of Alabama-Huntsville, who received first place prize of a full complimentary registration as well as hotel accommodations and travel expenses.

General Conference

Note: Click on Session Titles below to view paper titles in each session.

ABET 2000 and Water Resources Education Issues

Advances in Distributed Database Management

Arid Lands Studies

Bridge Scour Case Studies

Calibrating Groundwater Models

Climate: Change, Data, and Analysis

Computer Modeling of Sediment Transport

Decision Support Systems

Design Storms and Precipitation

EPA Wet Weather Flow Research Program I.

EPA Wet Weather Flow Research Program II.

Fish Waterways: Protection and Restoration

Flood Hazard Case Studies I.

Flood Hazard Modeling Applications

Flood Hazard Principles

GIS and Navigation

GIS and Water Quality

Gas Transfer and Fish Habitat

Geomorphology and Restoration: Illustrated Principles

Highway Stormwater Research in California

Hydraulic Structures I.

Hydraulics of Open-Channel Flow I.

Hydraulics of Open-Channel Flow II.

Hydraulics of Open-Channel and Groundwater Flow

Hydrologic Engineering Center (HEC): Modeling Activities Update

Illinois River Studies

Innovative Approaches to Stormwater Management Technology

Interdisciplinary Training, Research and Water Resources Projects in the 21st Century: EWRI's Role

Interdisciplinary Training, Research and Water Resources Projects in the 21st Century: Institutional Perspectives

Interdisciplinary Training, Research and Water Resources Projects in the 21st Century: Red River Flood Reduction Agreement

Long-Term Groundwater Monitoring: Can the Burden Be Reduced?

Management of Floods in the Red River Basin

Paleohydrology Studies

Water Policies for the Future

Expert Witness Panel and Tutorial

Parsons Brinckerhoff EWRI Student Design Competition

Partnerships and Public Relations

Physical Models of Scour Processes

Precipitation and Flooding: Radar to Prediction

Rainfall Intensity-Duration-Frequency Studies

Rainfall-Runoff Modeling: Old to New

Rainfall-Runoff Models: Updates and Uncertainty

Sediment Movement in Closed Storm Drains: Design and Case Studies

Sediment Transport Modeling

Sediment and Miscellaneous

Shared Vision Modeling in Water Resources Planning

Stormwater I.

Stormwater II.

Streambank Stabilization

Studies Using HEC Software

Urban Watersheds: Pollutant Source, Loads, and Control Policies I and II.

Water Distribution Systems Analysis: Case Study Applications

Water Distribution Systems Analysis: Feedback Control and Network Reliability

Water Distribution Systems Analysis: Model Structure and Parameter Estimation

Water Distribution Systems Analysis: Optimal Network Design and Operation I.

Water Distribution Systems Analysis: Optimal Network Design and Operation II.

Water Distribution Systems Analysis: Optimal Water Quality Management

Water Distribution Systems Analysis: State Estimation and Modeling

Water Distribution Systems Analysis: Unsteady Flow and Mass Transport

Water Quality Case Studies

Water Quality and Watersheds

Water Quality: Reuse and Processes

Water Resources

Water Supply and Water Intakes

Water Use I.

Water Use II.

Watershed Analyses

Watershed Assessment Issues

Millennium Symposium on Sedimentation Engineering

Dam Removal and Associated Sedimentation Processes

Experimental Study on Bed Load Control in Torrents by Open Slit Dams

Philippe Frey and Sébastien Tannou

Numerical Modeling of Sediment Migration During Dam Removal

Blair Greimann and Cassie Klumpp

Dam Removal Sedimentation Evaluation

Thomas R. Grindeland, Hans R. Hadley, and Anand Raman

Sediment Movement from the Removal of Dams on Battle Creek

Cassie C. Klumpp and Blair P. Greimann

Environmental Sedimentation Problems

Variations in Organic Particle Deposition Rate and Stream–Subsurface Exchange Due to Silt Accumulation in a Gravel Bed

Aaron I. Packman, Jeffrey MacKay, and J. Denis Newbold

Formation and Maintenance of San Bernardino Kangaroo Rat Habitat, Santa Ana River Alluvial Fan, California

M.D. Harvey, S.C. Trabant, D.S. Biedenharn, and K.J. Thomas

Stable Knickpoints Formed in Cohesive Sediment

Sean J. Bennett, Kerry M. Robinson, Andrew Simon, and Gregory J. Hanson

Recent European Research into the Behavior of Sewer Sediments and Associated Pollutants and Processes

Richard Ashley, Bob Crabtree, and Alasdair Fraser

Erosion of Cohesive Materials

Measuring the Erodibility of Cohesive Soils

Jean-Louis Briaud, H.C. Chen, Francis C.K. Ting, Kiseok Kwak,
Seung-Woon Han, Prahoro Nurtjahyo, Yiwen Cao, and Ya Li

Investigating Erosion of Cohesive Riverbeds Using Coupled Finite Element Hydrologic and Stress-Deformation Modelling

Andrew J.C. Collison and Andrew Simon

Cohesive Sediment Transport in Natural Streams: State of Knowledge

Tai D. Bui

The Role of Pore-Water Pressures and Upward-Directed Seepage Forces in the Erosion of Cohesive Streambeds

Andrew Simon, Andrea Curini, Gregory J. Hanson, and Andrew J. Collison

Field Sediment Measurements

Adjustment of Total Suspended Solids Data for Use in Sediment Studies

G. Douglas Glysson, John R. Gray, and Lisa M. Conge

Assessment of Non-Point Source Sediment Load from the California Portion of the Truckee River Watershed

Jennifer G. Duan

Development of Methodology to Reduce Suspended Sediment Sample Collection on the Missouri River at Sioux City, Iowa

Selena M. Forman, David T. Williams, and John I. Remus II

Water Intake Sediment Problems in Thermal Power Plants

Yifan Zheng and Adnan M. Alsaffar

Flow-Sediment Turbulence Interaction and Bedforms

The Effects of Cluster Bed Forms on the Longitudinal Velocity

A. Schuyler and A. Papanicolaou

Turbulence and Coherent Flow Structures Associated with Bedform Amalgamation: An Experimental Study of the Ripple–Dune Transition

F. López, R. Fernandez, and J. Best

Experimental Study of Turbulent Macrostructures Behind Dunes

Joselina Espinoza-Ayala and Polioptro Martínez-Austria

Alluvial Resistance and Sediment Transport for Flows over Dunes

Juan J. Fedele and Marcelo H. García

Mathematical Modeling of Sedimentation Processes

A Three-Dimensional Model for Cohesive Sediment Dynamics in Shallow Bays

Parmeshwar L. Shrestha, Alan F. Blumberg, Dominic M. DiToro,
and Ferdi Hellweger

The Calculation of Transverse Eddy Diffusivity Using Turbulence Data

Daniel J. Wren, Sean J. Bennett, Brian D. Barkdoll, and Roger A. Kuhnle

Sediment Transport Modeling in Mountain Streams

E. Wicklein and A.N. Papanicolaou

Testing the Capabilities of the Sed2d Sediment Transport Routine

Pablo A. Tassi and Carlos A. Vionnet

Reservoir Sedimentation

Volume Lost to Sedimentation in Cochiti Lake, New Mexico

Stephen M. Kolk and Drew C. Baird

Front-Fixing Model of Turbidity Currents at River Deltas in Lakes and Reservoirs

Svetlana Kostic and Gary Parker

Sediment Modeling of Big Bend Reservoir, South Dakota

Martin J. Teal, Marc A. Schulte, David T. Williams, and John I. Remus II

Grove Lake Sediment Bypass

Dwight Hanson

Sediment Movement in Closed Storm Drains

Sewer-Sediment Control: Overview of an EPA Wet-Weather Flow (WWF) Research Program

Chi-Yuan Fan, Richard Field, Fu-hsiung Lai, and Daniel Sullivan

Shear Stress Distribution in Partially Filled Pipes and Its Effect on the Modeling of Sediment Transport in Storm Drains

Jean E. Berlamont, Koen Trouw, and Gert Luyckx

Non-Cohesive Sediment Transport in Clean Sewers and with Small Mobile Beds

Chandra Nalluri and Jose J. Ota

The Movement of Total Suspended Solids in Combined Sewers

Adrian J. Saul, Peter J. Skipworth, Simon J. Tait, and Peter J. Rushforth

Sedimentation Mechanics

Bed Forms in a Sand–Gravel Stream with Unsteady Flows

Roger A. Kuhnle

Non-Equilibrium Sediment Transport: Numerical Experiments

Ping Chen and Rollin H. Hotchkiss

Determination of Bed Shear Stress by Digital Particle Image Velocimetry in Turbulent Open Channel Flow

James Robert Martin Jr., Laura J. Steinberg, and Efstathios E. Michaelides

Geometric Characteristics of Step-Pool Streams

A.R. Maxwell and A.N. Papanicolaou

Vito Vanoni: His Legacy and Milestones in Sedimentation Engineering

The Legacy of Vito A. Vanoni

Norman H. Brooks

Generalized Exner Equation for the Conservation of Sediment Mixtures

Gary Parker

Review of Models for Flat-Bed Sediment-Laden Flows

D.A. Lyn

Building upon the Legacy of Vito Vanoni: Volume 2 of Manual 54 *Sedimentation Engineering*

Marcelo H. García

Symposium on Modern Velocity and Discharge Measurement Techniques and Applications

Acoustic Measurement Techniques: Analysis

Estimation of Turbulence Parameters Using an Acoustic Doppler Current Profiler (ADCP)

Mark T. Stacey

Effects of Aeration on the Performance of an Acoustic Doppler Velocity Meter (ADV)

K. Warren Frizell

Analyzing Acoustic Doppler Velocity Meter (ADV) Data Using WinADV

Tony L. Wahl

Side Looking Doppler Velocity Sensors

Ramon Cabrera, Jerry Mullison, and Daryl Slocum

Acoustic Measurement Techniques: Applications I

Measuring Sacramento River Diversions with ADFM Technology in the Glenn–Colusa Irrigation District

Michael A. Metcalf

ADFM Measurement of Tidally-Induced Flow and Stage in a Canal Headworks

Tracy B. Vermeyen

An Acoustic Velocity Measurement System for Aiding Barge Traffic in the Colorado River Locks near Matagorda, Texas

Jeffery W. East and Charles Scheffler

Use of Acoustic Technology to Define Hydraulic Characteristics of an Estuary near the Mississippi Gulf Coast

K. Van Wilson, Jr.

Acoustic Measurement Techniques: Applications II

Discharge Calculations of Natural Channel Flows with Acoustic Flow Meter (AFM) Data

Dapei Wang

Use of Acoustic Technology to Aid in the Regulation of Ross Barnett Reservoir near Jackson, Mississippi: Trials and Tribulations

John B. Storm

Effect of Temporal Resolution on the Accuracy of Acoustic Doppler Current Profiler (ADCP) Measurements

Juan A. González-Castro, Kevin Oberg, and James J. Duncker

Application of Acoustic Velocity Meter (AVM) Measurements in the Computation of the State of Illinois Diversion from Lake Michigan

Carolann Biegen

Ocean Tide Waves Propagation Along Downstream Amazon River: Measuring the Amazon Discharge at the Estuary

P. Kosuth, J. Callède, and A. Laraque

Discharge Determination

Large-Scale Particle Image Velocimetry: A Reliable Tool for Physical Modeling

Marian Muste, Zhijian Xiong, Allen Bradley, and Anton Kruger

Refinement of Large-Scale Particle Image Velocimetry (LSPIV) Technique for Monitoring River Surface Flows

Ichiro Fujita and Shiro Aya

Application of Flow Velocity Distribution Models to Channel Discharge Measurements

Dapei Wang, Pat McCurry, and Raymond Bourdages

Contrasting Discharge Computation Methods in Riverine and Tidal-Affected Flows in Mississippi

D. Phil Turnipseed

Measurement Uncertainty and Calibration

Proposed Uncertainty Assessment Methodology for Hydraulic and Water Resources Engineering

Marian Muste and Frederick Stern

Evaluating the Measurement Accuracy of Surface Water Flows and Accumulated Volumes

Brian T. Wahlin, Albert J. Clemmens, and John A. Replogle

Towing Basin Speed Calibration of Acoustic Doppler Current Profiling Instruments

H.H. Shih, C. Payton, J. Sprenke, and T. Mero

A Laboratory Evaluation of Unidata's Starflow Doppler Flowmeter and MGD Technologies Acoustic Doppler Flow Meter

Tracy B. Vermeyen

Novel Measurement Approaches

New Developments in Design and Application of Long-Throated Flumes

Tony L. Wahl, John A. Replogle, Brian T. Wahlin, and James A. Higgs

Flow and Velocity Measurements Using Vortex Shedding and Magnetic Flow Meters, Jones Hole National Fish Hatchery

Clifford A. Pugh and Robert F. Einhellig

Air Concentration and Velocity Measurements on Self-Aerated Flow down Stepped Chutes

Jorge Matos and Kathleen H. Frizell

Test Results with the EasyQ Rivier Flow Sensor

Lee Gordon, Sven Nylund, and Atle Lohrmann

Optical Measurement Techniques and Analysis

Simultaneous Laser Induced Fluorescence (LIF) and Particle Image Velocimetry (PIV) Measurements of a Laboratory Modeled Coastal Plume

Qian Liao, Gustavo Zarruk, and Edwin A. Cowen

Characteristics of Turbulent Plumes Using Planar Laser-Induced Fluorescence (PLIF) Technique

S. Rahman, L.P. Dasi, D.R. Webster, and P.J.W. Roberts

Scaling and Inhomogeneities in Oscillating-Grid Flows

Yong-Kon Yi and Denis A. Lyn

Extraction of Coherent Structure from Particle Image Velocimetry (PIV) Data Using Wavelet Transform

Hitoshi Miyamoto and Tohru Kanda

Panel Discussion: Future Directions in River Discharge Monitoring

In Search of Techniques for Monitoring River Discharge by Non-Contact Measurement of River Cross-Section and Velocity

Ralph T. Cheng, John Costa, F. Peter Haeni, Nick Melcher,
and E. Michael Thurman *Paper was not available at time of publication.*

Advances in the Application of Acoustic Doppler Current Profilers for Hydraulic Measurements

Kevin Oberg *Paper was not available at time of publication.*

Symposium on River Restoration

A Restoration Spectrum: Dam Removal, Incised Channels, and Cumulative Effects

Dam Removal: A Tool for River Restoration on the Naugatuck River

Laura A.S. Wildman and James G. MacBroom

Dam Removal and Stream Restoration on Goldsborough Creek in Western Washington State

Douglas G. Lantz

Large Woody Debris Structures for Incised Channel Rehabilitation

F. Douglas Shields Jr., S.S. Knight, C.M. Cooper, and S. Testa

Case Study: Requirements for Cumulative Effects Analysis

Sigurdur M. Gardarsson and Thomas R. Grindeland

Bank Erosion and Protection

Bank Erosion in Meandering Rivers

José F. Rodríguez and Marcelo H. García

Evaluation of Bank Protection Methods

Anand Prakash

Restoration of Thunder Bay River Erosion Sites

Andrew Blystra, Brad MacNeill, and Heather Enterline

Scour Evaluation Program for Toe-Down Depth Assessment

Carlos C. Carriaga

Channel Instabilities and Processes in Unstable Channels

Bank Instabilities Along the Missouri River: The Role of Pore Water Pressures and Flow Releases

Andrew Simon, Andrea Curini, F.D. Shields, Jr., and R. Brian Bell

Ice-Induced Thalweg Oscillations Along the Fort Peck Reach of the Missouri River

Robert Ettema, Leonard Zabilansky, and Bret Bledsoe

Modeling Channel Instabilities and Mitigation Strategies in Eastern Nebraska

Eddy J. Langendoen, Andrew Simon, and Carlos V. Alonso

Knickpoint Erosion and Migration in Cohesive Streambeds

Andrew Simon, Sean Bennett, and Mark W. Griffith

Channel Morphology and Hydraulic Design

The Response of Pool-Riffle Bedforms to Variations in Stream Discharge: A Modelling Approach

Scott N. Wilkinson, Robert J. Keller, and Ian D. Rutherford

A Design Procedure for Sizing Step-Pool Structures

D.B. Thomas, S.R. Abt, R.A. Mussetter, and M.D. Harvey

Naturalization of Urban Streams Using In-Channel Structures

José F. Rodríguez, Marcelo H. García, Fabián A. Bombardelli,
José M. Guzmán, Bruce L. Rhoads, and Edwin Herricks

San Miguel River Restoration: Geomorphology and Hydraulic Engineering as a Basis for Design

C.G. Wolff, M.D. Harvey, and R.A. Mussetter

Dam Removal: State of Science and Restoration Options

Dam Removal: Physical, Biological, and Societal Considerations

Martin W. Doyle, Emily H. Stanley, Michelle A. Luebke, and Jon M. Harbor

Dam Removals: A Discussion of Issues and Impacts

Marty E. Rye

Evaluating Stream Restoration Options After Dam Removal Using HEC-RAS

Michael E. Barber and Dwight E. Perkins

Condition Assessment Needs for Prioritizing Small Dam Removal

Glen R. Andersen and Michael E. Barber

Riparian Zones, Wetlands, and Channels

Effect of Riparian Vegetation Density on Stream Flow Velocity

Taner Pirim, Sean Bennett, and Brian Barkdoll

Performance of the Bonita Channel Wetland Mitigation Area

Stanley D. Polasik

Channel Restoration in Peat Channels

Karen C. Kabbes

Prediction of Stream Geometry in the Maryland Piedmont Based on Land Use and Urbanization

Seth Brown and Glen Moglen

River Restoration Case Studies I

River Re-Naturalization: Beyond the Stream Classification Approach

Tai D. Bui and James H. Milligan

Restoration Management Procedures for Michigan's Upper Peninsula Watersheds

Jonathan M. French, Dennis L. Johnson, and Kris Mattila

Sacramento River Gradient Restoration Facility

Scott A. Hogan, Mark R. Peterson, Thomas W. Smith, and Peter Valentine

Selected Aspects of Management and Rehabilitation of the Yarkon River (Israel): Planning and Implementation

David Pargament, Ezra Henkin, and Avital Gasith

River Restoration Case Studies II

Levee Lowering of the North Bank Levee Along the Salt River in Tempe, Arizona

Robert L. Davies, Brian Calvert, and Jim Bond

Optimization Modeling Approach in the Design of Stable Channel System

Carlos C. Carriaga, I. Kaan Tuncok, and Larry W. Mays

A Partnered Approach to Design of “Natural” Wash Corridors in an Urbanizing Pseudo-Alluvial Fan Area in Northeast Phoenix, Arizona

Nasir Raza, Dave Schaub, Christi Brasher, Ottozawa Chatupron, and Robert Ward

Opportunities of the Corps of Engineers Ecosystem Restoration Program and Its Application to the City of Alamosa, Colorado

Ira Mark Artz, David Batts, Jason Carey, and Khaled Abu-Zeid

*Sedimentation Engineering Design in River Restoration:
Task Committee Monograph Draft*

Initial Project Planning and Development

Peter Klingeman and Rebecca Seal Soileau

Detailed Project Development: Pre-Design Assessments and Analyses

Richard Hey, F. Douglas Shields, and Peter Klingeman

Project Design Analyses

William Fullerton, Drew Baird, and Peter Klingeman

Construction and Post-Construction Operating and Monitoring

Martin Doyle, Dale E. Miller, and Peter Klingeman

Stable Channel Design

Whitewood Creek Reclamation Plan: A Sound Basis for Design

R.A. Mussetter, M.D. Harvey, C.G. Wolff, and D.G. McDowall

Stable Channel Design for Mobile Gravel Bed Rivers

Anthony L. Firenzi, Chester C. Watson, and Brian P. Bledsoe

A Stable Channel Design Approach for the Rio Salado, Salt River, Arizona

Marc A. Schulte, Selena M. Forman, David T. Williams, Glen Mashburn, and Rene Vermeeren

Hydraulic Design for Channel Restoration on the Santa Ana Reach of the Rio Grande

Morgan S. Byars, Lyle W. Zevenbergen, and Peter F. Lagasse

Symposium on Well Hydraulics

Computer-Based Analysis of Aquifer and Well Components

United Nations Ground Water for Windows Software

William R. Talbot

Simulating Well Hydrodynamics

Fred VonHofe and Otto J. Helweg

WTAQ: A Computer Program for Aquifer-Test Analysis of Confined and Unconfined Aquifers

Paul M. Barlow and Allen F. Moench

Contaminant Transport Modeling at Underground Gasoline Tanks Sites

Khaled I. Hamza and Amgad S. Elansary

Development, Testing, and Rehabilitation of Aquifers and Water Wells

A Downhole Flowmeter for a Better Definition of Well Hydraulics

William R. Waldrop

Optimization of Groundwater Remediation Planning While Considering Both Fixed Cost and Time-Varying Operating Cost

Chin-Tsai Hsiao and Liang-Cheng Chang

Comparison of Numerical and Physical Model Results: Velocity Distribution on a Well Screen

Scott F. Korom, Kristján Bekker, and Otto J. Helweg

Risk-Based Management of Contaminated Groundwater: The Role of Geologic Heterogeneity, Exposure and Cancer Risk in Determining the Performance of Aquifer Remediation

R.M. Maxwell, S.F. Carle, and A.F.B. Thompson

Fundamental Topics and Contemporary Issues in Well Hydraulics

Natural Groundwater Tracers for Hydrochemical Evolution Investigations

Mahdi Al-Sayed

Numerical Simulation of Groundwater Contamination

Metin Ger, Özgür Ugras Baran, and Bülent İrfanoğlu

Goals for the ASCE Task Committee on Well Hydraulics

T.W. Anderson

Research Needs in Well Hydraulics

Nazeer Ahmed

Groundwater Management

Computationally Efficient Optimization of Groundwater Remediation

Raju M. Rohde and Christine A. Shoemaker

Optimizing Groundwater Remediation Design Under Uncertainty

Amy B. Chan Hilton and Teresa B. Culver

Optimization of Dechlorination of Chlorinated Ethenes

Mathew Wills, Christine Shoemaker, and James Gossett

Optimal Reservoir Operation and the Value of Carryover Storage

Andrew J. Draper and Jay R. Lund

Spatial Multiscale Techniques for Groundwater Management Modeling

Yong Liu, Barbara S. Minsker, and Faisal Saied

Head Loss and Efficiency of Aquifers and Water Wells

Water Well Efficiency

Otto J. Helweg and Melanie Bengtson

Optimal Ground Water Distribution Systems

Melanie Bengtson and Otto J. Helweg

Determining Ground Water System Well Losses

Scott Korom, Kristján Bekker, and Otto J. Helweg

Using Borehole Flow Data to Characterize the Hydraulics of Flow Paths in Operating Wellfields

Frederick Paillet and James Lundy

Hydraulic Conductivities, Groundwater, and Well Hydraulics

Infiltration over Soils with Spatially-Correlated Hydraulic Properties

Rao S. Govindaraju, R. Morbidelli, and C. Corradini

Formulating the Subsurface Flow from the Sloping Valley Bed Alluvium

E. Khazai

Recharging Aquifers in Saudi Arabia with Secondary Effluents Through Amended Sand

Achi M. Ishaq and Abdur-Rauf Mahsood

Long-Term Groundwater Monitoring II: Can the Burden be Reduced?

A Multiobjective Approach to Long-Term Groundwater Monitoring Design

Patrick Reed, Barbara Minsker, and Albert Valocchi

Latin Hypercube Sampling of Random Hydraulic-Conductivity Fields for Monte Carlo Analysis of Groundwater Flow and Mass Transport

Yingqi Zhang and George F. Pinder

Evaluating Observations in the Context of Predictions for the Death Valley Regional Groundwater System

D. Matthew Ely, Mary C. Hill, Claire R. Tiedeman, and Grady M. O'Brien

Miscellaneous Topics of Interest in Aquifer and Well Hydraulics I

A Fundamental Criterion for Choice of Type, Number, and Configuration of Water-Clutch Objects

Dusan Polomcic

Calibrating the VonHoff–Helweg Model

Fred VonHoff, Scott Korom, and Otto J. Helweg

Lognormal Distribution and Direct Runoff

Nazeer Ahmed

Modification of Stream Flow Routing for Bank Storage

Mohamed M. Hantush, Morihiro Harada, and Miguel A. Mariño

Miscellaneous Topics of Interest in Aquifer and Well Hydraulics II

Spatial Interpolation of Hydraulic Conductivity Using Radial-Basis Function Networks

Bin Zhang and Rao S. Govindaraju

Wellfield Rehydration: “A Partnership for Improvement”

R. Gibney, K. Coates, and D. Daigle

A Characteristic Solution to Nitrate Transport and Fate in Groundwater in Agricultural Watersheds

Mohamed M. Hantush and Miguel A. Mariño

Groundwater Quality in Donbass Basin of Ukraine: Pollution Sources Identification and Water Resources Planning and Management

Michael V. Babaev, Leonid S. Galetskiy, Edmund Gosk,
Vyacheslav G. Magmedov, Bjarne Madsen, and Evgen A. Yakovlev

Pumps and Pumping Stations

Hydraulic Impacts on the Impeller of Vertical Axial Pumps Installed in Selected Intake Structures

Hartmut Rosenberger, Dieter-Heinz Hellmann, Falko Schubert, and
Gerhard Schwarz

Development of a Compact Intake Chamber for Vertical Tubular Pumps

Falko Schubert and Hartmut Rosenberger

An Attempt to Clarify Acceptable Pump-Throat Velocity-Distribution Criteria in Pump-Intake Model Studies

Tatsuaki Nakato

Waterhammer Protection for the Toshka Pumping System

Amgad Saad Elansary

Conference Posters I

Bridge Abutment Scour: Countermeasures and Channel Migration

Local and Contraction Scour at Bridge Abutments

Francesco Ballio

Economic Considerations in Designing Bridge Scour Countermeasures

Stuart M. Stein, David R. Pearson, and J. Sterling Jones

Time Scale for Contraction Scour at Bridges

Lyle W. Zevenbergen

Methodology for Predicting Channel Migration: NCHRP Project No. 24-16

P.F. Lagasse, S.A. Schumm, and L.W. Zevenbergen

Bridge Pier Scour

BrEase: A Computer Program for Evaluation of Pier Scour and Stream Stability

Kevin S. Flora

Scour at Wide Bridge Piers

J. Sterling Jones and D. Max Sheppard

Local Scour at Complex Pier Geometries

J. Sterling Jones and D. Max Sheppard

A New Sediment Transport Formula for Local Scour Prediction

Xibing S. Dou and J. Sterling Jones

Flood Studies

Breach Morphology Observations of Embankment Overtopping Tests

William Hahn, Gregory J. Hanson, and Kevin R. Cook

Some Palaeoflood Indicators in the River Murray Valley of South Australia

Robert P. Bourman, Fleur Tiver, and Kristine James

Simple Approach for Flood Forecasting

Md. Mafizur Rahman, Md. Sabbir Mostafa Khan,
and Md. Fayzul Kabir Pasha

Sulphur Branch Channelization Project Number 031

James P. Amick

Hydraulic Structures

"Trash Gate": Lake Cumberland Debris Management System

Charles Taylor, Jr., and Wayne Stuart

Design Procedure of a Lateral Diversion from a Triangular Channel

Ali Uyumaz

A Hydraulic Structure for Taking Water and Reducing Sand Disasters

Xingqi Zhang, Yasuhiro Akiyoshi, and Kiyoshi Yukutake

Intelligent Construction Systems: The Convergence of Computing, Communication, and Construction

John M. Kurdzeil, Charles R. Nelson, James A. Nystrom, and
D. Lee Peterson

Irrigation and Sewer Pipe Maintenance

Knowledge Acquisition and Validation of an Expert System for Prioritizing the Inspection of Sewers

Margaret A. Hahn, Richard N. Palmer, M. Steve Merrill,
and Andrew B. Lukas

Pipeline Pigging of Central's Irrigation Canal Siphons

Jerry D. Steinke and Michael A. Drain

Lake Studies

Hydrodynamic Classification of Wind-Induced Mixing

George A. Krallis and Richard N. Weisman

Mathematical Model to Predict the Salt Conditions in the Pereira de Miranda Reservoir: State of Ceara, Brazil

Raimundo Souza and Zoi Pétalas

Hydrological and Geochemical Dynamics of the Mixing Water Zone of the Rios Solimões and Negro in the Amazon Basin

A. Laraque, J.L. Guyot, P. Seyler, and N.P. Filizola

Regression Dynamic Programming for Multiple Reservoir Control

K-Y. Daisy Fan, Christine A. Shoemaker, and David Ruppert

Soil and Groundwater Challenges

Electronic Dataloggers

Billy Cummins

Enhanced Mobility of Lead in Soil Rhizosphere: Model Development and Validation

K.V. Nedunuri, A.P. Schwab, and R.S. Govindaraju

Evaluation of Treating PCB-Contaminated Sediment with Zero-Valent Iron

John Stansbury, Angel Deangelis Lowery, and Frederic Laquer

Wellhead Protection and Its Implications

Andrea Trujillo, Zohrab Samani, and Jorge Garcia

Watershed Modeling and Stream Restoration

Watershed Modeling in a Pseudo Alluvial Fan Area in Northeast Phoenix and Scottsdale

Nasir Raza

Watershed Modeling with State and Local Partners in Illinois

Deva K. Borah and Maitreyee Bera

Test of Some Selected Stream Restoration Techniques Adapted to Mid-Slope Urban Streams in Korea

Hyoseop Woo, Jinwon Lee, Duhan Lee, Jaero Park, and Samhee Lee

Conference Posters II

Note: Manuscripts were not provided for any of these presentations

Bridge Abutment Scour and Velocity

A Model for the Depth Averaged Tangential and Radial Velocities in a Deep Meandering Channel

Amartya Kumar Bhattacharya and Srijib Kar

Abutment Scour Prediction Procedure for Compound Channels

Terry Sturm

Bridge Pier Scour and Channel Stability

Experiences with Field Installed Scour-Monitoring Devices for Bridge Piers

Thomas Cooper, Huey-Long Chen, Dennis Lyn, A. Ramachandra Rao,
and A. Altschaeffl

Bridge Scour Countermeasures: Costs and Effectiveness

Reduction of Scour Around Bridge Piers Using Upstream Piles

Amartya Kumar Bhattacharya and Koustuv Debnath

Case Studies and Miscellaneous

Hydraulics Design of Bukit Paramatha, a Ground Reservoir in Malaysia

Farid Uddin A.K.M.

Embankment Failure Analysis of the Tampa Bay Regional Reservoir

Jesus Merly, Randall Graham, and Richard Gibney

Drainage and Sediment Control

An Investigation of Factors Influencing Solids Transport and Deposition into Highway Drain Inlets

Thomas Quasebarth, Donald Schroeder, Rick Chappell, Roger Churchwell,
and Gary Lippner

Construction of Environmental Features Within High Speed Concrete Channels in Hawaii

James Pennaz

Irrigation: Control and Optimization

Grand Prairie Area Demonstration Project: An Integrated Hydraulic and Control Systems Model

Mark Hammons, Ray Fish, Nick McNeill, Wytze Schuurmans,
Peter-Jules van Overloop, and Arjo Hof

Optimization and Control of Water Distribution in Surface Irrigation

Angela Fister and Scott Yost

Optimizing Supplemental Irrigation Demand by Extending Crop Sowing Dates

Theib Oweis and A. Hachum

Lakes: Simple to Complex Models

Water-Budget Analysis for Lake Management

Louis Motz

Measurements I

Using SonTek Argonauts for Velocity Indexing

John Sloat, Chris Ward, and Fajun Wang

Afflux Due to Bridge Pier

Masoud Ghodsian, Mehdi Shafieefar, and S.J. Hashemi

Use of the Optical Current Meter in the U.S. Geological Survey, California District

M. Webster and Robert Mason

Three-Dimensional Natural River Flow Measurements Using an Acoustic Doppler Current Profiler Equipped with a Differential GPS

Matahel Ansar and John Goodson

Measurements II

Summary of International Applications of Acoustic Doppler Current Profilers in Hydraulic Measurements

Elizabeth Nystrom, Kevin Oberg, and Charles Melching

Using Acoustic Doppler Profilers from Moving Boats

Vadim Polonichko, Hening Huang, and Matthew Hull

Furrow Geometry Parameters: Estimation and Error Analysis

Dawit Zerihun, M. Kessira, J. Feyen, and Charles Sanchez

Hydrodynamics of the Mixing Process of Rio Negro and Rio Solimões Waters to Form Amazon River

Alain Laraque, Jean Loup Guyot, Patrick Seyler, and N.P. Filizola

Estimation of the Bottom Speed of the Amazon River Using ADCP and Related Correction of Discharge Measurement

Jean Loup Guyot, P. Kosuth, V.S. Guimaraes, and Jacques Callede

Impact of Ocean Tides on Sediment Flows to the Amazon Estuary

Alain Laraque and P. Kosuth

Recent Trends in Hydro Relicensing

The National Hydropower Initiative: Forest Service Response to FERC Relicensing

Paul Uncapher and Walt Dortch

Recent Trends in Hydroelectric Project Relicensing

Mark Killgore

Reservoir Optimization I

Optimization Model for the Multireservoir System Operation the Upstream of Yellow River

Yangbo Chen

System-Wide Optimization of Dam Operations to Control Water Level Fluctuations

John Nicklow and Eric Minder

Reservoir Optimization II

A Non-Parametric Test Based on Wavelet Analysis

Huey-Long Chen, A. Ramachandra Rao, and Midhat Hondzo

Reservoir Operation Models: Revisiting Probabilistic Balancing Rule Models

Emmanuel Nzewi

Scour: Advanced Topics

Sediment Entrainment Predictions for Instream Construction of Pipeline Water Crossing

Femi Ade, Michael Bender, Dejiang Long, Scott Reid, and Serge Metikosh

Storm Surge Scour at Coastal Bridges: Documenting the Effects of Hurricanes Bonnie, Dennis, and Floyd

Paul Fisher and David Froehlich

Sedimentation Engineering: Poster I

Hydraulic and Geomorphic Characteristics of Nakdong River in Korea

Gye-Woon Choi, G.H. Kim, H.B. Seoh, C.H. Hahm, and S.J. Ahn

Sedimentation Engineering: Poster II

On the Contraction Scour in Alluvial Channels

Youssef Hafez and Mona El Kady

Stream Power at Bridge Abutments for Pre- and Post-Scour Conditions

Hani Noshi and Albert Molinas

Sedimentation Engineering: Poster III

The St-Venant-Exner Equations for Near-Critical Flows

Dennis Lyn and Mustafa Altinakar

Soil Chemistry

Monitored Natural Attenuation at a Remediated Site: A Case Study

Emmanuel Nzewi

Stream Flow: Estimation and Design

Practical Site Design Recommendations for Baseflow Sustainability of Small Streams

Richard Weisman and Christopher Hager

Water Quality Case Studies

Water Quality Problems and Issues in Pakistan

Javaid Afazl

Integrated Modeling to Manage SSOs

Shawn Dent, Priya Sathyanarayan, Jeanne Work, Seema Bhimani,
Len Wright, and Charles Mosley

Water Quality Problems Resulting from Wind Induced Resuspended Sediments

Thomas Burke

Water Quality I

Using Sequential Splitting Operator Method to Solve a Bacterial Regrowth Model

Weidong Zhang, Francis DiGiano, and Cass T. Miller

Evaluating the Importance of Watershed Size and Land Use on Water Quality in Urban Lakes

Paul McGinley

Water Quality II

Evaluating the Performance of Model Infiltration Gallery for Water Treatment

Badiur Rahman and Fazlul Bari

Retention and Depuration of *E. coli* by the Zebra Mussel and Its Application in Watershed Management

James Selegan, Thomas Heidtke, and Jeffrey Ram

Water Use III

Optimisation of Integrated Urban Water Use and Re-Use Using Simulated Annealing and Life Cycle Costs

Christopher Zoppou and Shiroma Maheepala

Wetland Considerations

Evaluation of Flows in Wetlands Adjacent to Everglades National Park

Raymond Schaffranek and Maria H. Ball

Wetlands Classification Using Hyperspectral Remotely Sensed Data

Robert Wallace

Unattached Papers

15,000 Miles of Linear Watershed: One Transportation Agency's Response to the Clean Water Act

John Johnston

Issues in the Development of a Virtual Database for Flood Management

Slobodan Simonovic

A Bridge to Prosperity: Hydraulic and Scour Analyses of the Ganges River Crossing near Paksey, Bangladesh

Md. Abdur Rahman and David Froehlich

A Financial Planning Decision Support Tool for Water Resources Management

Mark Davis, H. Stephen McDonald, Greg Dennis, Terri Thomas,
and John Collins

Conservation of Electrical Power and Water Resources Management for Khindsy Lake of Central India

Thimma Reddy and Malleswara Rao

Building Partnerships in the New Millennium: Integrated Information Systems for Integrated Solutions

Tagelsir Gasmelseid and Abd Doka

Slater Channelflood Hazard Mitigation Plan

Lan Weber

GIS-Based Ice Jam Modeling and Analysis in Central New York State

Jon Zufelt, John Weed, and Calvin Reed

Use of Incremental Damage Assessments to Reduce Spillway Costs

Stephen Jamieson and Keith Ferguson

It May Have Been Smaller Than You Would Like to Admit: Flow Competence Restriction of HEC-RAS

Gary D'Urso

Use of a Two-Dimensional Flow Model for Assessing Flood-Management Plans

Te-Yung Hsieh, Ho-Cheng Lien, Chih-Tsung Hsu, and Jinn-Chuang Yang

Application of a Coupled Surface-Groundwater Hydrologic Model in a Barrier Island Setting: A MIKESHE Case Study

Johnny Martin, Timothy Reid, and Robert Moresi

Optimization of Conjunctive-Use Operation for Water Supply Using a Novel Genetic Algorithm and HEC-5

Cho-Chung Yang, and Chang Liang Cheng

A Stochastic Simulation Model for Evaluation of an Emergency Outlet from Devils Lake, North Dakota

Aldo Vecchia and Gregg Wiche

Use of Paleoflood Data in Performing Site-Specific Probable Maximum Precipitation Studies

Edward Tomlinson

Paleoflood Analyses for Corps Projects

Jon Fenske

The Cape Fear River Basin Model: A Study in Water Resource Management and Planning

John Lesnik, Ramona Holdstock, and Johnny Martin

Sustaining Water Resources Through Community Participation

Srikanth Srigiri

Calibration of a Watershed Model to Multiple Real Time Storm Events

Thomas Burke

Floodplain and Watershed Management in the Napa Valley

David Dickson

Shared Vision Planning for Everglades Restoration

Richard Punnett

Chattanooga, Tennessee's, Successful Back-to-Basics Approach to Stormwater Management

Darren Mulford and Tom Scott

Robust On-Line Monitoring of Integrated Quantity and Quality in Water Distribution Systems

Mietek Brdys, Wiktor Chotkowski, and Kazimierz Duzinkiewicz

Modeling of Pressure Regulating Devices Now Solved

Olivier Piller and Bernard Bremond

A Case Study: Groundwater Monitoring Network in Peninsular Malaysia

Farid Uddin A.K.M.

Towards an Information System on Administrative-Institutional Settings in WRM

Peter Gijsbers

Analysis of the Application Efficiency Function of Furrow Irrigation Systems

Dawit Zerihun, Charles Sanchez, and Kathryn Farrell-Poe

Salinity Monitoring and Municipal Water Supply Well Operation, Pt. Reyes Station, California

Chris DeGabriele

Santa Margarita River Watershed Analysis

Martin Teal and Ejaz Mohammad

Sediment Erosion Rates

Wilbert Lick

Sewer Solids and Processes: The State of Knowledge

Richard Ashley, Thorkild Hvitved-Jacobsen, Michel Verbanck,
and Jean-Luc Bertrand-Krajewski

Investigation of the Mechanics of Sediment Transport Through Tracer Experiments

Andrea Marion and Luigi Fraccarollo

Effect of Spatial Averaging on ADCP Velocity Measurements

Juan Gonzalez-Castro, Kevin Oberg, and James Duncker

Flow Measurements in the Chicago River for Lake Michigan Diversion Accounting: Horizontal and Vertical Acoustic Profiling in a Complex Unsteady Flow Regime

James Duncker

Evaluation of Horizontal Acoustic Doppler Profilers for Streamflow Measurements

Kevin Oberg and James Duncker

An Experimental Investigation of the Effects of Air-Entrainment on Turbulence and Mixing in a Laboratory Model of Breaking Waves

David Frostclapp, Edwin Cowen, and Kuang-An Chang

Use of an Acoustic Doppler Current Profiler (ADCP) to Measure Hyper-Saline Bi-Directional Discharge

Brian Loving and Kevin Johnson

A Three-Dimensional-PIV-Based Flow Meter for Fully and Partially Filled Conduits

George Papadopoulos and Khaled Hammad

Errors in the Estimation of Net Discharge in Tidal Channels

Michael Simpson and Roger Bland

Bioengineered Bank and Channel Stabilization on Sand Creek at Bluff Lake Park, Denver, Colorado

Troy Thompson, Julie Ash, and Jay Windell

When Should We Care About Channel Instability?

Martin Doyle and Jon Harbor

Effective Implementation and Benefit from the Step Drawdown Test

Terry Feng

Groundwater Recharge in Ain El-Figeh Damascus, Syria

Mostafa Soliman, Nagi Ali, and Rateb Sayegh

Long-Term Monitoring Cost Reduction Using Geohydrological and Geostatistical Thinking

Cary Tuckfield, Gene Shine, and William E. Jones

A Study of Evaluating Groundwater Vulnerability and Prioritizing Sites for Monitoring

Badiur Rahman and Fazlul Bari

Optimal Design of Groundwater Monitoring Network Based on Identification of Groundwater Parameters

Chang Liang Cheng

Rubber Dams in Bangladesh to Harness Small Stream Flow for Winter Irrigation

Sajjad Mohammad Khan and Eklmur Reza

Paleoflood Hydrology and the Estimation of the Recharge into the Alluvial Aquifer of the Arava Valley, Israel

Noam Greenbaum, Yehouda Enzel, and Uri Schwartz

Application of a Coupled River Aquifer Model (Modbranch) to the Choele Choel Island, Patagonia, Argentina

Leticia Rodriguez, Carlos Vionnet, Pablo Cello, and Gustavo Ferreira

The Illinois River Ecosystem Restoration: State of Illinois Perspectives

Jim Mick

Illinois River Studies

Nani Bhowmik

A Case Study of Pollutant Trading on the Truckee River

Seema Bhimani, H. Stephen McDonald, and Greg Dennis

Modeling Water Quantity and Quality to Assess Reservoir Operations on Klamath River Salmon Survival

Marshall Flug, Sharon Campbell, and R. Blair Hanna

Simplistic Methodology for Estimation of Agricultural Water Use Within a Large Watershed

Johnny Martin, Ronald Sneed, and Ramona Holdstock

Capacity-Contingent and Welfare-Optimal Pricing: The Case of Industrial Water Uses

Jihad Elnaboulsi