THE LAST LINE

The final piece of Dallas Area Rapid Transit’s expansion opens two months early and millions below budget

New York’s first new bridge in 50 years improves safety, mobility on Brooklyn-Queens Expressway
Hotel and Transit Center transforms Denver International Airport into air-to-ground intermodal facility
Accelerated bridge construction reduces costs, speeds rehabilitation of a historic Minnesota bridge
An issue that is essential to our economic growth is investing in the nation’s infrastructure, namely our roads, bridges, airports and other transportation assets.

It is critical that the nation restore or upgrade its crumbling infrastructure coast to coast. We are seeing promising developments at the federal, state and local level, as many states and municipalities commit to major transportation investments. In the November 2016 election alone, voters in 22 states approved ballot measures that will provide $203 billion in funding extensions and new revenue for state and local transportation projects.

With a combined power of state/local dollars in the near term, America may have a once-in-a-lifetime opportunity to reposition its transportation infrastructure for the future. And, yet, there is one major challenge: spending the money in the right ways.

We first must repair hard-working transportation assets that are seriously deficient or dangerous. More broadly, however, we must make our infrastructure investments very strategically to achieve the gains—in jobs, economic growth, global competitiveness and quality of life—that Americans deserve.

Here are a few ideas for ensuring that America achieves the greatest benefit from its transportation spending in the coming years:

- **Prioritize Projects Transparently** — We must preserve taxpayers’ trust by removing politics from the equation. One approach is to use data-driven scoring models to standardize and rationalize the decision-making process and determine how well they ease congestion, improve economic development, provide access to jobs, enhance safety and environmental sustainability, and efficiently use land.

- **Deliver Projects More Efficiently** — Many states now allow the use of the design-build method for delivering large, complex transportation projects. By adopting design-build for more projects, even smaller projects, America can get more transportation improvements for the dollars invested.

- **Innovate Before We Construct** — Before we widen highways to reduce congestion, we should consider more cost-efficient techniques, including the use of ramp metering, which uses traffic lights to adjust the flow of vehicles entering the highway, or breakdown lanes for travel, which use signage to notify drivers when these lanes are open for traffic. These techniques can increase capacity during times of greatest demand, without building new lanes.

- **Advance User-Centered Mobility** — Technology is revolutionizing virtually every aspect of travel, from digital maps for planning trips, GPS guidance and digital tickets for trains and subways to ride-sharing. We need to invest in strategies and technologies that erase the seams between modes, so travelers can assess and activate their mobility options easily.

We can expect significant debate as our national, state and local leaders seek agreement on a range of transportation-related policy issues. Hopefully, these debates will lead to more predictable and sustainable funding for our transportation infrastructure, not just for the next 10 years, but for the next 40.

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**OPENING PERSPECTIVE**

*Ananth Prasad*
Transportation Practice Leader
HNTB Corporation
Innovative construction manager-general contractor approach facilitates under-budget, ahead-of-schedule delivery of light rail service in south Dallas.

Minneapolis’ Franklin Avenue Bridge achieves speedy rehabilitation using accelerated bridge construction model.

A new Hotel and Transit Center make Denver International Airport a destination in its own right.

The New York State Department of Transportation looks to design-build delivery to cut years off massive K Bridge replacement.

Groundbreaking CityMAP™ project studies how interstate highway design will impact economic development and mobility in Dallas.

Louisiana restores precious coastal wetlands in the state’s first engineered sediment diversion project.

The new Sisters Creek Bridge improves safety and convenience along Jacksonville, Florida’s, transportation system.

Dallas Area Rapid Transit’s SOC-3 light rail line, delivered two months ahead of schedule and $3.5 million under budget, spurs economic development and fulfills a longtime community promise.
Some 25 years ago, Dallas Area Rapid Transit leaders envisioned a light rail service that would move commuters effectively and efficiently around Dallas. That vision was fulfilled in October 2016 with the opening of the South Oak Cliff Blue Line Extension (SOC-3), the final project on DART’s planned expansion program.

The project added two new stations and extended one of DART’s earliest lines southward for 2.6 miles. It also modified the existing Ledbetter Station platform, SOC-3’s connection to the Blue Line. The platform was extended to permit boarding and de-boarding for three trains, rather than the previous two, and converted into an ADA-compliant level-boarding platform. SOC-3 terminates at the University of North Texas at Dallas, which didn’t even exist when the first section of the Blue Line was built some 20 years ago.

As leader of the joint-venture team Blue Alliance Partners, HNTB was selected to design and manage construction on the $101 million project.

Dallas Area Rapid Transit’s SOC-3 line, open two months ahead of schedule and $3.5 million under budget, spurs economic development and fulfills a longtime promise to the community of south Dallas.
Calling on a deep technical bench

DART operates the longest light rail system in the country. Unlike previous sections of its 93-mile system, SOC-3 was built through an undeveloped section of Dallas. Such a project is unusual for light rail, which usually connects suburban or urban areas, according to Steve Knobbe, HNTB project manager.

“Having the rail line run through undeveloped land, with a third of the project over creeks and rivers, created challenges from a fire and life safety standpoint,” Knobbe said. “If a train were disabled or on fire, where would people evacuate?”

HNTB encountered equally demanding challenges on the systems engineering side. DART previously had contracted with separate design firms for each aspect of its projects. In the SOC-3 project, design work was combined into a single contract that gave Blue Alliance Partners responsibility for all design.

As a Blue Alliance Partners joint-venture partner, HNTB completed structural, signal, overhead contact, traction power and system communications design. The firm called on its solid bench of experts from multiple offices throughout the country to coordinate the technical design across all disciplines.

“This project allowed HNTB to demonstrate its deep national transit experience and expertise,” Knobbe said. “Engineers and designers from nine HNTB offices provided specialized design. The work provided by multiple offices was handled by an HNTB team in Dallas, and that coordination was seamless to DART.”

To address the fire and life safety issues created by building on virgin land, HNTB designed paved evacuation areas off the side of the right-of-way, known as areas of refuge. These refuge areas serve as access points for first responders and provide areas where passengers could gather if they had to evacuate a train. The design team coordinated with the Dallas Fire-Rescue Department to ensure alignment with standard safety operations and procedures.

HNTB engineers also were tasked with connecting the SOC-3 extension to the original Blue Line, built in the late 1990s.

“The specifications for the communications backbone — cameras, phones, fire alarms, visual message signs at the platforms, communications links back to the control center, indication reporting and controls and the stations’ public address systems — all were outdated,” Knobbe said. “We installed a fiber optic network from the project nearly 5 miles to connect to DART’s control center, and we updated all the specifications for the communications pieces.”

Incentivized CM-GC

For SOC-3, DART chose a modified construction manager-general contractor delivery method. DART had used CM-GC, an emerging alternative delivery method, successfully on several previous projects. Under CM-GC, the project owner hires the contractor and the designer at the same time. The contractor guides design to ensure constructability.

CM-GC gave DART more control over project cost and schedule. Under that delivery method, a contractor submits a not-to-exceed cost when design is at 1 percent. The contractor then works directly with the designers under owner-controlled contracts to develop a design that can be built at or below the not-to-exceed number.

At approximately 65 percent of design, the contractor is required to submit a firm fixed price for construction based on the project’s defined scope and schedule. Unfortunately, DART was not able to reach a fixed-price agreement with its original contractor.

“With that change, we lost six months,” said Reza Shirmanesh, DART design and construction manager. “HNTB helped us through that challenge by extending the design to allow us to find a new contractor.”
DART’s modified CM-GC arrangement was beneficial in reducing costs and speeding up the SOC-3 schedule after the change in contractors. DART, Blue Alliance Partners and the new contractor signed a cooperation agreement to confirm that they would work jointly to find additional cost and schedule savings. If the project came in under the guaranteed maximum price, the three parties to the agreement would split the unspent funds.

“HNTB helped us expedite design and construction management, coordinating with the contractor to gain the six months we lost and still finish the project two months early,” Shirmanesh said.

In part by adjusting the track elevation to eliminate walls, Blue Alliance Partners and the contractor also delivered the project $3.5 million under budget.

“By saving cost and schedule time, we were able to distribute the money in the incentive pool among the parties,” Shirmanesh said. “Delivering the project before the advertised date and below the not-to-exceed budget, even with the setbacks we encountered, is proof of the success of having chosen the modified CM-GC methodology.”

Exceeding diversity goals
Because DART wanted the design and construction management team to reflect the primarily African-American community surrounding the SOC-3 line, it set a 51 percent minority/disadvantaged business enterprise goal for the project.

“That was a very aggressive goal, and a very important one to DART,” Knobbe said. “HNTB said we would achieve 60 percent, and people said it wasn’t possible.”

HNTB actually exceeded its stated goal, hitting 61 percent M/DBE participation through its Blue Alliance Partners joint-venture agreement with MBE firm Dikita Enterprises, Inc., and 11 other subcontractor relationships.

“Dikita is located in the expansion area and historically has worked for DART, but lacked technical expertise on a big project,” Knobbe said. “The joint venture assured DART that we not only took its M/DBE goal very seriously, but that we also could marry Dikita’s knowledge with HNTB’s long-standing experience on large projects and capitalize on each other’s expertise.”

Success at the end of the line
City leaders had promised the Blue Line extension to area residents for many years. Now that it is open, the additional capacity allows better connectivity for those traveling to UNT Dallas campus, as well as increased transit access for those living in south Dallas, which had been a concern for the local community.

DART also hoped the SOC-3 line would spur economic development on the vacant land southward from Ledbetter Station to the growing UNT-Dallas campus. The city is building a new recreation center along the extension, and major developers already have purchased land and submitted plans for mixed-use development.

“The SOC-3 project made for much safer operation and happier customers at Ledbetter Station,” Shirmanesh said. “The new Camp Wisdom station, the access point for the new recreation center, will make that center convenient for the community to use. UNT-Dallas has a master plan that will add on to its facility from the DART station to the campus. The success of the SOC-3 project has gained DART popularity in the public eye, made the politicians who were involved more credible and enhanced our legacy.”

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“This project allowed HNTB to demonstrate its deep national transit experience and expertise. The work provided by multiple offices was handled by an HNTB team in Dallas, and that coordination was seamless to DART.”

— STEVE KNOBBE
HNTB PROJECT MANAGER
The historic Franklin Avenue Bridge was an engineering marvel when it opened in 1923. At the time, it contained the longest concrete arch span in the world.
The historic Franklin Avenue Bridge, officially the F.W. Cappelen Memorial Bridge, has carried travelers over the Mississippi River in Minneapolis, Minnesota, since 1923. When opened, the concrete deck arch bridge, featuring arch ribs reinforced with a steel Melan truss, contained the longest concrete arch span in the world. It is named after its designer, Frank W. Cappelen, a prominent Norwegian-American engineer for the city of Minneapolis, and is one of five prominent deck arch structures constructed over the Mississippi and Minnesota rivers during this era. 

The bridge is adjacent to the University of Minnesota and serves as a vehicular connection across the Mississippi River, as well as a connection between two major pedestrian and bike corridors on either side. Pedestrians and cyclists account for 20 percent of average daily traffic.

In 2007, Hennepin County Public Works called for a comprehensive structural investigation and assessment of the bridge. That investigation showed that the bridge was structurally sound, but needed rehabilitation. Deterioration was present in concrete elements, especially those near the structure’s expansion joints. Hennepin County Public Works retained HNTB as the project team lead in 2015 to complete permitting, stakeholder engagement, design and construction documents. The Section 106 process resulted in a rehabilitation report that recommended a full deck replacement, spandrel cap beam replacement, that damaged areas be repaired, expansion joints eliminated and the original concrete piers be restored.

The need for ABC

The bridge’s deck and spandrel cap beams are supported on two arch ribs. Replacing the cap beams while maintaining traffic on the bridge would have required substantial falsework and taken two construction seasons to complete with traditional cast-in-place methods. Therefore, closing the bridge and completing deck and spandrel cap beam replacement using accelerated bridge construction methods was the only logical solution.

Accelerated bridge construction (ABC) uses innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the on-site construction time. ABC moves construction away from traffic and builds as much of the new bridge as possible offline. Activities are performed concurrently, usually in a controlled environment, to quickly and efficiently design, fabricate and erect replacement bridge systems. The result often is a faster construction schedule. But that is not ABC’s primary goal. ABC’s mission is to reduce user costs by minimizing mobility impacts and reducing traffic delays.

The most common form of ABC is the use of prefabricated bridge elements. These elements can be fabricated in a controlled environment off site and assembled in place at the bridge site. This construction method can best be described as building blocks. Building prefabricated components off-site and quickly putting them in place once on-site was the ABC technique particularly suited for this rehabilitation project.

The best candidates for ABC are:

- Workhorse bridges with high traffic volumes
- Bridges whose closures would require long detours
- Bridges where staged construction may not be viable
- Bridges important to the local economy
- Bridges in environmentally sensitive areas

Although ABC has been used largely for replacing bridges, it also is gaining traction in the rehabilitation arena. ABC has been used successfully to replace bridge decks, portions of substructures and widen heavily traveled bridges. The Franklin Avenue Bridge met several of the criteria for ABC implementation and provided an ideal candidate to apply innovative ABC rehabilitation concepts to restore a local landmark. As noted herein, the inability to do the work using staged construction and the need to avoid long closures were two key factors that favored an ABC solution.

Rehabilitation with speed

An inspection and load rating helped define what structural rehabilitation work was required and what modifications could be achieved. The results helped HNTB educate historians, cyclists, pedestrians and other audiences about what lane configurations
The bridge could support. This resulted in a bridge rehabilitation study report that documented:

- Purpose and need
- Historical background
- Character-defining features
- Condition assessment
- Load rating analysis
- Comparison of rehabilitation alternatives
- Documentation of recommendations to proceed with a design

for each aspect of the bridge

“We initially had more than 30 combinations of rehabilitation and deck replacement options, but quickly consolidated them into a baseline alternative that included everything our project partners agreed needed to be done,” said Dan Enser, HNTB project manager. “We could then focus on the three remaining items to resolve — deck width at the east end, span 1 and 5 load posting and would the bridge be coated or not. Completion of the bridge rehabilitation study report in six months was key to delivering the project because once completed, it documented all work that was agreed to by stakeholders to be done to the bridge.”

Construction on the $42 million project began in spring 2015 with below-deck rehabilitation work and casting of the precast deck panels and spandrel cap beams. On May 8, 2016, the bridge was closed and the ABC process began.

ABC speeds rehab, public acceptance

“ABC made the project schedule palatable to the county and to the public,” said Jim Grube, county engineer for Hennepin County Public Works. “The replacement cap beams and deck panels were fabricated offline months before the bridge closure, significantly reducing the impact to the public while improving the quality of the elements and reducing worker exposure.”

ABC also helped build goodwill between the owner and community. Grube noted that the community agreed to “give” the bridge to the project from May to August, but wanted it “back” by September. The Labor Day re-opening met that expectation, only 116 days after closure.

“To close this bridge for an extended period of time would have been a hardship for the local users,” said Travis Konda, on-site HNTB senior technical adviser. “The surrounding community encompasses diverse socioeconomic groups, including many who rely upon non-vehicular modes of transportation. ABC supported the rapid turnaround.”

Sequencing, innovative materials help meet deadline

Detailed sequencing kept work on schedule. Pre-closure work included transferring a four-foot diameter water main and a large utility duct bank to temporary beam supports without changing the profile of the utilities.

Pre-closure deck sawing was critical to meeting the accelerated project schedule. Removal took place immediately after closure, followed by existing cap beam removal and new cap beam installation. Utility loading was moved to the new cap beams, followed by casting in place of curved overlooks at the end of the river piers.
Deck panel placement was completed within tight tolerances on a two percent cross-slope. They were joined with ultra-high performance concrete (UHPC) to achieve a full moment connection by bonding to the exposed aggregate deck panel key-ways. Using UHPC allowed for shorter lap lengths between panel reinforcement with the largest joint being 9 inches.

Application of polyester polymer concrete (PPC) overlay supported the ABC approach. PPC quickly gains strength, allowing traffic on the bridge within hours of placement, improves ride quality and protects deck panels and construction joints from water ingress.

Drainage improvements and a new crosswalk completed approach work.

Communication, collaboration shine
Ongoing meetings with stakeholders incorporated as many viewpoints as possible, helped users understand how the rehabilitated bridge would improve their community and took into account the historic status of the bridge. HNTB also became embedded with the client and contractor team which kept activity moving.

“The exciting part of civil engineering construction is to witness the physical creation of new project from a well-thought-out plan,” said Paul Backer, Hennepin County construction project engineer. “It’s thrilling to see the smiles of people on opening day.”

“The biggest factor on ABC jobs is upfront planning with the owner, contractor and designer,” Konda said. “This means going through each step to vet proposed scenarios in terms of project goals. Planning and having contingencies are key to success. These efforts from the entire delivery team ensured success for the Franklin Avenue Bridge, in particular.”

Opening day
At its Labor Day 2016 opening, drivers, bicyclists and pedestrians received a rehabilitated bridge that included:

- A new deck and spandrel cap beams
- Two, 12-foot vehicular lanes on the west end
- Four, 11-foot vehicular lanes on the east end
- Historically accurate lights, exterior ornamental railings, cap beams and colors
- Restored river pier overlooks
- Repaired arch ribs, piers and abutments
- West abutment, span 1 and pier 1 structural repair with board form finish
- 12-foot to 17-foot-wide barrier-separated shared bicycle/pedestrian paths
- A new crosswalk at the west approach for bikes to cross Franklin Avenue and go south
- New inner barriers separating vehicles from pedestrians and bikes

“We restored this bridge back to its glory days with an ornate concrete railing, river pier overlooks, cap beams with scrolled ends and historical lighting,” Enser said. “Being able to educate stakeholders about the bridge’s structural capabilities and the collaboration between the engineering and historical disciplines led us to sound conclusions that give drivers, bicyclists and pedestrians a safe bridge that is historically accurate.”

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AT A GLANCE
HNTB used ABC to restore Hennepin County’s Franklin Avenue Bridge. The team used:

- 350 precast deck panels (2,987 cubic yards of concrete; 311 cubic yards of UHPC; 1,369,909 pounds of epoxy coated reinforcement bars; and 76,493 pounds of polished, stainless steel plates)
- 5 cranes: 3 dedicated full time to spans 2, 3 and 4; two dedicated to the end span and approach at each end of the bridge
- 2 helper cranes, which moved material from transfer barges to staging areas for the larger cranes and installed lighter deck panels
- 7 barges that supported cranes on the water and were used to move material from a staging yard upriver to the bridge
DENVER’S NEW DESTINATION

A new Hotel and Transit Center complex at Denver International Airport recasts the airport as an intermodal air-to-ground facility—and a draw in its own right.
While people in most cities go to the airport just to catch flights, Denver residents and visitors now also can catch the train to the airport, which has become a destination in its own right.

A new, 23-mile commuter rail line from the city’s downtown Union Station delivers travelers to their airport connections and residents to the airport terminal interface structure. There, an 82,000-square-foot open-air plaza connects the airport’s Jeppesen Terminal and the new hotel and regularly plays host to events such as community fairs, gala dinners, art events, concerts and other sporting events, such as putt-putt golf. In the winter, it will sport an ice skating rink.

The Hotel and Transit Center added public bus service to and from the transit center, as well, recasting the airport as an intermodal center, said Tom Rossbach, HNTB aviation architecture leader.

“The program demonstrates a model that other major hub airports are going toward — rail service from the central business district, a regional bus center with an on-site conference hotel and easy connections to rental car facilities and parking garages,” Rossbach said. “With the additions, Denver has become an intermodal air-to-ground center.”

**Planning clarifies the need**

Denver’s original master plan, created in the late 1980s, called for a mass transit connection and a hotel.

In 2009, the airport initiated advance planning for the program. The 18-month process included studying potential locations for future concourses and evaluating how the Great Hall, which originally was a calming traveler’s oasis but was modified into a security checkpoint after 9/11, might be returned to its original purpose.

The advance planning, for which HNTB provided technical plans, quickly focused attention on the overarching need for a building that would house an airport hotel and a transit center.
The Regional Transportation District, Denver’s public transit authority, had previously agreed to build a rail line from downtown to the airport. When RTD secured approval and funding to construct the line, it “was the final catalyst for the Hotel and Transit Center project at Denver,” said Stu Williams, the airport’s senior vice president-special projects. “The two had to work together.”

Bringing its national airport development experience to bear, HNTB provided fiscally and technically appropriate planning for both the air and land sides of the project, according to Scott Steckler, HNTB project manager.

Preserving the view
As development began, HNTB stepped into the program management and construction management roles, reviewing all design and overseeing implementation of the technical planning concept during construction. The firm also created the building information model and served as a liaison to coordinate the BIM between the design team and the contractor.

“The project was highly visible, and there was scrutiny from the public to make sure we met the designed program,” Steckler said. “As a team, we went through a value engineering process to make sure the design fit the budget.”

Strategic planning was particularly important because the airport’s view corridors, which provide sightlines to the facility’s iconic canopy structures, had to be maintained. The new Westin Hotel, built directly above the transit center, achieves this goal with a “saddle” design that resembles a bird in flight.

To be financially viable, the hotel had to have at least 500 guest rooms. While preserving views of the iconic terminal tent roof structure from the airport approach roadways to the south, and the future south aircraft runways from the air traffic control tower to the north, its design — sloped in the middle and higher on either side and limited to a certain height due to Federal Aviation Administration airspace surface restrictions — also created capacity challenges. The length of the HTC also was limited to the distance between the airport roadway curbs to/from the Jeppesen Terminal.

“The design team splayed out the east and west elevations of the hotel, giving it a sloped face,” Steckler said. “That configuration allowed the maximum number of rooms — one or two more per floor — for a total of 519 guest rooms.”

“Projects are often planned in isolation. In this case, we thought about future needs ... The design focused on what the airport might need 20 years out.”

— TOM ROSSBACH
HNTB AVIATION ARCHITECTURE LEADER
The hotel guestrooms occupy only the top nine floors of the new 14-story structure. Trains arrive on the first-floor platform level, where departing airline passengers can check their bags before being transported via escalators up five floors to the airport’s main security screening area.

**Taking the long-term perspective**

Like all major airport programs, DEN’s Hotel and Transit Center encountered challenges along the way.

“Because of the way we had to contract the program, we had multiple general contractors, and coordination of that work was challenging, but imperative,” said Williams. “We needed to maintain regular interaction and coordination with other agencies, including RTD. We had lots of folks working in a limited area and, throughout the program, we had to keep the airport operating at full capacity while being cognizant of the budget and trying to meet an aggressive schedule.”

“The HTC program had a very fast pace and critical deadlines,” Steckler said. “The hotel was scheduled to open in November 2015, and there were interim dates we had to meet, so RTD could start testing the train a year before it would be operational. The program management team was on-site with staff full time to solve issues that came up during construction. The program was delivered on time and within 7 percent of the final budget, even after project additions were made.”

The completed Hotel and Transit Center not only fulfills immediate goals, but — because it was built with Denver’s long-term plans in mind — also positions the airport for future growth.

“Projects often are planned in isolation,” Rossbach said. “In this case, we thought about future needs: how the transit station might be expanded, where future concourses might go and where security checkpoints and gates might need to be added. We allowed for future baggage system and roadway expansions. The design focused on what the airport might need 20 years out.”

Even the 1.5 million cubic yards of dirt excavated to make room for the Hotel and Transit Center were preserved to be used for future runways and taxiways.

As another step in DEN’s plans for continual improvement, the Hotel and Transit Center’s rail connection and outdoor plaza provide a new front door for the Jeppesen Terminal.

“The mass transit connection has enhanced access to the airport for those arriving and departing,” Williams said. “The hotel is a huge asset ... The appearance of the transit center and hotel are unique and have enhanced DEN’s position as a world-class airport.”

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TRIUMPH

HNTB joins forces to replace New York City’s Kosciuszko Bridge

Everyone knew there would be nothing easy about replacing New York City’s Kosciuszko Bridge. The team that accepted the challenge would have to relocate decades of underground utilities, resolve major drainage issues, work within extremely limited right of way, avoid an active hazardous waste site and fulfill the enormous task of keeping the existing bridge open to traffic.

But the New York State Department of Transportation and the expert project team it selected triumphed. This year, the Department will open a new cable-stayed bridge in its place.

Department Project Director Robert Adams sums up the ambitious bridge replacement project with one word — “Success.”

“The amount of progress has been unprecedented. We’ve worked closely with the community for many years on this project, and have been commended for it,” Adams said.

First cable-stayed bridge to open in New York City

The current Kosciuszko Bridge, built in 1939, carries the Brooklyn-Queens Expressway/Interstate 278 and more than 160,000 vehicles a day over Newton Creek — levels of traffic it was never designed to carry.

“Over the past 20 years, the Department has spent a great deal of time and money to maintain the through-truss bridge in a state of good repair,” Adams said. “By replacing the bridge, we address its deficiencies: the steep roadway grade, narrow lane widths and lack of shoulders.”

To replace the Kosciuszko Bridge, the Department is building twin cable-stayed bridges in two phases. Phase 1 delivers the new Queens-bound bridge and demolishes the existing bridge. The new Queens-bound bridge — the first cable-stayed bridge in New York City — will feature, in its final configuration, five standard-width lanes and two full-width shoulders. It will be wide enough to carry both directions of traffic until phase 2 delivers the Brooklyn-bound structure under a future contract.

The future Brooklyn-bound span will carry four standard-width lanes, a full-width shoulder and a 20-foot-wide bicycle and pedestrian path. New parks and improved waterfront access also are planned.

First design-build contract cuts years off project

The Department selected Skanska-Kiewit-ECCO III Joint Venture in association with HNTB to deliver the massive Queens-bound structure and provided notice of award in March 2014, with a notice to proceed in May 2014. At $555 million, phase 1 is the largest single contract ever awarded by the Department.

Prior to receiving design-build legislative authority, the Department had planned to deliver the project under a series of four smaller design-bid-build contracts, with a projected completion date of 2024.

“With design-build, we are saving three to four years on overall project completion, which ultimately will provide savings to New York taxpayers,” Adams said.
K BRIDGE FIRSTS

- New York City's first major bridge since the Verrazano-Narrows Bridge opened in 1964
- The first cable-stayed bridge to open in New York City
- The largest single contract ever awarded by the New York State Department of Transportation
- The first major design-build project in the five-borough region
“The Kosciuszko Bridge is proof that visionary projects can move from traditional design-bid-build to design-build as the design-build program is being developed,” said Jim Peterson, HNTB project director.

The Department set an aggressive schedule for the design-build team, with the new construction and demolition complete by the end of 2017, 43 months from notice to proceed. The entire design-build team understood the importance of meeting this schedule — as the Department planned to have phase 2 construction start in summer 2017.

Knowing SKE wanted to start installing the main span’s drilled shafts in October 2014, HNTB went to work on the final bridge design immediately. In five months, the firm had conducted wind testing, performed non-linear time history analysis, progressed the entire bridge design to the 20 percent level and finished design of the bridge foundations by December to meet the schedule.

“For a cable-stayed bridge, that is the epitome of accelerated,” said Hans Hutton, HNTB engineer of record for the cable-stayed unit.

According to Hutton, cable-stayed is one of the most complex, computationally intensive bridges to design, let alone deliver under design-build.

“When we first considered the approach, this was a 12- to 14-month design,” Hutton said. “In reviewing the schedule, it was clear that SKE needed the design in 9 months. With continual communication among SKE, HNTB and the Department, this schedule was met.”

“It is rare to have a job of this size with very few changes to the base design,” said Youssef Dehne, design-build manager for SKE. “Being on schedule is proof the job was designed efficiently and was the result of extensive collaboration between the Department, city agencies, SKE, HNTB and the third parties. Everyone works very well together.”

Adams agrees.

“The team meets frequently and is committed to addressing issues quickly, so everyone can continue working,” he said. “That helps everyone stay on schedule, so the focus can be on doing quality work and delivering the job safely.”

**Solution balances asymmetrical design**

Design-build has a greater chance of succeeding when owners state what is important to them in the contract. For the Department, the cable-stayed design was important. Constituents had asked for a
signature bridge, and the longer spans inherent in the cable-stayed design provided flexibility in the structure’s design.

“Most cable-stayed bridges are equally-loaded three-span symmetrical bridges with two towers,” said Charlie Dodge, HNTB design manager. “The new Queens-bound structure is a two-span cable-stayed bridge with one tower — and the spans are not equal lengths. The back span is 377 feet, the main span is 624 feet — a configuration required to avoid the railroad right-of-way and environmentally sensitive areas below.”

The asymmetry presented several design and construction challenges. The shorter span is lighter, which creates uplift on the back span that must be addressed. (Visualize a balancing scale with a much lighter mass on one side of the fulcrum.) To make the asymmetrical design work, HNTB added massive concrete counterweights to the back span to balance both sides of the bridge. Each step of the bridge erection process also was analyzed to ensure the necessary balanced loading during construction of bridge superstructure and cables.

Replace-in-place avoids cost of temporary bridge
As lead designer, HNTB was responsible for tackling the challenging design of the Brooklyn connector.

“The old Brooklyn approach viaduct and the new Brooklyn connector occupied the same space — they had the same alignment on the same elevation,” Dodge said. “How do you replace a structure while keeping it operational?”

One early design concept was to build a 1-mile temporary bridge to service traffic while the viaduct was replaced. But that would be time-consuming and expensive. Instead, HNTB designed and SKE rebuilt the viaduct in-kind, one lane at a time, while traffic continued to flow on it, also known as the “replace-in-place” concept.

“We moved traffic into the far left-hand side of the existing viaduct while we deconstructed the far right-hand lane and built a new lane in its place,” Dodge said. “We repeated the process, moving from right to left, building the new viaduct one lane at a time.”

HNTB’s design called for constructing approximately 2,000 feet of earth-filled embankments under the existing viaduct, using prefabricated modular retaining walls (T-Walls®). The proposed embankments were constructed in tight quarters adjacent to and beneath the existing viaduct.

“This is where HNTB’s geotechnical experts really shined,” Peterson said.

HNTB conducted significant structural analysis to ensure the existing bridge would be stable and structurally sound as crews dismantled it in pieces.

“We gave SKE advance notice of where work could proceed and where remedial actions might be needed, so schedule changes were not a surprise,” Peterson said. “And, the Department received assurance that traffic patterns and motorist safety could be maintained on the existing bridge.”

National design approach is key to project success
The core design management team, led by Dodge, worked in New York City and met regularly with SKE and the Department. However, this wasn’t a co-located team with everyone in the same room.

“For a project of this size and complexity, HNTB provided SKE and the project with the best engineering talent available from coast to coast in our firm,” said John Friel, HNTB Design Build Division President.

At the peak of design, more than 150 HNTB employees from New York, Missouri, New Jersey and other office locations supported the design effort. Co-locating talent from multiple offices is nearly impossible, but with the use of technology and the commitment of each office to dedicate those employees and their time to the project, HNTB created virtual co-location that allowed all designers to work together in one direction, and complete the job.

“Virtual co-location allowed our best and brightest bridge design experts to collaborate on this massive project, and deliver it successfully,” Peterson said. “Every office that worked on the project pulled its weight — it was the ultimate team approach.”

Adams anticipates completing the bridge on schedule, on budget and to the benefit of the community.

“I-278 is the only north-south directional interstate in Brooklyn and Queens,” he said. “The project makes this critical corridor in New York City’s transportation network a safer, more effective and efficient highway.”

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The Dallas City Center Master Assessment Process, CityMAP™, is a groundbreaking study of the challenges and opportunities that lie in redesigning the area’s aging urban interstate corridors.

Although TxDOT’s foremost objective was to relieve chokepoints along nearly 30 miles of urban interstate and state highway corridors, TxDOT saw a bigger opportunity to study how congestion relief would impact city design.

In early 2015, TxDOT asked its general engineering consultant, HNTB, to lead the assessment. The firm was to engage community stakeholders, the City of Dallas and Dallas County to learn what was happening along the edges and over and under the corridors.

The outreach effort would result in one of the most comprehensive urban highway assessments the transportation industry has ever seen.

HNTB leads TxDOT effort to

MAPPING

THE CITYMAP PROCESS

With feedback from stakeholders and the public, CityMAP successfully created a long-term vision for transportation, urban design and development scenarios associated with major interstate corridors around downtown Dallas. The results of this initiative revealed how CityMAP could be implemented in and personalized for other cities.
uniting a city over the future of its downtown corridors

DALLAS’ FUTURE

Shaping the future one stakeholder at a time
TXDOT knew some stakeholders would have reservations about speaking publicly in large groups, so all outreach was conducted individually, face-to-face.

To meet TxDOT’s expectations, HNTB’s James Frye, Dallas urban design and planning department leader, and his colleague Brandi Crawford, HNTB senior landscape architect, assembled a multidisciplinary team of planners, engineers, traffic managers, urban designers, economists, real estate developers and public relations specialists, as well as experts in freeway geometrics and cost analysis.

For the next nine months, the CityMAP team conducted 80 listening sessions with local, state and federal elected officials, the chamber of commerce, nonprofits, professional associations, coalitions/advocacy groups, developers, colleges and churches.

“Together, we focused on highway design and how it can contribute to economic development, mobility and livability,” Crawford said.

In addition, HNTB held three large public meetings, reviewed previous planning studies, analyzed current corridor design projects, studied traffic patterns and then looped stakeholders and the public back in through recap sessions, intended to first vet key findings and, later, to vet the draft assessment.

“HNTB embraced the concept of providing a holistic approach to the corridor and giving life to the thoughts and opportunities others expressed,” said TxDOT Commissioner Victor Vandergriff. “They did an excellent job of facilitating the stakeholder engagement and putting together the detailed report.”

Submitting a menu of alternatives
The 450-page document, completed in late 2016, provides a menu of innovative roadway designs and adjacent neighborhood and community development options. Scenarios include compressing highway footprints, taking sections of highway below grade, relocating portions of highway and improving connections.

“CityMAP is careful not to make recommendations as to which design scenario should continue into the project development process,” Frye said. “TxDOT believes that decision rests with taxpayers and community leadership.”

Reinventing transportation planning
Frye expects the momentum and excitement over what has been achieved in Dallas will carry elements of CityMAP forward to help shape any future edits to the Metropolitan Transportation Plan in Downtown Dallas.

Throughout the process, people from many diverse backgrounds, neighborhoods and communities shared a wide array of views on the future of Dallas’ urban highway system and the catalytic potential for surrounding neighborhoods, parks, streets and development. Bringing a broad range of ideas and opinions into one comprehensive document was unprecedented, and a major victory for all.

“After you’ve been through a comprehensive process like CityMAP and witnessed its power to unify communities, you can’t go back to business as usual,” Frye said. “It revolutionizes the way transportation planning is done.”

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CityMAP benefits:
• Minimizes public and local partner resistance
• Avoids costly planning and design delays
• Allows governing agency to test multiple scenarios for community acceptance, operational performance, funding feasibility and partnership potential

See the full plan at www.dallascitymap.com.
Creating New Coastland

“A typical crevasse has a 10- to 20-year cycle. The fact that this project is still creating land after 30 years is unprecedented.”

— DAVID ST. MARIE
HNTB COASTAL RESTORATION LEAD

Years in the making | 1986-2017
Images from the original project site
HNTB prepared preliminary and final plans and specifications for the construction of three artificial crevasses. The diversions would bring more Mississippi River sediment into the area to offset the losses caused by erosion and subsidence.
More than 50 years ago, the Louisiana Department of Wildlife and Fisheries embarked on an ingenious initiative to address the rapid erosion of coastal wetlands being swallowed up by rising sea levels, sediment depletion, subsidence and storm surges. At the time, coastal wetlands were estimated to be eroding at a rate of one football field per hour; today’s estimates are closer to a football field every 45 minutes.

The LDWF implemented its own diversion program by mimicking mother nature and cutting openings into the natural levees along the water’s edge. This program’s success led to a grant to fund a more robust project that would harness the natural cycle of the Mississippi River Delta in order to rebuild land mass in a wildlife area known as the Pass-a-Loutre. The project would divert sediment-rich river water through man-made cuts along the water’s edge. State officials hoped that over time, layer upon layer of sediment would accumulate and eventually form new land.

To implement this first engineered sediment diversion project, LDWF partnered with Louisiana’s Department of Natural Resources and selected HNTB to lead the engineering and design in 1986. The project entailed three strategic cuts, or crevasses, in the natural levees along the Mississippi River to divert sediment into the wildlife area. HNTB conducted surveys, selected crevasse sites, developed designs and monitored construction. During the planning stages, HNTB conducted an extensive evaluation of potential crevasse sites to find areas that would maximize sediment flow.

“Proper site selection is the most critical component,” said David St. Marie, HNTB coastal restoration lead. “You want maximum sediment loads in the river section adjacent to large, shallow receiving areas to capture the most sediment for wetland building.”

The initiative has proven to be a resounding success. To date, the Pass-a-Loutre Marsh Creation Project has created and sustained 760 acres of land and thousands of acres of submerged aquatic vegetation — resulting in one of the first such land-building efforts in the world and one of the most cost-effective coastalland restoration projects in U.S. history.

Originally budgeted at $300,000, the project was constructed for a one-time cost of $88,060, which has to date amounted to an investment of a mere $252 per acre (adjusted for inflation). That cost per acre is continuing to decrease because more land is being built.

“A typical crevasse has a 10- to 20-year life cycle,” St. Marie said. “The fact that this project is still creating land after 30 years is unprecedented.”

The Pass-a-Loutre Marsh Creation success is just the beginning, however. Since 1932 Louisiana has lost more than 1,883 square miles of coastal land — an area nearly the size of Delaware, according to the U.S. geological survey.

“It’s a crisis down here,” said St. Marie, a native of coastal Louisiana. “We are fighting a historic battle to stem coastal land loss.”

HNTB has worked to save or restore Louisiana’s coast for the past 30 years, partnering with the LDWF, the state’s Department of Natural Resources, the U.S. Army Corps of Engineers and the Coastal Protection and Restoration Authority, which now leads the charge to protect and restore coastal Louisiana since Hurricane Katrina.

All agree, preserving the wetlands is a matter of public safety and economic necessity.

“The wetlands prevent the Mississippi River from bifurcating into smaller, less navigable water channels once it reaches southeast Louisiana,” said Andy Nyman, professor at Louisiana State University’s School of Renewable Natural Resources. “Wetlands are also our first defense against storm surges, which will increase in intensity with rising sea levels. The wetlands protect the levees, so the levees can protect us.”

One of the state’s next initiatives is a $1.3 billion sediment diversion project, 70 miles north of Pass-a-Loutre. It will be fully funded through fines from oil spills.

“Sediment diversion is one of the most cost-effective things we could do,” Nyman said. “It builds land and it survives hurricanes much better than older wetlands.”

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NEW CROSSING FOR SISTERS CREEK

HNTB provided construction engineering and inspection services to the Florida Department of Transportation on the replacement of the Sisters Creek Bridge in Jacksonville, Florida. Design-build delivery was used to replace the original 1950’s bascule bridge with a high-level fixed-span bridge that allows improved clearance for the marine channel. The new 3,288-foot bridge carries Heckscher Drive over Sisters Creek, part of the intercoastal waterway system that runs from New England to south Florida. The new bridge includes two 12-foot lanes, two 10-foot shoulders and two 6-foot sidewalks. The structure is designed to withstand possible ship impacts by making the three-channel spans continuous for live load, as well as improve the safety and convenience of Jacksonville’s transportation system and the intercoastal channel. Construction of the project was completed in late 2016.

More project photos available for Apple and Android on the HNTB App.