

Pipelines 2024

Condition Assessment

Proceedings of Sessions of the Pipelines 2024 Conference

Calgary, Canada
27 – 31 July 2024

Editors:

Khalid Kaddoura
Richard Nichols

ISBN: 979-8-3313-0336-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2024) by American Society of Civil Engineers
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

For permission requests, please contact American Society of Civil Engineers
at the address below.

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, VA 20191
USA

Phone: (800) 548-2723
Fax: (703) 295-6333

www.asce.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Contents

Asset Management

Strategic Approach in the Assessment of Watermains Using Indirect and Direct Methods	1
Khalid Kaddoura and Rabia Mady	
First Address Your Valves, Then Assess Your Pipe	9
Britt Klein	
A Multi-Pronged Approach in Condition Assessment and Risk Analysis of Underground Utilities at GLWA’s 1,700 MGD Water Resource Recovery Facility	16
Sadaf Teimoori, Ahmad Habibian, Mohsen Sadatiyan, James Broz, and Greg Marker	
Applied Research Turns Wire Breaks into Innovation Opportunity for GLWA	26
Graham Bell, John Norton, Todd King, Jerrod Wade, Mike Higgins, Rob King, Mike Hooper, Arun Thankarajah, and Sebastien Perrier	
So, You Think You Can Inspect? The Saga of City-Wide Inspections in the Nation’s Capital	37
Tatiana Baranova, Jessica Shiao, Pono Hanson, Kaylie Kramer, and Sohan Patel	
UM Closed-Form Solution App: An Analytical Framework and Predictive Tool for the Capacity Estimation of Pre-Stressed Concrete Cylinder Pipe with Broken Wires.....	47
Wentao Wang, John Norton Jr., Jerome P. Lynch, Todd W. King, Alan Bair, Curt Wolf, and Graham E. C. Bell	
Affecting the Grand Trifecta—Integration of Condition Assessment Program to Launch Multi-Billion Dollar Capital Improvement Program Updates	57
Tom Davies, Wes Pierce, and Nicole Conner	
Adapting Oversampling and Hyperparameters Tuning to Improve the Performance of Prediction Model for Sewers	65
Madhuri Arjun, Shah Rahman, Arjun Nanjundappa, and Anas Hammouri	
Age Is a Misunderstood Predictor of Pipe Failure Risk.....	73
Kevin Laven, Shaoqing Ge, Marco Dignum, Michael Zantingh, Nimarta Gill, Kumaraswamy Ponnambalam, and Harry Krinas	

Case Studies

Case Studies for Condition Assessment of Potable Water, Raw Water, and Sewer Force Mains.....83
 M. Brent Johnson

Planning and Design to Rehabilitate the Semielliptical Joint Outfall of a Unit 3C Trunk Sewer.....91
 Leonel Juarez, Rosann Paracuelles, and Seema C. Shah-Fairbank

Concrete Pressure Pipe Assessment and Management

Maintaining Service Despite Wire Breaks: Condition Assessment of a Low Pressure PCCP System.....101
 Taylor Ahrendorf, Gary Parker, and Cassandra Flores

Lessons Learned from the 20-Year Assessment/Renewal of the Homestake Transmission Pipeline.....110
 Randy Parks, Tom Hankins, Ron Sanchez, Ted Hartfelder, Carl Bundschuh, and Konnor Bursaw

Securing Water Supply for Tomorrow: Enhancing Resilience and Sustainability of Bradford West Gwillimbury’s Transmission Main.....120
 Javed Mukri, Katy Modaressi, and Peyman Samimian

The 48-in. PCCP Condition Assessment That Grew130
 Benjamin C. McCray and Panduranga Kuruva

Advancements in Acoustic Monitoring of Prestressed Concrete Cylinder Pipe: Getting More from Existing Condition Assessment Techniques.....139
 Rob King

Trust the Process: Great Lakes Water Authority’s Progressive Management Approach to Distressed Prestressed Concrete Cylinder Pipe.....148
 Scott Jauch, Glenn L. Edgemon, John W. Norton Jr., Olivia Olsztyn-Budry, Jerrod Wade, Jeffrey B. Giddings, Graham E. C. Bell, Chris Elenbaas, Filip Buniewicz, and Rasko P. Ojdrovic

Statistical Analysis and Insight from the Water Research Foundation PCCP Failure Database 1942–2022.....157
 Roberto J. Mascarenhas, Graham E. Bell, John W. Norton Jr., Ed Padewski, Mike Higgins, and John J. Galleher

Independent Comparison of Electromagnetic Inspection Tools for AWWA C303 Bar-Wrapped Pipe by Blind Verification Testing.....167
 Murat Engindeniz and Alvin Addisho

Bringing Multiple Assessment Methods to Bear to Manage a 1970s PCCP Transmission Main Susceptible to Continuing Wire Breakage.....182
Murat Engindeniz, Robin Kumar, Sean Hsieh, and Troy Bontrager

Ferrous Pipe Assessment and Management

Enhanced Capital Planning through Spatial Analytics for Cast Iron Pipelines: Leveraging High Resolution Inspection Data192
Greta Vladeanu, Sepideh Yazdekhesti, Dustin Park, and Jesi Lay

Standard Practices for Corrosion Control of Pipelines202
Andrew J. Fuller, Gwen Sullivan, and Hassan Rashidian-Dezfouli

Comprehensive Condition Assessment Improves Reliability of a 150-Year-Old Critical Water Transmission Main.....212
Nirav K. Shah, Vennila Durai, and Brian Ball

Leak Detection

Pipeline Mapping with Next Generation Spherical In-Line Inspection Tools222
Marshall Kennedy, Eric Toffin, and Alexander Down

The Heartland of Alberta’s Approach to Leak Detection.....232
Josh Greenberg, Leo Huang, Justin Hebner, and Kailee Erdman

This Old Pipeline: The Assessment of a Century Old Steel Pipeline241
Clinton McAdams and Arne Nervik

Pipeline Failure Analysis and/or Testing

Cracking the Code: Modeling Ultrasonic Wall Loss Data to Predict Cast Iron Pipe Failure251
Ikram Efaz, Leo Liu, Masood Hajali, Ashan McNealy, and Peter Gaskamp

Performance Evaluation of Earthquake Resistant Ductile Iron Pipe Joints Using Combined Experimental and Numerical Method.....261
Shih-Hung Chiu, Qinglai Zhang, Kenichi Soga, Shakhzod Takhirov, Wonjun Cha, David Katzev, and Jeff Mason

Pipe Failure Risk Statistics from over Ten Million Pipe-Years of Records272
Kevin Laven, Shaoqing Ge, Marco Dignum, Michael Zantingh, Nimarta Gill, Kumaraswamy Ponnambalam, and Harry Krinas

Pipeline Hydraulics/Transient Analysis

Working with Combined Sewers: Geometric and Hydraulic Elements of Egg-Shaped Sewers.....282
 Kevin L. Enfinger

How to Use Condition Assessment Data to Improve Force Main and Lift Station Design and Operation291
 Edward Carpenetti, Sunakshi Hada, and Bethany McDonald

Deposit Analysis of Pipelines with Hydraulic Grade Lines Measured by Free-Floating, In-Line Tools300
 Matthew Kindree, Anouk van Pol, and John van Pol

Sewer Condition Assessment

Lessons Learned from Using Vortex Flow Insert for H₂S Sewer Corrosion and Odour Prevention.....310
 Olugbenga Ibikunle and Omobolanle Kojeku

Multi-Sensor Autonomous Inspection Device for Condition Assessment322
 Timothy Andrews, Dmitri I. Shilov, and David Burton

Top 10 Hurdles to Large Diameter Condition Assessment.....330
 Chandler Carpenter and Osai Robinson

Free-Floating, Screening Level Visual Inspection of Large Sewers in Los Angeles, CA338
 Gary N. Skipper, Mark A. Poppe, Michael A. Metcalf, and Drew M. Skipper

System Modeling and Artificial Intelligence

Innovative Approach to Estimate Prestressed Concrete Cylinder Pipe Remaining Useful Life.....348
 Rabia Mady and Khalid Kaddoura

AI-Influenced Condition Assessment Analyses for Toronto Trunk Sewers.....353
 James Tustin, Julian DiGiovanni, Marya Jetten, and Mustafa Mufty

Leveraging AI, Cloud Technology, and Advanced Analytics for Sewer Condition Assessment and System Management364
 Chris Macey and Rodger Weller

Artificial Intelligence Used within Utility Engineering Projects and the Professional Engineer’s Responsibility374
 D. Blaine Hunt

Resolving Left Truncation Issues and Enabling Pipe-Specific Likelihood of Failure Models.....379
 Dayu Apoji, Shih-Hung Chiu, Tara Sweet, David Katzev, and Kenichi Soga

Valve/Appurtenance Inspection and Management

Optimizing Valve Management: Integrating Valve Criticality Analysis and Condition Data for a Comprehensive Valve Management Program.....391
 Sepideh Yazdekhasi, Greta Vladeanu, Sewelo Keleagetse, and Kris Carter

Valve Criticality: Determine the Risk of Your Valves before You Risk Your Valves or Worse!399
 Ty Wall, Beth O’Brien, and Michael Lehrburger

Water Condition Assessment

Holy Toledo! Condition Assessment of a WWII Era 78” Raw Water Steel Pipeline.....407
 Robert J. Card

Developing and Executing Large Diameter Water Pipeline Physical Entry Inspection Protocols.....420
 Jim Geisbush, Christina Collins, and Madhuri Arjun

City of Calgary’s Long-Time Feedermain Condition Assessment Program Shows This Is Not Their First Rodeo429
 Josh Greenberg, Leo Huang, and Justin Hebner

Reviving Reliability: Safeguarding the Waukegan Effluent F-3 Force Main436
 Daniel DeFever, Nick Wolf, Evan Biedenbach, Ashan McNealy, and Nathan Wilson

Leveraging an Aggressive Inspection Program and Predictive Modeling to Develop an LSL Inventory for Jackson445
 Brendan T. O’Brien, Meredith Degner, Pat Brown, and Ian Robinson

Sound Decisions: Leveraging Ultrasonic Technology for Pipeline Inspections in the City of Grapevine455
 David Clark, Kent Conkle, Chris McDowell, Mazen Kawasmi, Stephen Johnson, and Alec Propst

Water Pipeline Rehabilitation or Replacement

Development of a Framework and Business Processes for GLWA’s Linear System Integrity Program.....464
 Susan Donnally, Olivia Olsztyn-Budry, and Jody Caldwell

Jackson’s Watershed Moment: From System Crisis to the Pursuit of Safe and Reliable Drinking Water472
Patrick Brown, Ted Henifin, Russell Snow, and Kristen Whatley

Inspection of 40-Year-Old Tunnel under a Railroad Line to Reuse for Installation of New 90-in. Water Carrier Pipe.....482
Elizabeth Blackwelder, Courtney Jalbert, Jason Gehrig, Mike McCure, and Beau Uran