The Role of High-Accuracy Location for Public Works Emergency Management (see page 48)

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The APWA Reporter, the official magazine of the American Public Works Association, covers all facets of public works for APWA members including industry news, legislative actions, management issues and emerging technologies.

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Embracing technology

Elizabeth Treadway, PWLF
APWA President

The world is changing so rapidly in the realm of communications, and the role of technology is critically important in our ability to engage our citizens we serve. Recently TED presented a session called “Coding a better government” (http://www.ted.com/talks/jennifer_pahlka_coding_a_better_government.html). TED is a nonprofit organization devoted to ideas worth spreading, and in this case the idea is using technology to facilitate citizen involvement with government. The speaker was Jennifer Pahlka, the founder of Code for America (CFA), which matches software geniuses with U.S. cities to improve local services. The San Francisco-based nonprofit aims to help cities use the web to increase efficiency, transparency and citizen participation. Through its fellowship program, CFA recruits top tech talent to spend a year building civic software designed to help cities cut costs, work smarter and engage more with their citizens. Communities chosen for the 2013 program include Las Vegas, Louisville, Ky., New York City, Oakland, San Francisco, San Mateo, Calif., South Bend, Ind., Summit County, Ohio, and the Cities of Kansas City, Kansas and Missouri.

CFA-developed applications range from a platform for community engagement in Philadelphia, transportation apps to track real-time subway and bus arrivals, a school selection tool for parents in Boston, and an open suite of municipal icons for everyone. You can look at all the applications and learn more about them at http://codeforamerica.org/projects/.

Many public agencies have developed applications for citizen involvement on their own. One of those is the City of Lenexa, Kansas. Lenexa chose to use its own staff to develop the Lenexa 311 App, instead of an outside firm. It allows service requests from citizens to be directly transferred into an internal database. Because the database is internal, citizens can see the status of their request in real time as it is being worked through the system. Residents can also see and track requests submitted by others, so that they know whether someone else has already reported their issue to the City. The City’s Enterprise Systems & Technology Department (EST) has released the “Lenexa 311” App on the Apple iTunes App Store.

Residents can still call the City or use the City website at www.lenexa.com to report a problem; however, the app just makes that process easier and more efficient. Residents can take a photo of the problem, add the location and include details about the problem. They choose the request type, and press the “submit” button automatically sending the request to the correct staff person. You can get complete information at this year’s session in Chicago:

“Using Technology to Its Fullest Potential. Using iPads, the City of Lenexa, Kansas, is enhancing the productivity of staff at all levels. Field staff view, create, and close out work orders onsite. A traffic signal app identifies and documents issues. Street...
crews use Omnicast to observe street conditions during snow and ice events. iPads cost less than laptops and are more functional in the field."

There are many applications available to and appropriate for public works activities. Beginning in 2011 at the Denver Congress, APWA began hosting “There’s an App for that.” Public works employees were encouraged to meet and demonstrate applications that they used for typical daily job functions or they had modified to work for a particular situation. Some of those apps include:

- **LoveCleanStreets – Report environmental crime with your mobile and have it resolved by the local authority.**

- **AndSnow – In-cab navigation assistance for optimized or current existing snow routes. The app user, having received routes and hazards files from Spatial Matters, loads the route; turns on GPS; and follows the route, seeing turns in advance, route hazards (known dangers) as points with labels.**

- **Theodolite – Theodolite is a multi-function augmented reality app for the iPhone that serves as a compass, GPS, map, zoom camera, rangefinder, and two-axis inclinometer.**

- **Radar Motion – Radar Motion has many regional radars available for download. You can pick the one for your location.**

- **Mobile 311 – Mobile311 is a GPS workforce management system for municipalities that provides all large and small municipal departments with a most cost-effective solution for field and office tracking and reporting.**

In the past few years we have seen a revolution in the relationship between public works departments and our customers, the public. We are no longer separated by a lack of direct communications with the public and the services we provide to them. In a time of shrinking budgets and growing needs this is both a blessing and a curse. The public needs are now only a click away from being made known to us. The sense of immediate input will result in increased expectations of our citizens and it will take some time for our agencies to change their processes and cultures to align with this new normal. The end result can be a more efficient, responsive and satisfying form of providing our services to the public but expect some growing pains along the way. Whenever you change old, longstanding ways of doing business it will cause stress on your systems not to mention your staff, but be prepared to overcome the problems and inevitable resistance. This brave new world expects us to stand and perform using all the new resources now being made available to us. Lead on public works professionals and show us all the way!
Cybersecurity a top priority for the Obama Administration and Congress

Laura M. Berkey-Ames  
Government Affairs Manager  
American Public Works Association  
Washington, D.C.

Safeguarding our nation’s cyber systems that control critical infrastructure is vital for mitigation, preparedness, response and recovery operations of public works agencies and their first responder partners that provide law enforcement, fire and emergency medical services. Accordingly, the Obama Administration and Congress have made cyber risk to critical infrastructure a top policy priority for 2013.

As first responders and guardians of critical infrastructure, public works agencies have an important role in this policy debate. Public works agencies rely on secure cyber systems to control traffic management systems, water and wastewater treatment facilities, emergency services/communications and other vital operations and services. These cyber systems must be resilient to the increasing threat of terrorism, as well as to damage and disruption from natural or technological disasters. Cyber system risk management is key to ensuring that communities are capable of handling emergency situations and daily operations.

In February 2013, President Obama issued both an executive order and a presidential policy directive that provided further direction on strengthening the nation’s critical infrastructure systems, and how to preempt cyber threats and attacks.

The Executive Order 13636, Improving Critical Infrastructure Cybersecurity, expands the Enhanced Cybersecurity Services, which establishes a voluntary information sharing program between the federal government and critical infrastructure owners and operators. Moreover, the executive order directs the development of a Cybersecurity Framework which will consist of voluntary consensus standards and industry best practices to reduce cyber risk. As framework development moves forward, the federal government is instructed to consult with state, local and tribal governments, and subject matter experts including the Department of Homeland Security’s (DHS) Critical Infrastructure Partnership Advisory Council (CIPAC) and Sector Coordinating Councils. APWA is an active member of CIPAC and the DHS Emergency Services Sector Coordinating Council.

Presidential Policy Directive 21 (PPD-21) establishes a national policy on critical infrastructure security and resilience. Replacing Homeland Security Presidential Directive 7 (HSPD-7), PPD-21 clarifies critical infrastructure-related functions, roles and responsibilities across all levels of government, as well as public and private owners and operators of critical infrastructure systems. Unlike HSPD-7, which focused on physical acts of terrorism, PPD-21 focuses on all hazards—as threats to critical infrastructure can be natural, man-made or cyber related.

President Obama’s FY 2014 Budget also supports a renewed focus on managing cyber risk. Totaling $1.2 million for infrastructure protection and information security, the budget includes enhancements to cyber threat analysis and mitigation activities, as well as improving information sharing between federal, state and local partners, and the private sector. The FY 2014 Budget reflects the Department of Homeland Security’s increased responsibilities as identified by the Executive Order and PPD-21.

As the Obama Administration moves forward with its cyber initiatives, defining the federal government’s cybersecurity role has been a contentious issue on Capitol Hill. Currently, this debate is well underway in the 113th Congress. Many congressional Democrats favor establishing national cybersecurity standards and expanding the role of the Department of Homeland Security, whereas many congressional Republicans lean towards strengthening information sharing and intergovernmental coordination.

“We cannot interfere in one area of the ecosystem without paying due attention both to the consequences of such interference in other areas and to the well-being of future generations.”  
On January 22, the Cybersecurity and American Cyber Competitiveness Act of 2013 (S 21) was introduced by Senate Commerce, Science and Transportation Chair John Rockefeller (D-WV). S. 21 establishes a “sense of Congress” that gaps in cybersecurity pose a rapidly growing nationwide threat and that bipartisan legislation should (1) enhance security of public and private communications and information networks; (2) establish information sharing for cyber threats; (3) develop a public-private system to assess cyber risk and respond to cyber attacks; (4) promote research and development; (5) promote cybersecurity and information technology training; (6) enhance diplomatic and international cooperation; (7) prevent and mitigate identity theft; and (8) expand tools and resources for investigating and prosecuting cyber crimes.

It is anticipated that in July the Senate Homeland Security and Governmental Affairs Committee will introduce cybersecurity legislation that will contain more technical language focusing on the impact cyber risk has on public works-related critical infrastructure systems.

On February 13, the Cyber Threat Intelligence and Sharing Protection Act of 2013 (HR 624) was introduced by House Permanent Select Committee on Intelligence Chair Mike Rogers (R, MI-8). HR 624 expands voluntary information sharing of cyber threats between government and the private sector, provides liability protection to companies, and limits the government’s use and retention of classified cyber threat information. On April 18, HR 624 passed the House by a vote of 188 – 127, and will now move on to the Senate for consideration.

Around the same time last year, legislation identical to HR 624 passed the House but was not taken up by the Senate. Time will tell if history will repeat itself. Perhaps Congress will be able to compromise rather than reach an impasse over this partisan policy debate. In the meantime, the Obama Administration is moving forward to address cyber risk through its release of Executive Order 13636, PPD-21 and the FY 2014 Budget.

For additional information, please visit these webpages:


Members of APWA's Government Affairs Committee met recently with senior-level federal agency officials to hear the latest updates on public works issues, including transportation, stormwater and emergency management, when the committee met in Washington, D.C., in April.

Representatives from the Federal Highway Administration provided an update on current work to implement MAP-21’s performance management and environmental planning provisions, and representatives from the Environmental Protection Agency discussed work on an upcoming stormwater rule and other activities. A representative from the Federal Emergency Management Agency covered changes made to the Stafford Act, which Congress enacted following Hurricane Sandy to improve disaster response and recovery, and staff from the American Society of Civil Engineers (ASCE) discussed ASCE’s 2013 Report Card for America’s Infrastructure, which graded the nation’s infrastructure a D+ with a funding shortfall of $1.6 trillion. The Water Resources Management Committee members also took part in the meetings on the Hill with congressional staff and members to advocate for APWA’s priorities.

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For more information about these programs or to register online, visit www.apwa.net/Education. Program information will be updated as it becomes available. Questions? Call the Professional Development Department at 1-800-848-APWA.

### 2013

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If you have expertise that you would like to share, please use the online Call for Presentations form to describe your expertise and perspective on the topic. www.apwa.net/callforpresentations/

- **= Click, Listen, & Learn program (Free to Members)**
- **= Live Conference (Paid Registration)**

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**How Data Can Keep Your Roads Safe**

**June 20, 2013 • 10:00 am CT**

Register online today at www.apwa.net/Education or call 800-848-APWA
On the cutting edge

Carol S. Estes, P.E.
Professional Development Program Manager
American Public Works Association
Kansas City, Missouri

The Engineering & Technology (E&T) Committee is one of APWA’s broadest Technical Committees. The committee provides education and information to help public works agencies understand and utilize cutting-edge technology and sound engineering principles. The committee sponsors technical sessions at APWA’s annual Congress each year, provides informative articles in the June issue of the Reporter, and sponsors informative Click, Listen & Learn programs.

At the APWA Congress this year, the E&T Committee will present three educational sessions. In the first, “Monetizing Public Works Assets: Salvation or Snake Oil?”, attendees will learn how to evaluate strategies for turning fixed capital assets into cash and income for their communities, identify potentially useful strategies for doing so, and assess the potential rewards and risks of monetizing public works assets.

In addition to the educational sessions at Congress, the committee has been writing articles for this edition of the Reporter. Articles submitted by the committee include:

- “Safety benefits associated with adaptive traffic signal control” by Jim Clark and Dennis Randolph
- “Legal issues in public works: the transportation example” by Brian Coon and Dennis Randolph
- “Robotic-based asset management systems for sanitary and storm sewers” by Tim Graeb and Dennis Randolph
- “Marketing is not a four-letter word: public works maintenance managers must learn to communicate” by Joe Crossett and Kyle Schneweis
- “Managing for public works performance” by Andrew Lemer
- “Safety and the public works profession” by Dennis Randolph

This year, the E&T Committee completed a new publication, Project Delivery Systems: An Introduction for the Public Works Professional. The guide includes a discussion of the most common approaches for project delivery. Approaches are described by first grouping them into three risk categories. The first are approaches where the owner assumes most risk and control. Then the guide moves to those where owner and builder share risk to some degree. Finally the guide closes with approaches where the builder assumes most of the risk. Then within these categories the book describes:

- Common project types that typically use the system for implementation
- Usual staff skills needed during project implementation
- Typical steps followed for professional service and builder selection
- Description of common organizational structures of the delivery teams
- Cost implications for design, construction, maintenance and life cycle
- Typical strengths and weaknesses of the system, and
- Suitable types of projects to carry out using the system.

To make new technology more accessible to members, E&T members propose to actively scan emerging
new technology that could improve public works practice and to encourage thinking about future best practices, five to ten years hence. The committee envisions a brief item in each issue of the Reporter with possible tie-in to the APWA website and perhaps social media.

As the committee looks to the future, it is their hope to serve as a resource to chapters and members. With a diverse committee makeup which includes representation from the public, private and education sectors, it is the mission of the committee to serve the needs of members. As always, the committee welcomes any thoughts and comments. The current members of the Engineering and Technology Technical Committee are:

- Mr. Venu J. Gupta, P.E. (Chair), Director of Facilities Development & Management, City of Milwaukee, Wisconsin
- Ms. Laura S. Cabiness, P.E., Director, Department of Public Services, City of Charleston, South Carolina
- Dr. Andrew Lemer, Senior Program Officer, Transportation Research Board, Washington, D.C.
- Mrs. Sherri K. McIntyre, P.E., Assistant City Manager, City of Kansas City, Missouri
- Mr. Craig M. Olson, P.E., Public Works Director/City Engineer, City of Clyde Hill, Washington
- Mr. Dennis A. Randolph, P.E., Director of Public Works, City of Grandview, Missouri
- Mr. David L. Lawry, P.E. (APWA Director-at-Large), Director of Municipal Services, Chastain & Associates, LLC, Chicago, Illinois
- Ms. Carol Estes, P.E. (Staff Liaison), Professional Development Program Manager, APWA Kansas City Office

Carol Estes serves as the liaison to three of APWA’s Technical Committees: Engineering and Technology, Transportation, and Utility & Public Right-of-Way. She also serves as the staff liaison to the Donald C. Stone Research Council. She can be reached at (816) 595-5222 or cestes@apwa.net.

Thank You for Celebrating!
National Public Works Week 2013

Every year National Public Works Week gets bigger and better. The number of participating municipalities continues to grow, which means the number of citizens who are exposed to the value of public works grows.

At APWA one of our main goals is to educate the general public about the value and necessities of public works projects throughout North America, and public works professionals like you are our best ambassadors.

Public Works Professionals don’t stop after National Public Works Week is over, neither should the celebration. Keep the recognition in your area going by finding additional ways to celebrate the men and women of public works!

Go to apwa.net/npww to find out additional ways to celebrate and recognize the everyday heroes of public works.
Facilities & Grounds Committee finds what the buzz is all about in Washington State Chapter

Nikki Guillot
Professional Development Program Manager
American Public Works Association
Kansas City, Missouri

When it comes to spring conferences, the Washington State Chapter really rolls out the red carpet. The great venue and packed expo floor was a perfect backdrop to the enthusiasm of the local members. It’s easy to see why the Facilities & Grounds Committee sought to meet in Vancouver, Washington for their spring meeting in March, traveling from as far away as Connecticut, Florida, Georgia, and Kentucky to join in the professional fellowship and high-quality educational offerings.

With the help of committee member Debbie Sullivan, Director of Technical Services for the City of Olympia, and the many dedicated volunteer leaders at the Washington State Chapter, the quick but productive trip provided a valuable opportunity for the committee to meet with APWA members, give a presentation on facilities and grounds in public works, and tour outstanding public facilities in the area. A successful business meeting engaged committee members in a vital strategic planning session during one of only two face-to-face meetings this year.

The committee business meeting centered on the contributions of the committee to APWA including supporting popular programs like live “Click, Listen & Learn” sessions and the Donald C. Stone Center for Leadership Excellence in Public LEED Gold-certified Vancouver City Hall is home to 260 employees from five municipal departments.
Works. The committee continues to focus support on chapter Technical Committees and the new Subcommittee on Urban Forestry to stay relevant to members in facilities management and grounds maintenance. Collaborating on programs with other Technical Committees is also key to bringing public works professionals together as in the upcoming webinar on “Modifying Operations and Facilities for Alternative Fuel Vehicles” with the Fleet Services Committee.

Not only did the Washington State Chapter provide meeting space and a presentation session but two excellent site visits as well. Committee members toured the LEED Gold Certified Vancouver City Hall and the Clark County Center for Community Health. The former home of The Columbian newspaper, Vancouver City Hall is now home to 260 employees from five municipal departments, saving overhead costs and providing more efficient business operations. Staff enjoys natural light of the open floor plan, a roof garden and bike commuting facilities while the city reaps considerable savings from geothermal heating, a dedicated server room and efficiency sensors for lighting and restroom fixtures.

Clark County’s innovative Center for Community Health combines multiple social services under one roof on the Veterans Affairs campus. The facility brings together federal, state, county and nonprofit partners to provide deeply integrated services from consumer advocacy to tribal housing and mental health services. The campus provides convenient access for residents, resulting in cost savings for the county, their partners and customers. In addition to functional efficiency, the center features solar powered water heating and other energy saving fixtures.

APWA Louisiana Chapter joins Louisiana Good Roads and Transportation Association in taking the lead to advocate for public works

APWA’s Louisiana Chapter partnered with the Louisiana Good Roads and Transportation Association in sponsoring a meeting featuring Senator David Vitter of Louisiana to discuss transportation and water resources priorities. Sen. Vitter is Ranking Member (second most senior) on the Senate Environment and Public Works Committee, which has jurisdiction over important infrastructure programs. The committee’s priorities include oversight of implementation of the surface transportation law, MAP-21, and passage of the Water Resources Development Act of 2013, which authorizes flood control, navigation, ecosystem restoration and water supply projects administered by the U.S. Army Corps of Engineers. The committee will also be the lead Senate Committee drafting the MAP-21 reauthorization legislation, expected next year. The meeting was held March 16 in Mandeville, Louisiana.

The Facilities & Grounds Committee extends their collective gratitude for the warm welcome they received and the great experience of public works at the Washington State Chapter. Particular thanks to Pete Capell, Chapter President; Mark McCauley, Director of General Services from Clark County; Tim Haldeman, Director of General Service with the City of Vancouver; and Jill Marilley, Board Director to Region 9 for all of your help in making this meeting a success!

Nikki Guillot can be reached at (816) 595-5221 or nguillot@apwa.net.
Chicago on the cheap: Yes, Mother, all roads really do lead to Chicago

Joel Koenig
Senior Project Manager, Crawford, Murphy & Tilly, Inc.
Chicago, Illinois
Member, APWA Chicago Metro Chapter Congress 2013 Steering Committee

As I write this version of “On the Cheap” I recall the 1987 film starring John Candy and Steve Martin where they make a bizarre, heroic and comical effort to get to Chicago. It was titled Planes, Trains and Automobiles. The movie reminds me that there is more than one way to get to Congress; some may be a little easier on your wallet than others.

Many of you are just getting around to making your plans for the Congress. One quick way to save is to register before July 1 and save $50. Another is to use the Congress hotel reservation system. Just for comparison, the Hilton is asking less for a hotel stay for this year’s Congress than what they did last fall for the local municipal conference. Don’t forget to take advantage of this.

If you are like most Congress attendees, you’re just getting around to making your travel plans. I’ve been driving around Chicago for many years and I am always tickled when I hear my friends in other cities tell me how bad rush hour traffic is in their town. Well, not to brag, but here in Chicago, we don’t just limit our traffic congestion to an hour, we call it “peak hours.” What that really means is from 6 a.m. to 7 p.m. you can expect delays. That includes Saturdays and Sundays too! So if you have a choice, don’t drive into the city.

If you are going to drive, be aware that parking downtown is expensive. Be prepared to pay upwards of $50/day to park at the Hilton or the Palmer House. What are your alternatives? You could try parking at nearby garages for less and walking a couple blocks back to the hotel. One website that can help you find nearby garages is http://chicago.bestparking.com. I would suggest if you do this, make sure this is a secured garage that allows overnight parking. You do not want to overstay the hours of the parking lot, an expensive lesson I only needed to learn once. Now my next suggestion may seem odd, but why not use the long-term parking lots at the airports? For those driving in from the north and northwest, you might consider using parking lot “F” (that is “F” for frugal) at the O’Hare Airport. This will cost you only $9/day, and you can easily take the CTA blue line downtown. For those arriving from the south, Midway Airport’s long-term parking is $14/day. The CTA orange line will also get you downtown for $2.25.

For short-term stays, there are a couple of suburban locations along the Metra commuter train line that have recently implemented pay-by phone systems, which allows visitors to park for a couple of nights and pay each day with this system (parking is free at some Metra stops on weekends). Three communities I know that do this are Libertyville, a northern suburb, and both Aurora and Naperville, western suburbs. If you want more information check out the cities’ websites, Metra’s website or contact me.

Speaking of trains, my friend Larry regularly takes Amtrak to and from Congress and finds it a very good alternative to flying. He says, “Amtrak provides great and friendly on-board services, good food and terrific scenery. The schedules are great for Chicago as most trains begin and/or end at Chicago’s Union Station, at

When at the airport look for the direction signage to take you to the CTA rail line (Ground Transport).
convenient hours. As a result, there is frequent service especially within a 500-mile radius. Standard coach class is generally very affordable, the seats are comfortable and the café car provides a good variety of food and drink at reasonable prices. Possibly the best of all benefits, you can arrive 30 minutes before departure and you can take your bags right on the train with you, no security checks, no hassles.”

Larry goes on to say he “likes to spend time in the lounge car. You can meet many interesting people and can enjoy a panoramic view of the scenery.” He does remind us that on the down side, like any form of transport, there are occasional delays. However, during delays, you can have a drink or a bite to eat and enjoy the views.

Now, at the risk of putting you all off, have you considered the bus? Seriously, these aren’t the cruisers of your college days. They can be well-appointed and many have wi-fi, allowing you to surf the web away from home. Yes, Greyhound is indeed still in business. But there are several other providers that include Megabus, Trailways and Van Galder/Coach USA. Greyhound has its own terminal downtown, and the others use curbside pickup at Union Station. In truth, I was reluctant to recommend this, but I have since learned since starting these articles that many business travelers like the regional bus service to the city, finding it cheap and less stressful than driving. If you are less than a six- to eight-hour drive from Chicago, this might be an option worth considering.

Now my last travel suggestion has to do with schedules and stretching out your stay. As you are all savvy travelers you already know how to find low-cost airfare, train and bus tickets. Typically, the early flights and late departures can be a less costly alternative than at prime time. Coming in early or staying later in the day also has the advantage of letting you enjoy our city a bit longer. However, what do you do with the luggage when you can’t get into your room or have already checked out? Both the Hilton and the Palmer House offer the opportunity to check your bags with the Bell Hops. It might cost you a couple of dollars per bag to do so, but what an inexpensive way to stretch out your stay an extra day or so.

Joel Koenig can be reached at (312) 357-2075 or at jkoenig@cmtengr.com.
Recently, Dr. William Wallace from the Management Staff College at Fort Leavenworth’s education system invited me to observe a debriefing session. The Debrief is the last segment of their advanced leadership training program which focuses on critical thinking. There are over 300,000 civilian professionals who support our nation’s military. Leadership training of these individuals must parallel the professional development of the functions they support. Thus, the military considers leadership development an essential part of assuming high levels of responsibility within the ranks of their civilian workforce. Individuals are required to participate in many of the courses, ranging from two- to four-week sessions; some are online and others are residential professional development experiences.

Dr. Wallace and I had been discussing ways to teach, encourage and promote critical thinking and I was very pleased to be invited to see how the best and brightest within the military and in the civilian part of the military learn and execute this rather complex set of skills. With Fort Leavenworth being only an hour from Kansas City, this was a great opportunity.

A debrief is a presentation to a panel of high-ranking military leaders (colonels and lieutenant colonels). It is the culminating exercise after addressing a problem identified as a priority by the Secretary of the Army. The recommendations are judged by military subject matter experts who consider each of the Secretary of the Army’s list of priorities to be their priorities. Options had to be well considered, plausible and effective. The panel of subject matter experts from the military listened and then weighed in on the proposals; their comments were thorough and thought provoking.

Prior courses (online and face-to-face) provided the context for this culminating experience. In this last segment, to get to this point of proficiency in critical thinking, each group had to constitute themselves as a team, define the scope of the problem and resolve it. They understood that their recommendations could potentially be acted upon. The program participants came from a wide range of functions, ranging from human resources to deployment experts.
The diversity of the participants added to the complexity of problem solving and presented a real-world opportunity to think critically. Each team worked together on one of four units and ultimately repeated the critical thinking task four times. The task was to develop an implementable strategy on a critical task, in short order, working with individuals they had just met. Each debrief strategy would be developed within a week’s time. The focus was on performing, not just studying the elements of what constitutes effective critical thinking.

I pondered critical thinking education for public works professionals specifically focusing on the Donald C. Stone (DCS) Center candidates. I had the Rigor-Relevance template (http://www.apwa.net/DR/index.asp?ID=1505) in mind as the model for the DCS Center design for critical thinking. The condition of our nation’s infrastructure and the complex nature of public works challenges and problems meant that, like the military, the charge will always be to find well considered, plausible and effective solutions in increasingly unknown real-world situations. Even though the contexts are different, it was easy to see the parallels between both organizations and the eminent need to foster, train and support the development of critical thinkers.

The DCS Center uses various methods to develop critical thinking leaders: the mentors—critical thinkers themselves—work one-on-one with a candidate to discuss how to implement the knowledge candidates bring to the program from their personal experience, the institutes and other training programs. It is about getting the candidates to act, implement, practice, solve problems, make decisions and try something new, something old or something borrowed.

The candidates are also required to develop a project. This requirement showcases the candidate’s ability to think critically. Projects are the candidate’s culminating work, bringing together professional experience and what they have learned while in the DCS Center program. The project requirements differ by level; for instance, Public Works Supervisor (PWS) candidate projects focus on making a critical decision, solving a problem or improving a process within their agency, organization or community.

Candidates in the Public Works Manager (PWM) program should be good at planning, thus their project requirements focus on planning programs or projects that are implementable. The plans should consider the three aspects of sustainability: social, economic and environmental. The plan should also consider the system or big picture. It should answer the question: How will the project affect the organization in which it will be implemented? What processes, people or policies will be affected? How will the plan be implemented and what are the anticipated outcomes?

The candidates submitting a Public Works Executive (PWE) project should address policy-related interventions. How will this new or improved policy affect public works agencies, organizations, legislation, communities, or all of these? The PWE candidates must defend their proposal before a simulated council, town meeting or equivalent.

Much like the leadership development in the military, public works leaders are tasked with pulling teams together from diverse backgrounds, with limited resources, to provide the best solution for decision makers in a timely manner while maintaining high-quality standards.

As the DCS Center continues to evolve, we will find new ways to develop, reinforce and promote those essential critical thinking skills and thus support the leadership within public works in their daily work of keeping civilization going by strengthening our infrastructure and thus building community and communities.

I would like to thank Dr. Wallace and the personnel at Fort Leavenworth who hosted and graciously allowed me to see their advanced leadership development program. Thank you for sharing educational strategy in such an important area as critical thinking.

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EnviroShare: A County-wide Environmental Management Solution

Stan Brown, P.E., PWLF
City Manager
City of Oakwood, Georgia
Member, APWA Small Cities/Rural Communities Committee

Introduction
In a community with 183,000 residents, a county government, eight municipalities, seventeen sewer service districts, five water service providers, multiple private and public solid waste and recycling services, and nine land use and code enforcement agencies, simple questions such as, “Where do I recycle my used motor oil, dispose of my trash, apply for sewer service, report an environmental code violation, or volunteer to help clean up my community?” are often not so simple to answer. This challenge, along with a grassroots interest from citizens and businesses to “green” our community, served as the catalyst for the creation of the Hall County Environmental Management System also known as EnviroShare.

About EnviroShare
Established in December 2010, as Hall County’s Environmental Management System (EvMS), EnviroShare is a county-wide, voluntary network of local governments, school systems, residents, businesses and nonprofit organizations that work together toward common environmental goals. Former Hall County Commissioner Ashley Bell was the local champion who recognized the need and led the movement to create the Hall County Environmental Management System also known as EnviroShare.

From its beginning, the purpose of EnviroShare was to (1) encourage public and private entities to adopt policies, processes and practices that enable organizations to reduce environmental impacts and increase operating efficiency, (2) create a synergy through more efficiently working together, (3) improve quality of life for our citizens, and (4) embrace environmental stewardship as an integral part of the our economic development strategy. As stated by Commissioner Bell, “My goal was to create a big table where we could take private-sector ideas and use them in the public sector. Being green means saving green.”

Mission
Engaging our community and inspiring environmental action to create a greener footprint and healthier economy through research and education.

Vision
Hall County, Georgia will be a model community where:

- Actively caring for the environment is second nature.
- Citizens, businesses and governments unite to put their passion for environmental issues into action.
- Environmental quality, economic development and community engagement intersect to achieve a higher quality of life.
- We have a clean and healthy environment free from pollution to air, water and land.
- We exceed expectations across all sustainability issues and proactively reduce our environmental impacts.

Organizational Model
With a defined mission and vision in place, the next startup step was to create an organizational structure. Following the model of the Gainesville-Hall Metropolitan Planning Organization (a transportation planning agency) and benchmarking other similar environmental management system structures, the EnviroShare organizational model (see exhibit on p. 17) was designed to include an external Steering Committee (appointed by the partners), internal Steering Committees (within...
The EnviroShare organizational model

Each partner’s organization, a Citizens’ Advisory Committee (with representatives appointed by the county commission and partnering cities), and Technical Committees (referred to as work groups) for the land, water and energy/air components of the program. In addition to these committees, the Steering Committee also created performance management and public education and outreach work groups to track and report the status of the program and communicate the results to the community.

Under this model, the Steering Committee is tasked with establishing the general policies and managing the business and affairs of the organization to include establishing EnviroShare goals and objectives, an annual work program, and the tracking/reporting of program results and accomplishments. The Steering Committee members consist of representatives of EnviroShare partners (local governments, industries, utilities, businesses, schools, nonprofits, etc.) who have executed a partnering pledge to actively participate and establish their own internal steering committee and goals to support the EnviroShare mission and vision.

The Citizens’ Advisory Committee (CAC) represents the residents and county-wide stakeholders and serves as advisors to the Steering Committee. The CAC provides collective input from the citizens, serves as a link for stakeholder input, supports EnviroShare initiatives, and enhances collaboration among all program participants.

The Technical Committees (Land, Water, Energy/Air Work Groups) consist of a cross-section of partners, CAC members, business representatives and community volunteers interested in environmental stewardship. These work groups are responsible for assessing baseline environmental conditions, developing and recommending goals, objectives and work programs to the Steering Committee and performing assigned work tasks and activities.

Goals/Objectives/Work Program. Examples of the goals developed by the work groups and adopted by the Steering Committee are:

- Preserve Hall County’s sense of place through the conservation, protection, replenishment and master planning of our parks, greenspace, viewsheds, tree canopy, and forest resources.
- Foster sustainable development which enhances the economic viability, preserves the character of Hall County, and encourages a sense of connectedness.
- Strengthen the image and charm of Hall County through coordinated efforts to enhance property conditions and community appearance.
- Create a greener community of national renown through a model waste management plan that engages all Hall County population groups.
- Preserve Hall County’s sense of place through the conservation and protection of our water resources.
- Maintain and enhance air quality, both indoor and outdoor, in Hall County through sound, acceptable, achievable clean air practices.
- Support and encourage improved energy use and performance in Hall County through identification of resources, innovative practices, and opportunities.

With the adoption of goals and objectives, the last startup step of the Greenprint was to identify the actions needed to achieve the goals and meet the objectives. In this process, the Land, Water and Energy/Air Work Groups organized their tasks, each related to a specific goal and objective, into an annual work program. (Task examples include “…develop a shared...
vision of sustainable development among local governments...”; “...promote reduce, reuse, recycling and re-purpose options...”; “...identify valuable viewsheds within the county and develop a strategy for their conservation...”). The work program, maintained on a web-based platform, is updated in real time and is adjusted annually to achieve the EnviroShare mission and vision.

Implementation
Upon completion of the startup phase, EnviroShare transitioned into implementation of the following Greenprint components: (1) work program execution, (2) performance management, and (3) public education and outreach.

Work Program Execution. The EnviroShare work program execution is carried out by the Land, Water, and Energy/Air Work Groups. Each work program task is assigned to a responsible party (“task owner”) who develops the scope of the task, forms a work team, develops a timeline, performs the task, and provides status reports to the work group by updating the web-based work program. Upon completion of work program tasks, the task owners summarize the outcomes and lessons learned from accomplishing the task. The work groups meet as needed to discuss and report work program progress, coordinate efforts, and to collaborate on updates, additions, or adjustments to the goals, objectives or work program.

Performance Management. The Performance Management Work Group is tasked with the responsibility for tracking and reporting the progress of the overall EnviroShare work program. In carrying out this task, the Performance Management Work Group provides guidance to the other work groups to ensure consistency in the work program development and reporting formats. This work group provides quarterly status reports to the Steering Committee and submits an annual report of program accomplishments.

Public Education & Outreach Program. The Public Education and Outreach Work Group assists the other work groups and the Steering Committee in communicating the EnviroShare mission, vision, activities, and accomplishments to the community. Tasks related to this effort include developing a communications strategy (messages, methods, target audience identification), providing environmental education tools and resources, and recruiting EnviroShare partners and volunteers.

Results
EnviroShare may be in the early stages of its development, but the following benefits are already evident: (1) a strong synergistic effect as a result of the public-private partnership focused on environmental stewardship; (2) enhanced coordination of existing public and private environmental services and resources; and (3) an increased recognition and awareness of the environment as factors to consider, along with economic impact and the human element, when master planning and making community-wide decisions. Although the future chapters are yet to be written, the committed public-private partnership and citizen involvement experienced thus far are encouraging and will prove to be essential to the long-term sustainability of this collaborative effort to achieve the EnviroShare vision of “greening” our community.

For additional information on the EnviroShare Environmental Management System, contact Stan Brown at sbrown@cityofoakwood.net or visit www.enviroshare.org and www.hallcountygreenpages.org.
Diversity events at the 2013 Congress in Chicago

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City of Largo, Florida
Chair, APWA Diversity Committee

If you have been to Congress in the past few years, you already know about the work the Diversity Committee puts into educating and informing our fellow members on inclusiveness and tolerance. This year will be no different. The Diversity Committee has worked very hard this year to continue great programming and provide some new education to help public works professionals succeed.

First-Timers Meeting
This year, the Diversity Committee will again host our annual welcome reception for first-time attendees of Congress. This event is in its 17th year and has become a staple of the first-timers’ Congress experience. On Sunday morning a breakfast will be held at McCormick Place where first-time attendees can meet fellow public works professionals, members of our committee, and APWA leaders including the Board of Directors, the Chicago Metro Chapter leadership, APWA Past Presidents, and of course our Executive Director and our President. This is a great opportunity to make some new friends, get to know a little bit more about APWA, and most importantly, learn how to navigate Congress effectively to make it the best experience possible for you!

Diversity Brunch
On Tuesday, August 27 at 10:00 a.m., come join the Diversity Committee for a ticketed brunch where we will hear from Chicago Tribune columnist Rex Huppke and some of his views on diversity in the workplace. Mr. Huppke writes a column entitled “I Just Work Here” and he frequently answers, through his columns, questions from readers about their office or work environments. This event costs $40 additional to your registration, but it is well worth the cost. Come out and enjoy good food and a great speaker with us!

Technical Sessions
This year, the Diversity Committee has commissioned two technical sessions to be given in Chicago. The first is a returning session called “A View from the Top” and focuses on successful women in public works. The second is a session entitled “Workforce Diversity: Recruiting and Retaining Minorities and the Disadvantaged” which will discuss ways various chapters have helped to train, recruit, and empower workers that may or may not have higher education and vocational training opportunities. These sessions are both on Tuesday, August 27, and will be back-to-back in McCormick Place. Many of APWA’s leaders have offered to provide their background and knowledge on these topics to help all of us become better managers and to celebrate inclusiveness.

“A View from the Top – Women in Public Works Talk about Their Lives and Careers.”
This session will include our favorite APWA Board members and moderators, Sue Hann and Cora Jackson-Fossett, with speakers from around the country: Jill Marilley from Washington; Joline McFarlane from Alberta; Mary Anderson from Florida; and Kealy Dedman from Ontario. They will go over the lessons they have learned as women who have made it to the top. They will discuss the thinking behind their career decisions, the importance of finding good mentors, and tell you stories about the challenges they have faced and conquered. You do not want to miss this session.

“Workforce Diversity: Recruiting and Retaining Minorities and the Disadvantaged.” In this presentation, Bill Dunlop from Wisconsin, Charles Pinson from South Carolina, and I will teach attendees about various ways that our chapters and organizations have successfully recruited and retained individuals that do not have the same opportunities as many of us in public works.
works management. This will include discussions on recruitment techniques from the Wisconsin Chapter, internal diversity programming from Anderson County, South Carolina, and finally educational opportunities from Pinellas County, Florida. Join us to learn how you can implement these types of programs in your chapter or community.

Our profession continues to become more inclusive and integrated with folks from all races, genders, creeds, and nationalities. It is truly a wonderful time to be a part of APWA and this committee hopes that through this year’s Congress, we can continue to move the Association forward. We look forward to seeing you in Chicago, and hope you come and enjoy our events!

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Your Vote in APWA Does Count
As an APWA member, you will have the opportunity to vote for members of the APWA Board of Directors between July 5 and August 5, 2013:

- APWA President-Elect;
- At-Large Director in the functional area of Fleet & Facilities Management; and
- Regions I, II, V, VI and VIII Regional Directors (by APWA members in those respective regions)

The ballot will be available for online voting between July 5 and August 5, 2013 on the “Members Only” section of the APWA website. There will also be a voting icon on the home page of our website. If you do not have access to a computer at home or work, you may access the APWA website at your local public library or other public access points. If you are not able to vote online, you may request a paper ballot from Cindy Long at (816) 595-5220. Additional reminders of the voting process will be sent through the infoNOW Communities; via e-mail to every member for whom we have an e-mail address; and in future issues of the APWA Reporter.

If you have questions, please contact Cindy Long at clong@apwa.net or (816) 595-5220.
The Public Works Historical Society: Value for young professionals

Rylan Wadsworth
Public Works Director
Town of Montreal West, Québec
Member, Public Works Historical Society Board of Trustees

It was only in 1916, in the storm of World War I, that pack trains of mules and horse-drawn wagons were replaced on the Western Front by the first generation of a strange new kind of military transport: motorized army vehicles. Rickety cars and trucks, and clumsy tin-can tanks, bolted together like steam boilers. The first age of automotive transport had come to warfare.

But the war ended before the military reliability of these new-fangled machines had been fully tested. And so in July 1919, safely back in America, the U.S. Army decided on a daring experiment—to send a crawling convoy of these cranky and temperamental new machines on an epic cross-country journey, from Washington, D.C. to San Francisco. This was a crossing of nearly 3,000 miles, grinding and bouncing over the only “transcontinental highway” of the time—a primitive roadway which was in some stretches little more than a rutted dirt trail, linked by timbered wooden bridges so old and undependable that the convoy often had to ford rivers and streams, rather than depend upon aging bridges that collapsed under the convoy’s weight.

That first army convoy did make it to San Francisco—coast to coast—and in only 62 days! One participant who rode along on that dusty, epic transcontinental transit was a young Lieutenant-Colonel of the Tank Corps who would later become America’s 34th President, whose name was Dwight D. Eisenhower.

And it was that rugged cross-country journey in 1919 that opened the future President’s eyes to the vital military and domestic need for a modern transcontinental highway network. And years later when Eisenhower became President he finally had the authority to make an ambitious American road-building project a reality—41,000 miles of a National Highway System, which altered life in America forever and added billions of dollars to the national economy.

Work on this evolving project continues to this day, employing thousands of public works professionals, many of whom are members of APWA.

This is just one brief story from America’s great public works history. As today’s young public works professional you are now part of that history. So why not learn more about your common heritage? Take the opportunity to learn about all the other builders and visionaries, the working men and women who built and are still building the modern infrastructure of America, whose work we, as young public works professionals, continue each and every day.

You can find out a great deal more about our great public works history with an annual membership in the Public Works Historical Society. Historical research, scholarly collaboration and the preservation of important historically significant public works projects are a small sample of the work with which the PWHS is currently involved.

For more information on the benefits of PWHS membership and how to join the Public Works Historical Society, please consult http://www.apwa.net/PWHS/.

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“What sets worlds in motion is the interplay of differences, their attractions and repulsions; life is plurality, death is uniformity.”

Octavio Paz (1914-1998), Mexican poet and critic

Diversity Awareness Corner
Recognize Your Leaders

In April 2012, the City of Tempe’s Solid Waste section embarked on a rigorous goal-setting process around providing value service to our residents and business customers as defined by rates charged, environmental sustainability, and customer satisfaction. We kicked off the process with a meeting of the entire solid waste team where we presented short- and long-term budget information and projections, satisfaction survey results for the past five years (trash and recycling services consistently receive the highest or among the highest results of any city service), and cost-of-service data for each of our service areas. We then actively encouraged collection and administrative staff to volunteer to form teams to address key issue areas including business processes, disposal and diversion strategies, and operational efficiency.

While there was significant interest at first, as the hard work of setting and achieving goals, researching information, collecting data, and identifying solutions progressed through the year, participation in the process fell off. However, from day one through the present, Solid Waste Equipment Operator II Michael Ulmer stands out as the most consistent, helpful, dedicated and committed member of the original team. Michael possesses a unique combination of technical equipment operation and routing knowledge, and the ability to think strategically in terms of where he wants our comprehensive solid waste program to be: the best in the country.

Toward that end, Michael took the lead role in our fleet readiness goal around making sure we have enough trucks ready for duty each morning. He initiated a best practice for optimizing existing (but underutilized) technology to perform required pre- and post-trip CDL vehicle inspections and integrate with Fleet Operations to proactively identify and resolve key maintenance problems. Michael then developed and coordinated, with assistance from his team, an outstanding training program on the use of the technology for approximately fifty solid waste equipment operators. In addition, he has spearheaded a rerouting plan for the Commercial Collection section which has resulted in operational efficiencies, and has deployed that knowledge to our residential collection operations as well. His current efforts include coordinating the development of SOPs for key operations, and maintaining “scoreboards” for some of our key goals (see above). Michael’s initiative and perseverance have contributed greatly to the improvements in our operations.

If you would like to submit a nomination for a future Recognize Your Leaders column, e-mail Becky Stein at bstein@apwa.net.
Managing infrastructure

Steven R. Price, PWLF
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City of Goose Creek, South Carolina
Member, APWA Leadership and Management Knowledge Team

Any public works leader knows that the list of professional responsibilities assigned to them can sometimes seem endless. In my city, our officials like to sum up what we do this way: “If it’s not on fire and can’t be arrested, then it probably belongs to public works.” That statement is a bit tongue-in-cheek, but is humorous more for its truth than its hyperbole. It also speaks volumes about the role of public works in our society.

Typically, management is largely associated with directing people to accomplish a specific goal. But the successful public works leader must be able to manage more than the human workforce. The ability to develop, and ultimately master, competencies that involve controlling physical assets is critically important. Inside the mixed bag of public works functions, we find that managing infrastructure garners the most attention.

Infrastructure is the framework that supports our civilization. There has been a lot of conversation about the state of public infrastructure recently—most of it not encouraging. The intrinsic value of infrastructure only becomes readily apparent when it is no longer available or fails to serve its purpose. The infrastructure management challenge, from a leadership perspective, is to provide the technical, financial, and managerial direction necessary to deliver a high level of service and reliability at the lowest possible cost... always.

Where, how, and what

Years ago, I was involved in a raging debate about how to fund a wastewater system rehabilitation project. During one of the many information meetings designed to explain the work to local leaders and citizens, a prominent member of the community expressed his growing frustration at the complexity and cost associated with bringing the long list of improvements to fruition by stating: “All I really care about is that...when I flush...the dirty stuff goes away.” He did not care where the “dirty stuff” went, or how it got where it needed to go, or what was involved in getting it there. He simply took for granted that such things would be taken care of. Actually, my contrarian friend helped to define the basic scope of infrastructure management. It is where, how, and what. Where is the infrastructure? How is it functioning? What needs to be done to make it work better, longer, more effectively?

As the evaluation of managed infrastructure progresses from the general to the specific, realize that it is not necessary to be a subject matter expert on everything that falls under our purview. Rather, success comes through a working knowledge coupled with the capacity to plan, organize, and direct forces and factors that impact the assets under our control.

A short analysis of several infrastructure categories reveals the need to apply some fundamental tasks in order to effectively manage critical public assets.

- Planning for the short and long term
- Knowing the cost to operate, the cost to maintain, and the cost to replace
- Establishing level-of-service targets
- Protecting the public health
- Defining the roles and responsibilities of personnel that control and operate infrastructure
- Minimizing loss and inefficiencies
- Communicating effectively with upper-level management, elected officials, regulators, and the public

Potable Water Distribution

Providing safe and plentiful drinking water to our communities is one of the greatest responsibilities of a public works leader. A well-managed water distribution system not only enhances the quality of life, but also provides safety and economic benefit through adequate fire suppression and access to reliable supply.

Improperly-managed water distribution infrastructure will almost certainly lead to increased main break frequency and other component failures that can affect...
water quality, directly impact public health, limit fire flows, and disrupt service to businesses and residential customers. Also, the risk of significant damage to other buried infrastructure as a result of catastrophic water distribution system malfunction increases dramatically without proper stewardship.

Planning and management of water distribution infrastructure by the public works leader include: developing an accurate distribution system map and system component inventory; crafting a schedule of routine, preventive, and operational maintenance; analyzing the hydraulic capacity and capability of the system; establishing standards for repair and replacement of pipe and other system components; and formulating a strategy for identifying, prioritizing, and implementing system rehabilitation methods.

**Wastewater Collection and Disposal**
When properly designed, operated, and maintained, a wastewater collection and disposal system functions to protect the public health and provide water pollution control. The effective collection, treatment, and disposal of wastewater through well-managed public infrastructure contribute directly to the quality of water in streams, rivers, lakes, and watersheds.

Aging collection system infrastructure can allow rain and snow melt to enter sanitary sewer systems, and during significant wet weather events it is possible for influent flows to exceed the capacity of treatment plants. Controlling these flows so as to ensure the continued operation of the treatment process and to prevent backups and overflows of raw wastewater in basements or on city streets is a key infrastructure management responsibility.

Effectively managing wastewater collection and disposal assets requires the public works leader to secure resources and initiate functions to perform infrastructure inventories, develop system maintenance planning, ensure safety and training for efficient operation, manage overflows, conduct routine inspection and repair, evaluate source flow, assess the structural condition and hydraulic capacity of the system, and develop standards for design and repair.

**Stormwater and Flood Management**
For many years, stormwater and flood management was often seen as a low priority in comparison to other public works functions. The result was that, in many cases, stormwater and flood management was one more additional duty susceptible to poor planning and inadequate financing. Federal regulations addressing both stormwater discharges from Municipal Separate Stormwater Sewer Systems (MS4s) and flood hazards have changed the perspective. Still, challenges persist for public works leaders.

Typically, there is limited knowledge regarding the location and condition of existing stormwater infrastructure. Defective portions of the system tend to remain that way for long periods of time and may not be detected until a complete failure occurs, usually exacerbated by a significant wet weather event. Additionally, many flooding problems derive from poor design, lack of maintenance, upstream development that overwhelms the conveyance system, and the deterioration of natural and man-made drainage-ways.

A public works leader must go beyond simply overcoming the basic “drainage problem” issue and develop a stormwater and
flood management program that utilizes organizational, financial, technical, and legal components. Long-range infrastructure planning is critical to stormwater and flood management, and allows an agency to define what it wants to accomplish through its program. The main element of long-range planning is accomplished through a master plan. This comprehensive approach allows a public works leader to address specific issues such as mitigating known flooding problems and acute stormwater management issues, while identifying opportunities to provide environmental enhancements and improve flood control capabilities.

Streets, Sidewalks, and Structures
The task of maintaining safe and efficient street systems has never been more difficult. Everyone depends on surface transportation infrastructure for travel and commerce, yet funding constraints grow as repairs and improvements shrink.

Transportation infrastructure management comes with a sizeable planning component. The public works leader will need to build competency in evaluating the mobility of citizens to employment, shopping, education, health care, and other public facilities. There is strong demand for increasing the convenience and safety of necessary travel while avoiding the detrimental impacts of transportation facilities on communities and neighborhoods.

Sidewalks and other types of pedestrian facilities are a key component of infrastructure included in the public works sphere of responsibility. The integration of pedestrian and bicycle facilities along roads, streets, and rights-of-way are no longer the exception. Walking and bicycles are important transportation modes, particularly in residential neighborhoods, and high-density areas such as central business districts and the campuses of academic institutions.

If it were easy, everyone would do it
Being a competent public works leader is immensely demanding, but enormously rewarding. There are few professions with such a broad range of responsibilities directly impacting communities. Good results come from good leadership built on the foundation of strong core competencies. Our job is to be the very best at managing the very complicated. That is, quite simply, what we do.

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References
Sustainability and opportunity: growth in Latin America

Tyler Palmer
Division Manager
City of Moscow, Idaho

The world is getting smaller or perhaps just better connected. Nowhere is this more apparent than with our environment. The climate, air and water know no borders. These are global resources that require worldwide cooperation. As part of this effort the Latin American Task Force continued our cooperative relationship with ICLEI-Mexico by attending the National Sustainability in Public Works Conference held in Hermosillo, Sonora, Mexico, April 9-12.

Our delegation included Tyler Palmer, Chairman of the Latin American Task Force, and Thomas Fisher and Francisco Leyva from the City of Tucson. Mayor Nancy Chaney and Councilman Tom Lamar from the City of Moscow, Idaho, also attended as guests of ICLEI-Mexico.

Mayor Chaney gave welcoming remarks and also presented a session on sustainability initiatives. “We hope that our experiences can help others in their efforts, as we learn from them. This conference was a great opportunity to interact with our counterparts from ICLEI-Mexico on environmental issues that affect us all,” said Chaney. Lamar spoke about bicycle facilities and how to encourage ridership. “It was exciting to have my remarks well received by leaders within Mexico,” Lamar stated. “I understand that some people will move my comments into action to help develop bicycle infrastructure there. I was very impressed by the work in Mexico to improve lighting systems, and am bringing back those lessons to Moscow.” Leyva gave a presentation on signal coordination and Fisher gave a presentation about Tucson’s new Downtown Links transit project. Palmer introduced the attendees to the City of Moscow EcoDriver program. “My experiences representing the American Public Works Association in Mexico have been very gratifying,” Palmer said. “It is great to share ideas with people from different parts of the world, and learn new ways to approach challenges.”

With many of the world’s fastest growing economies located in Latin America, the demand for modern infrastructure is growing at a fast pace. APWA has an opportunity to position itself as a resource and authority for the hemisphere. Many of our conferences, documents, and resources are of great interest to these developing countries.

There will be a great opportunity to hear more about collaboration and business with our Southerly neighbors at Congress in Chicago this August! We will be honored to have Mr. Edgar Villaseñor Franco, Executive Director for ICLEI in Mexico, Central America and the Caribbean, present a session entitled “Building Sustainable Business with Mexican Local Governments.” The session will be held at 8:30 a.m. on August 25. Attendees will learn how Mexico is dealing with rapid growth and sustainability. It will also be a good chance for sponsors who are interested in expanding their business into Mexico to learn more about the process.

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Managing for public works performance

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With last year’s Fourth of July weekend approached and the looming expiration of the latest of a string of short-term resolutions threatened to shut down highway construction projects across the nation, the notoriously fractious U.S. Congress managed to pass a transportation reauthorization bill. The legislation, Moving Ahead for Progress in the 21st Century (MAP-21, Public Law 112-141), quickly signed into law by President Obama, ended years of month-to-month uncertainty that had faced transportation agencies since the previous six-year law had expired in 2005. While MAP-21 is written to last only two years, the legislators congratulated themselves; the Washington Post newspaper quoted Sen. Barbara Boxer (D-Calif.), chairwoman of the Environment and Public Works Committee, “This is a bill that everyone can be proud of—whether they’re Republican or Democrat.”

The lawmakers emphasized how the bill’s spending provisions would help save millions of jobs. Federal and state transportation agency officials noted that the law calls for a significant restructuring of highway and transit programs. But what makes MAP-21 truly transformative and important for all public works leaders is its emphasis on performance measurement. Section 1203 of the act asserts that “Performance management will transform the Federal-aid highway program and provide a means to the most efficient investment of federal transportation funds by refocusing on national transportation goals, increasing the accountability and transparency of the Federal-aid highway program, and improving project decision making through performance based planning and programming.”

While the U.S. Department of Transportation has for some years issued its biennial Conditions and Performance report to Congress on physical and operating characteristics of the highways, bridges, and transit, MAP-21 is transformative in making an explicit link between performance and national goals. Similarly, public works officials have had to meet drinking water and wastewater treatment standards that were federally-established to pursue environmental goals, but the linkage between the standards and what most of us understand as “performance” is tenuous at best.

And while MAP-21 applies only to federal surface transportation programs, the underlying idea that we should be managing for performance is likely to have broad appeal to public works customers and their elected representatives. The Government Finance Officers Association, for example, has for several years been promoting adoption of performance measurement as a way to enhance accountability and improve management practices.

Public works performance?

We generally define performance as the execution of a task or fulfillment of a promise or claim. We say that musicians give a good performance when they play well, entertaining their audiences and perhaps giving listeners insights on the meaning and emotion behind the music. Workers have annual performance reviews intended to be an assessment of how well they and their immediate supervisors think they are doing their jobs.

For public works infrastructure, performance has something to do with moving people and goods, supplying water, removing wastes, and keeping us comfortable; providing these services reliably; and recovering quickly if there is a problem. However, just as we might disagree about whether a singer has given a good performance, public works stakeholders—individual users, companies that depend on the services, government agencies and their staff that build or operate facilities and equipment, people who live near the facilities, and others—may have their own ideas about both what is the task or promise the infrastructure should fulfill and how well the job is being done. These stakeholders are a diverse bunch and their ideas change from time to time, sometimes pretty quickly. Trying to understanding what might be meant by “good performance” for public works gets complicated.
For highways, MAP-21 states seven goals as the basis for defining performance: (1) safety, reducing traffic fatalities and serious injuries; (2) infrastructure condition, keeping the infrastructure asset system in a state of good repair; (3) congestion reduction; (4) system reliability, improving the system’s operating efficiency; (5) freight movement and economic vitality; improving the national freight network to support trade and economic development; (6) environmental sustainability, enhancing transportation while protecting the natural environment; and (7) reducing project delivery delays, to control costs and promote jobs. The law also makes keeping transit system assets in a “state of good repair” a goal as well, but transit-system stakeholders presumably care about equipment and track condition because it affects how reliably and safely the buses and subways make their runs.

The law tasks the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) with identifying—by April 2014—specific performance measures to be used to administer funding programs and with setting targets to be used to judge acceptable performance. The federal rule-making process is a drawn-out affair that gives interested members of the public a chance to comment on and possibly influence what the measures and targets will be. Both agencies have been actively soliciting ideas from the professional community and interest groups such as APWA, American Association of State Highway and Transportation Officials (AASHTO), and American Public Transportation Association (APTA).

**Meaning what you measure**

The idea of managing public works to achieve good performance is not entirely new, of course, and some agencies already claim to be doing it. Close examination can yield some confusing evidence, however.

One city agency, for example, indicates on their public website that they have adopted reducing their annual number of construction change orders as a performance measure. The website shows a bar chart of the total number of change orders for each of the past eight years, generally declining.

This is good, right? It is not too difficult to understand the likely correlation between issuing change orders and increases in construction costs, and certainly keeping construction costs under control is a worthy goal. But change orders can be reduced by avoiding complicated projects, or by remaining rigid about the plans and specifications even when there is new information or the project requirements should change, by simply cutting the amount of construction that gets done. Reducing the numbers of change orders can then lead to reductions in services, dissatisfied customers, or both. The point is, the adopted performance measure is at best ambiguous and arguably not really related to what the community expects of its public works...not so good!

Even when you select a measure that meaningfully represents what stakeholders think of as performance, there can be problems with using the measure. Most road users—drivers, passengers, shippers whose goods can be damaged in transit—agree that a smooth ride is at least part of good performance. There is widespread agreement that the International Roughness Index (IRI) is a reasonable measure, and the FHWA requires that all states collect and report IRI data for their National Highway System roads (for the agency’s Highway Performance Monitoring System). However, research sponsored by the National Cooperative Research Program (NCHRP; full disclosure: I manage part of that program) comparing data from 32 states found that differences in how agencies measure IRI make it difficult or impossible to assess road roughness throughout the national system. Some of the confounding differences the researchers found were measurements made in one direction only, or on only one lane of a multi-lane highway, variations in equipment design and travel speed, and variations in the length of road segment used to collect data. AASHTO and FHWA are working together to try to eliminate such inconsistencies.

**Understanding what we mean**

A major problem has been that we have not agreed on what measures best represent several important aspects of public works “performance.” On some aspects of performance, we hardly know what we mean or how even to begin measurement.

The term “serious injury” probably summons up similar images for most of us. Probably few would disagree that reduction of serious injury is related to improving highway safety. But how we would judge precisely whether a highway crash entails serious injury or measure the seriousness is open to interpretation.

Or consider congestion. Like serious injury, most of us probably have similar thoughts about what the word means. But do we measure it in terms of traffic volume or time lost or both? If morning traffic is moving freely on most of the streets in an area but the exit ramps from the freeway are packed, is congestion worse than at midday when a vehicle...
at almost any intersection in the area is likely to wait through two cycles of the traffic lights?

Like emergency management personnel, the people trying to deal with these problems tend to triage the several dimensions of public works performance. Some dimensions—road roughness, for example, or drinking water clarity—are well understood and there is some consensus about how to make the measurement. These parts of performance are “ready for prime time”; they can be quickly adopted and used by multiple jurisdictions (for example, if required by a law such as MAP-21). There may be some discomfort as agencies that do things differently have to adjust their work procedures, but not a lot of development work is needed.

Other dimensions fall into the categories of “needs some work” or “not real close.” For roads, congestion is most likely to be in the second category, environmental sustainability in the third. There is no question that we still have work to do to make public works performance management fully effective. APWA and other public works organizations are actively engaged in this work.

Good communication as a step toward good management
In any case, the effort that it takes to think through what exactly are the tasks, promises, or claims we expect public works to perform and how we can try to measure and judge the performance helps the various stakeholders to communicate more effectively about expectations and priorities. Improving communication, in turn, is a step toward better management.

In particular, if you want satisfied customers, there is no substitute for keeping in touch with what the customers want and expect. Sometimes the customer needs to be educated about the choices and tradeoffs that a public works manager faces, other times the manager just needs to listen carefully to his or her constituency. Having in hand clearly stated goals, performance measures, and reliable reporting of past performance supports both kinds of activity. Involve stakeholders in developing the goals, measures, and how performance is reported goes a long way toward ensuring that the customers will be satisfied. Even when service quality is not so good—during recovery from a major weather event, for example—well-informed stakeholders are more likely to appreciate that many factors influence service and orderly recovery is one dimension of good performance.

The right thing to do, but hard to do right
Managing public works to deliver the services customers want and expect, even when it is not required by a law like MAP-21, clearly is the right thing to do, but experience shows that doing it right can be challenging...for all the reasons already cited: The stakeholders have to be involved in establishing what exactly the term “performance” means, and details of that meaning are likely to vary from community to community; establishing a set of explicit performance measures and presenting measurements in ways that communicate effectively with stakeholders is the next challenge; finally, managing consistently to achieve high performance can require fortitude in the face of current demands.

While experience illustrates the challenges, it also shows there are ways to meet the challenges. In working openly with stakeholders to set up performance measures, targets, and measurement procedures, responsible public works managers should focus on the outcomes to be achieved—performance reports—rather than the process of developing those reports. Put the emphasis on long-term improvement and the contribution that good public works performance makes to the community’s well-being, not quarter-to-quarter or even year-to-year comparisons. And do not expect there to be a clear linkage of performance and budgets; arguments that spending more will lead to improved performance are seldom convincing, while deteriorating performance can be evidence of insufficient resources.

Public works are assets that embody an investment made to pursue the community’s broad interests, now and into the future. By explicitly measuring and effectively managing public works performance, public works managers help ensure that these investments yield high returns.

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Safety and the public works profession

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The American Society of Civil Engineers’ 2013 Report Card for America’s infrastructure reports the overall cumulative “GPA” for America’s infrastructure rose to a D+. While this reflects a rise since the last report card’s D, D+ still suggests there are many problems and unmet infrastructure needs to overcome before we get some decent marks for the country.

It will take a “team” to improve our infrastructure GPA. That team will include politicians, accountants, planners, environmentalists, builders, and everyday citizens who will pay the bill for the work. But often leading the work for communities around our nation will be members of the public works profession, folks with formal training and practical working experience in civil engineering. So it is fitting that we pay attention to the report card results.

Looking at the details of the report card, it should strike us that our work to improve these grades entails much more than “building big projects” or “spending large amounts of money for the sake of spending.” In particular, our work often goes to providing the framework within which economic development can take place. More important, though, is that we intend our projects to make people safe and the environment healthier. We provide basic life-safety and health protection for the over 315 million people of our country.

Safety has been something public works officials have taken seriously for a long time. Worker safety is a basic part of our work programs. But there is also another aspect of safety that, while we consider it an important consideration of every project, other members of our communities or society in general do not appreciate our involvement. That is in our health and life-safety efforts.

Every day the civil engineers of public works take a quiet backseat to the safety work of our associates in police and fire departments. Yet on a continuing basis, what we do often affects the health and safety of more members of our community more often than our partner safety specialists. A look at the categories detailed in ASCE’s Report Card clearly explains this idea. The categories reference just a few of the safety and health-related considerations we take as a profession yet point to a much greater number that we consider overall (see sidebar).

We often must “sell” our projects to elected officials and voters using various arguments—most often boiling down to some cost-benefit or rate-of-return factor. However, our economics-based arguments miss the point, that we intend much of what we build to make life possible in our modern civilization. Also, we make life possible, not in a literal sense, but a real sense. We do this by building works that are safe and reliable, and prevent death and injury in a proactive way.

An axiom credited to Benjamin Franklin goes “an ounce of prevention is worth a pound of cure.” We often hear it used when we talk about health. Yet, if we think about it, the part the civil engineers of public works play in infrastructure is considering two issues. First, we find out what that ounce of prevention is that can best protect humans and their health first, and then consider other living beings and our environment as well.

Engineers in the public works field have a wide range of interests and skills. A day of work can move from rules on air or water quality, to devising routes for solid waste collection, to whether we need “No Parking” signs along a neighborhood street, and many other topics between. But in each case, we decide whether our actions or decisions will save lives and prevent injury to the people who live in, visit, or travel through the communities we work for. For example:

- When we talk highway safety, we mean we design streets and roads to handle high numbers of speeding traffic so crashes do not take place. During the 99 percent of the time when police are not around to enforce traffic laws the roads and streets still run safely because we have designed them to be safe. Our signs and traffic signals are along roads 24 hours a day, 365 days a year to remind drivers to be...
safe and help guide them from place to place.

- We design sanitary sewers and wastewater treatment plants with a primary role to safely transport disease and chemical-laden water away from people and dispose of it. By doing so drinking water sources are not contaminated nor people infected. In the United States especially, the lack of outbreaks and deaths from diseases such as Cholera, Diarrhea, Dysentery, Typhoid Fever, E. coli, and Hepatitis A have a great deal to do with the effective handling of wastewater and the systems that public works engineers develop and manage. Our facilities are proactive actions taken to prevent bad from happening, as opposed to actions we take in reaction to an outbreak of disease.

- Safe and adequate amounts of drinking water are a basic, fundamental need of human life. Finding enough sources of drinking water, treating it, and then transporting it to taps in every home, building and factory make it possible for life and our economy to go on. Also, providing enough water means it is available for firefighters to use to fight fires and do their important work. But again, having suitable, high-grade facilities in place means we have less need to respond to emergencies.

- Dams and levees help us to manage our water resources. Together they provide protection against flooding that still costs many lives
each year around the world. Dams also play a part in our water supply systems by providing reservoirs that we can draw from during periods of drought. That we can often develop facilities that solve several potential problems means in the long run we save money and resources that we can then use for other important works.

- In our country, buildings and bridges are safe and reliable to occupy and use because public works engineers make sure they are structurally sound and designed to handle wind, snow, and earthquake loads. Modern societies are dependent on the structures we design, build, inspect and take care of.

We don’t celebrate the fact loud enough, or often enough, that public works embodies the essence of engineering. That is, we are the folks who put theory to work every day serving our customers by developing practical solutions to problems that make their lives better.

There are all types of engineers in public works—graduate, registered, and people who have worked their way through the ranks solving big and little problems every day. But regardless of their background, every day public works engineers work to make people’s lives better, more productive, and above all safer and healthier to live. We need to make sure the world understands that simple fact. More than everything we need to stress that improving our infrastructure Report Card will mean a healthier, safer country.

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Categories in ASCE’s Report Card

**Aviation** – Noise levels for hearing protection, runway design and maintenance to minimize take-off and landing incidents.

**Bridges** – Structural integrity to prevent catastrophic failure, and locating to minimize impacts on waterways and water quality that degrade drinking water quality, and prevent backwater flooding.

**Dams** – Protecting from structural failure, providing reliable water source for drinking and growing food, and managing flow to prevent flooding.

**Drinking Water** – Providing safe drinking water.

**Energy** – Minimize negative impacts on air, water, and other ecosystems to prevent health impacts.

**Hazardous Waste** – Safe disposal of debris and chemicals dangerous to human health and the environment, and cleanup of old contaminated sites to protect drinking water and the environment.

**Inland Waterways** – Minimize and prevent erosion that harms fisheries and marine life, and protects shores against flooding.

**Levees** – Design and construction to prevent flooding.

**Ports** – Design ports to withstand damage from a wide range of man-made and natural forces and interconnect efficiently with rail, highway, and air facilities.

**Public Parks and Recreation** – Design and construct safe, attractive facilities that allow everyone to enjoy the natural areas of our country, and to exercise and relax in safe surroundings.

**Rail** – Develop and operate safe rail transit systems that can move large numbers of people safely, and over long distances, and large amounts of goods efficiently, thus conserving resources and reducing the need to build wider highways.

**Roads** – Design, construction and maintenance of safe roads; installation of traffic signs, pavement markings and traffic signals for safe roads.

**Schools** – Structural design to make buildings safe from collapse and withstand a wide range of man-made and natural forces while protecting occupants.

**Solid Waste** – Safe disposal of waste generated by homes and businesses to prevent spread of disease and vectors, and to prevent contamination of drinking water supplies.

**Transit** – Develop and operate safe mass transit systems that can move large numbers of people safely, thus conserving resources and reducing the need to build wider highways.

**Wastewater** – Designing and operating systems that handle waste flows to prevent contamination of drinking water supplies and the environment in general, minimizing the contacts between dangerous chemicals and pathogens and humans.
Safety benefits associated with adaptive traffic signal control

Jim Clark, P.E., Southeast Territory Engineering Manager, Rhythm Engineering, Lenexa, Kansas; Dennis Randolph, P.E., PTP, PTOE, PWLF, Director of Public Works, City of Grandview, Missouri, and member, APWA Engineering and Technology Committee

The World Health Organization (WHO) calls traffic injuries a “global public health problem” accounting for a staggering 1.27 million lives lost each year. WHO also reports that in 2006, one of the worst years for traffic crashes in the United States in recent history, there were 42,642 road traffic deaths and a further 3,305,237 nonfatal road traffic injuries documented.

To narrow the scope of this problem further, according to the Federal Highway Administration (FHWA), of the 33,808 reported deaths on U.S. roadways in 2009, 7,043, or about 21 percent, were intersection related. The FHWA reports about 700 people are killed in red-light running crashes—the most common type of crash in urban areas—and an estimated 165,000 are injured annually. It follows that improving intersections should be a priority in reducing the human and economic costs of traffic crashes.

Traffic Signal Timing
Traffic signal timing measures stand to increase road safety by improving the conditions that lead to collisions at or near signalized intersections. Engineers refer to traditional signal timing optimization tools as “off-line” optimization. Traffic engineers have used these tools for many years to coordinate signals—a measure agreed by multiple Department of Transportation agencies to reduce stops and delays—and in turn reduce intersection conflicts to travelers.

However, for traffic engineers to develop ideal timing plans off-line there must be an ongoing commitment to update the plans. This commitment includes efforts to collect data every few years to keep pace with changing traffic demands.

On the other hand, adaptive traffic control system (ATCS) functionality is different from off-line optimization methods. For instance, the ATCS used in the studies described below, InSync, constantly gathers traffic data then analyzes, optimizes and adapts signal timings in real time, that is, every second, to changing traffic demands.

With traditional optimization techniques, traffic engineers develop predetermined system timing plans stored in controllers. The controllers then download plans based on time of day or responsive control thresholds. In contrast, ATCSs can continuously measure traffic flow using sensors and analyze the flow data using artificial intelligence technology. InSync, for example, performs this analysis to develop a local optimization solution. Then it combines its local optimization algorithm with a global coordination plan to efficiently serve traffic demand along signalized roadways.

Safety Impact of ATCSs
ATCSs produce safety benefits by reducing the conditions that lead to crashes. ATCSs also minimize opportunities for conflicts by decreasing the number of stops, queues and delay. They do this through optimizing service at individual intersections and creating progression where possible. According to the National Cooperative Highway Research Program (NCHRP) Synthesis 403, ATCS solutions reduce the likelihood of crashes at intersections “through decreases of some efficiency-related performance measures, which highly correlate with some safety metrics (for example, a decrease in the number of stops reduces the chance of rear-end crashes).”

Theoretically, ATCSs often coordinate signals better than traditional off-line solutions because they adapt in real time to changing traffic demands. The FHWA recognizes that signal coordination reduces traffic crashes and that reducing stops not only removes opportunities to run red lights, but also reduces the desire to “beat” a red light. To the extent ATCSs can contribute to reducing stops, queues and delays by improving local signal operation and signal coordination, they should also improve safety, assuming all other factors remain consistent.

The unique characteristics of modern ATCSs such as the system reported on here are the ability to decrease stops, queues and delay as well as significantly improving safety while:

- Optimizing traffic control based on delay of individual movements as prescribed in the Highway Capacity Manual (HCM)
• Not using a traditional cycle length, thereby giving it greater flexibility to adjust to changes in demand and better coordinate signals to create progression in both directions (and, since InSync is not constrained by cycle, there is no signal transitioning)

• Not only gathering data in real time but also optimizing in real time, adjusting green time, phasing and sequencing as often as each second

Because these characteristics are proven effective at reducing stops, queues and delays, the critical factors leading to crashes, it follows that their decline is the reason this ATCS improves safety.

Evidence from five recent ATCS implementations in Columbia County, Georgia; Topeka, Kansas; Lee’s Summit, Missouri (two sites); and Springdale, Arkansas verifies the safety benefits of ATCS deployments. Early data on the ATCS deployments at these five sites reflect the key benefit of confirmed stop frequency, delay and travel time reductions: a resulting decline in intersection-related traffic crashes.

The five corridors (see Table 1) each had the ATCS implemented between 2009 and 2011. The total number of intersections for all five systems was 40, and the total length of corridors was 8.5 miles. To determine the safety effectiveness of the implementations, before-and-after crash data were collected. Each of the corridors had a different amount of before-and-after data collected, with a total of 78.3 signal-years of before period and 41.0 signal-years of after period data collected.

Each of the corridors had decreases in crashes (on an annualized basis), with percentage changes (after compared to before) ranging from -15 percent to -30 percent, with an aggregate change of -22 percent. Annual crash-related cost savings were also computed for each corridor and they ranged from about $360,000 to over $1.2 million, with a

<table>
<thead>
<tr>
<th>Corridor and Agency</th>
<th>Scope of Corridor</th>
<th>Before Period</th>
<th>After Period</th>
<th>Change In Crashes</th>
<th>Signal Years Exposure</th>
<th>Annual Crash-Related Cost Saving</th>
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</thead>
<tbody>
<tr>
<td>Washington Road Columbia County, GA</td>
<td>5 Intersections</td>
<td>1 Length (miles)</td>
<td>1.0 Years</td>
<td>162 Ave. Annual Crashes</td>
<td>1.0 Years</td>
<td>120 Ave. Annual Crashes</td>
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<tr>
<td>21st Street City of Topeka, KS</td>
<td>7 Intersections</td>
<td>1 Length (miles)</td>
<td>2.0 Years</td>
<td>142 Ave. Annual Crashes</td>
<td>2.0 Years</td>
<td>108 Ave. Annual Crashes</td>
</tr>
<tr>
<td>Missouri Highway 291, Lee’s Summit (Missouri DOT)</td>
<td>12 Intersections</td>
<td>2.5 Length (miles)</td>
<td>3.0 Years</td>
<td>262 Ave. Annual Crashes</td>
<td>1.0 Years</td>
<td>217 Ave. Annual Crashes</td>
</tr>
<tr>
<td>Chipman Road City of Lee’s Summit, MO</td>
<td>8 Intersections</td>
<td>1 Length (miles)</td>
<td>2.0 Years</td>
<td>89 Ave. Annual Crashes</td>
<td>0.6 Years</td>
<td>76 Ave. Annual Crashes</td>
</tr>
<tr>
<td>Thompson Road/ Hwy 71, City of Springdale, AR</td>
<td>8 Intersections</td>
<td>3 Length (miles)</td>
<td>0.9 Years</td>
<td>63 Ave. Annual Crashes</td>
<td>0.9 Years</td>
<td>44 Ave. Annual Crashes</td>
</tr>
<tr>
<td>Total</td>
<td>40 Intersections</td>
<td>8.5 Length (miles)</td>
<td>8.9 Years</td>
<td>718 Ave. Annual Crashes</td>
<td>5.5 Years</td>
<td>565 Ave. Annual Crashes</td>
</tr>
</tbody>
</table>

Table 1
combined total of over $4.3 million of savings a year.

These five implementations support the effectiveness of ATCSs in improving road safety. They show that real-time signal coordination and dynamic signal optimization based on delay of individual movements result in significant improvement even on arterials previously running coordinated timing plans.

**References:** Contact the authors for a complete version of the study with a full reference list documenting recent safety research from the FHWA, AASHTO and more.

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The Springdale Police Department reported the InSync ATCS reduced crashes on the corridor by 30% based on crash data for the 12 months before and 12 months after ATCS installation.

A before-and-after study revealed significant reductions in stops, travel time and delay on Washington Road, a Columbia County, Georgia, corridor with an average daily traffic (ADT) of 40,000. The County's traffic engineer, Glen Bollinger, provided the crash data for the year before and after deployment of adaptive traffic technology. In 2009, before deployment, the Washington Road study corridor experienced 162 total crashes with 114 of those occurring at intersections (as opposed to mid-block). In 2010, after deployment of InSync, the study corridor experienced 120 crashes of which 79 occurred at intersections. These figures represent a 26% reduction in total crashes.
The field of public works exists in an arena where politics, personalities, engineering, and even common sense sometimes collide. Recognizing that public works projects depend on public and political support is critical to capturing the essential public tax dollars to fund public projects and maintenance. However, engineers act surprised and even upset when politics plays a part in what engineers consider engineering decisions. Ironically, controversial issues cause engineers to become reluctant to engage in politics when engineers are ideally suited for the political realm.

Consider that engineers are comfortable dealing with rules and codes and working within given constraints. Almost intuitively, engineers seek the “best alternative.” Most critically, perhaps, engineers understand working within a budget. What better criteria could there be for a politician?

Why is politics important?
Resources, financial or otherwise, are the lifeblood of civilization; without adequate resources, neither infrastructure nor simple maintenance can be planned or implemented. In the “Obligation of the Engineer,” of the Order of the Engineer, members swear “to serve humanity by making the best use of Earth’s precious wealth.” Engineers too often remain reluctant to fight for the resources necessary to meet this sworn obligation, in the political system controlling those resources on the largest scale.

The evidence is clear that existing public works infrastructure and systems are in a state of disrepair and are continuing to decline. It is estimated that 32 percent of the nation’s major roads are in poor or mediocre condition and 24 percent of our bridges are structurally deficient or functionally obsolete. Whatever the cause of this current state of disrepair its toll in lives and property is certain. Implementing modern engineering technology and design certainly could reduce the National Safety Council’s estimated 32,400 traffic-related deaths in 2012. Whether your concern is lives, efficiency, or economy, it is clear something must be done.

Politics and the art of apparent compromise
Grassroots efforts or direct political interaction are essentially the two methods to effect political change. Directly approaching the public can be perceived as an “end run” around elected officials, often ending in catastrophe. Directly approaching politicians can even be more difficult (and professionally catastrophic) because of the significant number of interests a politician must carefully balance. Unfortunately, even when both politicians and their constituents agree, they are generally not trained professionals, thus often forcing engineers into a design limited by financial, political, ethical, and even moral constraints.

Again, engineers, who are comfortable working within constraints, can serve as problem solvers by merely recognizing that “political opposition” is not a barrier, but merely a limitation around which the project must be designed. Constraints can be changed sometimes, and barriers, whether financial or physical, can often be moved. This same principle applies to the political realm; engineers must work with politicians, concerned citizens, contractors, developers, and stakeholders. The goal must be building not only consensus, but gaining the essential “buy-in” to a project or funding—all without compromising the essential ethics of the profession.

However, the lesson is simple: if engineers are not proactive when working within the political realm, the profession must remain reactive and must yield to financial and sometimes even unreasonable political pressures. Proactively investing efforts in stakeholder education and persuasion can prevent the diversion of precious resources that we could direct instead to other more critical issues. In short, engineers must lead, follow, or get out of the way.

Fact finding from advocates
Once we admit that even engineers must act within workings of the political system, the nagging question remains: “What do I do when perhaps [fill in the blank here: “vocal citizens,” “influential contractors,” or “elected officials”] tell me I need to implement what I know is a bad engineering system?” Perhaps more
bluntly, “How do I avoid letting someone tell me how to design or build something that he or she simply does not have the professional training or experience to do?” The answer is more complicated than it may appear at first blush.

We have all heard the supreme complaint, “I have a problem! If you do not do something about people [again, fill in the blank here with: “speeding” or “people failing to yield”] on my street, someone is going to be killed and it will be your fault!” This is usually followed by a demand for various traffic control measures, often backed up with petitions from residents. And, because these advocates have built sheds or gazebos in their backyards, they have become experts on constructing multimillion-dollar projects (just as people with a driver’s license believe they are traffic engineering experts).

While it is easy to be either flippant or dig in one’s heels, there may be useful information to be gleaned from even the most belligerent of complainants. Listen carefully and remember that each person brings a different (and perhaps even beneficial) perspective to the table. However, as professionals, we must not succumb to such pressures as the basis for a professional decision and must help elected officials avoid the same inappropriate reaction. This is important if we are to protect ourselves and our organizations from charges of negligence.

Avoiding negligence
Generally, a person has acted negligently if they have departed from the conduct expected of a “reasonably prudent person acting under similar circumstances.” This is a “civil wrong,” called by attorneys a “tort” (not to be confused with the multi-layered “torte” which we enjoy at holidays!). However, because engineers have special training, skills, and experience, the bar is raised to conduct expected of “a reasonably prudent engineer.” Simply working for a governmental agency does not provide a magic immunity from negligence. Generally, governmental immunity is limited to “acts and omissions constituting the exercise of a legislative or judicial function, or constituting the exercise of an administrative function involving the making of a basic policy decision.”

Often, as one works his or her way up the ladder of the public works profession, one’s primary motivation may be to acquire decision making authority (read: power), better compensation (read: money), or sometimes even greater responsibility (read: fame). However, achieving these desires exposes the engineer to the potential for culpability (read: fault). Culpability is the specific level at which our failure has affected the public.

Culpability can be categorized into three levels of negligence. Ordinary negligence is a person’s failure to be careful under particular circumstances or failure to follow rules and standards. People who lack formal training—or those distracted by too busy a workload—can commit negligent acts or negligent omissions because they do not know that the “rules” do not account for the probable consequences of their decisions or they simply cannot complete all assigned tasks with due diligence, regardless of skill or ability.

Gross negligence, on the other hand, is carelessness with knowing disregard of the potentially resulting harm. Unlike instances of ordinary negligence, people who commit gross negligence often know the rules but place other considerations ahead of safety or the public good. For example, our current obsession with minimizing costs can lead to taking shortcuts and doing work in a way that is cheaper but often lacking critical safety features.

A level of culpability even more severe than gross negligence is the “intentional tort,” where a person’s voluntary act violates a right or causes injury to another, or when the actor knows (or should have known) that a violation or injury could occur. Intentional torts can occur when the actor sacrifices an individual’s rights or property wrongfully, sometimes even for the “public good.” Intentional torts include trespass, defamation, invasion of privacy, fraud, and conversion (a broad description of all types of theft)—all of which can occur while making decisions involving the design, construction, maintenance, and operation of public works.

Although engineers certainly strive to avoid an intentional tort, it is sometimes difficult to determine what the appropriate “standard of care” is to avoid negligence. A Bench Approved Jury Instruction (BAJI) states (paraphrasing), “In performing professional services for a client, an engineer has the duty to have that degree of learning and skill ordinarily possessed by reputable engineers practicing in the same or similar locality and under similar circumstances. It is the engineer’s further duty to use the care and skill ordinarily used in like cases by reputable members of the engineering profession practicing in the same or similar locality under similar circumstances, and to use reasonable diligence and engineer’s best
This verbatim instruction would be given to jurors serving in a court case asserting professional negligence. Note that it does not contain a single word about “politically popular” or “easier”—and the courts will certainly never use the phrase “least expensive” when examining the standard of care.

**In the end…consistency**
Reasonable and competent engineers follow standards, rules, codes, and laws. They develop policies and procedures. If there is no written policy, they take the time to develop it and get it approved. If the engineer, in his or her best judgment and for the safety of the public, violates a policy, the engineer documents it and justifies it. If policy is violated often, the engineer seeks to change the policy.

In the engineering profession, it is second nature to follow rules, codes, policies, and procedures—just like a politician. It is time to don the politician’s hat and not only be aware of how the political system works, but become major players in the political process.

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Robotic-based asset management systems for sanitary and storm sewers

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Public works is often slow in adopting modern technology. The day-to-day “firefighting” of public works officials often diverts attention and energy away from evaluating new ways of doing work. However, adoption of technologies that are commonly used in other industries where there is budgetary pressure to “do more with less” can mean tremendous benefits for public works infrastructure. In particular, asset management has been shown to be a particularly effective approach to managing various components of the public infrastructure.

However, asset management systems are data intensive, and collecting data and its processing into useful information can be a long and expensive process. Yet using modern robotic-based systems and “software-as-a-service” can mean an efficient and accurate collection, including use of data for infrastructure such as sanitary and storm sewers. Here we describe a system that can make developing sewer asset management systems a reality for many communities.

Modern asset management
Sanitary and stormwater collection system infrastructure are typically aging and funds for maintaining them are limited. The challenge in managing these assets is to decide the lowest cost, longest useful life plan for collection systems. These decisions are typically made difficult because of a lack of a baseline understanding of the true current state of assets. The failure to truly understand the current state of collection system assets makes it needlessly difficult to answer these common questions that collection system managers must deal with:

- Where are the most pressing problems to address to preserve services?
- What are my long-term concerns that need to be factored into future CIP and O&M budgets?
- What are the most appropriate projects to do at any given time to preserve services?

Ultimately the critical question is, “What is the best way to spend the limited funds available to be the most responsible steward of these abundant and critical wastewater and stormwater assets?”

According to the EPA, sewer system assets that are not sufficiently understood and proactively maintained will typically deteriorate faster than expected and lead to higher replacement costs and emergency repair costs. The EPA stipulates that there are five questions at the core of proper asset management practices:

1. What are my required levels of service?
2. What is the current state of my assets?
3. Which are my critical assets?
4. What are the minimum life-cycle costs?
5. What is the most appropriate long-term funding strategy?

Underground assets
I&I or inflow and infiltration is a big problem for managers of sanitary sewers. Managing infiltration at acceptable levels requires a fact-based maintenance program that transcends anecdotal experience and paper maps. A comprehensive condition assessment program is required for capacity management, prevention of I&I and making sure that treatment plants are not needlessly overloaded.

For decades, when sanitary sewer and storm pipes got cracks or other damage, the only choice was the expensive operation of digging up the damaged pipe and replacing it, usually requiring the street to be repaved afterwards. Many cost-effective methods of remediation and rehabilitation now exist. The key question for fact-based asset management or “Smart Spending” is to determine a fact-based answer to the question, “With the limited funds available, what pipe should be fixed according to what method to extend the useful life of this pipe at the most reasonable cost?” The answer to this question requires information that has been previously either unattainable at the rate needed or unaffordable based on conventional technologies.

Condition assessments
The technology needed to fix a true “baseline understanding” of your collections system and storm system assets within a reasonable time frame
now exists in the form of autonomous robots such as those shown in Figure 1.

The sensors on such robots can collect vast amounts of data that can then be used to evaluate sewer conditions. Figure 2 shows a graphic representation of a sewer developed from the data collected by robot system.

Because of the high speed of data collection and the rapid analysis of the sensor data, use of robotic technologies can take a municipality that might be on a twenty-year assessment cycle and produce that same amount of data in less than a year. Then, armed with this information, those asset managers are best suited to decide the “smart spend.” If it took your doctor twenty years to give you a full body physical to determine your health, would you ever be confident of their recommendations during that period? Constantly making critical decisions without complete information is counterintuitive and a constraint on our industry based on dated technologies.

**Software to process data**

Ultimately all of this is a data management problem and far too many utilities do not have digital records. The “system of record” in many municipalities is the most tenured employee and a paper map. While most municipalities do not have resource-rich IT staffs, software-as-a-service asset management applications help overcome these legacy constraints. A comprehensive underground asset management system for wastewater and stormwater can manage every aspect of the collection system including inspection management, work management and asset management. Moreover, such a system can provide modern, up-to-date mapping and data presentation that allows users easy access to their system’s data (see Figure 3).

Such a centralized system of record is designed to provide condition, capacity, location and history of the collection system assets. When such systems are provided to owners as software-as-a-service, owners are able to prioritize assets and needs and decide how to spend the limited capital dollars the best way possible.

While an open system is critical to optimizing available information, getting the data-gathering services and hosted software from a vendor in a turnkey type fashion cost-effectively give municipalities the information needed and the control over the process with only one vendor to manage.

**Conclusion**

Determining the lowest cost, longest useful life plan for collections system and storm system assets requires data to facilitate a “Smart Spend.” Today’s wastewater managers need to evaluate and consider technologies that are commonplace in other industries, such as autonomous robots and hosted software-as-a-service, to help spend the limited dollars they are tasked to manage in the most appropriate manner. A turnkey program where one vendor gathers the data, digitizes it, and hosts it for a utility and their engineers can truly help overworked municipal managers ensure they are doing the right projects, at the right time, to mitigate the most risk at the lowest cost.

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Marketing is not a four-letter word: public works maintenance managers must learn to communicate

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“Marketing” was once a term primarily associated with the use of advertising and other promotional techniques to increase sales, but its influence is expanding into the public sector. Marketing is still a tool for creating demand for products or services people did not know they wanted. Humanity survived for centuries before soft drinks and social networks; but today both are billion-dollar industries thanks to successful marketing. The same marketing practices, however, can be used to promote the importance of products or services that are fundamental to a functioning society, like healthy infrastructure.

Few public works officials think their jobs include marketing. They are making a mistake. Public works officials at all levels can and must help people understand the value created by investment in public works and infrastructure preservation. That means marketing.

A recently completed research project under the Transportation Research Board’s National Cooperative Highway Research Program (NCHRP) set out to help transportation officials by developing guidance that state departments of transportation and other transportation agencies can use to develop and implement strategies for communicating the role and importance of maintenance and asset preservation in sustaining highway system performance. The research product, NCHRP Report 742, Communicating the Value of Preservation: A Playbook, can be adapted to the full range of public works services and facilities.

Every public works professional fighting to maintain infrastructure faces a never-ending push and pull struggle among needs, politics, and budget constraints. Few, however, have mastered the art of communicating about their work in ways that ensure infrastructure wins. Fortunately, the building blocks for creating messages that stick described in NCHRP’s Playbook are not hard to learn:

Identify audiences

A good place for public works officials to begin building their communication efforts is getting to know the audience for their preservation messages better. Infrastructure professionals need to take time to ask, “What does my audience value, what will make them trust my message, and what do I want them to do?”
Audience identification matters because success for public agencies means satisfying key stakeholders according to their definition of what is valuable. If those stakeholders are not satisfied, something will change, whether budgets, priorities, or staffing.

Getting started with audience identification is easy. Begin by planning a “brainstorm session” on potential audiences with a cross section of internal staff and think about audience characteristics that might affect communication about preservation and maintenance issues. With a basic list of audiences in place, it’s time to discuss how groups on the list can either be segmented in terms of the interests, values, and emotions that drive their support of maintenance and preservation, or grouped together. Potential audience segments might include elected officials, industries that depend on good infrastructure, and advocacy groups.

Use the list of audience segments to map stakeholder segments on an “interest/influence” matrix that characterizes their interest level in preservation along one axis and the strength of their power and influence over preservation issues along the other axis. The completed matrix will provide a visual impression of audience clusters that support, oppose, or are indifferent to preservation issues in four distinct groups, including “promoters,” “defenders,” “latents” and “apathetics.” (See above.)

The interest/influence matrix technique for “mapping” audience segments according to their level of interest in preservation and their ability to influence outcomes helps focus attention on moving audience segments into the top right corner of the matrix and keeping them there. These are the medium or high interest/high influence audience elements and they include:

- Stakeholders who are already supportive, but need buttressing with resources and information; and
- Stakeholders with enough common interests to become part of a support coalition.

Think of this group as the basis from which to develop an ongoing coalition of support for maintenance and preservation.

**Design messages**

Audience identification leads naturally to message design. Engineers and other professionals involved in public works often resist efforts to “craft” messages, preferring more technical conversations. Effective preservation messages should rely on a strong analytic foundation, but to cut through the clutter of a world crammed with messages, they must also be succinct and resonate with their audience on an emotional level.

When crafting messages, don’t be hesitant to tap the immense amounts of technical expertise, data sets, and analysis that public works agencies possess; this expertise is particularly well established in the arena of infrastructure preservation, so take advantage of it. But use the information to create concise and compelling messages that not only deliver powerful facts clearly, but also appeal to the emotions and interests of important audience segments and work in multiple delivery channels:

Messages like this one engage audiences while offering a positive call to action.
• **Use system attributes data in messages** – Facts about the size and scope of infrastructure are often used in preservation messages. Describing the extent of a system can give a sense of its scale and importance. Identifying the age of a system or its elements can convey its historical significance and the sense of urgency required to protect these critical infrastructure investments.

• **Use system condition data in messages** – Measures of asset condition, remaining life, and many other system condition attributes can help communicate how condition relates to customer expectations, how the condition has improved or declined over time, and the scale of preservation task at hand.

• **Use system’s economic value in messages** – Conveying how the infrastructure system provides economic value to communities is becoming increasingly important among public agencies. This information conveys a sense of the importance of system elements and therefore infers the importance of preserving them.

Data by itself, even data that has been translated into a simple and clear message, rarely resonates. The best messages do not rely entirely on the numbers; instead they build on data to tell a story in a way that resonates with audiences personally and emotionally. Facts and logic alone aren’t enough to move key audience segments to action; in fact, three basic principles often characterize messages that stick:

• **Be relevant:** Audiences should relate to the message; they should instinctively agree with the premise and feel the message is directed toward and applies to them.

• **Be engaging:** Messages should draw attention and be interesting to the audience; otherwise they will be ignored and forgotten.

• **Stay positive:** Don’t turn off audiences with a negative message that criticizes or invokes fears; try instead to inspire.

• **Offer a call to action:** The message should inspire the audience to do something or feel a certain way.

**Message delivery**
No matter how clever and memorable a preservation message is, without the right delivery tactics, the message won’t reach the minds of its audience at the right time and motivate them to action. The volume of messages Americans receive each waking hour continues to skyrocket, and sending preservation messages on
autopilot will not likely get much attention. Today, getting heard and remembered requires building a “surround sound” presence for messages that establishes a constant drumbeat across multiple delivery channels ranging from face-to-face conversations, speaking engagements, press articles, and editorial opinions to blog entries, social media conversations, and websites:

• **Direct contact** – Direct audience contact message delivery options are easy to implement, low cost and very much a part of successful preservation message delivery; they range from formal speaking engagements to looser formats like open dialogue sessions or “closed door” meetings. If used on a regular basis, direct audience contact is a powerful delivery tool because no filter comes between you and the audience, messages can be explained in-depth, and feedback on whether messages are working is immediate.

• **Traditional media** – Traditional media strategies range from printed factsheets and brochures to orchestrated media events designed to land stories in newspapers and on radio stations, and television (and cable) stations. The continued power of traditional media as a communications medium necessitates it as a core delivery method for messages. Traditional media—such as newspapers or television channels—confer status on messages because they offer recognizable and credible branding. Furthermore, traditional media often feeds new media—blogging and other new media channels often focus on what is going on in traditional media.

• **New media** – New media channels are a rapidly evolving way for state department of transportation and other transportation agencies to communicate. Commonly defined as Internet-based media, new media has evolved over the last decade from an emphasis on e-mail and modest websites into a much wider portfolio of information channels including blogs, YouTube, podcasts, Twitter, Facebook and other electronic tools. New media tools offer a low-cost alternative to traditional media that also allows DOTs to enter a two-way conversation with their stakeholders that can help strengthen connections. It can be used to convey visual or succinct narrative messages, but it also supports dissemination of more detailed technical information.

Message delivery options come in many shapes and sizes. Use all or many of them to create a “surround sound” campaign that gets messages heard, seen and remembered. This means getting messages out via traditional media, on the Internet and on the ground in face-to-face settings. Some versions of the message will be delivered visually—in pictures, video, charts and graphs; other versions will be in the form of words like a newspaper op-ed or a presentation from agency leaders; some will be a combination of both visuals and words, such as a blog post or a brochure. Catchy slogans delivered via website, in e-mail, or on slides will resonate with high impact/high interest audiences, but they can also get more detailed when delivered via a full presentation at a stakeholder forum or on your website. This is what a surround sound message delivery approach looks like.

For more ideas about communicating preservation needs, pick up a copy of NCHRP Report 742: Communicating the Value of Preservation: A Playbook, which is available at NCHRP’s website (www.trb.org).

For more information, please contact Joe Crossett at (240) 252 5111 or crossett@highstreetconsulting.com.
The Kansas City Streetcar Project: Technology and infrastructure supporting urban revival

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Early in the twentieth century, Kansas City, Missouri, was home to over 300 miles of streetcar track serving a bustling metropolis. Streetcars once dominated the downtown scene, first pulled by horses, then towed by cables, later powered by steam, and finally humming with electricity. The city was built on a backbone of streetcar transportation. Then, after World War II, service slowly declined until 1957, when the last streetcar ran down the Country Club line and into history. Streetcar rails existed only as a memory to those who had ridden them (and also as a subterranean obstacle to anyone trying to excavate streets downtown!).

Until today – over 50 years later
The City is in the midst of resurrecting this long-dormant transportation mode. Funding has been secured, and design is underway. Led by a Public Works Department with a history of successfully overseeing significant and complex projects (such as downtown's Sprint Center Arena), and backed by City leaders and active downtown stakeholders, an initial $100+ million starter line is moving forward.

What sparked this revival? Primarily, a growing body of evidence that streetcars are economic development catalysts, transforming downtowns back into the vibrant, vital economic engines they once were. The experience in cities such as Portland and Seattle has convinced many other U.S. cities to reexamine streetcars. And Kansas City is on the fast-track to implementation.

Downtown reboot
The corridor chosen to reignite Kansas City's streetcar system is Main Street. A north-south route through the heart of downtown, Main Street connects the Central Business District, the new Power and Light Entertainment District, the historic River Market, the refurbished and grand Union Station, the burgeoning and eclectic Crossroads Art District, and the shopping/tourist destinations at Crown Center. Other notable destinations within a short walk of the planned line include the Government District, the Sprint Center Arena (the nation's third busiest), the Kansas City Convention Center, and the newest jewel in the city's crown—the Kauffman Center for the Performing Arts. Historically, Main Street carried streetcar traffic well into the 1950s; thus, this route will restore a vital piece of Kansas City's history.

The Interface of technology and public service
Perfectly suited for a constrained urban environment, the streetcar will generally run in mixed traffic (not in dedicated transit lanes). In fact, the road will be reconfigured to better serve both streetcars and automobiles—by putting Main Street on a “road diet,” converting outside travel lanes to parking lanes and adding turn lanes throughout the route. In addition to these traditional infrastructure improvements, the City will be implementing some technologies that aren’t always part of a public works project.

The streetcar vehicle itself is a complex technological system, requiring a series of technical decisions to ensure that the overall operation can best suit Kansas City’s needs. Most modern systems use double-ended, double-sided vehicles—meaning that the vehicle does not need to turn around in order to reverse directions, and that passenger doors are located on both sides, maximizing operational flexibility. Streetcars typically operate as single-unit cars at frequent headways—in this case, the City plans for each stop to be served by a streetcar every 10 minutes during most periods.

The vehicle and alignment are being designed to optimize travel-time efficiency. In transit parlance, this means minimizing “dwell time,” the amount of time the streetcar is stopped while passengers get on and off. One key to attaining Kansas City’s dwell-time target of 20 seconds will be the use of level boarding, which
allows all passengers (including those with wheelchairs or strollers) to quickly enter and exit. To facilitate level boarding, the City will be increasing curb heights to 14 inches at streetcar stop platforms.

Also, the system is planned to be run fare-free, meaning passenger boarding will not be slowed by fare collection. Even if a fare were to be implemented in the future, ticket vending machines (TVMs), most likely off-vehicle, would be used to keep dwell times short.

The system contains many elements that municipal public works officials are used to considering in transportation design: horizontal curvature, horizontal clearances, grades, and vertical clearances. Other elements are not so typical: platform dimensions relative to vehicle door spacing, in-vehicle climate control, track weather conditions, vehicle interior layout, vehicle width, vehicle length/capacity, and even special equipment needed for items such as wheel trueing.

The streetcar vehicles will be electric (750VDC), with traction power provided via an overhead contact system (OCS) consisting of poles carrying overhead wires. A pantograph atop the streetcar will raise and lower to maintain contact with the OCS. A small number of power substations will be spaced fairly evenly along the alignment to power the OCS. An alternative powering method—on-vehicle rechargeable battery technology—was evaluated, but was considered too untested for Kansas City use.

Even the chosen rail type is something of an emerging technology, at least in the United States. Block rail will be used for the majority of the project. A “webless” rail section used for tramways in Europe, block rail is less than three inches tall and is designed for light-duty installations (streetcar or light rail) that can be continuously supported in a concrete slab or precast panel. Block rail was recently introduced into the U.S. market in response to the Federal Transit Agency’s move to support domestically manufactured rail and trackwork products for federally funded transit projects. Although foreign-made girder rail has traditionally been used in modern streetcar and LRT systems across the country, current market demand does not justify the upfront investment a U.S. mill would incur to purchase the equipment to roll girder rail. In contrast, the simple shape of block rail allows it to be rolled with equipment that mills already typically have on hand, with the only added investment being for milling the rolls to the proper shape.

The streetcar system’s design incorporates several other technological elements, including transit signal operations, a LEED™ Gold vehicle maintenance facility, a “Hawk” pedestrian signal at one location, and automated “next vehicle” signing at stops.

“Becoming Real” and beyond
A transportation solution of this magnitude—requiring a sizable investment in infrastructure, capital, and technology—could not become a reality without dedicated champions in both the public and private realms. In Kansas City’s case, this meant a Mayor and City Council with the vision—but more importantly, the tenacity—to maintain the project’s forward momentum even in the face of funding uncertainty and a sometimes steep public learning curve. These efforts were complemented by tireless grassroots advocacy from engaged downtown residents, many of whom went from door to door, “marketing” the streetcar wherever they could and generating a groundswell of enthusiasm for the project. The result of all these efforts was a voter-approved Transportation Development District that will fund nearly three-quarters of the project cost. The nonprofit Kansas City Streetcar Authority was formed to operate the system, which is expected to open in the spring/summer of 2015.

Once the funding votes had passed, stakeholder interest skyrocketed. Rail transit proposals have come and gone in Kansas City over the decades, but the streetcar is the first to secure funding and “become real.” Downtown business owners have quickly become deeply engaged in the process, asking questions and providing their intimate knowledge of how downtown works—thereby helping the design team to fine-tune the track alignment and station locations.

With the certainty that the streetcar starter line is going to happen, City leaders are widening the vision. Studies are getting underway to examine the potential for eight new lines, including one crossing the Missouri River into North Kansas City. Thus, Kansas City is ready to return to its streetcar roots with an urban rail system that combines the great framework established in the past with today’s cutting-edge technology—to create a vibrant, connected future.

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Block rail can be fairly easily manufactured in the United States.
The role of high-accuracy location for public works emergency management

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High-accuracy location, as part of the public works infrastructure, is increasingly serving as an integrated tool for local, state and federal governments as they seek more efficient ways of protecting citizens and public property against natural and man-made emergencies. The model for using high-accuracy location for public safety and crime prevention is well-documented. Those successes have led to increased consideration for a location solution to augment public works efforts during or after an emergency. However, not all location solutions are equal, and in an era of frozen or declining budgets, government decision-makers must make educated decisions in determining which location solution best meets their needs.

High-accuracy location helps save lives in an emergency
A high-accuracy wireless telecommunications location system, deployed prior to a natural disaster, can be instrumental in helping authorities to alert citizens, locate victims and survivors, and to help save lives. Prior to a disaster, and in coordination with the existing early warning system, the local police or public safety agency can create a virtual geo-fence around the area in danger and identify all mobile devices (with prior permission). This information can be used to warn people (via text message) and also to establish a record for post-disaster search and recovery efforts. People can also be provided directions to the nearest shelter facility, if available.

These efforts are only possible if the location solution is able to locate people (via their mobile devices) with a degree of accuracy that enables timely responses to life-or-death situations. Key to this effort is for authorities to deploy a solution that is able to provide high-accuracy location, of citizens in the impacted areas, while offering unique capabilities such as geo-fencing and mass alert. Location technologies that offer the highest accuracy can be categorized as handset, or device-based, such as GPS, or network-based. And of the network-based, one of the most frequently deployed for public safety is Radio Frequency Pattern Matching (RFPM).

RFPM is the only high-accuracy, software-based, scalable location solution that requires no additional
hardware or software changes or additions to the mobile device or
at the base stations. It compares mobile measurements (e.g., signal
strengths, signal-to-interference ratios, time delays) against a geo-
referenced database of the mobile operator’s radio environment. RFPM
works extremely well in non-line-of-sight conditions such as dense urban
and indoor environments, where GPS-based solutions face severe
challenges. Since it is independent of line-of-sight conditions, RFPM
is highly reliable and is ideal for the mission-critical and safety-of-
life applications that public works authorities face in the event of an
emergency such as a natural disaster.

Bolstering public works efforts
In late October 2012, Category-3 Hurricane Sandy became the largest
Atlantic hurricane on record, and the second-costliest hurricane in
U.S. history, after Hurricane Katrina. Making landfall in the New York
City area, Sandy caused 285 deaths and $75 billion in damages. Coastal
areas in New York and New Jersey were especially hard hit, with
unprecedented pressure placed on the public works infrastructure in
those areas. For example, Sandy did extensive damage to the area’s
electricity infrastructure, including leaving over 800,000 residents in
New York City and Westchester County, N.Y. without power, and
95 percent of Newark, N.J. Most dramatically, an explosion at a Con
Edison electrical substation, located on the East River of Manhattan,
contributed to the mass power outages. Sandy, centered on areas
that depend heavily on mass transportation, was the largest
mass transit disaster in U.S. history, with over 40 percent of commutes
interrupted due to rail cars and tracks damaged in the flooding.

Public works authorities also had to respond to damage to drinking water
infrastructure, emergency centers, and schools. The list goes on and on.

With high-accuracy location in place, authorities would have a
powerful weapon to bolster their cleanup and recovery efforts. Some
of the features of high-accuracy location that could have been used include:

• A unique location feature such as location-enabled
  workforce tracking
  would enable public works administrators to quickly
  locate employees (via their mobile devices, and with
  prior permission) to assist in disaster recovery and cleanup.
  The same process is in place in many jurisdictions to track
  first responders when on duty to more efficiently allocate
  resources—an essential feature in the wake of a region-wide
  emergency, when public works employees may have had their
  own homes impacted and become scattered throughout
  the area with minimal communications.

• High-accuracy wireless
  location could be used in a
  machine-to-machine (M2M)
  application to track and direct
  public works trucks and other
  public safety vehicles. The
  overriding goal is to never have
  a government-owned vehicle
  out of communication with the
  central monitoring station. This
  is vital for the public safety uses of many vehicles, such as
  police cars and ambulances. In a chaotic, post-disaster
  scenario, the more intelligence that can be accessed through
  technology lessens dependence on overworked, stressed public
  authorities and to help ensure a quicker recovery.

• After the hurricane, the Red
  Cross and other organizations
  mobilized over 15,000 trained

*Location solutions enable first responders to more efficiently allocate resources during and after an emergency.*
workers to assist in the impact zones. Many of these were volunteers from other states with little knowledge of the areas in which they found themselves working. High-accuracy wireless location could be used to provide basic location-based services such as navigation to the closest points of interests such as hospitals, food banks, and shelters so that they could more efficiently use their time to assist survivors.

- With more sophisticated location solutions, enhanced features may be available to improve disaster response. Let’s say that, after the hurricane, a location snapshot found multiple devices converging in the vicinity of an unknown shelter location. Using a feature called reverse geo-coding, authorities could zoom in on a map and hover over the location to note that the address is 123 Main Street. A simple database search reveals that this is the location of a local community center, where residents went in search of shelter and were supposed to have been evacuated instead. They are in need of help, which is then dispatched using M2M to find the nearest police or ambulance.

In the aftermath of an emergency like Hurricane Sandy, all focus is on rescuing survivors and making their lives easier. However, public works agencies must also always be preparing for the next disaster, and explore ways to do their jobs more efficiently and, where possible, more inexpensively. High-accuracy location is a solution that enables multiple features, giving public works agencies the flexibility and capabilities they require to perform their most important task—serving the public.

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“Water conservation is becoming a serious issue for our community and we are discussing ways we might encourage our residents to conserve besides alternate watering days, etc. Can you suggest something else we might consider to get the point across?”

Many areas are facing prolonged drought conditions and others face the limited water supply source on a regular basis. The City of Peoria, Ariz., offers several rebate programs to their water utility users. They range from rebates for installing a hot water recirculator to upgrading high-water-use toilets to high-efficiency EPA WaterSense units, to converting high-water-use landscaping to Xeriscape-use landscaping; and providing a credit towards purchase and installation of a new water-efficient controller/timer. The programs are detailed in the Annual Water Quality Report with coupons included. For a copy of their brochure, contact Robin Bain at robin.bain@peoriaaz.gov. This program was designated as a Model Practice during the City’s recent Re-Accreditation Site Visit. I think you might find it a good discussion starter whether you can utilize all their programs or not.

“We are a small rural community with a lot of biking, walking, horse riders, and horse-drawn vehicles. We are looking for ways to improve the safety for these users but we don’t have a lot of staff or resources. Is there anything out there that might help us with these issues?”

The Office of Safety within the Federal Highway Administration has released a very useful, easy-to-follow guide for just such purposes and small and rural communities. The document is titled “Non-Motorized User Safety: A Manual for Local Rural Road Owners.” Approximately 60 percent of all road miles in the U.S. are non-interstates, rural roads maintained and operated by towns, counties, and Tribal governments. The non-motorized traveler faces daily challenges and safety concerns when utilizing the same roadway as motorized travelers, making the likelihood of dangerous, and often fatal, crashes far greater than on interstates. Statistics show the rural pedestrian crashes are nearly twice as likely to result in a fatality and rural bicycle crashes are three times as likely to result in a fatality as urban crashes of the same type. The Manual is designed to be used by local rural road practitioners, such as road supervisors, street superintendents, engineers, planners, local officials, law enforcement officers, and others who are responsible for designing and managing the rural road transportation network. You can access the Manual at http://safety.fhwa.dot.gov/local_rural/training/fhwasa010413. I think you will find it very helpful to begin your discussions on improving safety to your residents.

“With all the talk of alternative fuels for our vehicles, is anything being developed for mowers? We mow over 1,500 acres of parks, ball fields, cemeteries, and right-of-way and are wondering if there is a better alternative than the gasoline-powered riding mowers we are using now.”

Propane-powered mowers seem to be popping up all over the country now. In addition to the environmental advantages, several other benefits are touted. One is storability. Propane does not go bad and can be stored indefinitely whereas gasoline has a shelf life of only a month or two without additives. Propane is not spilled like gasoline when refueling which is not only an environmental hazard but a safety hazard since hot engine parts can cause spilled gasoline to catch fire. Propane burns much more efficiently than gasoline and produces less carbon monoxide and other greenhouse gases. It doesn’t evaporate like gasoline so the evaporative emissions are also reduced. Propane has less BTUs of energy per unit than gasoline. While this means that it takes more propane than gasoline to power an engine, the advantages are that less energy is wasted in combustion of propane. Engines run on propane run cooler, which means less stress on internal engine parts and extended engine life. Propane does not gum up over time like gasoline because it is a gaseous and not a liquid fuel, so carburetor problems are not an issue. Propane in the disposable cylinders is easier to transport than gasoline. The Town of Fishers, Ind., has recently purchased eight propane mowers and the City of Columbus, Ohio, purchased 14 of the mowers. The Propane Education and Research Council (PERC) has
offered a grant program. One of the grant requirements is that the agency staff must maintain records of maintenance, fuel use, and acres mowed for a minimum of 13 weeks and report this back to PERC. For more information on the difference between propane and gasoline engines, visit the Mother Earth News Magazine at http://www.motherearthnews.com/print-article.aspx?id=2147490568. To obtain information about possible grants visit the PERC site at http://propanecouncil.org/.

**Ask Ann**

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Fax questions to: (816) 472-1610
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**Public Works Director**

The City of Monterey Park is seeking a Director of Public Works who is a hands-on leader and excellent communicator with outstanding interpersonal skills. Knowledge of civil engineering principles and practices as applied to the field of municipal public works, including, planning, developing, designing, construction, operating and maintaining a variety of public works facilities. The new Director of Public Works will need to dedicate attention to achieving specific strategic plan objectives, and a dedication to providing exemplary services to all customers.

Graduation from an accredited four-year college or university with major in public administration, civil or mechanical engineering or a related field is required. Master’s degree is desirable. Certificate of Registration as a Civil Engineer (PE) either issued by the State of California or by a state having a reciprocal credential system is desirable. Annual salary range is $116,000 – $148,000, annually, plus excellent benefits.

Visit: [www.ci.monterey-park.ca.us](http://www.ci.monterey-park.ca.us) for additional information and required application or call 626-307-1334. Deadline to file: 7/15/2013 5:00 P.M. Terms and conditions subject to change without prior notice.

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Finnish city enlists GIS against annual snow assault

Jim Baumann
Writer
Esri
Redlands, California

John III, the Duke of Finland and son of King Gustav I of Sweden, founded Pori in the Grand Duchy of Finland in 1558. Located at the mouth of the Kokemäenjoki River, the settlement was to serve as a harbor and market town to revitalize trade with continental Europe. Pori was originally populated with approximately 300 residents who relocated from the nearby town of Ulvila. The new city quickly became commercially successful, and Pori prospered as a regional center for commerce and shipbuilding.

Today, Pori has nearly 84,000 residents who enjoy a high standard of living. The city is home to three universities, and the Pori Jazz Festival is one of the best known music festivals in Europe.

Located in northern Europe, snow cover in Pori lasts more than one-third of the entire year. Snowstorms can start as early as October and last into late April. During this time, city workers must keep 1,163 kilometers (723 miles) of streets and 295 kilometers (184 miles) of bicycle paths free of snow and ice.

Pori’s public works department is a longtime user of geographic information system (GIS) software, primarily for asset management and infrastructure maintenance projects. However, snowplowing operations were traditionally managed on a large wall map that detailed the city’s service areas. Supervisors dispatched drivers to plow streets and bicycle paths in the service areas in the same way they had been plowed for the past few decades. That is, the supervisors assigned the drivers to successively plow and replow each area during the winter without any consideration about how the routes might be better planned and the snowplowing service optimized.

“The city’s snowplow drivers just followed the same procedures that they had in the past,” said Pori GIS specialist Timo Widbom. “It wasn’t efficient, and while most roads were plowed regularly, some were plowed less frequently because of their location and the unavailability of specialized snowplows for particular sections of roadway.”

In early 2012, Pori entered into an enterprise license agreement with Esri, which allowed the city unlimited access to ArcGIS software and its extensions, including ArcGIS Network Analyst. With greater access to GIS for city employees, Widbom teamed with Aki Kaapro, GIS analyst at Esri Finland Oy, to build geoprocessing models to facilitate snowplowing and provide access to the geodatabase for those
public works employees involved in snow clearance.

First, they had to collect specific data on the existing roads in the city. To do this, the entire city was divided into approximately 800 grids, each measuring one square kilometer. All roads and paths within each grid were then visually inspected and categorized. While the city's pavement department maintains the road network in its GIS, there was little information on street care classifications, such as the amount of accumulated snow required on a specified roadway before it should be plowed. Street care classifications include a road's width and its topology, which can affect the snow buildup and the way that the road is plowed. It took more than a year to collect all the required data.

“The data collection process took us some time because we carefully inspected and collected data on all the roads and pathways in each grid, as it was critical to the development of our geoprocessing models,” added Widbom. “The collected data allows us to determine when and how a roadway should be plowed and the type of vehicle that we should use. For example, we use small plows for our bike paths, but our larger roadways sometimes require two plows used simultaneously.”

When the categorization of the city’s roads and bike paths was complete, Kaapro began to develop the two geoprocessing models. One determines the optimal snowplowing areas, and the other optimizes the routes to and through those areas. The models use a number of factors including the data previously collected in the inspection of the city’s streets and bike paths, street maintenance priority classifications, the type of snowplow vehicle required, and the total number of areas to plow. The first model uses the Location Allocation tool in Network Analyst to create demand points on those areas where snowplow service is required. After the demand points have been determined, the second model uses the Network Analyst VRP Solver to find the optimal routes to service and plow them. The model also allows multipoint routing and route reordering.

“Time stamps are calculated for each section of an optimized route to provide us with information about the length of time it takes to plow a specified road section and allow us to facilitate an animation of that section,” said Kaapro. “Supervisors can then enable the Time Slider window in ArcMap and discuss the routes with their drivers via the route animation. In addition, there are the conventional means to examine the routes via maps, driving directions, and so on. The main goal is to get the optimized routes to the drivers’ mobile navigators.”

Widbom has received a positive response from the drivers and their supervisors in the Pori public works department and plans to expand the implementation of the models’ results during this year’s winter season. In the future, he would like to make the city’s geodatabase available on smartphones so that the drivers can interact with the routing assignments from the field and review route history, if needed.

“Our route optimization models will allow us to reduce the overall number of kilometers driven by each snowplow driver while increasing the number of roads each plows,” said Widbom. “This provides us with a savings in both time and fuel costs.”

Jim Baumann can be reached at (909) 793-2853 or jbaumann@esri.com.
Products in the News

Tippmann Post Driving Equipment introduces side mount adapter for driving u-channel posts

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