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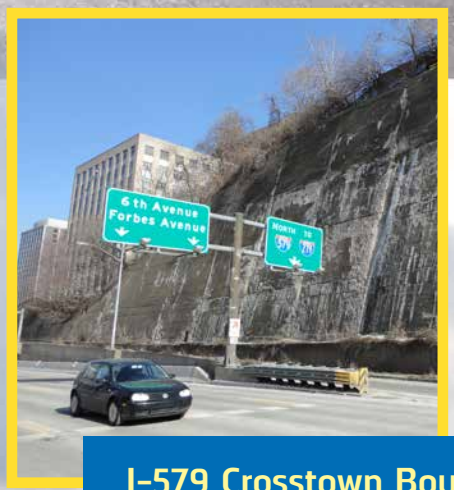
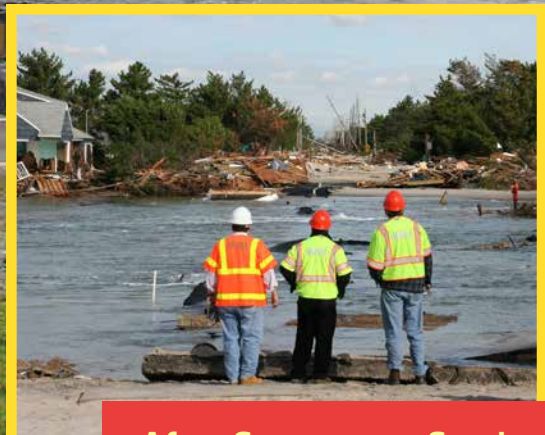


I-579 Crosstown Boulevard Bridge Preservation Project

See page 6

New Pedestrian Bridge, Tampa, FL

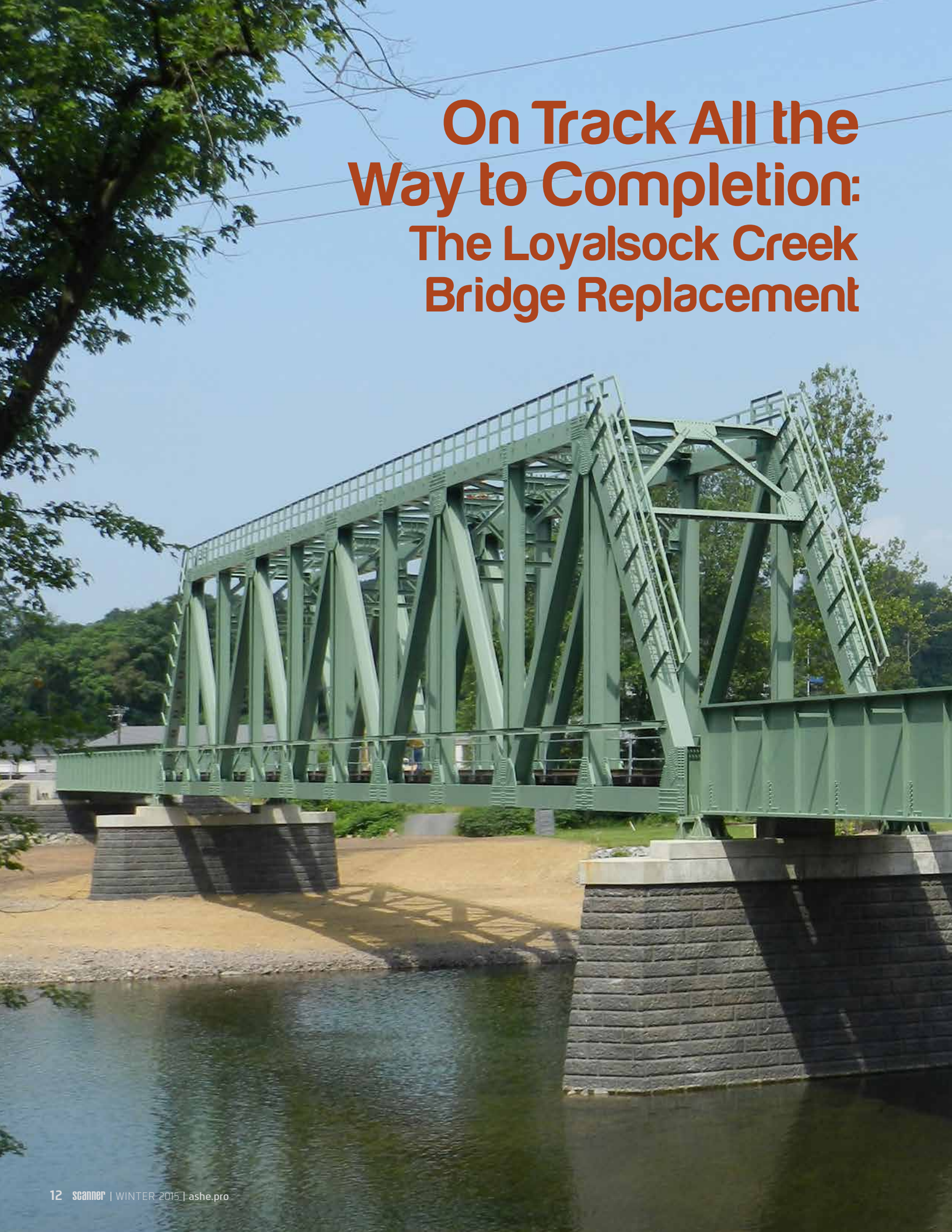
See page 32



After Superstorm Sandy

See page 21

On Track All the Way to Completion:
The Loyalsock Creek Bridge Replacement



by Jason Shura, PE, and Brian Wiser, PE, Keller Engineers, Inc., Hollidaysburg, PA; John Conrad, PE, Railroad Consulting Engineer, Tyrone, PA, **ASHE Altoona Section**

The Loyalsock Creek Railroad Bridge, located in the borough of Montoursville and Loyalsock Township, Lycoming County, PA, is a vital link for the Lycoming Valley Railroad (LVRR) between Williamsport and Muncy. The bridge carries nearly 18,000 railcars per year. The original six-span steel bridge, constructed in 1927, was substantially damaged by floodwaters from Tropical Storm Lee in September 2011. The bridge was immediately taken out of service, and a design of the replacement bridge was initiated. Despite loss of the bridge, rail service was maintained to all existing clients on this rail line through a second, but more distant, connection to the Norfolk Southern Railroad. The additional costs for this detour were borne by the bridge owner, SEDA-COG Joint Rail Authority (JRA), and its private operator, the LVRR.

The LVRR is one of six shortline railroads owned by JRA and operated by the North Shore Railroad Company, making it one of the nation's earliest examples of a public-private partnership. The JRA was established in 1983 to preserve rail lines targeted for abandonment in central Pennsylvania in order to continue and expand rail service to private industries that relied on these services. Today, the authority manages over 200 miles of track in eight counties and provides service to more than 80 customers employing more than 8,000 people.

The LVRR is an integral part of this system, serving over 40 industries in Lycoming and Clinton counties. The LVRR is an important supply line for companies pursuing natural gas exploration in Pennsylvania's Marcellus Shale region, hauling frac sand and transporting other products used by the gas industry. The LVRR also assists local industries with the shipment of a wide array of finished and raw materials, including plastics, utility poles, railroad ties, coal, grain, steel, aggregate and agricultural products.

Federal, state and local funds were quickly dedicated to the replacement of the bridge, with numerous funding sources including the Federal Rail Administration (FRA), Pennsylvania Department of Transportation Bureau of Rail Freight, Lycoming County and FEMA. John Conrad, PE, railroad consulting engineer, and Keller Engineers, Inc., were retained to design the replacement structure, and Jannotti Rail Consulting was retained to design all track construction. Design of the replacement bridge not only needed to return rail service on the LVRR as quickly as possible, but also needed to consider frequent flooding that impacts the borough of Montoursville, as well as minimizing impacts to Loyalsock Creek, which is used by the surrounding community for such recreation as fishing and boating. Other considerations included the numerous utilities on-site, including an overhead electric transmission line, two gas lines and two sanitary sewer lines. Relocation of many of these utilities would have been costly, and the decision was made to maintain the utilities in their current location. Finally, this project included rehabilitation and realignment of LVRR Bridge 195.77, which is within the limits of track reconstruction, and reconstruction of the borough of Montoursville's Mill Street with a new grade crossing to accommodate the new rail alignment.

A three-span structure with steel through-girder approach spans and a through truss main span was selected to minimize the number of piers in the creek and to allow work to be completed under the electric transmission lines. Tropical Storm Lee, which exceeded the 100-year storm, was used as the design storm. The resulting raise in track was nearly three feet, requiring almost one-half mile

(continued on page 16)

of track realignment. An open deck system was selected to minimize the required track raise and to permit access to the steel floorsystem for maintenance. Given that the cause of the original bridge failure was stream scour and undermining of the piers, all foundations were supported on steel piles driven to bedrock, even though bearing soils could have supported spread footings.

Bids were received June 5, 2013, and the project was awarded to Glenn O. Hawbaker, Inc., (GOH), of State College, PA, on June 30, 2013, with a total bid of $9.1 million. High Steel Structures, Inc., (HSSI) was the steel fabricator, and K.W. Reese performed all track construction. Construction started immediately to meet the 12-month construction schedule, and several challenges were encountered that required immediate coordination between the contractor, engineer and owner to maintain the schedule.

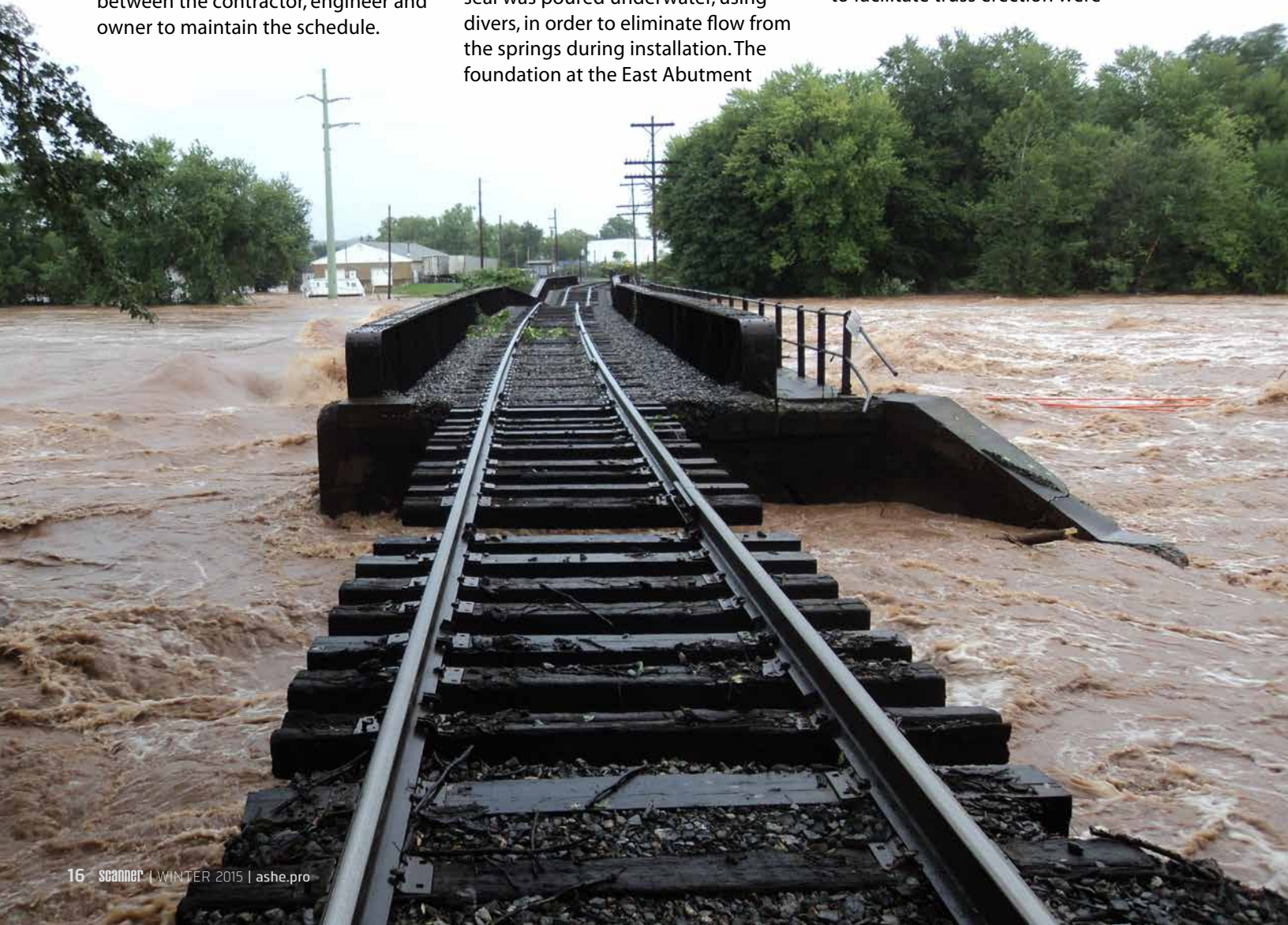
These challenges included:

Dewatering

Artesian springs were encountered at the East Abutment and Pier 1, requiring that 6,000 to 8,000 gallons per minute be pumped from the excavations. The surface soils at the project site prevented infiltration of this volume of water, and alternate methods for discharging the pumps were explored. After discussing many options, DEP approval was quickly obtained to install a dewatering pond within Loyalsock Creek. Turbidity curtains were utilized to prevent sedimentation within the creek, and the pond was cleaned periodically throughout construction. Additionally, the pile cap was raised two feet, and a concrete tremie seal was poured to facilitate construction of Pier 1. The excavation was flooded after pile driving was completed, and the tremie seal was poured underwater, using divers, in order to eliminate flow from the springs during installation. The foundation at the East Abutment was over-excavated, and large perforated pipes were installed with R-3 rock between the piles to direct water to four sumps to dewater the excavation.

Frequent Flooding of Loyalsock Creek

Frequent flooding of Loyalsock Creek caused numerous delays throughout construction. One of these flooding incidents was a six-foot increase in the water surface within a three-hour period when ice melt caused a release of water from a wetland upstream. Frequent overtopping of the construction causeway required that equipment and material be cleared regularly and that predicted rainfall be monitored to adequately plan operations. Sheet pile cofferdams were constructed for all excavations and left in place at the piers as additional scour protection. Temporary supports to facilitate truss erection were



founded on steel pipe piles to eliminate the risk of erosion damaging the towers.

Winter Operations

The original construction schedule included a winter shutdown; however, delays due to dewatering operations necessitated winter work to maintain the project schedule. In addition to form insulation, internal cooling pipes were utilized in the pier stems to minimize internal temperatures and temperature differentials for the 350-cubic-yard placements. A thermal control plan was provided by the contractor, and internal temperatures of the concrete in the larger pours were closely monitored during curing periods.

Shop Fabrication and Steel Erection

Streamlined shop drawing submissions were accepted to meet the aggressive construction schedule. All steel fabrications were detailed, using three-dimensional software, and shop drawings were limited to typical connection and member details. These drawings provided enough information to convey 3D model accuracy and to allow the third-party shop inspector to complete all inspections. Individual component details and assembly tickets were not reviewed by the engineer. Steel erection proceeded from the East Abutment and worked west with no significant delays or problems encountered. Each through girder span was erected in five days, and the truss span was erected in six weeks. Tension control bolts were used to reduce the time needed to perform final torque on all bolts.

Constant communication between the engineer, contractor and owner allowed all of these items to be addressed quickly, thus maintaining the completion date and controlling costs, without sacrificing quality. The bridge was completed on time, and the first train ran July 2, 2014, culminating in the largest project that the JRA has completed to date. The final construction included over 1.5 million pounds of steel, 2,300 cubic yards of reinforced concrete, 13,000 feet of steel piles and over one-half mile of new track construction, and was completed in 12 months. This structure was an almost all-Pennsylvania bridge, with the designer, contractor, fabricator and nearly all material provided from within the Commonwealth. The completed project allowed the Authority to fulfill its mission of providing uninterrupted service to its clients, continuing to encourage economic growth within JRA's member communities. The bridge consists of a light green steel structure setting on concrete piers and abutments that are both textured and stained.

The authors thank the following partners for their dedication to this project: George Fury, SEDA-COG JRA Project Manager; Jeff Stover, SEDA-COG JRA Executive Director; Paul Jannotti, PE, for track design; URS Corporation for H&H analyses; and Bud Dover, GOH Project Manager.
Questions regarding this project may be forwarded to John P. Conrad, PE, jpconrad@aol.com, or Jason Shura, PE, at jshura@keller-engineers.com.