

PROJECT: Caldecott Fourth Bore

LOCATION: San Francisco

OWNER: Caltrans

DESIGNER: Caltrans

CONTRACTOR: Tutor-Saliba Corp.

COST: \$390 million

START DATE: January 2010

COMPLETION DATE: June 2014

#1



A bore with details

California tunnel project rises above all the complexity

By Bill Wilson
Editorial Director

They already knew too much, but the conversation did not end there. It just got louder and more intelligent.

Caltrans engineers wanted to be absolutely sure they knew what they were dealing with before—and during—the process of breaking up the hard underground of the Caldecott Fourth Bore tunnel project in the San Francisco Bay area. They had historical data from the first three tunnels showing the rock geometry and compiled plenty of current information through a series of cores. There also was the court order to keep noise at a minimum, as well as the stamp of approval needed from the first responders in the area—both at the federal and local level.

Everyone involved in this complicated burrow-birthing rose high above the call of duty, and in the end the project was above all else after it was named to the top spot of the 2013 ROADS & BRIDGES Top 10 Roads list.

“I think we are very proud [of the No. 1 ranking], and I think we should be,” Ivy Morrison, public information officer for the Caldecott Fourth Bore, told ROADS & BRIDGES.

“We are very proud of our safety record.

We are very proud of the fact that we are on schedule and on budget, and we are very proud of the partnerships behind the project.”

There was a point when the details matched the intensity of the task at hand. The Caldecott tunnels pass through three primary rock formations, all dating to the Miocene Period between 5 and 23 million years ago. The Orinda formation on the east side of the tunnel project is the younger rock and is less likely to fracture, but the Sobrante formation on the west side was the least stable of the three and required extensive support in the final 50 meters prior to the breakthrough of the boring process. Due to the difficult ground conditions the Sequential Excavation Tunneling Method was used.

“In hindsight, if we knew what we knew now, the design plans were probably too detailed in terms of ground classifications,” said Morrison. “The plans identified four main ground classifications and then subcategories, and this may not have been necessary.”

The current and final phase of the project also comes with layers of inspection and verification. The tunnel’s fire and life safety systems are currently being installed and

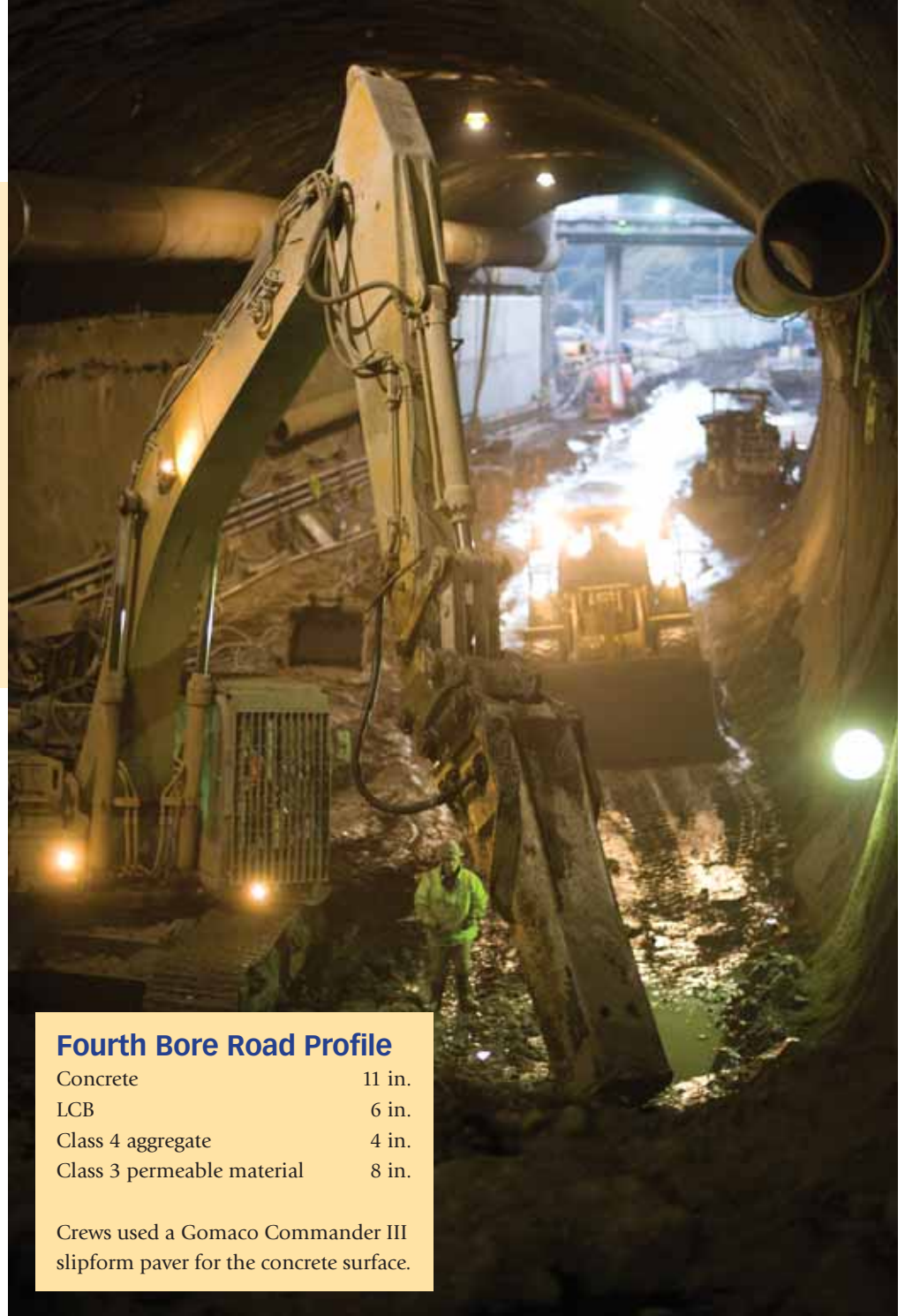
Did you know?

The original two-bore tunnel opened in 1937 and the entrance portals were designed by Alameda County Architect Henry Myer in an art deco motif. Because of this it was important to create the new tunnel bore in a similar design. "Art Deco Revisited" was selected as the tunnel's theme through an online public survey. Caltrans created a medallion design competition to provide children in grades K-12 in Alameda and Contra Costa counties an opportunity to play a role in designing the important architectural details of the new bore. The competition drew more than 300 entries and six winners were selected. The medallions incorporate art deco-themed elements such as simple geometric figures of the Bay Area's urban and natural landscape. The six medallions will adorn each side of the entrance portals.

must be integrated with each other as well as the legacy systems. They will then be tested and commissioned by the state fire marshal before functional testing is carried out, which culminates with a series of fire drills involving trained Caltrans tunnel inspectors and first responders. If everything checks out, the tunnel, which will function as a regional lifeline structure and must be able to reopen to emergency traffic within 72 hours following a major earthquake, should officially open to traffic by the end of 2013.

The Caldecott Fourth Bore's fire-detection system consists of linear heat, carbon monoxide and nitrous oxide detectors, video-detection cameras and 19 jet fans. Upon detection of a fire this system will provide an automated ventilation response to support a safe evacuation.

At press time crews also were finishing up the installation of 990 stainless steel panels on the tunnel walls, which are made up of 1.6 million kg of steel rebar. Morrison said it is essentially a double layer of framework, and the concrete lining is thinner than most applications, about 12 in., for a reason: It's expected to crack during an



Fourth Bore Road Profile

| | |
|----------------------------|--------|
| Concrete | 11 in. |
| LCB | 6 in. |
| Class 4 aggregate | 4 in. |
| Class 3 permeable material | 8 in. |

Crews used a Gomaco Commander III slipform paver for the concrete surface.

earthquake event, but the rebar will prevent any kind of collapse.

"If this tunnel was built in another part of the country you would not see this amount of rebar," Morrison remarked.

Environmental lawsuits carry the same impact wherever you are in the U.S., and the Caldecott Fourth Bore was facing an important one before construction even got a firm foot in the ground. Noise concerns were raised from the city of Oakland and project neighbors as soon as the Environmental Impact Statement was released, and a court

order called for the construction of a 30-ft-high, 11,000-ft-long temporary sound wall as well as constant noise monitoring. Nine sensors were installed, mostly on the Oakland (west) side, and data had to be posted on the project website daily. To date, Morrison said only a handful of complaints have been filed (mostly during excavation) and the project has not been shut down.

Opponents of the tunnel project also wanted a light-rail line to be considered, but it too would require a tunnel and "would not really solve the problem," said Morrison. **R&B**

#2

PROJECT: I-69 Evansville to Indianapolis Corridor, Sections 1-3

LOCATION: Evansville, Ind., to Crane Ind.

OWNER: Indiana DOT

DESIGNERS: American Consulting; ACE; Beam, Longest & Neff; Bernardin Lockmueller & Assoc.; Parsons Brinckerhoff; Wilbur Smith

CONTRACTORS: Multiple

COST: \$620 million

START DATE: Oct. 1, 2009

COMPLETION DATE: Nov. 19, 2012



Bat around

Indiana makes room for I-69 highway and for bats

By **Allen Zeyher**
Managing Editor

Constructing I-69 through 67 miles of southwest Indiana involved overseeing 15 construction contracts simultaneously building 268 lane-miles of interstate, 132 bridges and seven interchanges.

The project used 114,000 cu yd of structural concrete and more than 47 million lb of reinforcing steel in the bridges.

The Indiana Department of Transportation (INDOT) allowed the contractors to decide whether to bid concrete or asphalt pavement in their sections, depending on geotechnical conditions. The result was more competitive bid prices and savings of \$65.3 million for INDOT, compared with traditional pavement bidding.

Contractors constructed 50.2 centerline miles of concrete pavement and the balance in asphalt. Some sections feature concrete lanes with asphalt shoulders.

Some southwest Indiana citizens worried that I-69 might disturb the habitat of the Indiana bat, a small mammal about the size of a small mouse but with a wingspan of up to 10½ in. The bats give birth among the trees and hibernate in caves in southern Indiana and 20 other states. About 10% of the world's population of Indiana bats live in Indiana. Groups such as Citizens for Appropriate Rural Roads feared the construction would harm the federally endangered species.

INDOT led weekly meetings between INDOT's environmental services, INDOT's I-69 project managers, design consultants and the lead environmental consultant. As part of INDOT's mitigation efforts, the agency purchased several times more land for mitigation than it did for the roadway itself.

"Some of the land is already pristine: forests, streams or wetlands. As such, we're purchasing a preservation easement in perpetuity on the property," Will Wingfield, statewide communications director for INDOT, told *ROADS & BRIDGES*. "Some other properties may be purchased for the purpose of restoration, where we're restoring stream banks or planting trees in what would otherwise be farm land in an effort to mitigate the impacts of the highway."

Land clearing halted between April 1 and Sept. 30 of last year because the female bats give birth to their young under the loose bark of big trees.

Crossing the Patoka River National Wildlife Refuge, INDOT constructed a 4,400-ft bridge without planting a single pier in the water.

The twin four-lane bridges—one northbound, one southbound—include shoulders and two columns per pier. The southbound bridge features 31 spans; the northbound has 30 spans. **R&B**

#3

PROJECT: DFW Connector

LOCATION: Dallas

OWNER: Texas Department of Transportation

DESIGNER:

NorthGate Constructors (JV of Kiewit Texas Construction LP and Zachry Construction Corp.)

CONTRACTOR: North Constructors

COST: \$1.02 billion

START DATE: Feb. 17, 2010

COMPLETION DATE: Oct. 31, 2013



Connect four

\$1.02 billion highway project improves traffic for Texas' four biggest counties

By Jeff Zagoudis
Associate Editor

The DFW Connector project has been a long time coming in north Texas, according to Alyssa Tenorio, public information manager for NorthGate Constructors, the joint venture that served as general contractor on the \$1.02 billion undertaking. "The Texas Department of Transportation had been trying to do a similar project for years, but the funding just wasn't there until 2009," Tenorio told *ROADS & BRIDGES*.

The area comprises the four most populous counties in Texas and sits near the Dallas-Fort Worth International Airport, making it an important transportation hub for the state.

The DFW Connector project's goal is to rebuild portions of four highways, two interchanges and five bridges. State highways 114 and 121 have been the center of attention throughout the project, which was 94% complete at press time and scheduled for full completion by the end of September.

In the end, NorthGate Constructors and TxDOT hope to at least double, and potentially triple, traffic-flow capacity for the whole area.

Construction also will add a new series of managed toll lanes, the funding from which will help with continued operation and maintenance of the highway, and new

frontage roads. In total, the DFW Connector will be as wide as 24 lanes.

Much of the work was done during off-peak hours, keeping all lanes of traffic open during the day with full closures at night and on weekends. All concrete for the main highways was batched on-site with a Rexcon Model S batch plant. The contract also called for recycling of the existing concrete for reuse as the roadway base; Northgate utilized a Caterpillar concrete crusher to accomplish the task.

Productivity took a hit—literally—when an excavator from an unrelated construction site collided with one of the girders on the Texan Trail bridge over S.H. 114 in the early months of 2012. "You just never know what's going to happen," Tenorio said about the incident.

The bridge had already been scheduled for a rebuild, so the incident actually allowed crews to expedite the process. The unaffected side of the bridge was open to traffic just two weeks later.

Local, state and federal officials including Federal Highway Administrator Victor Mendez were on-hand for a ribbon-cutting ceremony for the DFW Connector in late August. As of press time, some small finishing details were still needed on S.H. 26, including new curbs, islands, paving and traffic signals. **R&B**

PROJECT: New Jersey Turnpike Interchange 6 to 9 Widening

LOCATION: Central New Jersey

OWNER: New Jersey Turnpike Authority

DESIGNERS:

Parsons Brinckerhoff; AECOM; Michael Baker; Louis Berger Group; TY Lin; Dewberry; Arora and Associates; Jacobs Engineering

CONSTRUCTION MANAGER:

AECOM/GPI/Parsons Brinckerhoff, a JV

CONSTRUCTION SUPERVISION:

Shaw Stone & Webster; HNTB

COST: \$2.2 billion

START DATE: 2009

COMPLETION DATE: Summer 2014

#4



Photo by Stokes Creative Group Inc.

Double your drive

N.J. Turnpike responds to traffic projections

By Allen Zeyher
Managing Editor

Traffic volume northbound on the New Jersey Turnpike is expected to increase by nearly 68% by 2032; southbound traffic is forecasted to increase by 92%.

Periodic traffic congestion is already increasing on the turnpike. Population and employment are growing in central New Jersey. Plus, the volume of goods flowing from Port Newark, Port Elizabeth, the Port of New York and New Jersey and Newark Liberty International Airport also is expected to increase.

To handle all the extra traffic, the New Jersey Turnpike Authority (NJTA) is in the process of widening the turnpike from the vicinity of Interchange 6, in Mansfield Township, to just south of Interchange 9, in East Brunswick Township.

NJTA is planning to put \$2.2 billion into the widening project. When complete, this widening will provide three additional travel lanes in each direction between Interchange 6 and 8A and one additional lane in each direction between Interchanges 8A and 9 and a new toll plaza at Interchange 8. The Interchange 6 to 9 program is the largest expansion of the New Jersey Turnpike's capacity since the roadway opened in 1951, adding 170 lane-miles, crossing three counties and 11 municipalities.

The widening will result in a 12-lane dual-dual roadway along the 35 miles between Interchange 6 and Interchange 9. It will consist of three car/truck/bus lanes and three car-only lanes in each direction.

Adding a third lane to the car/truck/bus lanes (outer roadways) of the 10-lane dual-dual roadway between Interchanges 8A and 9 will require adding a new lane to the existing car/truck/bus lanes in each direction for a 10-mile section of the turnpike.

The widening program also plans to improve connections to interchanges and service areas along the turnpike, relocate and expand the Interchange 8 toll plaza and associated ramps and widen the existing Interchange 7A toll plaza.

The widening project is currently spending about \$30 million a month, or \$1 million a day. The project remains on schedule for completion in summer 2014. To date, NJTA has completed and opened the third lane northbound on the outer roadway between Interchanges 8A and 9. The authority also has opened several ramps to and from toll plazas, seven newly constructed bridges that carry local roadways over the turnpike and recently completed the new I-195 westbound bridge.

The Interchange 6 to 9 widening program is being fully funded by NJTA. **R&B**

PROJECT: Accelerate 465**LOCATION:** Indianapolis, Ind.**OWNER:** Indiana Department of Transportation**DESIGNERS:** Stephen J. Christian and Associates, RW Armstrong, CTE, Burgess and Niple, Parsons Brinckerhoff**CONTRACTORS:** Walsh Construction Co., E&B Paving Co., Milestone Advisors**COST:** \$423 million**START DATE:** April 10, 2010**COMPLETION DATE:** Nov. 29, 2012

#5



A ring around Indy

INDOT bests airport traffic, construction surprises in time for city's first Super Bowl

By Jeff Zagoudis
Associate Editor

In case keeping traffic moving on Indianapolis' main interstate was not enough pressure, all parties involved with the reconstruction of I-465 were given a firm deadline of Feb. 5, 2012, to complete the \$423 million project. It was the day the city would host its first Super Bowl.

Work focused on an 11-mile portion of I-465 on the west side of the city, immediately adjacent to Indianapolis International Airport. "There aren't many north-south roads on the west side of Indianapolis," Will Wingfield, public information officer at the Indiana Department of Transportation (INDOT), told *ROADS & BRIDGES*, "so a lot of traffic uses I-465 as a local street." This combined with the high volume of airport traffic made increasing capacity and safety the top priorities.

Project elements included replacing pavement; reconfiguring interchanges to make them safer; and adding lanes north- and southbound at various points. Several bridges were reconstructed as well, including the 21st Street Bridge over I-465, which became one of the first with a U-beam design in the state of Indiana.

"Obviously the largest challenge was maintaining up to 100,000 vehicles per day traveling through the work zone," Wingfield said. Some road and bridge closures were needed, particularly in the early stages. Traffic was temporarily rerouted on I-74, including

shifting one of the three lanes to the opposite side of the road to create an express lane.

To keep traffic moving and get the road in good enough shape for the influx of Super Bowl visitors, INDOT implemented an accelerated construction schedule. As one example, crews were able to install a new 206-ft-long culvert for a regulated waterway in under a week by putting in more than 600 ft of trenchless pipe while road construction was still ongoing, creating a proper drainage environment.

Being that close to a major airport carried some burdens of its own. "There were hundreds of FAA permits that needed to be obtained," Wingfield said. In fact, each piece of equipment needed its own separate permit.

Construction crews received quite a surprise when they were working near the intersection of I-465 and Washington Street—excavation unveiled a group of underground fuel-storage tanks (likely from an old gas station) that no one had known about.

"You never know what you're going to find with a surface road," Wingfield admitted. INDOT was able to dig out the old tanks and replace them and limit environmental damage.

Even amidst these challenges, Walsh and INDOT were able to fully reopen this portion of I-465 to traffic in time for the big game. Full construction was completed on Nov. 29, 2012. **R&B**

#6



I-79 MEADOW LANDS INTERCHANGE

Washington County, Pa.

COST: \$23 million

LENGTH: 1.42 miles

DESIGNER: Gannett Fleming Inc.

CONTRACTOR:

Swank Associated Cos. Inc.

OWNER: Pennsylvania DOT

A split decision had unanimous support. Due to site constraints and environmental concerns, it was decided a split diamond interchange configuration was the way to go. A new northbound entrance ramp required the relocation of approximately 835 ft of the tributary to Chartiers Creek. The new channel also incorporated mitigation features including planting, mud sills, boulders and two wetland areas. To complete the interchange, S.R. 1047 needed to be relocated. This required the roadway to pass beneath existing I-79 to form the split diamond configuration.

#7



COLUMBUS CROSSROADS

Columbus, Ohio

COST: \$200 million

LENGTH: 2.5 miles

DESIGNER: CH2M Hill

CONTRACTOR:

Kokosing Construction Co. Inc.

OWNER: Ohio DOT

The I-71/I-670 interchange has been a main attraction for accidents over the years. All eyes will be on something else thanks to the first phase of the largest highway project in central Ohio history. Since the roadways in the belly of the interchange are located well below the groundwater table, a water field was installed to lower the groundwater table elevation during construction. Complete removal of two existing bridges, construction of a new two-span bridge and the completion of 125 ft of the first cut-and-cover tunnel in downtown Columbus was finished in 175 days.

#8



S.R. 408/S.R. 417 SYSTEM INTERCHANGE

Orlando, Fla.

COST: \$72 million

LENGTH: 3.5 miles

DESIGNER: RS&H

CONTRACTOR: The Lane Construction Co.

OWNER: Orlando-Orange County

Expressway Authority

The Orlando-Orange County Expressway Authority wanted a true system-to-system interchange to ease congestion. Solutions, however, were not always easy to find. One complex challenge was designing and building five bridges on three different sites. Designers also had to plan for the construction of Ramp G over an existing pond. Original plans were developed to accommodate an access road over the pond during construction. RS&H planned for 17 ponds overall to treat and attenuate runoff from the interchange.

#9



I-95 WIDENING FROM FISKE BLVD. TO PALM BAY ROAD

Brevard County, Fla.

COST: \$197 million

LENGTH: 18 miles

DESIGNER: Jacobs Engineering Group

CONTRACTORS:

Community Asphalt/Jacobs

OWNER: Florida DOT, District 5

The nation's largest highway along the east coast is going to have a much bigger waist line. The route is expanding from four lanes to six in order to accommodate traffic and a major evacuation route. Two bridge replacements at Wickham Road and U.S. 192 were constructed in two phases instead of three. To help minimize traffic delays, the structure subcontractor developed a temporary fast and secure shoring method, which prevented the support beams from falling off the beam seats until they were locked in place.

#10



12TH STREET RECONSTRUCTION

Oakland, Calif.

COST: \$32 million

DESIGNER: Rajappan and Meyer

CONTRACTOR: McGuire and Hester

OWNER: City of Oakland

Give the lake a little space—and some accessories. The 12th Street Reconstruction involves turning the roadway into a six-lane, tree-lined boulevard with signalized intersections and crosswalks as well as a landscaped median. It also will be built further away from Lake Merritt, which received a facelift with new pedestrian and bike paths and open-water bridges running over what were culverts. A new four-acre park also was created, and the project also included re-establishing a section of open channel to allow travel by kayak.