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See page 44

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NEW DIRECTIONS

I hope you all had a wonderful holiday season and got to spend a lot of quality time with your friends and family. It's always good to have a little downtime from work to rest up and reset for the opportunities and challenges of the coming year. I can't wait to see what 2024 has in store for ASHE. After spending the holidays with our family in Ohio, we are happy to be back in the warmth of Florida!

The fall was a whirlwind of activity on the ASHE front. In September, the Board held the quarterly meeting in Pittsburgh. Some of the bigger challenges we face as a volunteer organization are on the technology side, including such issues as the websites, cloud platforms, databases and social media accounts. We spent the Friday afternoon of the meeting in a workshop discussing these issues, and several initiatives are underway to help us better serve members, Sections and Regions. Watch for more information in the coming months. We also enjoyed dinner with members from the Pittsburgh Section's Board.

During the Saturday morning Board meeting, we heard reports from the Officers, Region representatives and Committee Chairs. Much work is being done by all, and membership has risen almost five percent since this time last year. The New Sections Committee, chaired by Brian O'Connor and Kathryn Fink, is engaging with several potential new Sections, including Denver and Kansas City. Dave Greenwood and Jim Shea, along with their committees, are working with the Regions to help them most effectively use additional funding they received from the National Board this past year. Under the leadership of Amanda Schumacher, the Public Relations Committee continues to provide updated promotional material to the committees, Sections and Regions while maintaining a presence on social media. The National Conference Committee, under the guidance of Nikki Parris, is working to maintain the quality of the Conferences. The Carolina Triangle Section is on track to host the National Conference June 5 to 9, 2024, in Raleigh. The 2024 Conference Chairs Drew Joyner and Terry Snow and their committee promises a great program planned, and I encourage you to attend. These are just a few examples of work being done by ASHE's volunteer leaders.

We have new leadership for scanner. After serving as Committee Chair for several years, Anis Shaikh has chosen to focus on the 2026 National Conference to be hosted by the Potomac Section. Thanks to Anis for his great work leading the scanner Committee. We welcome the new Chair, Rhonda Cordone, and look forward to continuing the high-quality publication to which we have become accustomed.

Also, after being the first and only Chair of the National Project of the Year Committee, Joe Rikk has stepped down to focus on his family. Joe and his committee built this program that garners much attention for ASHE and members. Taking Joe's place will be Dan Laird, Past President of the Pittsburgh Section, who will continue this work.

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From scanner's Chair

Look forward to hearing from each Section about what is going on in your area. Articles are the primary content for this magazine. However, MileMarkers and As the Wheel Turns give us a sneak peek into activities in your Section and what is new with individual members. As a national magazine, scanner is a unique publication, providing valuable information on what transportation projects are undergoing completion throughout the U.S. The Architecture/Engineering/Construction industry forms a portion of our nation's total economic product and plays a role in building and strengthening our communities. Transportation is the result of our society's expectations for accessibility and mobility. New developments, unique and rehabilitation projects, innovation, government policies and funding information are important to hear about. We encourage all Sections to participate. If you have information that you would like included, send it to your Section Leadership, and they will pass it along to the Scanner Committee. Do not miss your chance. We will be adding new features as the year progresses. Keep an eye out and be a part! If you have questions or would like to talk, you can contact me at rcardone@dewberry.com or 646-434-2826.



Rhonda Cardone
scanner Chairwoman
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NEW DIRECTIONS

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I've had several opportunities to meet with ASHE Sections over the past few months. In September, I traveled to Phoenix to meet with the Phoenix Sonoran Section's Board of Directors and speak at the annual state American Society of Highway Engineers/ American Society of Civil Engineers Conference. In October, I met with the Great Lakes Region Board and then spoke at the Central Ohio Section meeting during the Ohio Transportation Engineering Conference. Baltimore was the site of my visit to the Chesapeake Section Technical Meeting and 35th anniversary celebration in November. Additionally, there are other possible visits under discussion as I write this column. These Section visits are one of the highlights of serving as ASHE President!

If you are in one of the northern Sections, stay warm and look forward to getting your projects under construction in the spring. Likewise, if you are in the South, enjoy the sunshine and the (slightly) cooler temperatures. Be safe and continue telling the great story that is ASHE. 🇺🇸

Rounding Out an Avenue for Better Safety and Traffic Flow



Looking south, new SR 3016 Scalp Avenue and SR 756 Belmont Street roundabout. Existing SR 3016 bridge over SR 756 was removed and SR 3016 roadway profile lowered; profile of SR 756 roadway was raised to create at-grade roundabout.

by Matthew E. Thomas, PE, Project Manager, PRIME AE Group, Inc., and Jessica L. Urbas, PE, Project Manager, Pennsylvania Department of Transportation, **ASHE Altoona Section**



Traffic was maintained through the project site, bypassing roundabout location. This allowed bridge removal (in background) and major grade adjustments along the routes leading into roundabout.

To increase safety and efficient travel on Scalp Avenue in Geistown, PA, the Pennsylvania Department of Transportation (PennDOT) replaced an existing cloverleaf interchange with a single-lane roundabout.

Chosen to lead design for the project in District 9-0, PRIME AE Group's team also led a public involvement effort to secure support for the roundabout. Part of the project involved a Road Diet, in which two miles of approach roadways transitioned from four-lane to three-lane configurations to enhance traffic flow. Over a mile of new sidewalks and 32 curb ramps, compliant with the Americans with Disabilities Act, were added. LED roundabout street lighting improved visibility and safety.

Transit options also increased, with relocation of three bus stops and installation of two new bus pull-offs with shelters. By adding widened shoulders and Share the Road signage over a nearly two-mile stretch of roadway, the area became more bicycle-friendly.

Strategic placement of curbing and drive-ways helped control previously unregulated

entry points. Resurfacing efforts, involving milling and overlaying, spanned one-and-one-half miles of roadway.

Busy signalized intersections received upgrades and retiming for improved traffic flow and safety. Drainage improvements, including over 4,000 feet of pipe and 68 inlets, ensured better stormwater management. Environmental considerations were addressed with the realignment of an existing stream and the extension of a concrete box culvert.

The project also involved relocating over 4,000 feet of underground water, sewer and gas lines, along with the repositioning of 37 overhead utility poles. To minimize transportation disruptions, a traffic control strategy encompassed six complex stages, using temporary signalized intersections, roadways and short-term detours.

With completion of the project, the new roundabout on Scalp Avenue in Geistown provided more safety, better traffic flow and upgraded accessibility for the community. 🇺🇸

(more photos on page 8)

Plan view of the existing cloverleaf interchange converted into a single lane roundabout. Graphic colors coincide with the following improvements:

- Yellow:** Travel lane full-depth pavement construction
- Orange:** Shoulder full-depth pavement construction
- Light Blue:** Roadway milling and pavement construction
- Maroon:** Concrete truck apron, splitter islands, curbing
- Red:** Business parking lot full-depth pavement construction
- Dark Blue:** Driveway realignments and adjustments
- Dark Grey:** Concrete sidewalks
- Grey Cross Hatching:** Temporary Road & Existing Cloverleaf Interchange Pavement Removal

Rounding Out an Avenue for Better Safety and Traffic Flow

(continued from page 7)



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Looking southeast, Scalp Avenue bus pull-off with pedestrian shelter. As part of a Road Diet, Scalp Avenue was reconfigured from a four-lane road with no designated left-turn lanes into a three-lane with designated two-way left turn lane.



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Technology Keeps a Weather Eye on North Carolina

Stream gauge on NC 42 over Neuse River in Clayton

by Andrew Barksdale, Communications Officer, North Carolina Department of Transportation, ASHE Carolina Triangle Section

When a major storm sweeps through or a flash flood strikes, the North Carolina Department of Transportation (NCDOT) is better prepared to respond and recover thanks to its flood warning system.

The system is composed of three computer modeling programs that receive such data as rainfall amounts, river forecasts and storm surge predictions. The system also relies on an ever-expanding network of stream gauges to help NCDOT monitor over 2,000 miles of roadway and 15,000 bridges and culverts.

During a storm, the system automatically generates email or text alerts to warn NCDOT maintenance and bridge crews of potential problems. State and local emergency officials can also sign up for the alerts. "This innovative system not only helps keep our infrastructure more resilient against future flooding, but it has the real potential to save lives," said Matt Lauffer, PE, CPM, NCDOT's state hydraulics design engineer. "This helps us know where to deploy our resources in advance of a storm."

During Tropical Storm Idalia, which dumped about nine inches of rain over portions of eastern North Carolina over a short time in August, the system logged 109 alerts. Most of these predicted road inundation from the same excessive rainfall that flooded downtown Whiteville, the seat of Columbus County. NCDOT used the system to prioritize where to monitor flooding. A

total of 81 alerts for bridges and culverts were issued for Columbus County alone, with NCDOT inspecting every one of those sites as a result.

The flood warning system collects data from various local, state and federal agency partners. These include North Carolina Emergency Management (NC Emergency Management), United States Geological Survey, National Weather Service and National Hurricane Center. Other partners are Southeast River Forecast

Center and United States Department of Homeland

Howard Gap Road Bridge in Polk County damaged by flooding June 2023



Security's Coastal Resilience Center of Excellence, directed by University of North Carolina-Chapel Hill.

For several years, NC Emergency Management, a partner with NCDOT, had operated a similar flood warning system, but it was for buildings. "This advance warning system is a testament to the great things that come

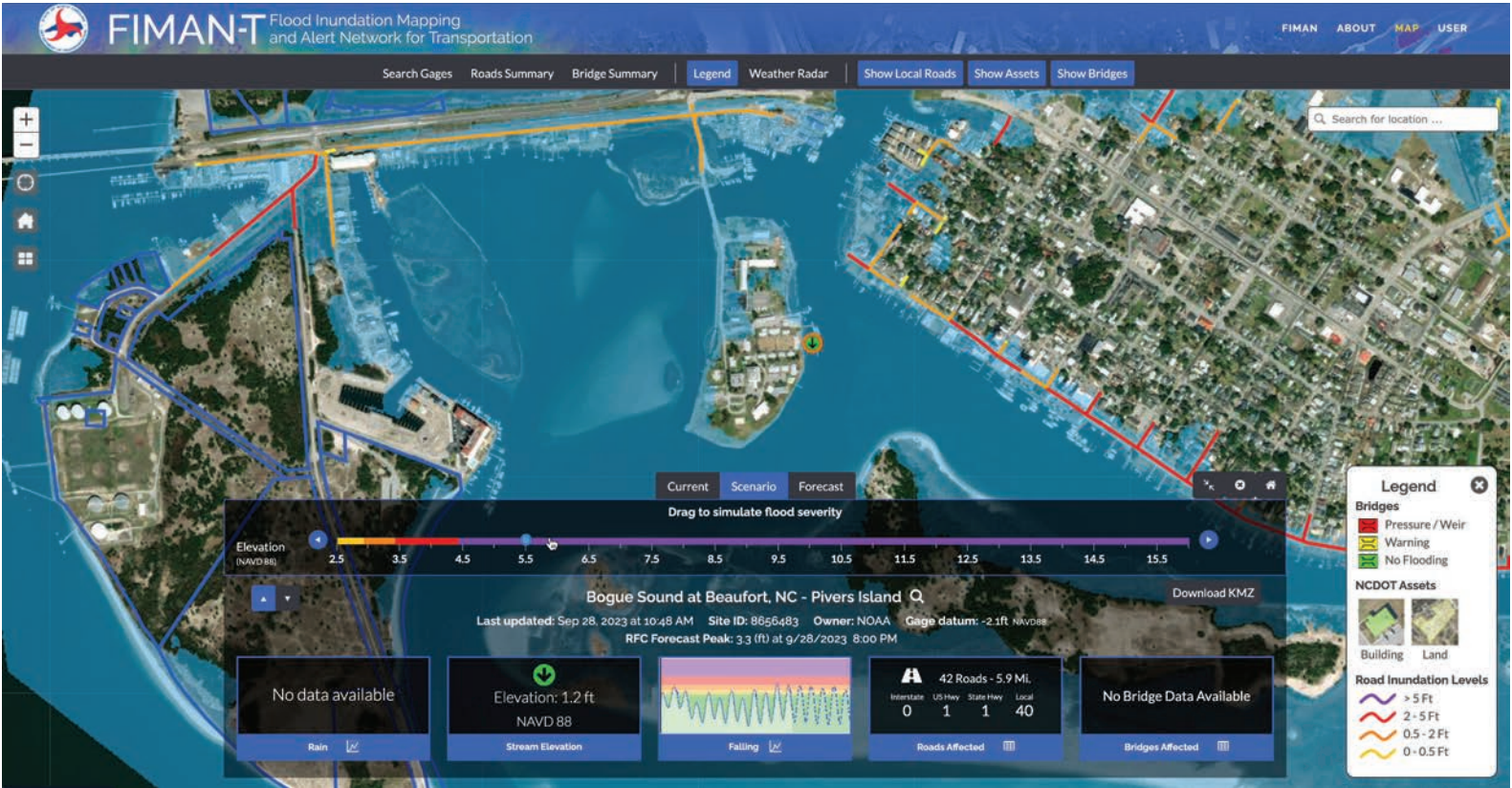
(continued on page 12)

I-95 in Lumberton flooded during Hurricane Florence



Technology Keeps a Weather Eye on North Carolina

(continued from page 11)



A computer screen of one of the three programs comprising NCDOT's flood warning system

when strong partners collaborate,” said William Ray, director of NC Emergency Management. “Together, these systems are helping our agencies quickly respond to storms so we can better protect the public from major flooding events.”

Storms can pop up at any time, not just during the hurricane season. One component of NCDOT’s flood warning system, dubbed BridgeWatch, may generate between 10 and 200 alerts per month. The other two components are the Flood Inundation Mapping and Alert Network for Transportation and the Transportation Surge Analysis Predictive Program. During a heavy rainstorm in the mountains of western North Carolina in June, the system sent an alert to NCDOT’s bridge maintenance office in Polk County. It indicated a problem for one bridge on Howard Gap Road. The alert said, “BridgeWatch rainfall alerts are provisional and indicate a potential for flooding at structure.” NCDOT crews went to the site, inspected it and immediately closed it to traffic. They confirmed that the flooding from the storm had caused a critical foundation failure. The bridge will be replaced.

The flood warning system is used in other ways. It is helping NCDOT predict tidal surges that

may impact such areas as NCDOT’s maintenance yard in New Bern. In September, the system identified predicted flood surge on US 264 in Washington and Belhaven.

After Hurricane Florence in 2018, the North Carolina General Assembly gave NCDOT a \$2 million grant to develop the flood warning system. It was phased in over three years and operational in 2022. Before this system, NCDOT was not able to predict which roads or bridges would flood.

The system initially focused on eastern and southeastern North Carolina and the coast. Those areas are generally the most affected by hurricanes, and highway corridors that people use for storm evacuations. Since then, the department has added 39 stream gauges to its highway network. More are planned to be added in 2024, with six being installed as part of the ongoing widening of I-95 in Lumberton. “This is a new system, and we are trying to optimize it and continue to improve it,” Lauffer said.

In September, the flood warning system garnered national attention when it was named a top-12 finalist for two prizes in the 2023 America’s Transportation Awards competition. 🇺🇸



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Making Pedestrians Safer:

by Brian Hughes, PE, Senior Project Manager, ms consultants,
ASHE Cuyahoga Valley Section

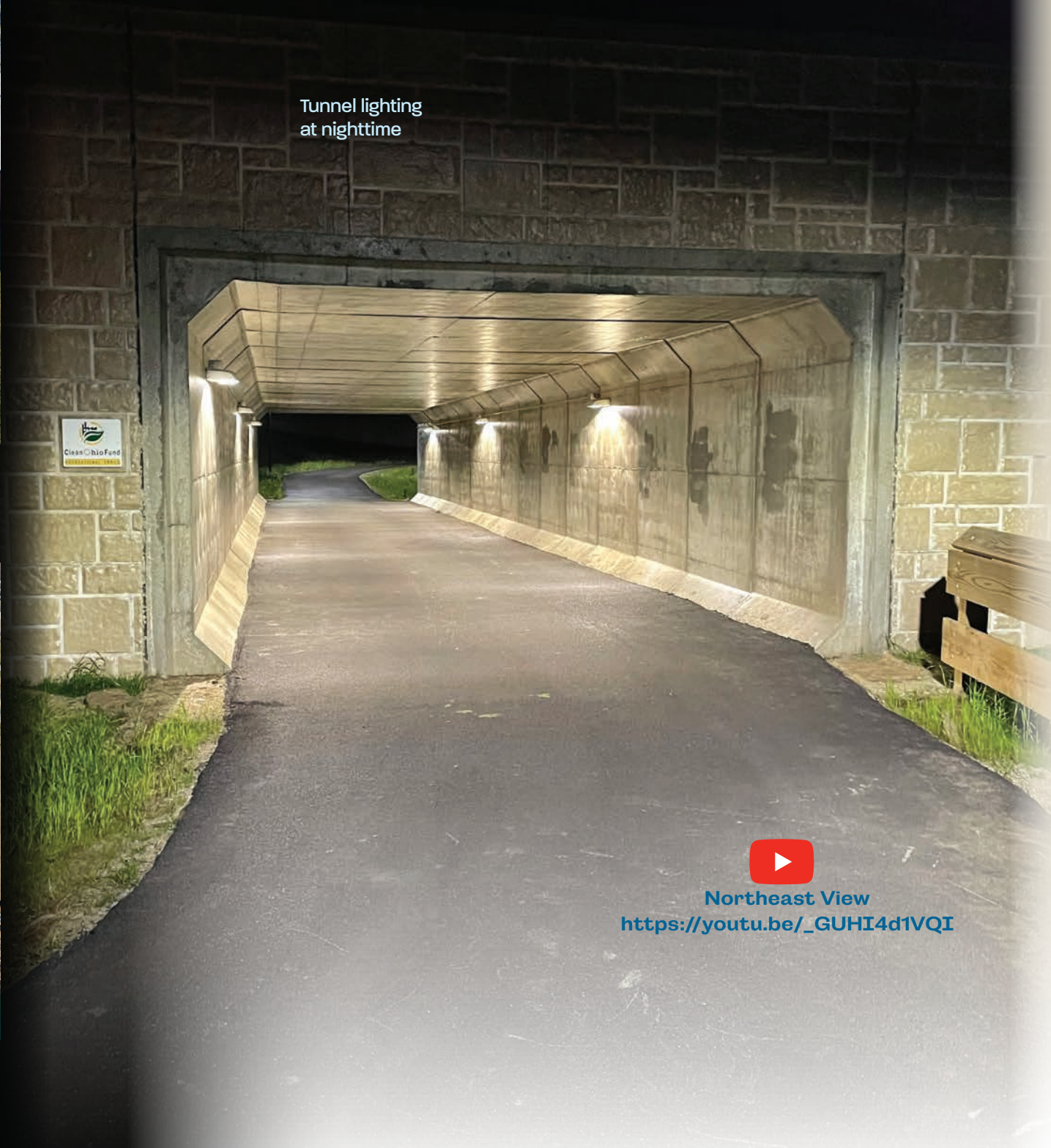
Fulton Drive Multimodal Tunnel



Depressed trail and tunnel, looking northeast



Finished construction, looking southwest



Tunnel lighting
at nighttime



Northeast View
https://youtu.be/_GUHI4d1VQI

In the northeastern Ohio community of Jackson Township, Stark County, approximately 13,000 vehicles travel daily on Fulton Drive NW, near the intersection of Wales Avenue. According to Stark County statistics, this roadway section was ranked in the top 15 for traffic accidents. Students and faculty from Jackson High School, and other pedestrians, had to cross five busy lanes of traffic at the Community Parkway crosswalk. This crossing provided access to a new amphitheater, library and North and South parks. With all of this activity, pedestrian safety was a primary concern. The project to build a multiuse pedestrian tunnel under Fulton Road was envisioned more than 20 years ago. In 2004, a preliminary design was created. However, it stalled due to the complexity of moving utility lines and a lack of funding.

After many failed attempts to acquire funding from various entities, Stark County Park District (Stark Parks) was awarded federal grant monies for the project in 2018. These funds were augmented with local financing contributed by Stark County Park District, Jackson Township and Jackson Local Schools.

Under contract to Stark Parks, ms consultants provided detailed engineering services and prepared construction plans to build the tunnel and adjoining trail connections. This would provide a passageway for pedestrians under Fulton Drive.

The goal of the Fulton Drive Multimodal Tunnel project was to create a safer, direct connection between Jackson High School and South Park on the south side of Fulton Drive. On the north side of Fulton Drive, pedestrians would have safer access to the library, North Park and amphitheater. The project included the following:

- 772-foot-long, 10-foot-wide shared-use path
- 95-foot-long, 16-foot-wide-by-nine-foot-high precast concrete tunnel section
- 153-foot-long soldier pile retaining wall in front of Jackson High School
- Decorative full-height tunnel headwalls/railings and a 137-foot soldier pile retaining wall in front of Jackson High School, each stained to match the library and amphitheater architecture

Relocating Utilities

Several of the high school's overhead utilities transitioned underground within the trail's footprint. These utilities interfered with the project's excavation, making this a challenge for the team. Since the only available space to build the tunnel was in the lawn area in front of the high school, the utility conflict issues required immediate attention. A Level B Subsurface Utility Locating survey was initiated. Utility coordination meetings with multiple owners took place to develop a relocation plan for the following:

- Electric service to the high school
- Aqua Ohio water service, 10-inch
- AT&T phone service
- MCTV cable and fiber communications
- Dominion Energy Ohio gas service, six-inch

(continued on page 18)

Making Pedestrians Safer: Fulton Drive Multimodal Tunnel

(continued from page 17)

South headwall
and tunnel
segments prior
to trail
construction



Southwest View
https://youtu.be/_GUHI4d1VQI



North headwall at start of construction

The team designed the relocation plans by moving the lines out of the construction zone and into a designated gas line easement and utility trench (except water). This progressed through the high school's parking lot and across their building frontage. During construction, the aerial power lines along Fulton Drive also had to be de-energized while the tunnel sections were being installed.

Since the utilities could only be taken out of service while school was not in session, this had to be completed well ahead of the tunnel construction process. The solution was to move the utilities during summer recess as an advance project, a year ahead of the tunnel project. Several utility meetings also had to establish coordination to minimize downtime to the high school's data and control systems.

Ultimately, the waterline owner relocated the facility within the roadway and under the tunnel immediately ahead of construction. On the north side, a 14-inch force main and an eight-inch gravity sewer interfered with the depressed pathway. The construction plans addressed relocation of the sewer and force main.

Designing an ADA-compliant Trail

Designing a trail profile and tunnel section compliant with Americans with Disabilities Act (ADA) regulations were also difficult. The project was constrained by the high school's frontage, parking lots and North Park's pond. To rectify this issue, the team developed trail alignment alternatives, which they presented to the project sponsors to build consensus.

The preferred alternative design met the ADA's five percent profile grade requirements while making important

connections at the south and north termini. Due to the high school's proximity, an extensive soldier-pile retaining wall was selected to minimize vibratory damage.

Aesthetic Design

To blend the tunnel design and the environment, the partners selected concrete-stain finishes to mimic the stone and brick used on the library and amphitheater buildings. From a distance, the color matches the library and amphitheater, unifying the design. Pedestrians exiting the north side of the tunnel have a view of the pond and fountain.

Sustainable Features Safeguard the Environment

The team incorporated post-construction best management practices for stormwater treatment by using vegetated filter strips and vegetated biofilters as safeguard measures to treat water prior to entering the adjacent pond.

A Lowered Risk of Vehicle/Pedestrian Accidents

The multimodal tunnel is open. Students, faculty and other residents no longer have to cross five lanes of traffic to access North Park, the library, the amphitheater or South Park. Using this mode of transportation significantly reduced the risk of a vehicle/pedestrian accident. Eventually, the tunnel will also provide a key link to the Stark Parks' Jackson Connector Trail. 🇺🇸

MileMarkers

News From Across ASHE-Miles



ASHE Pittsburgh Section Presents Projects of the Year Awards

ASHE Pittsburgh Section hosted its annual Past Presidents Banquet in November. Dan Laird received recognition as the group's immediate Past President. Board member Masha Rowley, PE, was also recognized for her contributions to the board and the Section.

The Project of the Year Awards were given in three different categories, honoring the teams of local agencies/owners, consultants and contractors. One award was presented to the Pennsylvania Turnpike Commission and its team of consultants for the US 22 to I-79 Southern Beltway

project. The 13-mile roadway project was divided into nine construction sections, involving multidisciplinary teams of local consultants and subconsultants.

Another major award was given to the Pennsylvania Department of Transportation for the McLaughlin Run Road Roundabout in Upper St. Clair Township, Allegheny County. The project involved reconfiguration of the intersection of SR 3004 (McLaughlin Run Road) and SR 3034 (McMillan/Lesnett Road) into a roundabout to ease traffic congestion at the intersection. See page 32 in scanner, to read about the project.

American Geotechnical and Environmental Services (A.G.E.S.) also received an award. The company served as part of the team for the aforementioned projects: as subconsultant to Mackin Engineering Company for the Southern Beltway and also to Larson Design Group for the McLaughlin Run Road Roundabout. Shown above, K.P. Chopra and Sebastian Lobo-Guerrero, PhD, PE, D.GE, represented A.G.E.S. at the award ceremony.



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A Safer Roadway for a Variety of Travelers

by Stephen Shimko, PE, Project Manager – Transportation, Michael Baker International, ASHE East Penn Section

The seven-mile stretch of SR 222 between Kutztown Bypass and Reading Bypass had heavy truck traffic between Reading and Allentown, PA. This created significant backups at the highway’s three major intersections. Congestion was especially hazardous for local residents, who depended on SR 222 to get practically everywhere. Many people in the area belong to the Mennonite community and cross SR 222 with horse-drawn buggies.

In 2011, the Pennsylvania Department of Transportation (PennDOT) engaged Michael Baker International to provide design services for a highway improvement project that encompassed three miles of the corridor. The goal was to improve intersection operations and minimize overall delay along the busy corridor.

Identifying the Solution

The team led design for the SR 222 Roadway Improvement Project to address existing traffic and safety issues. Their research included gathering input from stakeholders and the public to determine how mobility and safety concerns at two intersections could be alleviated by using roundabouts. The project involved the widening of SR 222 to a five-lane cross section with two 11-foot-wide lanes in each direction with a center turn lane. Ten-foot shoulders were provided to accommodate nonmotorized traffic, including horses, buggies and bicycles.

Multilane roundabouts were constructed at SR 222 and Genesis Drive/Tamarack Boulevard and SR 222 and Schaeffer Road to better accommodate traffic demands. The circulatory lanes of the roundabouts consisted of one to two variable width lanes and a 12-foot truck apron. It also included a mountable curb, concrete island and raised channelized splitter islands on each leg of the roundabout. A concrete curb was placed along the approaches to the roundabout as well as the outside perimeter of the roundabout itself. The lanes were wide enough to accommodate side-by-side trucks, as well as snow removal equipment. The project’s design allowed sufficient room for snowplows within the circulatory portion of the roundabouts.

(continued on page 24)





Due to the location of a historic property and the area’s existing topography, a signalized improvement at a third intersection was completed with turn lanes on the intersection approaches.

Overcoming Complexities

Throughout design and construction, the team had to overcome several challenges. Notably, utility impacts were extensive. Virtually every utility within the corridor had to be relocated to facilitate the construction of the proposed drainage features and roadway geometry. Relocations included major aerial lines, underground communication conduits and gas and water lines. Additionally, the project necessitated the replacement of the entire sanitary sewer system. The team worked with the utilities to determine private status and identify future right-of-way needs.

Horse-drawn buggies typically are not a consideration in highway improvement initiatives, but that feature was a critical concern for the project. To ensure that the local Mennonite community understood the project’s benefits and supported the roadway improvements, a public awareness program highlighted the design. It explained that the roundabouts could safely accommodate their horses and buggies.

The Samuel G. Kaufman House at the intersection of SR 222 and SR 73 was determined to be eligible for listing in the National Register of Historic Places in 1996. To avoid significant impacts to the property, several avoidance measures were successfully incorporated into the preferred alternative to achieve a finding of No Adverse Effect.

The team also worked with a local developer who had indicated plans to

develop a vacant 90-acre parcel adjacent to SR 222. The design included a full four-leg roundabout that provided direct access to this parcel. The final project constructed three legs of this roundabout to accommodate SR 222 and Schaeffer Road. When the vacant parcel is fully developed, the developer can add the fourth leg, and the existing striping can be eradicated to provide direct vehicular access to the parcel.

Due to the importance of SR 222 and the lack of alternate roadways, maintaining traffic would be critical during work on the project. The team used a combination of numerous staged construction patterns along with the use of nighttime construction and restrictions. Not only did this schedule keep traffic flowing, but it also assured that businesses in plazas along the highway would suffer no disruptions.

Realizing the Benefits

The roundabouts opened in June 2022, achieving the most important objective of the project: to reduce traffic issues and travel time on SR 222. Studies have shown that the introduction of roundabouts has reduced travel time on SR 222 by about 25 percent. It is a win for businesses that use the highway for shipping purposes, as well as for local travelers who now can reach their destinations more quickly and more safely. The completed project has not only enhanced intersection operations and reduced delay through the corridor; it also improved pedestrian accessibility.

Now trucks, passenger cars and horse-drawn buggies all travel smoothly on the roundabouts. The team’s deployment of multilane roundabouts has shown how this updated technology can be used effectively to improve roadways.❤️

ANNOUNCING

Scanner Article of the Year AWARD

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TRANSPORTATION SOLUTIONS
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AsTheWheelTurns

ASHE Members on the Move!



Cao received the 2022 Special Recognition Award from ASHE Houston Section. Shown with her are (left) Gabriel Odreman, PE, PMP, Past President, ASHE Houston Section, and Dexter L. McCoy, Fort Bend County Commissioner (Precinct 4).

Cao Joins Johnson, Mirmiran & Thompson

Houston, TX—**Nikole Cao, PE**, has joined Johnson, Mirmiran & Thompson as vice president and leader of the company's Houston office. Cao, **a National Director for ASHE's Southwest Region**, will be responsible for supporting regional business development and participating in the oversight of Texas operations. She has 25 years of experience in roadway engineering, hydraulic design, program management as general engineering consultant, design-build implementation and asset management for infrastructure projects in Houston, across Texas, and neighboring states. Cao has worked with the Texas Department of Transportation, regional toll agencies, numerous counties and city agencies.



ORC Makes Organizational Changes

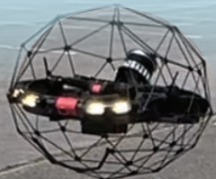
Charlotte, NC—**Steve Toth** has been named Chief Executive Officer (CEO) of the right-of-way provider O.R. Colan Associates (ORC). Toth, **a member of ASHE's Lake Erie Section**, has been with ORC since 1992. Richard McNally, another long-time member of ORC, was promoted to Chief Operating Officer.

After serving as ORC's CEO for 34 years, Catherine Colan Muth will become Chairman of the Board, focusing on governance and long-term planning.

Unmanned Aerial Systems Useful Above and Below a Surface

by Douglas A. Ford, PE, RLS, Region Two Survey Manager, Tennessee Department of Transportation, **ASHE Tennessee Valley Section**

The unmanned aerial systems platform, with lights, camera and LiDAR, descended into the culvert system through a 24-inch-wide area drain. A ground control point panel is at right.



This ELIOS-3 measured about 19 inches wide by 14 inches high, allowing it to fit easily into confined spaces typically challenging or dangerous for humans to enter.

The camera footage and LiDAR data captured this hidden junction where the six-foot-by-six-foot culvert widened to a 10-foot-by-six-foot section. It also captured inverts of drainage system connections near the roof.

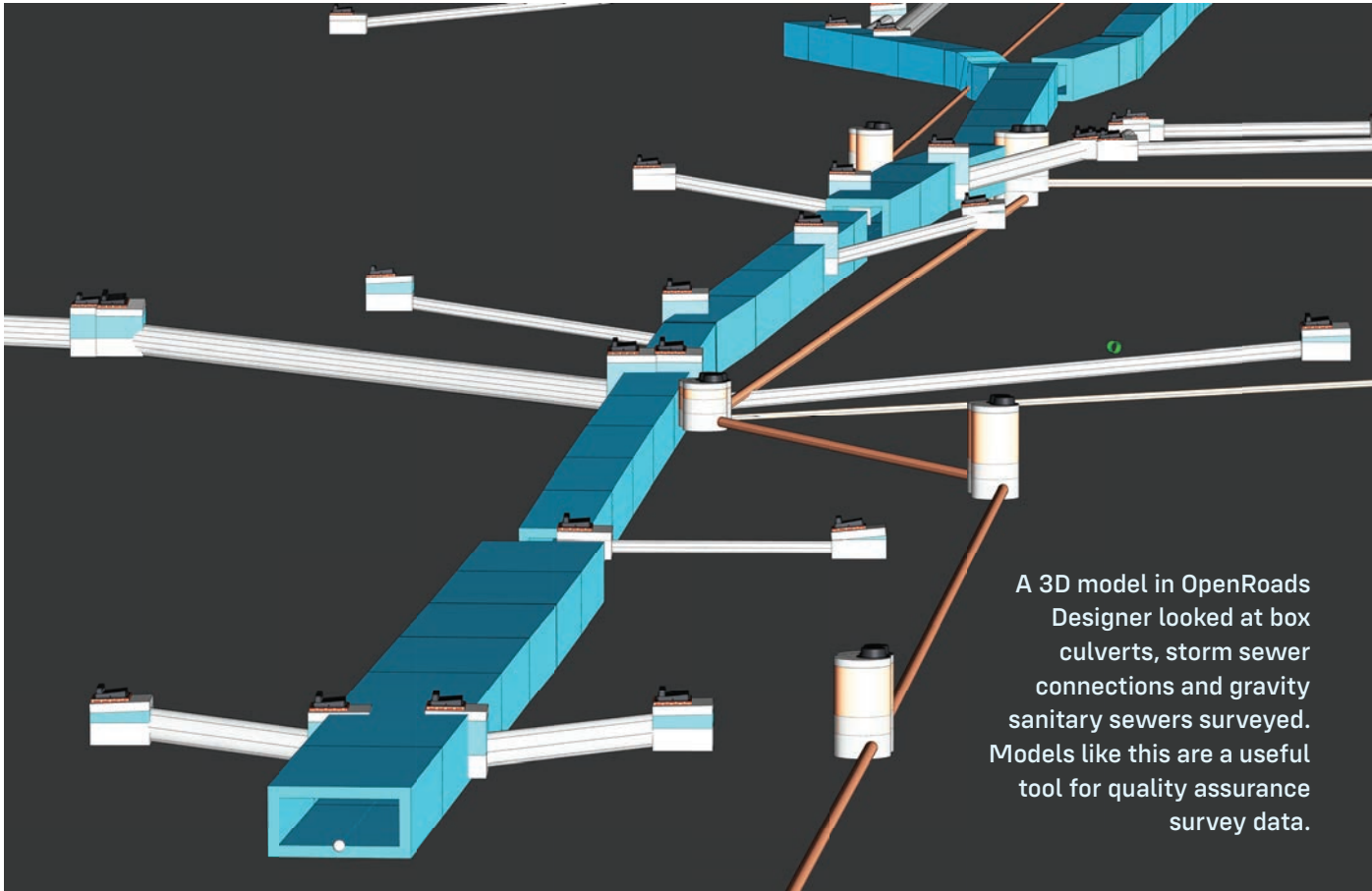
“There is very little oxygen down there, but also an abundance of carbon monoxide.”

The above is not inspiring news to hear when delivering a major route survey with a network of large drainage culverts. It was a problem for RaganSmith, the geospatial/survey project consultant, who required a safe solution to deliver its scope of a detailed drainage system survey. A month prior, Tennessee Department of Transportation (TDOT) partnered with this consultant for specialty reality capture surveys. These used mobile light detection and ranging (LiDAR) surveys for the heavily trafficked roadway and stationary LiDAR scanning inside the box culverts. Widening a four-lane major arterial to a five-lane section

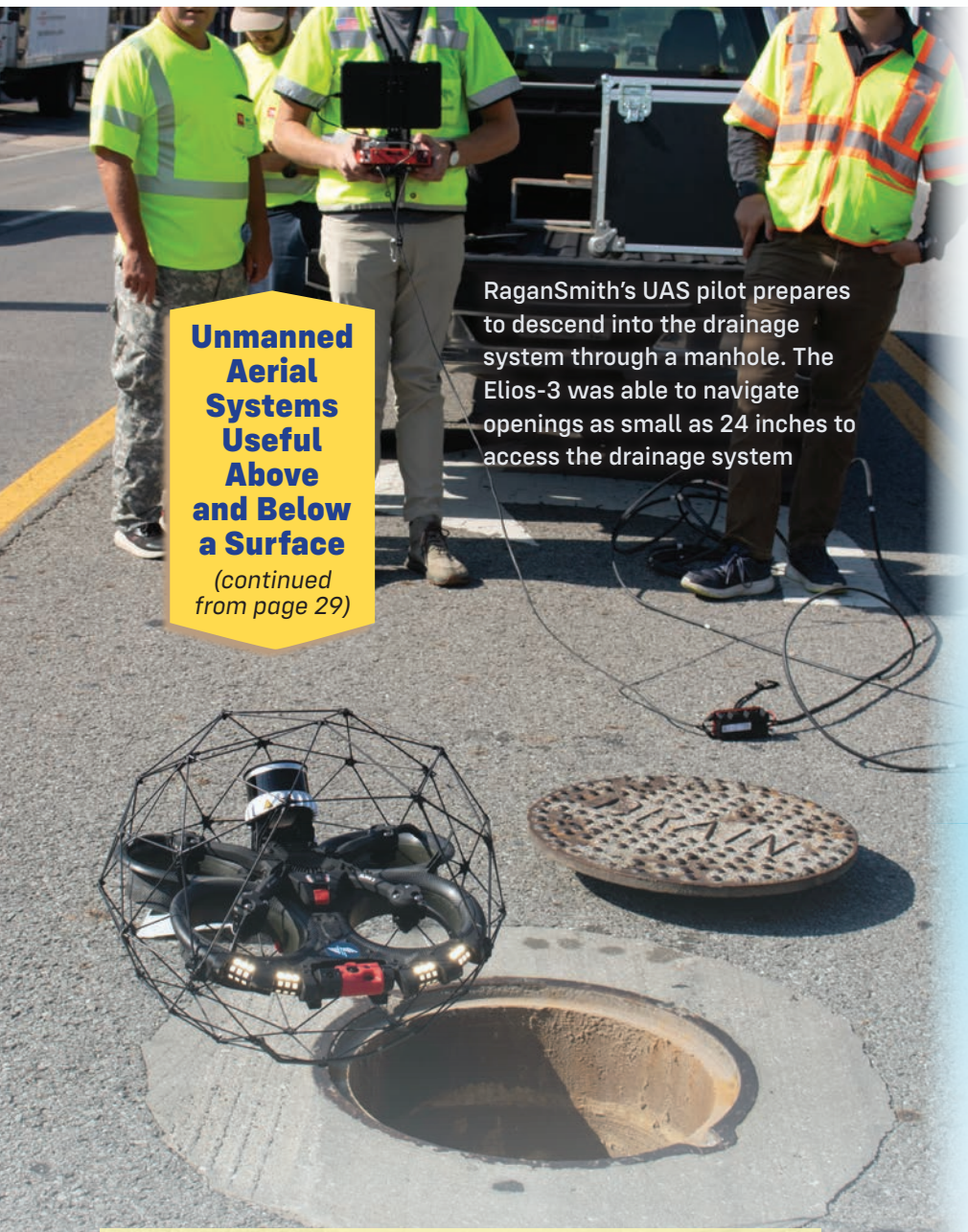
would improve the multimodal transportation corridor connecting commercial areas of Cookeville, TN, to the campus of Tennessee Tech University (Tennessee Tech). A major challenge to the project was that the highway was situated atop 1,200 feet of stormwater culvert running under the traveled way. This system started as a three-foot-by-five-foot stacked rock box. It exited as an 84-inch corrugated metal pipe and included various sections of reinforced concrete box culvert in between. The changes in material, sectional area and connections feeding stormwater to the system required the consultant to use confined-space-trained surveyors to LiDAR scan the system from within. However, heavy traffic and exhaust gases from the road above stopped a human-led

collection in its tracks when they detected the hazardous atmosphere. Forced air ventilation would have added costs for specialty subcontractors and required closure of multiple lanes during Tennessee Tech’s semester and finals week. The consultant researched and pivoted to the use of unmanned aerial systems (UAS) technology to get an accurate delivery without entering the anoxic portions of the drainage system. The UAS platform selected was the ELIOS-3, manufactured by Flyability, a Swiss company. Equipped with the surveyor payload and under the control of trained staff, the ELIOS-3 made short work of the closed drainage system. It mapped 3,000 linear feet of confined space in less than a week of field work. The missions took

(continued on page 30)



A 3D model in OpenRoads Designer looked at box culverts, storm sewer connections and gravity sanitary sewers surveyed. Models like this are a useful tool for quality assurance survey data.



**Unmanned
Aerial
Systems
Useful
Above
and Below
a Surface**
(continued
from page 29)

RaganSmith's UAS pilot prepares to descend into the drainage system through a manhole. The ELIOS-3 was able to navigate openings as small as 24 inches to access the drainage system

Note from the author:

While technology serves to make the inaccessible accessible and lessen project risks, the human risk with entering confined spaces will always be present and severe. Please take away these facts:

1. Asphyxia due to lack of oxygen or toxic atmosphere is the leading cause of death for workers in confined spaces.
2. Asphyxia is also the leading cause of death for those responding to help others who have already become a casualty.

Highway engineers are often in situations where they want to enter or inspect an area not intended for human occupation. Do not act without first understanding the safety protocols of the areas in which a person is to go. Stay safe out there.

place around short duration closures of turning lanes, and traffic impacts were less than 30 minutes during off-peak windows. The equipment was deployed atop the surface and entered the culverts through a utility hole, exiting from the next utility hole available. On the surface, the UAS system mapped the area surrounding the utility hole. This was used to merge the data to the survey of the road surface.

The ELIOS-3, enclosed in its own protective cage, made collisions with the surroundings a nonfactor. This was necessary, as the system had cameras and a precise LiDAR sensor, placing the ELIOS-3 in the category of technological investment and not just a tool.

The edited video footage was distributed to the project's interdisciplinary team of project managers, structural and hydraulic engineers, construction engineers and roadway designers. It gave context to the design decisions that would have typically been made on assumptions from decades-old design plans. The footage revealed trouble spots with deteriorating materials and locations where portland cement grout from prior maintenance was deposited in the culvert, affecting its hydraulic efficiency.

After processing the LiDAR-captured point cloud, the model was processed to export detailed 3D survey data into Bentley OpenRoads Designer software. TDOT surveyors and engineers used the data in a 3D utility model design and subsurface utility engineering of the urban widening project. RaganSmith and TDOT crafted a solution to eliminate design risk arising from unknown conditions delivered with the survey. This provided a win for TDOT as it continues to leverage technology in project development processes. 🇺🇸

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Pictured: RaganSmith Drone Pilot Zac Seaton with the ELIOS-3 LiDAR Drone outside the RaganSmith Nashville office.



RaganSmith



Before the McLaughlin Run Road Roundabout Project

McLaughlin Run Road Roundabout

by David Worst, PE, Larson Design Group, ASHE Pittsburgh Section

The McLaughlin Run Road and McMillan/Lesnett Road intersection in Upper St. Clair Township experienced persistent congestion, especially during peak hours. It was also prone to flooding. Resolving these issues involved such challenges as deteriorating existing infrastructure and acquisition of federal property. The preferred alternative was to convert this previously signalized intersection into a free-flowing, single-lane roundabout.

Construction for the McLaughlin Run Road Roundabout Project took place in Pennsylvania Department of Transportation's (PennDOT) District 11. Larson Design Group (LDG) was chosen as prime consultant for alternatives analysis, preliminary engineering, final design and construction consultation services.

Complexity

The project required twelve phases of construction sequencing to keep traffic flowing during construction. It was further complicated by:

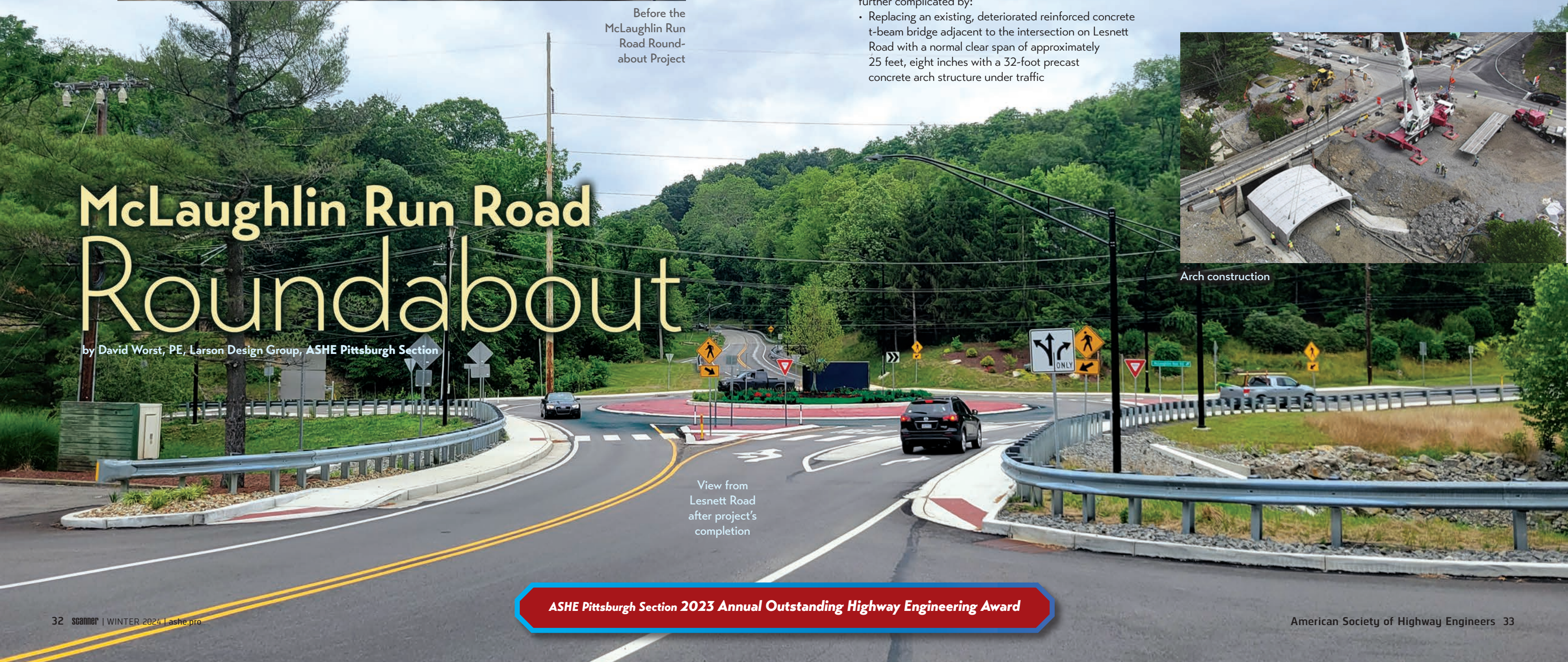
- Replacing an existing, deteriorated reinforced concrete t-beam bridge adjacent to the intersection on Lesnett Road with a normal clear span of approximately 25 feet, eight inches with a 32-foot precast concrete arch structure under traffic

- Requiring replacement of an existing concrete slab bridge on McMillan Road with a box culvert. This was further complicated with the necessity for mine grouting pockets within the influence areas under the structure foundation, all under traffic.
- Carefully sizing the arch culvert and setting the roadway profile so a 50-year storm could pass without overtopping the roadway
- Complex water, sewer and gas relocations, some incorporated into the construction contract. Relocation of utility poles avoided impacts to high-powered transmission lines adjacent to the road, without the need to involve the Public Utility Commission.
- The right-of-way plan required a partial acquisition from federal property (the post office), which was more complicated than a typical acquisition.

(continued on page 34)



Arch construction



View from Lesnett Road after project's completion



McLaughlin Run Road Roundabout

(continued from page 33)

New Application of Existing Techniques

Although more common now, at the time of the original award in 2014, roundabouts were a unique solution, particularly in a suburban area where this project was located. However, the team advocated for a roundabout, knowing it would fit the specifics of this project.

Additionally, the roundabout was on a grade that was not standard. This required grading the entire roundabout as an inclined plane and ensuring gradual cross slope transitions for a smoother ride. The roundabout was elongated to provide the proper deflection angles while minimizing the structure length over McLaughlin Run Road. It would also avoid high-power transmission lines on the east side of the road. To accommodate the traffic during construction, the upstream portion of the precast arch needed installation first. This was an approach not typical of normal construction methods, which would require jacking each precast section into place. However, to avoid this extra construction expense, the foundation was designed to allow for the precast arch to be installed level while keeping all required clearances.

Social and Economic Considerations

Replacing the traffic signal with a roundabout had advantages, including crash reduction and less future maintenance. Traffic could flow continuously through the intersection without having to stop and wait for the light to turn green. This would significantly reduce exhaust emissions, fuel consumption and travel time for motorists.

The project incorporated crosswalks compliant with Americans with Disabilities Act regulations, supporting pedestrian traffic. Along the tributary adjacent to the new

box, an existing smooth-faced slope wall was replaced by large rocks with voids, creating habitat for small aquatic creatures living in the tributary.

Aesthetics and Sustainable Features

With the history of McLaughlin Run Road and its washout issues along the stream, the upstream and downstream channels were lined with rock sized to stabilize the stream banks. On the roadway surface, the design used asphalt with a curb and gutter section around the outside to provide contrasting color instead of the use of roadway paints that wear and fade over time. Colored pavement was used in the splitter islands and truck apron.

Meeting Needs of the Client

This was the first roundabout constructed by PennDOT District 11 in Allegheny County. The team navigated an extensive alternatives process to evaluate options for this project's requirements, along with providing original cost estimates. LDG's estimate of \$4,654,217 was within five-tenths of a percent of the actual low bid of \$4,678,787. This level of accuracy for a project that was difficult to estimate helped the client plan and budget more effectively. The two-year construction project ended one month ahead of schedule.

Safety a Priority

The project converted a previously signalized intersection into a free-flowing single-lane roundabout that improved safety and efficiency. It also resolved frequent flooding incidents and alleviated congestion, leading to improved air quality over time. 🇺🇸

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Built in the 1930s as a two-lane, 18-foot-wide road, SR 100 was an integral part of the transportation network for industrial and commercial businesses in and around Lehigh County, PA. The corridor had been pieced together and widened over the decades to reflect increased demand. But it required a complete reconstruction to accommodate the current volume of traffic: an average of 42,000 vehicles daily, approximately 20 percent of which are trucks.

The SR 100 Section \$13 million Reconstruction Project in Upper Macungie Township involved over one-and-one-third miles of full-depth reconstruction between Industrial Boulevard and SR 1002 (Main Street/Tilghman Street) with:

- Four high-demand signalized intersections
- An interchange with I-78
- An at-grade railroad crossing

Project considerations included maintaining the four- and six-lane roadway curb-to-curb widths and preserving existing drainage outfall elevations. It also entailed milling/overlay of the I-78 interchange ramps and the SR 100 northern/southern limits, with no allowable detours of SR 100 traffic. Other upgrades were:

- Storm sewer improvements
- Curb replacement
- Upgraded traffic signal equipment
- Ramp improvement compliant with Americans with Disabilities Act regulations
- Water main relocation
- New cantilever sign structure

Under the Surface

Widened through multiple projects over the years, even straightforward design elements of SR 100 became challenging, such as:

- Underground utilities, including water, communications and sewer
- An existing water main that fluctuated in elevation and meandered through several sections of the existing drainage
- Unavoidable relocation of utilities

The SR 100 existing drainage networks conveyed flow offsite and outside the project limits. All existing outfalls and tie-in elevations had to be maintained.

With a deeper pavement section, multiple utility conflicts and required preservation of existing outfall elevations, the proposed stormwater network included iterations during construction. These were coordinated with the Pennsylvania Department

of Transportation (PennDOT) and project contractor New Enterprise Stone and Lime (NESL).

Keeping the Traffic Moving

No detours of SR 100 through traffic were allowed during construction. The original design called for traditional traffic control staging, consisting of four main stages along SR 100 between Industrial Boulevard and SR 1002:

- Median removal
- Shift traffic and reconstruct one side
- Shift traffic again and reconstruct the other side
- Median construction

An initial traffic analysis indicated substantial delays for motorists during peak hours throughout this part of the corridor during construction, particularly where SR 100 was reduced by one lane in each direction.

The project team coordinated with PennDOT and converted the corridor into five shorter segments. This minimized the inconvenience of construction within a particular area to shorter durations. NESL eventually condensed three segments into one longer segment to compensate for lost time during COVID-19. While segmented traffic control slightly lengthened the overall duration, it used similar staging and addressed economic considerations expressed by the municipality and its stakeholders.

The project team also reduced existing SR 100 four-phase traffic signals to two or three phases during construction, using minor street approach closures and local road detours. This method eliminated traffic signal yellow and all-red times, increased the amount of SR 100 green time and advanced the project's "keep traffic moving" philosophy.

The construction team fully reconstructed Schantz Road and Penn Drive intersections through three partial weekend intersection closures. These included either full or partial side street detours and maintained SR 100 through traffic. They also eliminated traffic signal control and limited side street approaches to right-in movements and stop-controlled right-out movements. During construction, these closures limited turning movements and increased worker safety.

(continued on page 38)

Completed SR 100 corridor, looking north toward Penn Drive and I-78 interchange

Reconstruction in a Busy Lehigh Valley Corridor

by Thomas J. Domieniecki, PE, PTOE, Matthew Reber, PE, and Frank Namatka, PE,
Gannett Fleming, Inc., ASHE East Penn Section



Completed SR 100 and I-78 interchange, looking south

Durable Pavement Options

The existing pavement featured various depths and materials, including concrete overlay and full-depth asphalt sections. The project team performed pavement alternative analysis and final pavement design. Current and future traffic conditions historically favored a conventional full-depth portland cement concrete (PCC) pavement. However, the combination of its higher cost (compared to asphalt) and placement of joints in a constrained work area while maintaining two lanes of traffic in each direction proved restrictive.

The project team considered a bonded concrete overlay on asphalt option that was approximately 73 percent less expensive than PCC. Still, similar issues with the PCC pavement did not allow easy construction. Both concrete options would also result in longer work zone durations and future maintenance requirements, which would likely have negative economic impacts on local businesses.

Ultimately, the project team and PennDOT recommended full-depth reconstruction with an asphalt pavement section, including a stone matrix asphalt (SMA)-wearing course. The cost of this option was approximately 27 percent less than full-depth PCC based on life-cycle cost analysis. SMA offered increased rut resistance from large truck traffic, relied on stone-to-stone contact for its strength and used a rich mortar binder to provide durability. This application, relatively new to PennDOT District 5-0, required coordination with PennDOT Central Office before implementing it into the design.

The selection of full-depth pavement and an SMA-wearing course was also a matter of sustainability. As industrial and commercial properties continue to develop, demand for this corridor continues to grow. The pavement structure accounts for this growth, with geotextile placed at the subgrade to separate poor soils from the new pavement structure.

Keeping it Safe

The project team met with Upper Macungie Township's Good Neighbor Coalition early in the project design for community input. During construction, impatient SR 100 northbound motorists used the driveway of an automotive business to cut through its property and turn right onto Penn Drive. After several near-misses between these motorists and its employees or customers, the business requested that NESL supply a temporary concrete barrier to block their SR 100 driveway during construction.

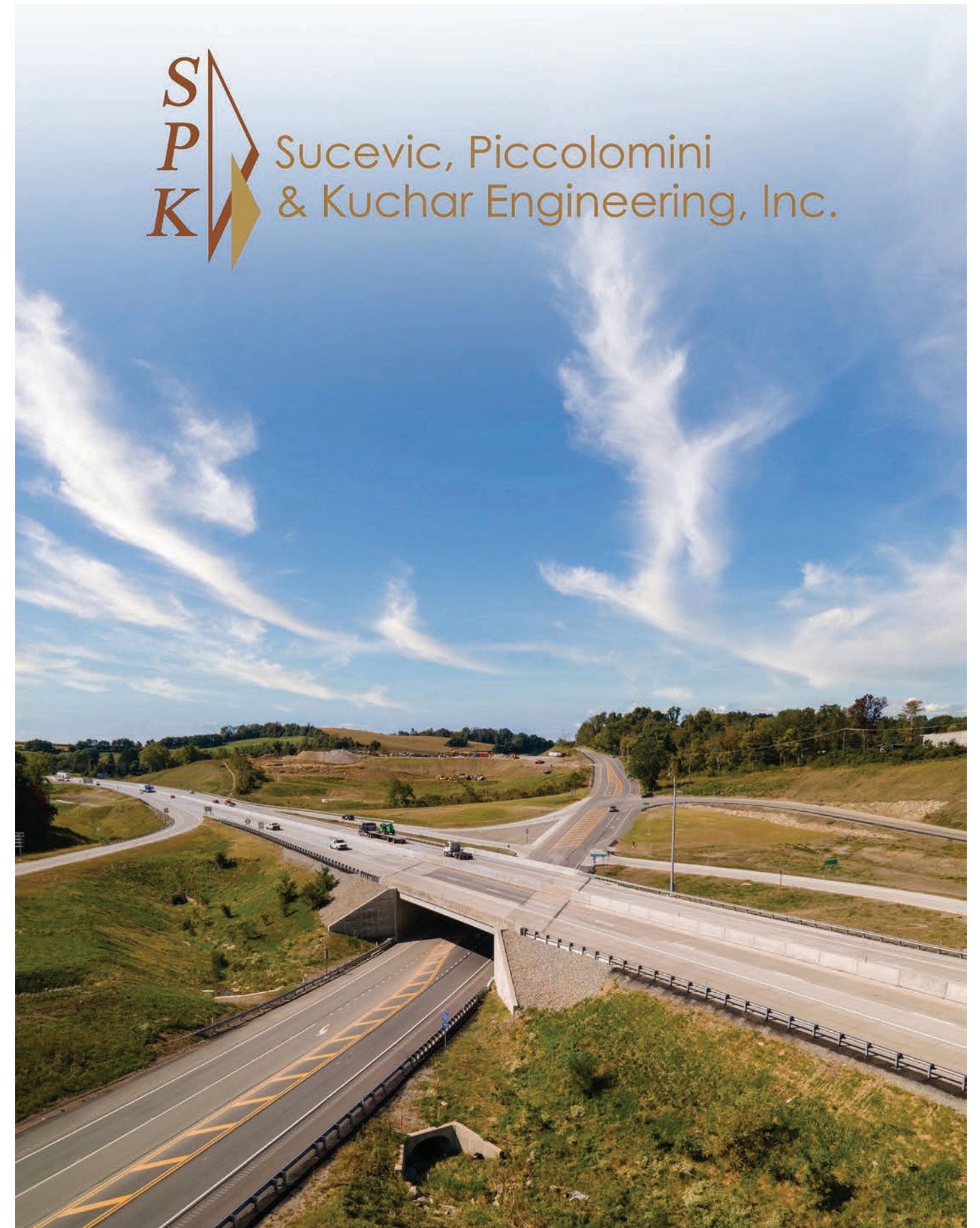
Project Complete

The project was substantially completed in December 2022 at a cost of approximately \$19.6 million. Before construction, SR 100 suffered from deteriorated pavement, different pavement materials and spalling medians and curbs. Its durable SMA-wearing course is suitable for truck traffic, with improved medians and curbs. The new pavement markings and signs will help to keep traffic moving in this corridor for years to come. 🇺🇸

Reconstruction in a Busy Lehigh Valley Corridor

(continued from page 37)

Completed Schantz Road intersection, looking west. Temporary closure of the east leg, resulting in two fewer traffic signal phases, kept traffic moving.



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A Win for All: Hunts Point Interstate Access

by Rhonda Cardone, Robert Gallup, PE, Dewberry,
Nader Basta, PE, LEED AP, DBIA— AECOM,
ASHE New York Metro Section

The newly widened Bruckner Expressway south of the southbound entrance from Bruckner Boulevard; Tiffany Street Viaduct, Bruckner Boulevard Service Road and new bike path are under viaduct.

By creating a new direct link to the interstate highway system, the Hunts Point Interstate Access Improvement Project boosts efficiency at the Hunts Point Food Distribution Center. It also improves the quality of life for the Hunts Point community.

The center processes more than 60 percent of the New York City metropolitan area's produce, fish and meat. It generates 15,000 jobs and \$5 billion in annual economic activity and is larger than 400 football fields.

An estimated 20,000 vans, box trucks and 18-wheelers move in and out of the market each day. Lacking a direct link to the interstate, these vehicles had previously traversed the surface streets in the nearby South Bronx neighborhood, contributing to greenhouse gas emissions and causing other problems that impacted the quality of life in the area.

A new split interchange off the Bruckner Expressway serves the Hunts Point Peninsula and realignment of the existing Bruckner/Sheridan interchange. This new interchange provides full directional access to and from the Bruckner and Sheridan expressways. It directs the truck traffic along the expressways and newly reconstructed Sheridan Boulevard away from residential neighborhoods.

The direct highway link, located between the Hunts Point Peninsula and the Bruckner and Sheridan Expressway, marked the largest design-build project in New York State Department of Transportation (NYSDOT) history. The project not only shifted vehicles off surface streets but also improved mobility, operations and safety while enhancing public health.

Teamwork

Developing and implementing this design-build program was complex. The team and subconsultants partnered with NYSDOT to get the job done. The AECOM/Dewberry joint venture provided project planning, an Environmental Impact Statement, preliminary engineering, three design-build procurement packages and program management. It also involved bridging documents (30 percent design), procurement assistance and technical consultation during construction throughout the life of this \$1.7 billion program for the Bronx I-278 corridor and area improvements.

The team gained program approval from numerous agencies. These included the Federal Highway Administration, Amtrak, CSX and Metro-North railroads, New York City Transit subway and buses and New York City Department of Parks and Recreation. The New York City Department of Environmental Protection, New York City Police Department and New York City Fire Department also gave approval.

(continued on page 42)

View, looking southwest, of Hunts Point Food Market area and along existing Bruckner Expressway in Contract Two south toward Randall's Island. Tie-in to existing Bruckner Expressway in Contract Three area is in foreground.

A Win for All: Hunts Point Interstate Access



New Bruckner Expressway dual viaduct entrance/exit ramp to and from Edgewater Avenue and Hunts Point Peninsula. The view, looking north, shows connection to new Sheridan Expressway and Concrete Plant Park along Bronx River.

(continued
from
page 41)

Project Delivery

The program was divided into three individual projects that could be bid out and constructed over a six-year period. This enabled certain construction projects to overlap between three design-build contracts, each of which included procurement support during the bidding process.

The team and NYSDOT met the objectives and schedule by tackling issues in advance of each contract's construction start. Conversations were held ahead of construction for Contract One, which dealt with right-of-way issues with private businesses along with coordination with Amtrak regarding clearance needs for a bridge replacement. To limit impacts during construction, Contract Three coordinated with other future area projects, including the Del Valle Square and Metro North Penn Station Access projects.

Bridging documents and performance-related specifications varied in structure replacement. Portions of Contract One and all of Contract Two included complete superstructure replacement of such components as concrete decks, steel girders, diaphragms and bearings.

Contract One construction was concurrent with the procurement phases of Contracts Two and Three. Breaking up the contracts enabled the team and NYSDOT to improve each sequential contract from lessons learned in the field. Contract Three's procurement phase was concurrent with the construction of Contracts One and Two, resulting in overall cost savings.

Contract Three included completely new structures, such as concrete decks, steel and concrete support girders, integral joint abutments and bearings. It also incorporated a new drainage collection system designed to discharge to an existing New York City Department of Environmental Protection outfall system to the Hunts Point Water Pollution Control Facility.

The program required a comprehensive Environmental Impact Statement (EIS) on an accelerated schedule, resulting in a positive Record of Decision for the project in less than two years. The EIS informed the design program scope development, including the sequencing of the segments, segment schedule durations and cost.

Roadway Improvements

Numerous highway improvements were required to deliver the new connection, such as access ramps to and from I-278 and the Hunts Point Peninsula. These ramps allowed for dedicated truck access to support critical city facilities at Hunts Point Market and full shoulders to mitigate roadway congestion. The program incorporated four specific design improvements for the corridor:

- Sheridan Expressway at-grade
- Bruckner Expressway over Amtrak and Bronx River Avenue
- Bruckner Expressway Viaduct
- Bruckner/Sheridan Interchange

The team led preliminary structural and civil utility designs that included 10 expressway bridges, viaduct structures, two pedestrian bridges, 36-inch trunk gas main relocation, comprehensive drainage and distribution watermain design. It also entailed private utility coordination, NYSDOT Intelligent Transportation Systems and complex Work Zone Traffic Control strategies. The strategies were designed to maintain traffic and pedestrian safety while maintaining existing traffic capacity on the expressway and local roads during construction.

The new interstate ramps at Edgewater Road and Leggett Avenue now provide access between the Hunts Point Peninsula and the Bruckner Expressway and Sheridan Boulevard. A third lane was added to the Bruckner-Sheridan Interchange to improve access to the expressway.

Advancing the Community

The program incorporated elements to improve quality of life in the neighborhood. These included a new bike path, subway and bus access, a new rail corridor station and an electric vehicle lot with charging facilities. New York State Governor Kathleen Hochul committed to rebuilding and modernizing infrastructure with this project as part of an unprecedented \$1.7 billion investment in the South Bronx. Governor Hochul said, "There is no better example of the important role modern infrastructure can play in ensuring the economic health and well-being of a community than Hunts Point."

Safety was enhanced through an improved interchange that provided right entrance and exit points for Sheridan Boulevard. The project added curb bump-outs, pedestrian refuge areas, ADA compliant pedestrian crossings and upgraded signal timing at several intersections along Bruckner Boulevard. Additionally, a one- and three-quarter-mile section of Bruckner Boulevard between Cypress Ave and Barretto Street was reconstructed, and 15 local intersections were upgraded.

The existing ramp at Hunts Point Avenue was closed to improve pedestrian safety near the Hunts Point Subway Station and accommodate the future Metro North station, part of the

Metropolitan Transportation Authority's Penn Station Access project.

The neighborhood now has greater access to green space with construction of new parks, the improvement of eight parks and addition of new park access and connections. A new, one-and-one-half-mile shared-use path on Bruckner Boulevard provided a connection to the 138th Street bike path heading to Randall's Island, Manhattan and Bronx River Greenway.

The project added direct park access to the Bronx River waterfront through the new Garrison Park and the new underpass to Concrete Plant Park. The project complied with New York State's Smart Growth Public Infrastructure Policy Act and its Complete Streets Act.



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A Fresh Start for Paterson's Spruce Street Bridge

by **ASHE North Central New Jersey Section**

The Spruce Street Bridge, built in 1931, spanned New Jersey's Passaic River and was known as the gateway to the Paterson Great Falls National Historical Park (Paterson Great Falls Park). The original bridge outlived its expected service life, requiring constant maintenance. It was structurally deficient and in need of reconstruction due to the deck condition and a functionally obsolete cross section. Passaic County selected WSP USA, Inc. (WSP), to design the bridge superstructure reconstruction. The project included full replacement of the bridge deck, profile improvements and enhanced pedestrian accessibility across the bridge. It also entailed signal upgrades at the intersection of Paterson's Wayne and Totowa avenues and traffic improvements along Spruce and Front streets.

A plan evolved to replace the existing deck with a new composite high-performance concrete deck, detailed to accommodate significant profile changes. However, there was a side effect to smoothing out the severe dip at the bridge's north end, without replacing the existing substructure or stringers. There were uncommonly large concrete haunches on the stringers. Further complicating this was the design team's desire to make the existing steel stringers composite with the new deck. To accomplish this, they developed a one-of-a-kind plan that used mild steel reinforcement to prevent cracking in the deep concrete haunches. The plan also called for shear studs stacked two and three high to properly transfer shear loads from the deck to the existing stringers. Avoiding a full bridge replacement with this design saved millions of dollars and a lengthy permitting schedule that would not have fit the need for swift improvements.

The highly traveled bridge was an important part of the local transportation network, thus the need for quick turnaround. Instead of looking to add lanes to account for the redevelopment, the focus was on serving the community with an improved bridge for vehicles. The team also wanted to design a safe and inviting structure for pedestrians wanting to connect to key points in the area. Such a change in direction required vetting by stakeholders and the public. The project included a stakeholder outreach program to ensure that all parties were satisfied with the direction of the project. The community adjacent to the Paterson Great Falls Park had a personal

(continued on page 46)

BEFORE: side view



Pouring of concrete deck



A Fresh Start for Paterson’s
Spruce Street Bridge [continued from page 45]

interest in improvements to this bridge, especially regarding access and safety. The rendering developed during design demonstrated major project features for the public. To achieve a consensus on how to proceed with the project, details about the number of lanes, sidewalk sizes, aesthetic treatments and profile improvements were communicated early with stakeholders.

Improved safety for the public remained the priority. The design called for elimination of a vehicle lane and removal of a severe turning conflict at Front Street by increasing the sidewalk widths on both sides of the bridge. This also allowed for safer pedestrian flow to eight nearby schools, Paterson Great Falls Park and Hinchcliffe Stadium, a National Historic Landmark.

Reconstruction of the bridge alleviated obvious structural concerns. It met current standards of the American Association of State Highway and Transportation Officials and New Jersey Department of Transportation Bridge Design Manual. Newly installed elements promoted safety for all transportation modes. Worker safety was also paramount. Planning for work around utilities was conducted during design and verified during construction. This ensured that appropriate clearances were available for all work activities and

equipment used on-site. Precautions were taken to ground all metal components. The field team worked within the developing COVID-19 guidelines as construction progressed, without any major outbreaks, work stoppages or Occupational Safety and Health Administration violations.

The bridge’s rehabilitation and aesthetic upgrades provided a structure that met performance expectations and enhanced safety, mobility and pedestrian access. The design team incorporated elements that paid tribute to those of the original Spruce Street Bridge and recalled its history. These included new parapets, lighting, stamped concrete and banner poles. The use of a special concrete mix for the new parapet created a coarse aggregate appearance, blending with the remaining historic balustrade adjacent to the bridge.

A ribbon cutting in September 2022 for the reconstructed Spruce Street Bridge featured a student who spoke about the importance of the structure for his individual use and what it meant to the community. The new structure supported the travel and safety needs of the community and surrounding schools. In addition, it helped reinvigorate the area, encouraging more visitors to Paterson’s Great Falls National Historical Park and baseball at Hinchcliffe Stadium. 🇺🇸



Aerial view of reconstructed Spruce Street Bridge near Great Falls National Historical Park.

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