ASHE scanner

Spring 2018

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Accelerated Redecking in Delaware

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Changes in the nationwide pavement condition report has new focus.

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MISSION

Provide a forum for members and partners of the highway industry to promote a safe, efficient and sustainable transportation system through education, innovation and fellowship.

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The *scanner* is published quarterly by ASHE as a compilation of articles written by various authors located across the nation. Any statements of fact or opinion expressed by the authors are their responsibility alone and do not imply a position or opinion by the officers or members of ASHE.

Greg Dutton, PE
ASHE National President 2017–2018

New Directions

As January arrived this year, many found themselves firmly in winter's grip. Frigid temperatures, ice and snow covered the north while atypical low temperatures settled in the south for longer than usual. Snow was even seen in Florida! By the time you read this, it will be spring, with warmer temperatures and new life already underway. ASHE is now in the second half of its fiscal year (June-May), and preparations are being made for the final yearly meetings, transition of new officers for 2018-19, selection of annual individual and project awards and finally the crowning ASHE event—the National Conference in Cleveland, Ohio, hosted by the Lake Erie Section, set for May 17-20 at the Westin Cleveland Downtown. The Conference featured technical sessions with opportunities to earn up to 9.5 professional development hours, a visit to the Rock & Roll Hall of Fame and destinations that included the Pro Football Hall of Fame and various other sites around Cleveland.

It has been an interesting year in terms of weather and politics. Transformation and turmoil have been the norm rather than the exception. Landscapes and atmospheres may change, but transportation's co-dependence with society is as strong and steady as ever. No matter what your background or affiliation is, maintenance and construction of roads and bridges, safety, moving goods and services more efficiently, complete streets, automated and connected vehicles, advancements in materials and construction techniques and the funding of it all is of vital interest to our industry. These common considerations will be here long after we are gone from the arena and will continue to be the business of ASHE long into the future. With over 6,500 members and growing, ASHE will be around for a long time.

The National Board completed its January workshops and quarterly meeting hosted by a vibrant Georgia Section in Atlanta. We celebrate their 20th anniversary this year as one of the largest Sections in the country, currently reporting 326 members. During the workshops, one of the topics explored included further development of a training module for the Regions and Sections that will enhance yearly transitions to new leadership and thus build on sustainability. We took another step in developing a new Strategic Plan that will carry ASHE's initiatives forward for another three years. We worked on internal processes and fiscal responsibilities to ensure that ASHE is aboveboard in all our actions.

The new Houston Section will have been chartered by the time this *scanner* is published. The leadership team is already on track and steaming ahead. Special recognition goes out to the New Sections Committee and the South Central Region for assisting with the process. Geographic expansion of our organization through the chartering of new Sections has been successful when ASHE members relocate to cities where no Section exists (Phoenix and Dallas-Fort Worth are recent examples), but there is a desire to continue the camaraderie that has been a hallmark of ASHE. If you or someone in your firm are relocating outside the existing footprint of ASHE, consider being a champion for a new Section. The New Sections Committee is eager to assist you throughout the entire process.

As this will be my fourth and final installment for New Directions, I look back on the first half of my term with fondness over the work accomplished by excellent leaders, and I look ahead with eagerness to where we will go this spring and beyond. It is gratifying to see the different aspects of ASHE throughout the country. I have had the privilege of meeting members from Phoenix to New York, and from south Florida to Pittsburgh. I have savored the opportunity to serve an

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SPRING 2018

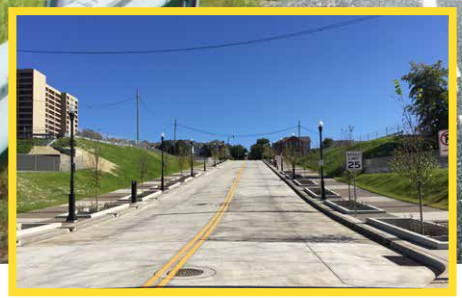
The ASHE National *scanner* Committee apologizes for any inconvenience that the delayed spring 2018 ***scanner*** may have caused. We suffered an unexpected and unavoidable production challenge, which will also delay—to a lesser extent—our summer and fall issues. We are doing our best to get the *scanner* releases back on schedule, and everything is progressing in a positive manner. Thank you for continuing to support ASHE and for your understanding.

Revised 2018 Schedule

Issue	Distribution	Materials Due (ads and articles/photos)
Summer '18	August	June 15
Fall '18	October	August 15
Winter '19	January	October 15

ASHE scanner

In This Issue



on the cover

Changes in the nationwide pavement condition report has new focus.

ASHE Franklin Section

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Meet the CHAIR

As Chair of the National *scanner* Committee, I work with those who help put together this publication. The scanner provides a glimpse into the kinds of projects and challenges that engineers and planners face daily—and showcases their work. Our articles are sourced from local ASHE Sections to give all an opportunity to be featured. My background is in transportation, and I have worked on such Washington, D.C., metropolitan area projects as the I-495 Express Lanes, Dulles Metrorail Silver Line—Phase 1 and the 11th Street Bridges project. My career has taken me through all aspects of the engineering design process, from the study phase through post-design construction support, and my role has varied from designer to reviewer to consultant. As I assume the role of Committee Chair, I will use my engineering knowledge and experience to ensure that the articles we publish in the *scanner* are technically accurate. Thank you for being a part of this organization.

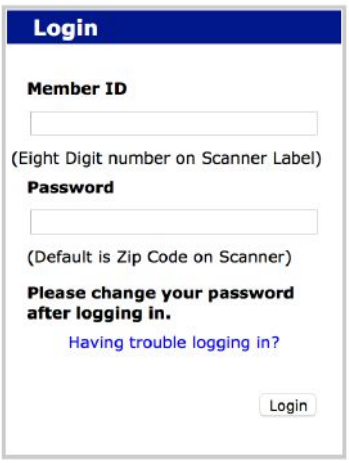
Anis

Anis Shaikh, *scanner chairman*

Have you changed your address, job or name?

Make an easy switch in ASHE's online database!

ASHE Member Center



1. To access the database, go to **www.database.ashe.pro**.
2. Input your personal ID number—the eight-digit number located on the *scanner* mailing label. (This will be your ID number for as long as you're a member of the Society.)
3. Add your initial password, which is the zip code (including the dash, if it is a nine-digit code)—also on the mailing label.
4. Change your password after your initial login to ensure the security of your data.
5. Review your personal data and make any changes necessary to keep your information up to date.

US 23/Pennsylvania Avenue Interchange Project: *An Innovative Solution to a Growing Problem*

by Tom Hibbard, PE, ms consultants, inc., **ASHE Central Ohio Section**

The city of Delaware lies in the heart of one of the fastest-growing counties in Ohio. Located in the center of the state, with a population of nearly 40,000, this expanding community has experienced 12 percent growth since 2010. Along with this growth has come the challenges of managing increasing traffic for the thousands of residents who commute between home and work every day. US 23 is a major arterial for this traffic and serves as a gateway to the city.

A PARTIAL INTERCHANGE

The US 23/Pennsylvania Avenue interchange was constructed in the 1960s as a partial interchange to save money and promote traffic movement through the downtown central business district. The interchange provided only for northbound entry to US 23 from Pennsylvania Avenue and a southbound exit from US 23 to Pennsylvania Avenue. There were no ramps to accommodate northbound traffic to Pennsylvania Avenue or southbound traffic from Pennsylvania Avenue, which today are the major routes for commuters.

As a result, northbound US 23 motorists often attempted to make a U-turn, north of Pennsylvania Avenue, to access Pennsylvania Avenue via the southbound US 23 exit ramp. U-turn movements violate driver expectations, particularly on a high-speed freeway facility like US 23, and are not a desirable method for accommodating traffic at an interchange.

A COST-EFFECTIVE SOLUTION

To meet the growing needs for improved access, Delaware retained ms consultants to evaluate alternative designs. After an extensive evaluation of the traffic demands, environmental impacts and costs, the alternatives were presented to the community. It was clear from this process that the Sandusky Street Extension alternative was the most favored and was advanced to final design and construction.

The Sandusky Street Extension was a cost-effective, low-impact solution to provide a safer, more direct access to US 23. A more traditional alternative of constructing a full interchange would have impacted the adjacent Historic Northwest District and the Olentangy River floodplain—and would have cost $8 million more to build than this $2.5 million project. By preserving much of the existing infrastructure, the city was able to accelerate the construction of this less costly, innovative solution by taking advantage of available funding. And the project does not preclude the construction of a full movement interchange, if needed in the future.

The project, completed in October 2016, included the construction of:

- The Sandusky Street Extension—a 1,040-foot-long, three-lane street with sidewalks
- The widening of 1,170 feet of US 23 for new turn lanes
- A two-phase traffic signal at the Sandusky Street–US 23 intersection

ACCESS AND SAFETY IMPROVEMENTS

The new, two-way Sandusky Street Extension replaced the southbound exit ramp and now accommodates the missing turning movements. Prior to this project, motorists attempting to access southbound US 23 from Pennsylvania Avenue had to choose one of several streets to travel south through a residential neighborhood or the congested downtown business district to access an entrance ramp. These streets were not designed to serve large volumes of through traffic. Without improvements, cut-through traffic would have continued to increase as the city continued growing, aggravating a safety concern for residents.

This project improves the circulation in the city by eliminating traffic that trickled through these local streets. Traffic from Pennsylvania Avenue now uses the new Sandusky Street Extension to make a right turn at the US 23 intersection to go southbound. And northbound US 23 traffic can now safely get to Pennsylvania Avenue by using a new turn lane in the US 23 median to make a left turn at the signalized Sandusky Street intersection.

Southbound US 23 traffic exiting at Pennsylvania Avenue uses the new right turn lane and turns right onto this new street. The remaining ramp continues to

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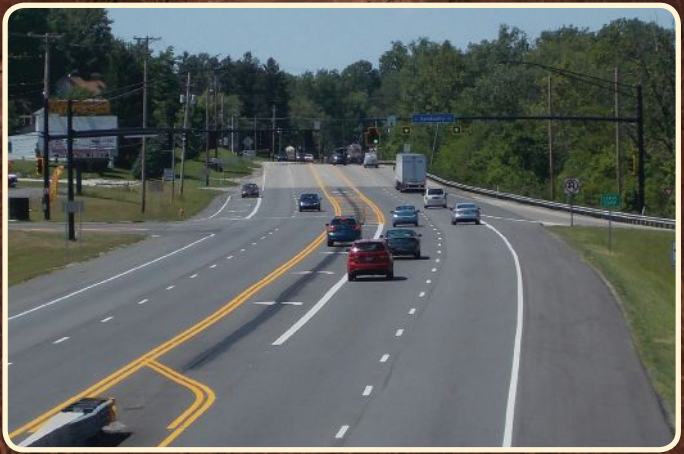
Looking north with Sandusky Street Extension, left, US 23, middle, and Pennsylvania NB on ramp, right

New Sandusky Street intersection with US 23 providing access to SB 23.

Decorative landscape walls are part of the new gateway to Delaware.



Left turn lane on US 23 provides access from NB US 23 to Sandusky Street.

serve traffic traveling from Pennsylvania Avenue to northbound US 23, bypassing the new US 23–Sandusky Street intersection. This permitted the use of an efficient, two-phase traffic signal operation.

A POSITIVE IMPACT

At a fraction of the cost, the city was able to advance this project much sooner than it would have with a full interchange. But available funding was not the only challenge faced by this project.

The project was located along the west bank of the Olentangy River. The project had to meet the stringent requirements of the Ohio Environmental Protection Agency and the Olentangy River Watershed Alternative General Construction Storm Water Permit to improve water quality flowing to the river. This was accomplished by constructing a vegetated biofilter along the west side of US 23 to filter storm water runoff. Potential river and floodplain impacts also had to be evaluated during the development of alternatives. The project had minimal impacts to the waterway when compared to other possible alternatives.

The Historic Northwest District is located immediately south and west of the Sandusky Street Extension. Impacts to this National Historic Register district were a concern during the development of alternatives for this project. More than just maintaining access to homes that used to be located along the southbound exit ramp, this project enhanced the neighborhood by constructing a true two-way street in front of these houses. With a new sidewalk, tree lawn, period post-top street lighting, street trees and landscaping, the character of this part of the district was improved.

Because this intersection also serves as the northern gateway into Delaware, aesthetics played an important part in the project. Landscaping with decorative, modular block walls and a monolith were included in the project to create an appealing entrance.

THE DEMAND FOR CREATIVE SOLUTIONS

As local communities and agencies struggle to make infrastructure improvements with dwindling funding, the demand for creative solutions continues to grow. The US 23/Pennsylvania Avenue Improvements demonstrated how a project can salvage existing infrastructure in an innovative way—with less cost and environmental impact to meet the demands for safety and access in a growing community.

Accelerated Redecking of DelDOT Bridge 1-717, I-95 Northbound over SR 1/7

by Jonathan R. Eberle, PE, and Neil A. Shemo, PE, **ASHE North East Penn Section**

Placement of UHPC in joints

Condition of the existing bridge deck

When the deteriorated bridge deck carrying I-95 NB over Delaware SR 1/7 began to spall concrete from the deck's underside to the roadway below, the Delaware Department of Transportation (DelDOT) slated the deck for an accelerated replacement, tasking AECOM with the design effort. This bridge in Newark, DE, carries four through-lanes as well as an entrance ramp over Delaware's principal north-south arterial roadway. It consists of four simple spans (32 feet, 70 feet, 70 feet, 36 feet) on a nearly tangent alignment with a 35-degree skew.

The existing cast-in-place concrete deck was composite and supported on rolled steel beams. After considering several alternatives for replacement, DelDOT decided that the steel beams and the substructure units would be reused as part of this project. Originally constructed in 1962, the bridge has been widened twice since—once in 1968 and again in 1983. The large traffic volumes carried by the structure (Average Daily Traffic=85,000), as well as traveling below it (ADT=67,000) on the six-lane, divided SR1/7 underpass, led to the decision to utilize Accelerated Bridge Construction (ABC) technology. Replacement of the bridge deck took place in two stages of construction, allowing three lanes to remain open throughout the construction process.

Consideration of Alternatives

The existing concrete deck on the bridge was in a state of distress, with more than 30 percent of the deck area patched, and concrete spalling from the underside. With these issues identified, DelDOT's decision-making criteria made the structure a prime candidate for a full-depth deck replacement. Preliminary engineering considered several alternatives involving ABC technologies.

One set of alternatives included replacement of the entire superstructure, along with the bridge deck. Options including longitudinal launching, slide-in bridge construction and modular superstructure units were considered. Some of these required a significant staging area, which was limited at the project location due to the proximity of adjacent businesses and steep terrain on in-field areas. These alternatives were easily eliminated. Further, the existing bridge superstructure steel was in good condition as it had recently been cleaned and painted and bridge ratings for live load were acceptable. With their goal to accelerate the replacement

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of the bridge deck—and knowing that replacing the superstructure would likely lead to subsequent delays in construction and increases in project costs—DelDOT decided to replace only the deteriorated bridge deck using precast concrete panels.

After consideration, DelDOT chose to use full-depth precast concrete deck panels with Ultra High-Performance Concrete (UHPC) longitudinal and transverse deck joint details, conventional expansion joints at piers/abutments and a Polyester Polymer Concrete (PPC) overlay. The selected layout involved precast panels oriented in the longitudinal direction of the structure, as opposed to the transverse direction typically chosen.

Due to the short span lengths, heavy skew angle and large width of the bridge, transverse panel orientation was not feasible for this project. Any attempt to run the panels in the transverse direction would have resulted in each panel being unique, requiring significant detailing effort. By running the panels in the longitudinal direction, many panels could be duplicated, saving detailing effort and fabrication time through the ability to re-use formwork. One reason that panels are oriented in the transverse direction is to limit the length of UHPC flow. When the flow is a significant length, the steel fibers tend to align, which can create a weak direction within the cured material. Limiting the length of flow to a recommended maximum of 10 feet alleviates concern of fiber alignment. With panels running longitudinally, the length of trough over the beams is limited to the shipping width of panels (typically eight to 10 feet). The developed layout provided trough lengths exceeding 24 feet, well over the recommended allowable flow length of 10 feet. To allow the developed layout to be used while limiting the flow length of UHPC, the closely spaced two-inch vent holes in the panels were enlarged to four-inch UHPC placement holes every 10 feet along the panel.

Hurdles

There were several hurdles to overcome throughout the construction process because this was the first precast panel deck replacement using UHPC in the state of Delaware.

The first hurdle occurred when the limited staging area caused the contractor to stack the panels on-site which, due to improperly placed dunnage, resulted in a flexure crack in the bottom panel. Upon inspection, engineers determined that the panel could be used because the crack was in transverse direction and did not cross any primary reinforcement. The crack was epoxy injected to restore bond, with further protection provided by the PPC overlay that would be placed on the deck later.

The highly fluid nature of UHPC also presented other hurdles during the project. A field mockup required by the contract specifications allowed the contractor, Mumford & Miller Concrete, Inc., to become familiar with the material and showed the importance of having all joints watertight. During construction, leaks from the formwork were generally small and quickly patched by the contractor to limit loss of material. However, during the second phase of the project, one of the forms broke free, causing a significant amount of material to spill before the leak was noticed and patched. In addition to the lost material, this form failure presented another issue: some areas of the joint that were already filled and covered had material loss. When the covers were removed, low spots were discovered limited to less than an inch, typically, but in some local areas up to four inches in depth. The UHPC supplier was able to expedite the repairs for this problem.

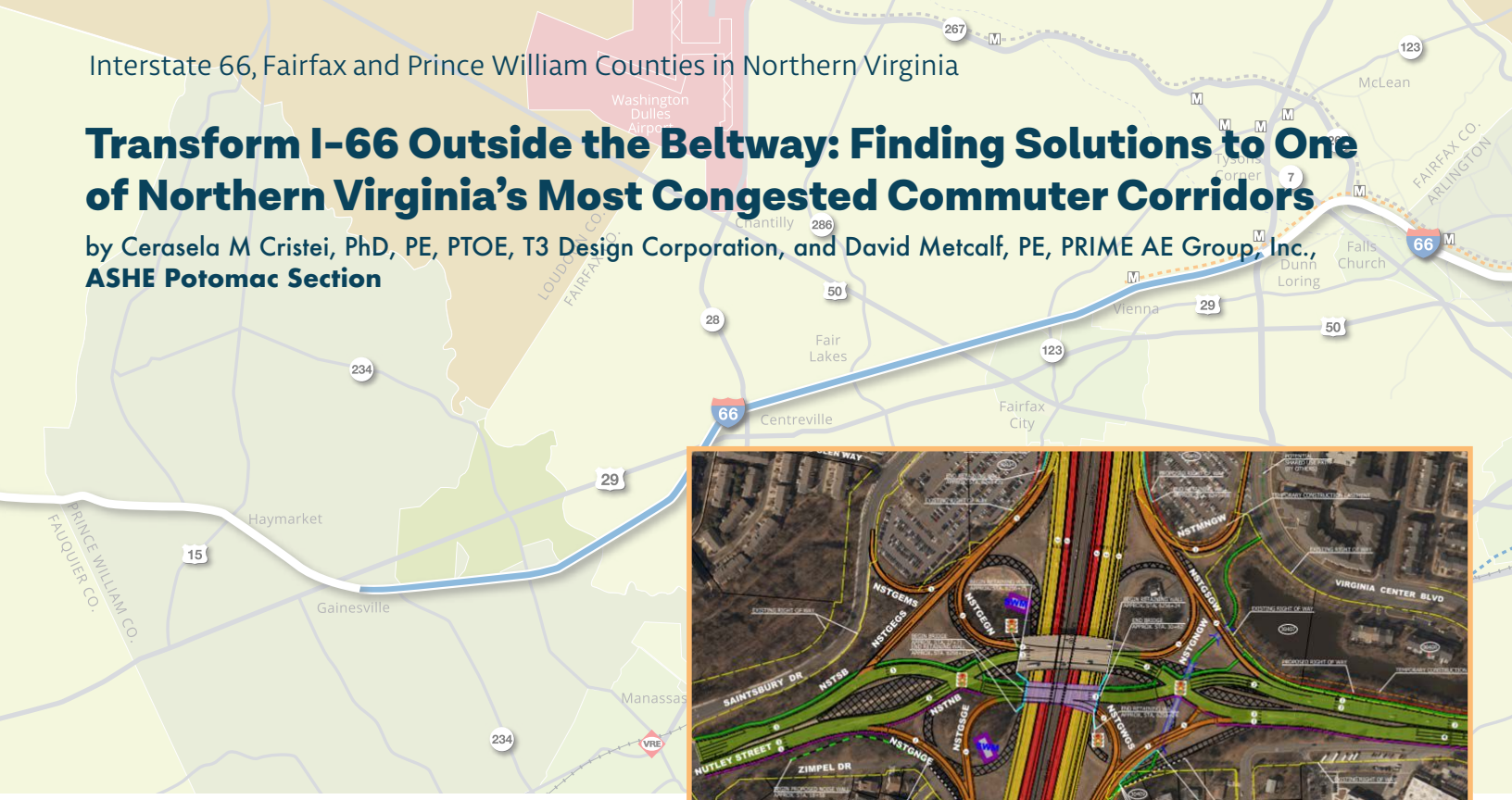
Conclusion

Although the use of ABC methods for this project increased the overall construction costs compared to a conventional deck replacement, they also lessened the impact to the traveling public. The reduced project duration required only 42 days of lane closures (including 10 days lost to weather), compared to the 132 days of estimated lane closures for conventional construction, resulting in a significant reduction in user delay costs.

Interstate 66, Fairfax and Prince William Counties in Northern Virginia

Transform I-66 Outside the Beltway: Finding Solutions to One of Northern Virginia's Most Congested Commuter Corridors

by Cerasela M Cristei, PhD, PE, PTOE, T3 Design Corporation, and David Metcalf, PE, PRIME AE Group, Inc., **ASHE Potomac Section**



66 Express Mobility Partners

Equity Investors

Cintra Global LTD, Meridiam Infrastructure North American Fund II

Design-Build Contractors

FAM LLC, a joint venture between Ferrovial Agroman US Corp., Allan Meyers, VA Inc.

Designers

American Structurepoint
Janssen & Spaans Engineering, Inc.
Louis Berger

The northern Virginia area has a Megaproject well into design and poised to start major construction soon. The Transform I-66 Outside the Beltway project is an undertaking that involves ASHE members from the Potomac Section.

This project comes on the heels of the $2 billion I-495 and $1.7 billion I-95 Express Lane projects, and will cost $2.3 billion to design and construct. The Virginia Department of Transportation (VDOT) Northern Virginia District applied lessons learned from earlier projects to this latest effort.

The I-66 corridor, a major east-west transportation corridor for the region, is in need of congestion relief. Commuter peak periods are often more than four hours and are not limited to one direction. Congestion also occurs during off-peak periods during the week and weekends.

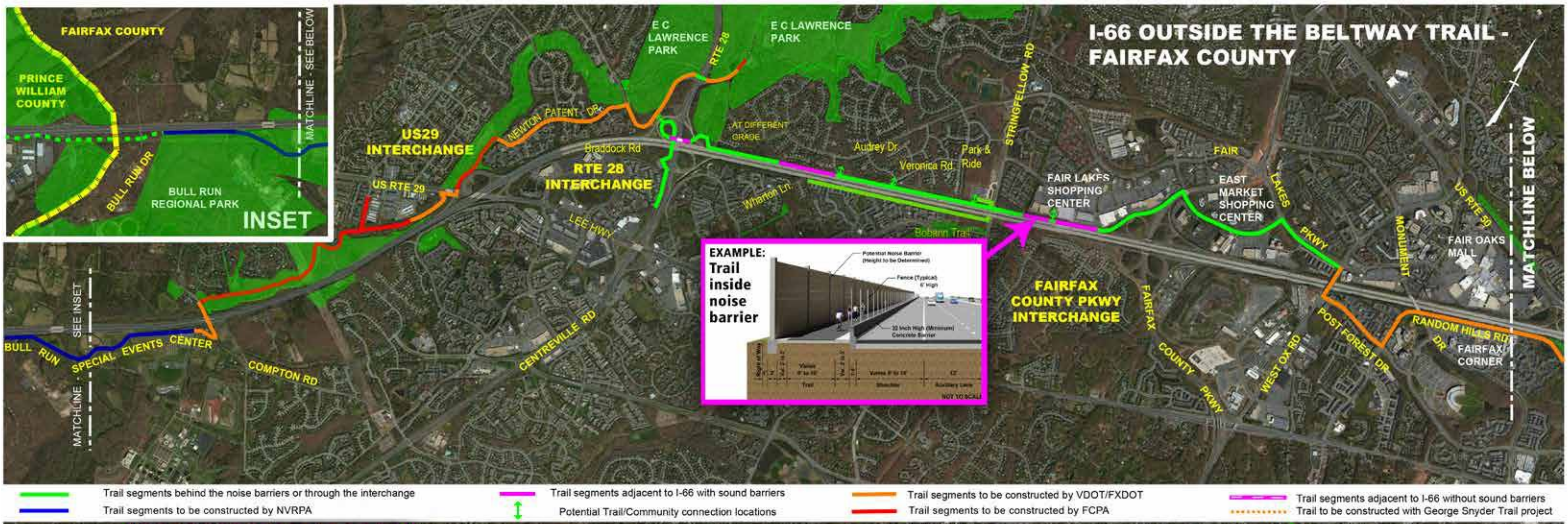
The project is a public-private partnership between VDOT, Department of Rail and Public Transportation (DRPT) and the selected private partner, 66 Express Mobility Partners (66 EMP). VDOT's Project Manager is Susan Shaw, Megaprojects Director.

There are challenges to delivering the project by December 2022, such as rebuilding interchanges, which includes a complex interchange at Route 28, along with relocating a commuter rail power station and safely maintaining traffic operation during years of construction. The engineering and construction is a collaboration between the partners and a long list of stakeholders.

Once operational, the Express Lanes will be tolled to manage the demand and will be free to vehicles with three or more people. Interchanges along the corridor will be

Managed Lanes, HOT Lanes, Express Lanes, Dynamic Tolling: What Is What?

- **Managed Lanes** use a management scheme to improve flow or maximize HOV or the like.
- **High Occupancy Toll (HOT) Lanes** allow High Occupancy Vehicles (HOV) and toll-paying vehicles.
- **Express Lanes** is FHWA's overall designation for HOT lanes/managed lanes.
- **Dynamic Tolling** is used to prevent congestion on the Express Lanes. Tolls are increased as the lanes near capacity.



improved and connected by auxiliary lanes, where needed, for added safety and reduced congestion. The project also preserves space in the median for future transit facilities. Over 4,000 Park and Ride spaces will be added at three new Park and Ride lots that will have direct connections to the Express Lanes. Since northern Virginia has one of the nation's highest HOV rates, this project will further provide an opportunity and incentive for drivers to consider other modal choices, such as HOV or transit.

Once completed, this project will:

- Move up to 4,000 more people per hour
- Reduce up to eight hours of daily travel delay
- Expand multi-modal options
- Improve traffic in the general-purpose lanes with a portion of trucks using the express lanes
- Reduce cut-through traffic on local roads
- Improve safety

As with any major public-private partnership project, the organization chart is more complex than the typical project. The new HOT lanes will be owned and operated for 50 years by 66 EMP. Cintra, a major concessionaire headquartered in Spain, formed 66 EMP. In a nearly two-year-long competition, 66 EMP was successful over a team formed by Transurban, an Australian firm that operates the area's other Express Lanes on I-95 and I-495. Key to 66 EMP's win was a grant to the region of $500 million for supporting projects.

Also, as with the other projects in the region, VDOT will be more than just an active partner. Although the purpose of the project is to add the HOT lanes, much of the work will be on the surrounding infrastructure that will be turned over to VDOT. To assist with this Megaproject, VDOT is using a General Engineering Contract led by ASHE Potomac gold member firms, ATCS and CH2M.

To mitigate the impacts to area traffic, 66 EMP and VDOT will implement a major Type C Transportation Management Plan (TMP). The plan consists of the full range of strategies, including fare reductions and incentives to increase buses, vanpools and carpools. The TMP includes enhanced incident response capacity, monitoring of local road network impacted by changes in traffic flow during construction and extensive real-time travel information. In addition, VDOT has advanced a Park and Ride lot project under a separate contract.

This project will tie into a network of Interstate Express Lanes. By the time the project is completed, the Virginia Beltway and I-95/395 corridor will all have connected managed lane options. A commuter from the western suburbs will be able to catch a bus or carpool and travel into the District of Columbia, Pentagon area, Tysons Corner and the National Geospatial Agency on fully managed, uncongested lanes. Finally, as a network of controlled roadways, it is natural to imagine the area's Express Lanes as the first facilities to use Connected Vehicle and Autonomous Vehicle technologies.

Gainesville to Manassas, Centreville to Beltway

In Memorium

Gweneth E. (Wolf) Englebreth, 89, a Charter and Life Member of the American Society of Highway Engineers, died in North Chesterfield, VA, on January 10, 2018. She was one of the 104 National ASHE Charter Members who signed the National Charter approved in 1968, and later became a member of the Society's first Section, ASHE Harrisburg Section. She was buried at the Dillsburg Cemetery. Dillsburg, PA.

ASHE Scholarship Totals for 2016 and 2017

	2016 Totals	2017 Totals
Great Lakes Region		
Bluegrass		$ 0.00
Central Dacotah	$ 4,600.00	$ 0.00
Central Ohio	$ 5,000.00	$ 5,000.00
Cuyahoga Valley	$ 4,000.00	$ 3,000.00
Derby City	$ 0.00	$ 0.00
Lake Erie	$ 1,500.00	$ 1,500.00
Northwest Ohio	$ 3,000.00	$ 3,000.00
Triko Valley	$ 2,500.00	$ 2,500.00
TOTAL	**$ 20,600.00**	**$ 15,000.00**
Mid-Atlantic Region		
Blue Ridge	$ 0.00	$ 3,500.00
Carolina Piedmont	$ 0.00	$ 0.00
Carolina Triangle	$ 6,000.00	$ 6,000.00
Chesapeake	$ 9,000.00	$ 9,000.00
Greater Hampton Roads	$ 5,000.00	$ 4,000.00
North Central West Virginia	$ 4,500.00	$ 4,500.00
Old Dominion	$ 4,000.00	$ 7,000.00
Potomac	$ 5,000.00	$ 5,500.00
TOTAL	**$ 33,500.00**	**$ 39,500.00**
Northeast Region		
Albany	$ 4,000.00	$ 2,500.00
Altoona	$ 1,500.00	$ 3,000.00
Central New York	$ 500.00	$ 500.00
Clearfield	$ 5,000.00	$ 4,500.00
Delaware Valley	$ 10,000.00	$ 15,000.00
East Penn	$ 4,000.00	$ 3,000.00
First State	$ 9,000.00	$ 13,000.00
Franklin	$ 4,000.00	$ 6,000.00
Harrisburg	$ 12,000.00	$ 20,000.00
Long Island	$ 2,500.00	$ 2,500.00
Mid-Allegheny	$ 2,000.00	$ 2,000.00
New York Metro	$ 7,500.00	$ 11,000.00
North Central New Jersey	$ 14,500.00	$ 15,500.00
North East Penn	$ 11,000.00	$ 12,500.00
Pittsburgh	$ 2,000.00	$ 2,500.00
Southern New Jersey	$ 12,500.00	$ 7,000.00
Southwest Penn	$ 8,500.00	$ 9,150.00
Williamsport	$ 0.00	$ 1,500.00
TOTAL	**$110,500.00**	**$131,150.00**
Rocky Mountain Region		
Phoenix Sonoran	$ 4,000.00	$ 7,500.00
TOTAL	**$ 4,000.00**	**$ 7,500.00**
Southeast Region		
Central Florida	$ 0.00	$ 0.00
Georgia	$ 4,500.00	$ 3,000.00
Houston		$ 0.00
Gold Coast	$ 0.00	
Northeast Florida	$ 14,500.00	$ 5,000.00
Middle Tennessee	$ 3,000.00	$ 3,000.00
South Florida	$ 0.00	$ 0.00
Tampa Bay		$ 2,000.00
TOTAL	**$ 22,000.00**	**$ 13,000.00**
GRAND TOTAL	**$190,600.00***	**$206,150.00**

ACCUMULATED TOTAL TO-DATE **$2,214,938.00**

* the grand total printed in the Winter 2018 *scanner* was incorrect due to a recording error

As The Wheel Turns

ASHE Members on the Move!

Schmalz Joins Naik Consulting Group

New York, NY—Naik Consulting Group announced that **Richard Schmalz, PE,** has joined the firm as Senior Vice President – NY office manager. Schmalz, ***past president of ASHE's NY Metro Section***, will be responsible for maintaining close liaison with clients, forecasting administrative, staffing and facility needs and assisting in the formulation of business, marketing and strategic planning for Naik's New York operation. Formerly, Schmalz was with NYSDOT, in Regions 10 and 11, culminating with the position of Project Director for Route 9A Reconstruction in downtown Manhattan after September 11. He has also held senior management roles in the consulting sector at STV, PB (now WSP), The LiRo Group and HNTB.

Harper Named Young Engineer of the Year

Delaware Valley, PA—**Alexa Egan Harper, PE, ENV SP,** was named 2018 Delaware Valley Young Engineer of the Year. A member of both the Women's Transportation Seminar and the ***American Society of Highway Engineers***, she currently serves the latter's ***Delaware Valley Section as Second Vice President*** and has held several committee and board positions over the past five years. She started the ASHE Younger Members Committee in 2012 to increase Section involvement through social networking and community service. As a senior project engineer in Gannett Fleming's highway department, her primary project has been the I-95/Pennsylvania Turnpike Interchange in Bucks County. Harper received her Bachelor's and Master's degrees in Civil Engineering from Carnegie Mellon University. She holds professional engineering licensure in Pennsylvania and New Jersey and is an Envision Sustainability Professional in the Institute for Sustainable Infrastructure.

organization that embraces diversity, promotes differing ideas, serves gladly and collaborates well. ASHE's focus, to date, has been both inward and outward seeking. The organization, starting at the Section level, has done well to provide a platform from which our current transportation system is promoted through networking and education opportunities.

National's March quarterly meeting was held in Philadelphia, centrally located near the Delaware Valley, Southern New Jersey, East Penn, First State and North Central New Jersey Sections.

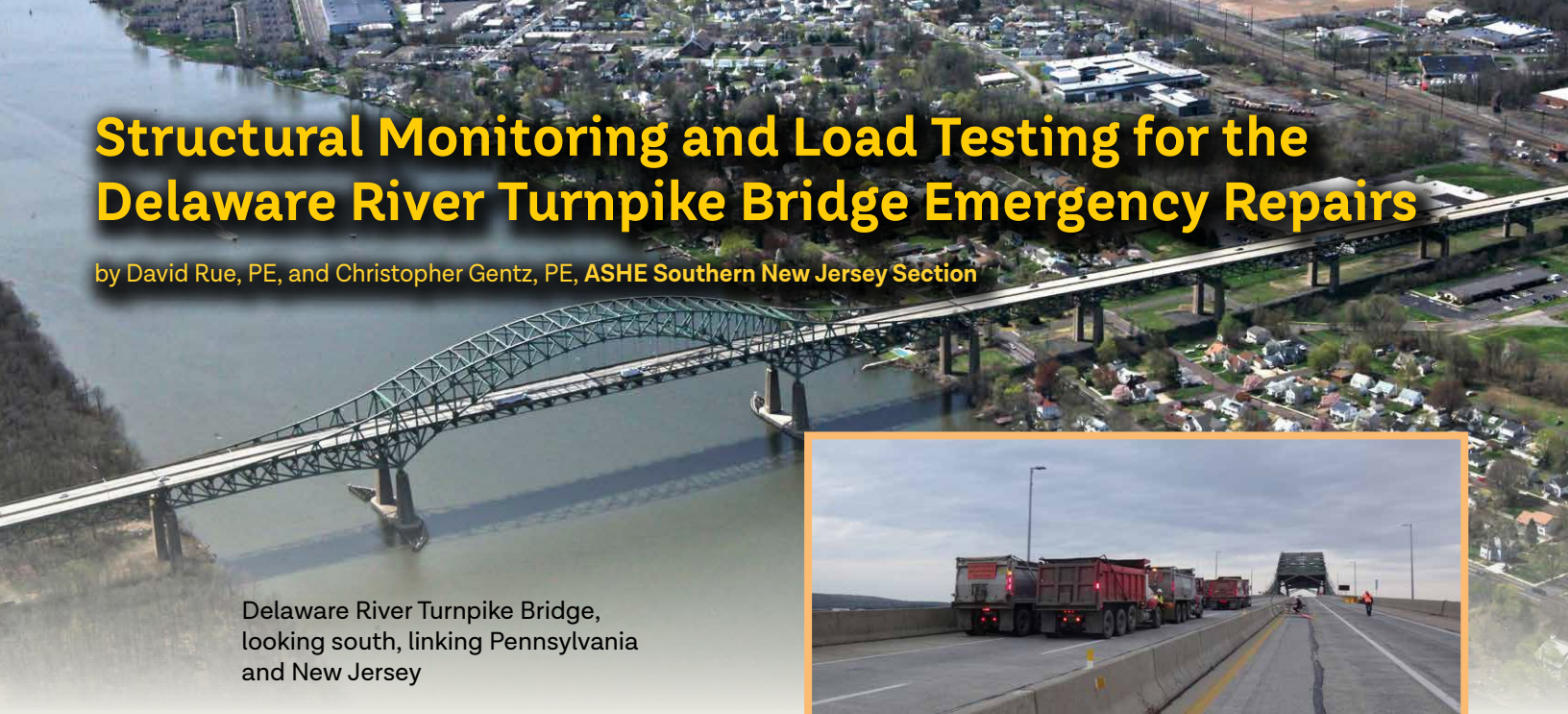
It was inspiring to meet and work with the leaders there and hear about their concerns and triumphs. At our workshops, topics for discussion included a new public relations campaign, finalizing our next three-year Strategic Plan and discussing growth through new Sections and Student Chapter start-ups. Other ideas are welcome.

As mentioned above, spring marks preparation time for transitioning to new leadership in the coming fiscal year. The ASHE nation will be in good hands as Richard (Dick) Cochrane takes on the mantle of ASHE President and Michael (Mike) Hurtt becomes First Vice President. They, along with other mentors and friends at National like Charlie Flowe, Frank O'Hare, Larry Ridlen, Shirley and John Stuttler and Sam Mody, have been such a blessing with their support and gentle advice. I believe that together we have accomplished much to improve this already-great organization. I do not have the space to thank all the other officers, directors and committee chairs who have been of such help to me and this organization. To those of you who have made a difference in my life and to our shared leadership of ASHE, I thank you! Special praise and appreciation go out to Charlie Flowe, who is completing his final term as our National Secretary and who has faithfully served ASHE for decades. His legacy of character and integrity is outstanding. ASHE will have the benefit of a strong new Secretary in Tom Morisi as he takes on this important role after shadowing Charlie this past year. Tom's quiet demeanor and thoughtful leadership will be an excellent continuance to what Charlie has provided. Please provide your full support to our new team. I encourage every member aspiring to fellowship and/or leadership to get involved in shaping the future of ASHE and promoting it wherever transportation is discussed.

ASHE is one of the premier transportation networking societies in the country. Hospitality is at its core. It has been a great blessing to me and will be to you, also. Serving as your President has been an honor and a privilege and the highlight of my career. I thank you for your support and pray for sunny days and smooth rides wherever you travel.

Structural Monitoring and Load Testing for the Delaware River Turnpike Bridge Emergency Repairs

by David Rue, PE, and Christopher Gentz, PE, **ASHE Southern New Jersey Section**



Delaware River Turnpike Bridge, looking south, linking Pennsylvania and New Jersey

Eight-truck static load test on bridge

The Delaware River Turnpike Bridge was opened to traffic May 25, 1956. As the primary link between the New Jersey and Pennsylvania Turnpikes, the Delaware River Turnpike Bridge carries an average daily traffic (ADT) of 42,000 vehicles. The structure is one of the largest single bridge installations on either turnpike and is jointly owned and maintained by both the New Jersey Turnpike Authority (NJTA) and the Pennsylvania Turnpike Commission (PTC). The bridge is currently being repainted as part of an ongoing rehabilitation contract.

On January 20, 2017, a paint inspector discovered a completely fractured top chord in the northern four-span continuous deck truss on the Pennsylvania side of the bridge. As the design consultant for the painting contract, WSP USA was informed of the fractured top chord. In conjunction with both agencies and their general consultants, the decision was made to immediately close the bridge to traffic.

Following the closure of the bridge, a team of engineers was formed to develop and design an emergency repair plan. The team consisted of engineers from both bridge owners, (NJTA and PTC), and multiple consulting engineer firms, including WSP (instrumentation and independent technical reviews), NJTA's General Consulting Engineer (GCE) HNTB (Engineer of Record for the repairs), PTC's GCE Michael Baker International (MBI) (ultrasonic inspections), Greenman-Pedersen, Inc. (visual inspections), Modjeski and Masters (destructive material testing) and STV, Inc. (construction supervision).

It was discovered through an inspection by GPI and in-depth structural investigation by WSP and HNTB that a stress redistribution occurred because of the fracture. This redistribution substantially altered the forces carried by the adjacent top chord members, concrete deck, stringers and lateral bracing system. Additionally, there was a significant transfer of load to the south truss members in the area of the fracture. Many members near the fractured top chord were found to be damaged due to the load transfers that occurred during the stress redistribution.

In response to this stress redistribution, the span containing the fractured top chord experienced a roughly one-inch vertical drop, over two inches of horizontal displacement and one-half-inch of lateral displacement.

The location of the fracture immediately adjacent to a residential neighborhood in Bristol, PA, and the size of the bridge complicated the possible solutions. It was decided to close several local roads that pass under the bridge and install eight temporary shoring towers. These towers initially served to stabilize the bridge and were ultimately used as jacking towers to raise the bridge back to its original elevation. Each tower supported a 600-ton jack that was used to restore the truss deflection close to its original configuration.

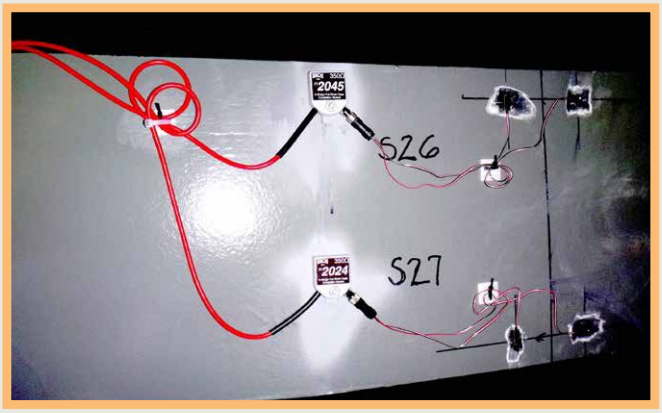
After the structure was secured, the damaged span was vertically jacked. The fractured member was then post-tensioned to restore its continuity over the pier and its original dead load force. A permanent repair splice was installed prior to removing the post tensioning to lock the dead load forces back into the repaired member.

With the uncertainty of force redistribution throughout the structural system following the fracture, and how the forces would redistribute during the repair process, it was determined that structural monitoring was the best way to understand the behavior of the structure during the repair process and verify the efficacy of the repair.

Temporary shoring/jacking towers

Fractured top chord
(photo courtesy of STV, Inc.)

Instrumentation was used to monitor the stability of the structure in its damaged state and how stresses moved through the truss members as it was lifted and post-tensioned in the repair process. It also provided an assessment of safe load capacity via a post-repair load test and finally, long-term observation of the structure under live load by continuing the monitoring after the bridge was reopened.



Instrumentation installed on the bridge

The structural response during much of the repair process was monitored in real time, on-site. Engineers from all consultants involved in the repair process, as well as representatives of NJTA and PTC, were on-site throughout the process to review the data and make any decisions that were necessary.

Since a measured response is not helpful if you are unsure what the expected response is, finite element modeling was used to determine anticipated stress distributions during the repair process. Several analytical models were developed in LARSA 4D to represent the different stages of repair. These models were used to examine the stress redistribution that occurred from the initial fracture of the top chord, predict the structural response of the bridge during the repair process, and evaluate whether the bridge would behave elastically in its repaired state.

To calibrate the first model and ensure that all models going forward were representative of the true response of the bridge, a load test was performed on the New Jersey side of the bridge, which has a nearly identical structural configuration compared to the Pennsylvania approach spans.

Following the repair of the structure, a final load test was performed on the repaired Pennsylvania four-span truss to confirm elastic behavior. The results of this load test were compared to the modeled response of the structure, as well as the measured response of the undamaged four-span truss on the New Jersey approach that was performed earlier in the repair process. The results of the load test confirmed the elastic behavior of the repaired truss, supporting the decision to re-open the structure.

Original estimates put the anticipated closure duration upward of three months. Much to the appreciation of the bridge owners and the motoring public, the Delaware River Turnpike Bridge was reopened March 9, 2017, ending a seven-week closure of a key artery between New Jersey and Pennsylvania. The bridge opening was almost a month ahead of schedule. The instrumentation that was installed on the critical structural members prior to the repairs has been retained on the bridge. The measured data continues to be monitored to assure that the repaired structure is behaving as anticipated and remains safe to carry traffic.

Rejuvenation of the Pittsburgh Hill District

by Ed Telega, PE, Michael Baker International, and Tom Ryser, PE, and Doug Straley, Sports and Exhibition Authority of Pittsburgh and Allegheny County, **ASHE Pittsburgh Section**

The historic Hill District, located in Pittsburgh, PA, was once a vibrant and densely populated neighborhood. During the 1950s, Pittsburgh's urban renewal efforts declared the neighborhood blighted, and 1,300 buildings on 95 acres of land were demolished to make room for a cultural center. The new center was to include spaces for music, theater, art, a hotel and residential apartments, but only a new public auditorium (known as the Civic Arena), an apartment building and a hotel complex were built. The remaining land was never developed, and what once was a thriving community became mostly surface parking. During the same period, I-579 (Crosstown Boulevard) was constructed, separating what was left of the Hill District and the economic activity and cultural life of downtown.

The goal of this multi-phase Lower Hill Infrastructure Redevelopment Project was to help repair past mistakes by redeveloping the 28-acre former Civic Arena site and providing a direct connection from the Hill District community to downtown Pittsburgh. The project included innovative storm water management components, new streets, sidewalks, utilities, interconnected traffic signals, energy-efficient lighting and a variety of enhanced accessibility features. The planned development anticipated residential, commercial and green spaces.

The Sports and Exhibition Authority of Pittsburgh and Allegheny County (SEA) selected Michael Baker International (Michael Baker) as the prime design consultant for the project. The project team and their responsibilities included:

- **Michael Baker** to provide roadway infrastructure design services, including preliminary engineering, final design and construction phase services, development of bio-retention tree well designs, obtaining environmental clearance required to advance the project and preparation of a pre-final geotechnical engineering report
- **Cosmos Technologies** to provide drainage design, E&S design and utility coordination
- **Environmental Planning & Design** to provide streetscape, landscape and irrigation design
- **Santangelo & Lindsay** to provide street lighting design
- **KAG Engineering** to provide surveying services
- **Monaloh Basin Engineers** to provide right-of-way research
- **John J. Clark & Associates** to provide public involvement services
- Contractor **Frank J. Zottola Construction, Inc.**, to move the design to reality

The infrastructure design and construction occurred in several phases. Element I included Fullerton Street and the eastern portion of Wylie Avenue; Element II included Logan Street and the middle portion of Wylie Avenue; Element II-C included the middle portion of Centre Avenue. Future elements will focus on the western portion of Wylie Avenue to connect Logan Street to Washington Place and renovation of the perimeter streets.

The infrastructure will support the planned vertical development, which is anticipated to provide 1,188 residential units, 250,000 square feet of commercial space, 632,000 square feet of office space, a 150-room hotel and 10 percent green space.

With a height difference of more than 13 stories, the topography of the site varies drastically. The challenging topography, combined with the goal of providing equal access to all users, made the integration of "universal design" parameters a critical component of the project. To increase accessibility, special attention was paid to the alignment and grades of the streets and the location of public spaces. The street types vary in width and incorporate various sidewalk and landscape features, and the tree wells add character, in addition to providing storm water control. Key pedestrian streets meet accessibility standards of a five percent slope or less.

Sustainability was the central tenet of design. Innovative solutions included complex bio-retention tree wells to incorporate storm water control along the streets, separate storm and sanitary lines to reduce combined sewer overflow events, LED street lighting to reduce energy consumption,

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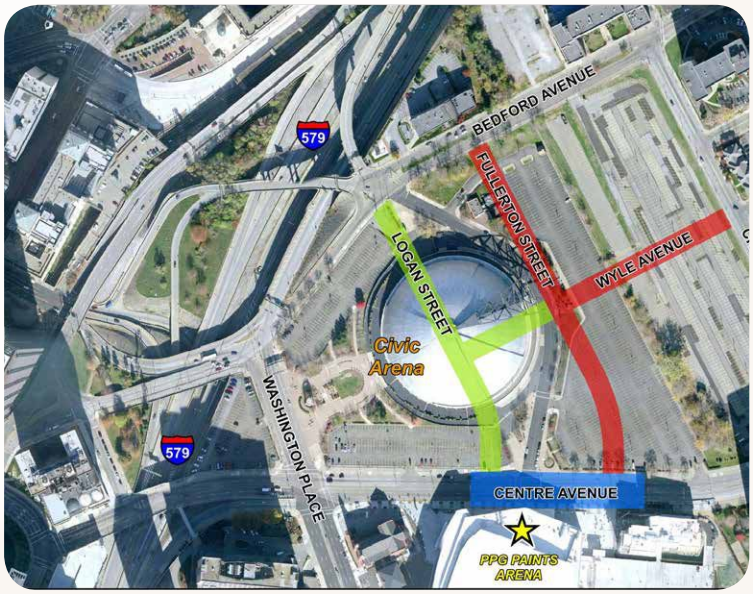

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Rejuvenation of the Pittsburgh Hill District

(continued from page 20)

advanced utility infrastructure to serve future vertical development and inner-connected traffic control devices to promote more efficient travel.

The finished infrastructure project was submitted as a part of the overall Leadership in Energy and Environmental Design Neighborhood Development (LEED®-ND) certification based partially on the bio-retention tree wells incorporated along the roadways that capture, control, and treat the "first flush" of rainfall. The 74 tree wells installed in Element I and the 54 tree wells installed in Element II are six feet wide by 20 feet long and are spaced 10 feet apart. The tree wells have two inlets along the curb line and slot openings on the sidewalk side for collecting rainwater. Each three-bay tree well was designed to accommodate the profile grade of the roadway. Weirs between each bay were designed to flow accumulated rainwater more than seven inches to the next downstream bay. If a rain event is so great that seven inches of water is reached in the lowest downstream bay, water will exit the water inlet at the curb line and flow back into the street for deposit into the next downstream inlet or tree well.

Finished tree wells eastern side of Fullerton Street

This project established a new standard for large-scale sustainable development in Pittsburgh, but it could be used as an example for other urban areas facing similar redevelopment concerns, particularly in terms of storm water management and treatment in urban settings.

The design also featured an abundance of new street and pedestrian lighting and decorative crosswalks to help pedestrians navigate streets safely, while adding variation to the monotony of concrete. The intersections include curb bump-outs, which provide refuge and shorter crossing distances, and interconnected traffic signals communicate with adjacent intersections to manage traffic efficiently and safely. Additionally, bike racks, benches and litter receptacles are placed to discourage pedestrians from mid-block crossing.

Pennsylvania Governor Tom Wolf, Pittsburgh Mayor William Peduto and several other federal, state and local officials attended the October 7, 2016, ribbon-cutting ceremony to mark completion of Element I. Elements II and II-C, were completed and open to traffic November 1, 2017. Funding procurement will determine the design and construction schedule for the remaining elements.

Lower Hill project aerial, looking east

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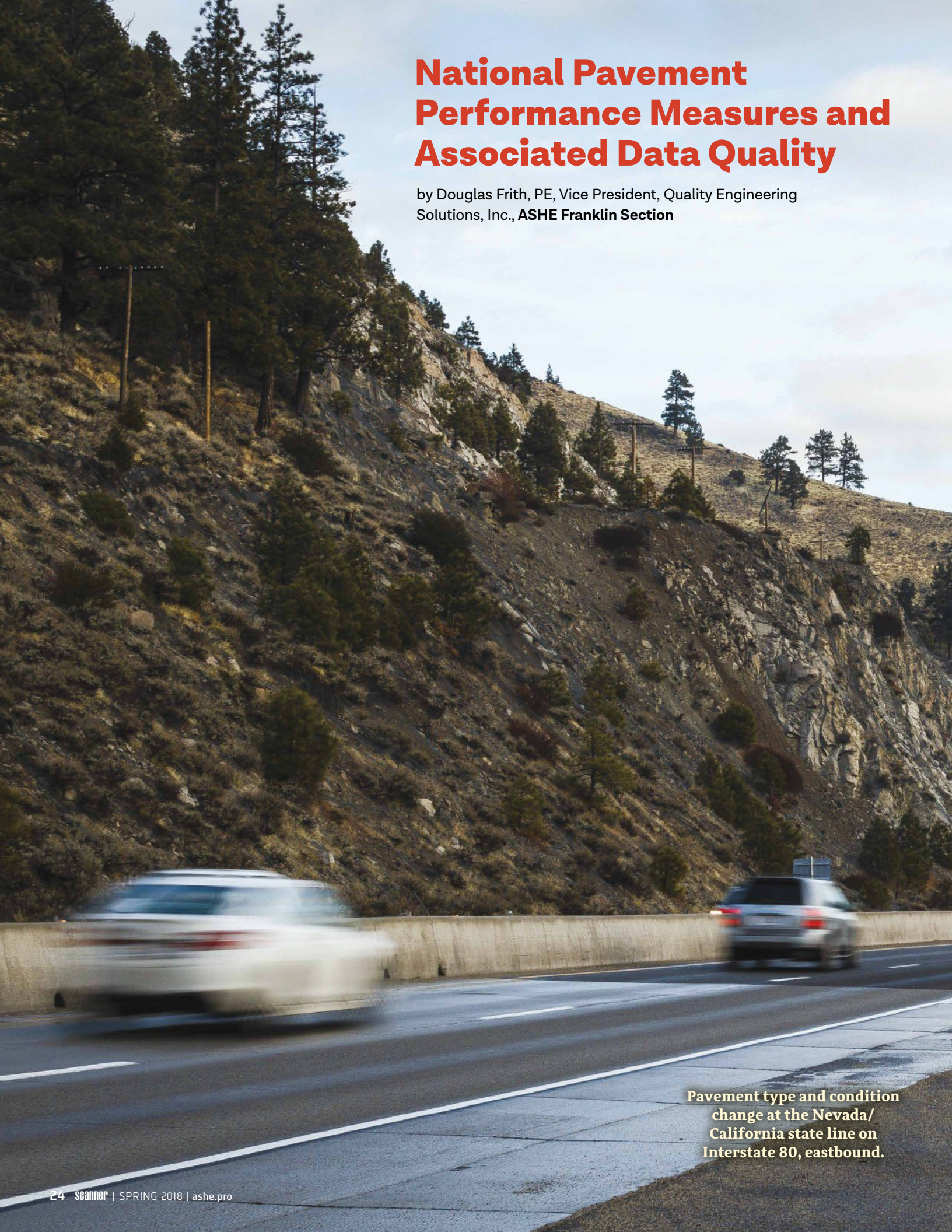
National Pavement Performance Measures and Associated Data Quality

by Douglas Frith, PE, Vice President, Quality Engineering Solutions, Inc., **ASHE Franklin Section**



Pavement type and condition change at the Nevada/California state line on Interstate 80, eastbound.

Performance measures on the National Highway System (NHS) have been required in the two most recent surface transportation authorization bills—Moving Ahead for Progress in the 21st Century Act (MAP-21) (1) and the Fixing America's Surface Transportation (FAST) Act (2). The Federal Highway Administration's (FHWA) Notice of Proposed Rulemaking (NPRM) became effective May 20, 2017. Part of this final rule requires the State Departments of Transportation (DOTs) to develop and implement a Quality Management Program (QMP) for the pavement condition metrics reported on the Highway Performance Monitoring System (HPMS) (3).

While building on previous progress in surface transportation, MAP-21 and the FAST Act placed a new focus on performance-based decisions. States are now required to set pavement condition performance targets based on a good, fair and poor rating system. To ensure the agency-reported condition data are compatible, the pavement condition data (ride quality, cracking, rutting and faulting) are to be reported following the guidelines in the HPMS field manual. Although condition data has been reported for several years on the NHS, this is the first time that a requirement for an approved QMP has been included.

The data QMP to be submitted for approval must address and provide details regarding the following five items, at a minimum:

- Data collection equipment calibration and certification
- Certification process for persons performing manual data collection
- Data quality control measures to be conducted before data collection begins periodically during the data collection program
- Data sampling, review and checking processes
- Error resolution procedures and data acceptance criteria

A long-standing question surrounding pavement ride, rutting, and distress data is focused on the integrity of the data. Network-level pavement condition data is utilized in a variety of short-term and long-term decision-making processes, from recommending treatments for the development of a current year maintenance plan to predicting future condition and remaining life, and meeting federal budgeting and reporting requirements. The quality of condition data collected for a pavement management system (PMS) may have direct and indirect effects on most of an agency's pavement management decisions. As most state agencies have well-established PMS, and years of regional and agency-specific expertise formalized into their decision-making systems,

(continued on page 27)

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Control site calibration measurements on State Route 14 south of Santa Fe, NM, conducted by QES staff members

National Pavement Performance Measures and Associated Data Quality

(continued from page 25)

it is important that efforts are made to preserve and bring forward that historical data and knowledge. To that end, information about how the various data collected, indices and other metrics stored in the pavement management databases and new technologies and contracts recently brought into use for data collection relate across state agencies. Quality Engineering Solutions, Inc., (QES) has developed a process to aid agencies in the development of the QMP. This process is technically based on the concept that the data quality must support the planned uses of the data. So long as the resulting recommendations are not adversely affected by variation in the data, the variation is acceptable. For the network-level application of pavement management data, it is important that the network-level recommendations not be affected by variation in the distress data. If the network-level recommendations for pavement treatment or MAP-21 reporting are not changed by the data, the data quality is at an acceptable level for this type of application.

This approach is unique compared with numerous efforts to assess individual ride, rutting and distress uniformity. This approach accommodates normal variation found in pavement performance data for many reasons, including the effect of change in crack appearance and size with temperature, progression of distress over time, variability among multiple raters, equipment variability and seasonal changes.

This approach has been applied to several agency datasets since 2000, and has proven to produce effective results in pavement management systems. The impact of the QMP will provide the means for advancing the usefulness of pavement management systems throughout the United States in an application for universal comparison to fulfill the requirement established by MAP-21. The consequence of elevating the effectiveness of PMS will result in improved cost effectiveness of state and municipal PMS systems, and the associated pavement rehabilitation and maintenance programs.

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Roadway Asset Management

Adding Efficiencies to Forecasting, Budgeting, Scheduling and Managing Roadway Projects

by Dominic Passanita, PE, Stahl Sheaffer Project Manager,
ASHE Williamsport Section

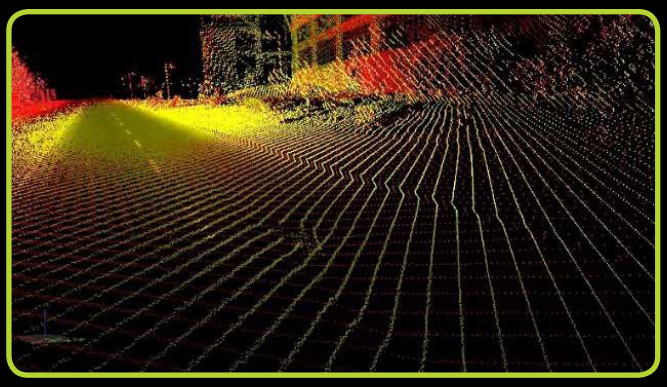
A proactive roadway pavement maintenance and rehabilitation plan to save money, compared to a reactive strategy, was developed by Stahl Sheaffer Engineering for Penn State. The plan included:

- Analyzing surface conditions more efficiently
- Prioritizing maintenance and repair projects to maximize expenditures and resources
- Reducing the risk of total roadway failure
- Providing a more objective way to select and implement projects

This solution provides the data for a comprehensive roadway asset inventory and a 20-year roadway maintenance prioritization tool. The project involved the following critical steps:

Roadway Identification and Condition Assessment

Stahl Sheaffer created a Linear Referencing System (LRS), like Pennsylvania Department of Transportation's Segment/Offset system, with a unique identifier for each road that contains location plus information about the roadway's importance to the university's network and mission.

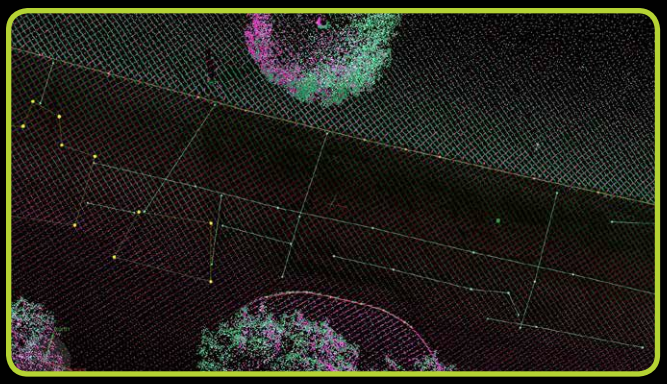


To assess conditions, Stahl Sheaffer conducted a 3D LiDAR scan of the 100 miles of roads on Penn State's main campus of University Park, in State College, PA, using a vehicle-mounted 360-degree camera and a dual laser scanner that collects 72,000 survey points/second. The resultant point cloud data illustrates all surfaces captured in the scan. From the scan data and 360-degree imagery, technicians at work stations extracted features and attributes for roadway distresses, sidewalks, curbs, signage, sight distance, trees, etc., and exported them as geodatabase entries and/or shapefiles. The roadway distress data was analyzed to determine Pavement Condition Index (PCI) for each roadway segment as outlined in ASTM D6434-09 *Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys*. The condition was based on the type (cracks, ruts, potholes, etc.), severity and area of the defects. Extracting data in the office allowed the project to be completed in significantly less time than conducting and documenting evaluations in the field, with reduced opportunity for error and enhanced safety for inspectors, and provided additional opportunity for Quality Assurance/Quality Control.

Because the data is electronic and georeferenced, it is linked to roadway segment(s) through the LRS and can be easily archived, filtered, queried and reported. *Example: A user could run a filter to determine which roadways have potholes to generate a work order and a map for a crew performing manual patching.*

Criticality and Prioritization

Criticality uses prioritization factors to rank the importance of assets and maintenance. Individual prioritization factors were devised to fit within the university's current asset management software. Each factor was then given a weight within the prioritization matrix to determine a numeric ranking, or criticality, for each roadway segment. Combined with the roadway's current condition, a final roadway



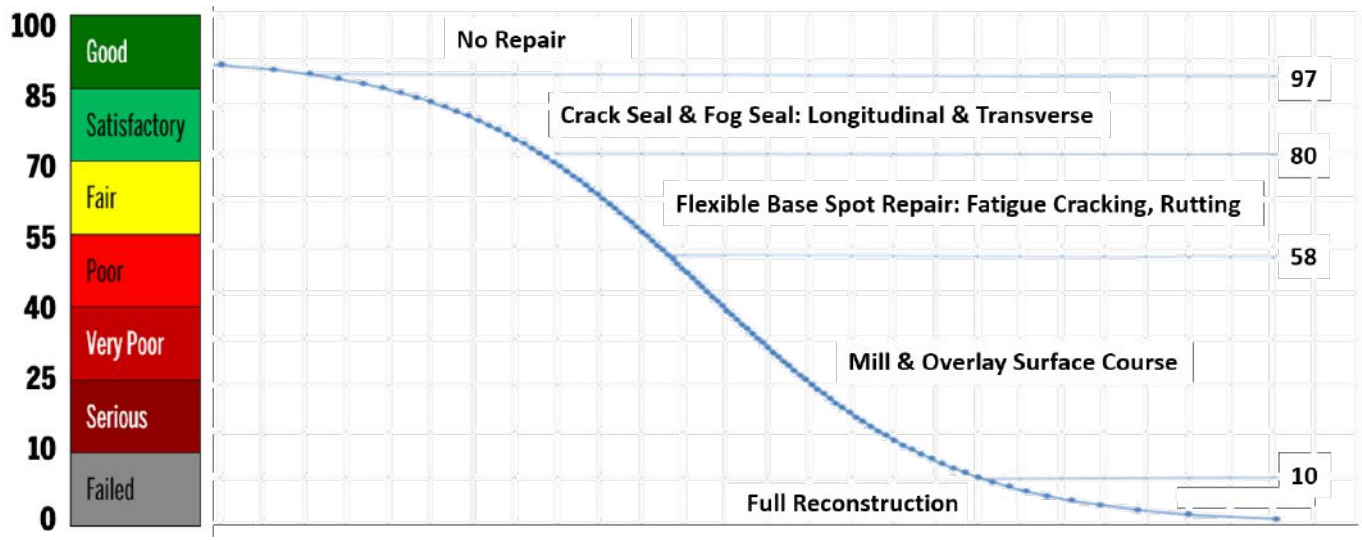


Figure 1. Paved Roadway Maintenance Condition Deterioration Curve and Repair Triggers

maintenance prioritization schedule was established. The goal of combining these factors is to focus resources on more valuable and critical projects. *Example: A crack seal and sealcoat project on a heavily traveled road in the heart of campus is prioritized over full-depth reconstruction of a highly deteriorated service road on the outskirts. Funding a project to slow deterioration of the more valuable feature benefits the budget long-term and satisfies the aesthetic threshold for highly visible corridors within the campus.*

Prediction of Maintenance Expenses

Maintenance expenses are the costs incurred over time to keep an asset functioning at a desired service level. As roadway assets deteriorate, the modality of maintenance changes. When roadway assets are newer, relatively inexpensive preventive maintenance is anticipated due to slow deterioration. As the roadway ages, costlier isolated repairs are expected until an overall rehabilitation of the surface is completed. Deferring preventive maintenance and performing isolated repairs result in higher costs due to the need to perform overall rehabilitation earlier in the service life. Failure to perform any maintenance is likely to result in expensive total reconstruction due to roadway failure.

To predict maintenance expenses, a curve modeling the expected deterioration rate of the roadway is used (Figure 1). The expected roadway distress type and quantity can be applied to the curve at the corresponding expected PCI, creating a trigger that assigns a specific repair modalty and applies the associated cost. Completing the prescribed maintenance results in an increase to the PCI. An isolated repair still counts as a distress, so that the PCI is only returned to 100 after an overall rehabilitation is performed, and then the process begins again.

Development of Maintenance Prioritization and Budget

Budgets can be developed based on funding availability or can be calculated based on the need to maintain assets at a certain PCI/service level. The latter methodology has the greatest potential to optimize spending. The goal of combining condition, criticality, maintenance expense and budget is to focus funds on more valuable maintenance projects, which typically means that in an environment where budgets are limited, more critical assets are maintained before less critical assets are rehabilitated (a "worst first" maintenance strategy).

Stahl Sheaffer created a Maintenance and Repair Prioritization Tool that provides the expected maintenance schedule for each roadway and the associated cost for the next 20 years based on:

- Current condition of the roadways
- Roadway deterioration model
- Roadway prioritization criteria based on criticality
- Standard maintenance and repair options, and their cost
- Yearly budget input (minimal trial and error budget input can allow user to determine the optimal budget for a desired service life of the network)

(continued on page 31)

Road	2017 PCI	2017 Repair	2017 Cost	2018 PCI	2018 Repair	2018 Cost	2019 PCI	2019 Repair	2019 Cost	2020 PCI	2020 Repair	2020 Cost	2021 PCI	2021 Repair
Road A	99	No Repair	$ -	90	No Repair	$ -	90	Crack Seal & Fog Seal	$ 6,154.00	90	No Repair	$ -	90	No Repair
Road B	66	No Repair	$ -	96	Mill & Overlay Surface Course	$ 214,992.33	99	No Repair	$ -	99	No Repair	$ -	95	Crack Seal & Fog Seal
Road C	91	No Repair	$ -	87	Crack Seal & Fog Seal	$ 11,702.77	94	No Repair	$ -	91	No Repair	$ -	87	Crack Seal & Fog Seal
Road D	74	Flexible Base Repair	$ 18,915.92	90	No Repair	$ -	86	Crack Seal & Fog Seal	$ 8,621.81	82	No Repair	$ -	76	No Repair
Road E	79	Flexible Base Repair	$ 6,881.47	92	No Repair	$	88	Crack Seal & Fog Seal	$ 5,605.12	87	No Repair	$	82	No Repair
Road F	83	Crack Seal & Fog Seal	$ 3,000.70	91	No Repair	$ -	87	No Repair	$ -	82	Crack Seal & Fog Seal	$ 4,042.66	82	No Repair
Road G	79	Flexible Base Repair	$ 2,950.60	92	No Repair	$ -	88	Crack Seal & Fog Seal	$ 2,601.82	87	No Repair	$ -	82	No Repair
Road H	99	No Repair	$ -	96	No Repair	$ -	96	Crack Seal & Fog Seal	$ 2,515.21	96	No Repair	$ -	96	No Repair
Road I	99	No Repair	$ -	98	No Repair	$ -	96	Crack Seal & Fog Seal	$ 2,414.84	98	No Repair	$ -	95	No Repair
Road J	82	Crack Seal & Fog Seal	$ 2,177.60	88	No Repair	$	83	No Repair	$	77	Flexible Base Repair	$ 8,201.29	78	No Repair
Road K	51	Mill & Overlay Surface Course	$ 19,974.75	99	No Repair	$ -	90	No Repair	$ -	90	Crack Seal & Fog Seal	$ 2,200.40	90	No Repair
Road L	74	Flexible Base Repair	$ 4,956.70	90	No Repair	$ -	86	Crack Seal & Fog Seal	$ 2,263.81	82	No Repair	$ -	76	No Repair
Road M	99	No Repair	$ -	98	No Repair	$ -	96	Crack Seal & Fog Seal	$ 1,051.60	98	No Repair	$ -	96	No Repair
Road N	99	No Repair	$ -	98	No Repair	$ -	96	Crack Seal & Fog Seal	$ 951.88	98	No Repair	$ -	95	No Repair
Road O	50	Mill & Overlay Surface Course	$ 25,873.88	99	No Repair	$	98	No Repair	$	96	Crack Seal & Fog Seal	$ 1,170.00	98	No Repair
Road P	67	Flexible Base Repair	$ 6,027.67	93	No Repair	$ -	77	Crack Seal & Fog Seal	$ 1,091.73	70	No Repair	$ -	62	No Repair
Road Q	34	No Repair	$ -	26	No Repair	$ -	19	Mill & Overlay Surface Course	$ 184,420.02	99	No Repair	$ -	98	No Repair
Road R	73	Flexible Base Repair	$ 6,522.80	90	No Repair	$ -	86	No Repair	$ -	81	Crack Seal & Fog Seal	$ 3,204.69	79	No Repair
Road S	99	No Repair	$ -	98	No Repair	$ -	96	No Repair	$ -	94	Crack Seal & Fog Seal	$ 4,133.66	98	No Repair
Road T	98	No Repair	$	96	Crack Seal & Fog Seal	$ 22,077.41	98	No Repair	$	96	No Repair	$	94	Crack Seal & Fog Seal

Figure 2. Maintenance and Repair Prioritization Tool with Sample Repair Schedule, Costs and PCI

Figure 2 shows how repair options affect costs and PCI ratings from year to year.

The interactive tool is designed to adjust repair recommendations and costs over a 20-year period as updated PCI conditions, repairs and/or budget numbers are entered. Prescribed maintenance and repair options can be changed as necessary to level resources. The tool automatically recalculates the scheduling, repair options and costs—allowing staff to see at what point the cost of deferred maintenance becomes a capital request as roads deteriorate to the point where reconstruction is necessary versus crack seal or other maintenance approaches.

An example comparing regular with deferred maintenance shows that a road that is left untouched until total failure (**Figure 3**) would have an anticipated 20-year maintenance cost (shown in red) of $1.5 million, while a road with regular maintenance has a significantly different deterioration track and will simply need to be milled and overlaid in 2035 (**Figure 4**).

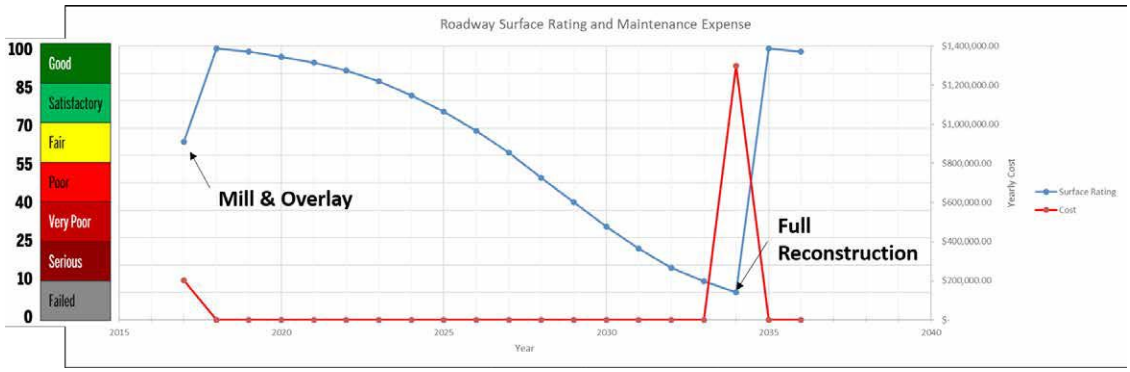


Figure 3. Sample 20-Year Roadway Repair Cost with No Maintenance: $1,501,600

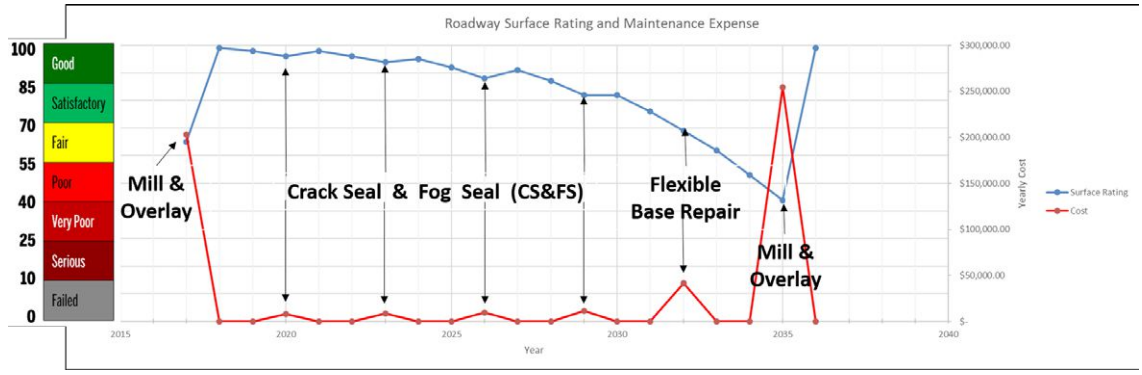


Figure 4. Sample 20-Year Roadway Repair Cost with Regular Maintenance: $536,560

A method of regular maintenance for this roadway example results in a savings of approximately $1 million over time.

The tool also facilitates campus collaboration and coordination, allowing roadway maintenance to be considered when planning for other construction projects.

Sawmill Parkway Extension Project: Connecting an Expanding County

by Jeff Griffin, PE, Burgess & Niple, ASHE Central Ohio Section

The Sawmill Parkway Extension is a four-lane divided roadway with a multi-use path along the entire four-and-one-half-mile length. The roadway is in Delaware County, Ohio.

Delaware County, the fastest-growing county in Ohio, now has a new direct connection to the Columbus metro area following the completion of the Sawmill Parkway Extension Project in November 2016. The new Delaware County road reduces commute times and congestion and opens access to 1,600 acres of land for development. With a portion of the project located within city limits, the city of Delaware officials call the four-and-one-half-mile roadway extension, ". . . Delaware's most significant transportation project for the last 30 years."

The four-lane divided roadway is the largest transportation project constructed by the Delaware County Engineer's office and includes five roundabouts and a multi-use path along the entire length. It was completed on schedule for $43.2 million, $8 million under the budgeted amount of $51.2 million. Delaware County Chief Deputy Engineer Robert M. Riley, PE, PS, noted, "The fact that this project was constructed at a price that was below what we had budgeted allowed our office to fund other projects in the county more quickly than they would have otherwise been." Burgess & Niple (B&N) provided planning, design, preliminary engineering, environmental services and public involvement assistance.

A Direct Route That Drives Development

The extension of Sawmill Parkway provides several benefits to the rapidly growing Delaware community, including:

Reduced Congestion: The population of Delaware County (196,463) has almost doubled over the last 15 years. The new roadway removes traffic from local roads with less capacity, easing the stress on the system. According to estimates from the Mid-Ohio Regional Planning Commission, by 2030 the traffic on one of the county's two-lane roads is projected to drop from 23,700 vehicles per day to 6,400 vehicles per day with the new road in place. About 26,000 vehicles per day are expected to use the Sawmill Parkway Extension by 2030.

Improved Travel Times: The Sawmill Parkway Extension provides a direct route that reduces commute times to interstates and the Columbus metro area. Roundabouts allow traffic to flow continuously, compared to intersections controlled by a traffic signal or stop signs.

Connecting the Community: A new multi-use path provides better connections for all travelers, including cyclists and pedestrians. The path helps to encourage alternate modes of travel and connects to nearby schools.

Driving Development: The Sawmill Parkway Extension improves access to 1,600 acres of land for development, increasing job opportunities. According to Delaware County officials, new facilities were constructed in response to the commitment to build the new road, and there has been increased interest in development along Sawmill Parkway since the project's completion.

Public Input Guides Design Decisions

To design and build a new road in a rural corridor, the county recognized the importance of public outreach early on and throughout all phases of the project. Public and stakeholder involvement included:

- Establishing and regularly meeting with an Advisory Council that included the project team and local government officials
- Stakeholder involvement during planning and design with members, including the Advisory Council, residents and representatives from businesses, schools and the Ohio Department of Transportation
- A series of six public meetings—five during planning and one during the design phase

(continued on page 35)

Houston Charters 43rd ASHE Section

ASHE's 43rd Section was chartered in Houston, TX, on February 13, with about 35 members, including its officers and directors. The chartering meeting featured Montgomery County Judge Craig Doyal as guest speaker. Also attending were ASHE National President Greg Dutton, ASHE National First Vice-President Richard Cochrane and National New Section Committee Co-chair Sam Mody. Held at the Hess Club in Houston, the event also featured an hors d'oeuvre buffet.

ASHE National First Vice-President Cochrane and Section Treasurer Alena Mikhaylova.

Section President Ahmed Valdez signs the Charter.

ASHE National President Greg Dutton and Section First Vice-President Inas Aweidah

Secretary Alena Mikhaylova signs the Charter.

Section President Ahmed Valdez addresses the group.

Judge Doyal, guest speaker, addresses the group.

Officers and directors are installed.

It's official—the Houston Section is the 43rd ASHE Section to be chartered.

The new road in Delaware County, OH, reduces commute times and opens up access to 1,600 acres of land for development.

Sawmill Parkway Extension Project

(continued from page 32)

While government officials supported the project, many residents were initially skeptical of the need for a new road. Public meetings helped to demonstrate the benefits and gave residents the opportunity to provide input on four possible corridor alternatives. The public influenced the final roadway alignment and requested the addition of roundabouts, a multi-use path and aesthetic enhancements along the parkway—all features included in the final project.

The public outreach also included the right-of-way acquisition associated with extending Sawmill Parkway. This was one of the more complex and time-consuming aspects of the project that extended over four years. Of the four road options, the final alignment chosen impacted the least amount of structures—three total (two homes and one barn)—and required the purchase of 135 acres.

Transportation Firsts for the County

In 2004, when the Sawmill Parkway Extension was in the early planning stage, there were not any roundabouts in Delaware County and only two open in the central Ohio region. During public meetings, residents asked the project team to consider using roundabouts at the five intersections along the corridor instead of signalized or stop-controlled intersections. Engineering analysis determined that roundabouts were a viable option. The new road's five roundabouts were designed to accommodate both everyday traffic and large equipment used by the commercial trucking and agricultural industries.

In addition to improving traffic flow, roundabouts have sustainable features that reduce impact on the environment. Fewer vehicles idling at intersections reduces air pollution from cars, electricity isn't needed to power traffic signals and signal maintenance is no longer required. Based on public input, lighting along the new road was limited to only near the roundabouts to minimize light spill to the nearby residential and farm properties.

Storm water management on transportation projects was another new concept when the Sawmill Parkway design process started. The project team was at the forefront of determining how to make retention ponds work on a large-scale road project. B&N and Delaware County were the first to tackle the design challenges and incorporate the ponds into a project of this magnitude and complexity.

Partnering to Connect a Growing County

The benefits of the new Sawmill Parkway Extension include:

- Residents can travel faster to points of interest around Columbus.
- Cars are removed from smaller, two-lane roads that were not designed to handle the rapid growth of the county.
- Access is open to more than 1,600 acres of land that is ready for new businesses and more job opportunities

This vital connection will serve residents, visitors and businesses for many years to come.

A total of five roundabouts along the Sawmill Parkway Extension in Delaware County, OH, helps traffic flow continuously.

ASHE
c/o TNT Graphics
207 E. Pine Grove Road
Pine Grove Mills, PA 16868-0344

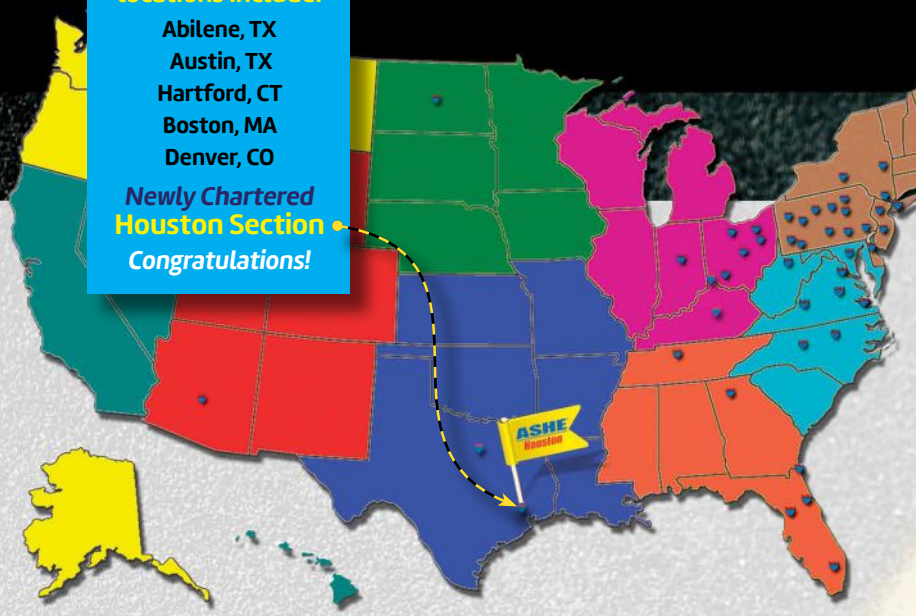
Change Service Requested

ASHE Membership

Emerging Section locations include:

Abilene, TX
Austin, TX
Hartford, CT
Boston, MA
Denver, CO

Newly Chartered
Houston Section
Congratulations!



Northeast Region

Albany	107
Altoona	213
Central New York	49
Clearfield	187
Delaware Valley	357
East Penn	113
First State	153
Franklin	133
Harrisburg	344
Long Island	63
Mid-Allegheny	135
New York Metro	168
North Central New Jersey	140
Northeast Penn	128
Pittsburgh	558
Southern New Jersey	88
Southwest Penn	276
Williamsport	131
Subtotal	**3,343**

Mid-Atlantic Region

Blue Ridge	78
Carolina Piedmont	62
Carolina Triangle	248
Chesapeake	291
Greater Hampton Roads	105
N. Central West Virginia	37
Old Dominion	93
Potomac	229
Subtotal	**1,139**

Southeast Region

Central Florida	48
Georgia	326
South Florida	11
Middle Tennessee	319
Northeast Florida	193
Tampa Bay	90
Subtotal	**987**

Great Lakes Region

Bluegrass	57
Central Ohio	181
Cuyahoga Valley	116
Derby City	83
Lake Erie	163
Northwest Ohio	44
Triko Valley	178
Subtotal	**822**

North Central Region

Central Dacotah	123
Subtotal	**123**

Rocky Mountain Region

Phoenix Sonoran	172
Subtotal	**172**

South Central Region

Dallas-Fort Worth	80
Houston	35
Subtotal	**115**

At-Large Memberships

Domestic At-Large	13
International At-Large	2
Subtotal	**15**

National Total	**6,720**
Professional Status	58%
Government	12%
Consultant	76%
Contractor	5%
Other	7%

Want to join and don't see a Section near you? Become an At-Large Member or visit our website to see how to start a new Section. www.ashe.pro