

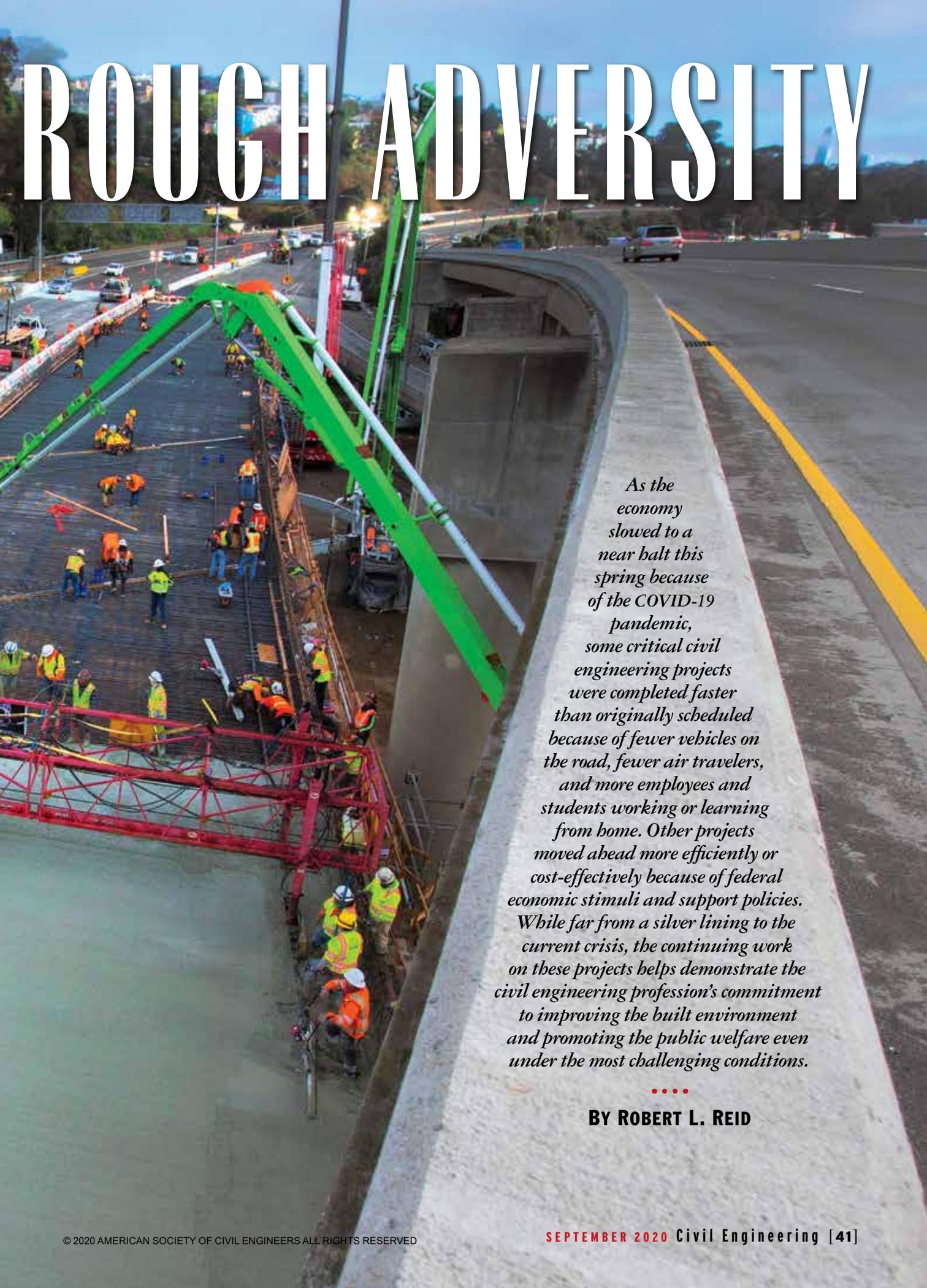
ACCELERATING TH



When stay-at-home orders dramatically reduced traffic, Caltrans work crews in San Francisco completed a deck-replacement project on U.S. Highway 101 in just under 10 days instead of the originally scheduled 18 days.

PHOTOGRAPH COURTESY OF JOHN HUSEBY/CALTRANS

ROUGH ADVERSITY



As the economy slowed to a near halt this spring because of the COVID-19 pandemic, some critical civil engineering projects were completed faster than originally scheduled because of fewer vehicles on the road, fewer air travelers, and more employees and students working or learning from home. Other projects moved ahead more efficiently or cost-effectively because of federal economic stimuli and support policies. While far from a silver lining to the current crisis, the continuing work on these projects helps demonstrate the civil engineering profession's commitment to improving the built environment and promoting the public welfare even under the most challenging conditions.

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BY ROBERT L. REID

AS THE COVID-19 PANDEMIC swept across the United States this spring and summer, many features of business, industry, transportation, education, and other aspects of what used to be considered normal daily life slowed significantly or shut down completely. Highways emptied of vehicles. Passengers disappeared from airports. Employees left their offices and began to work from home. Students stopped going to classrooms and started learning online. In some locations—the San Francisco Bay area, for example, and the entire states of Pennsylvania and New York—many infrastructure projects were deemed nonessential and at least temporarily put on hold.

Elsewhere, civil engineers experienced a different phenomenon: the shutdowns actually helped accelerate work on certain critical infrastructure projects, especially those in transportation. While hardly a silver lining to the current crisis, the lack of travel, stay-at-home orders, and other responses to the pandemic nonetheless meant that many infrastructure projects could be completed faster than originally scheduled, both in terms of when work on the projects started and how long they took to complete. Projects were also completed more efficiently, with fewer of the normal challenges that would have been expected before the pandemic. Some projects even saved money because of certain pandemic-related factors or received financial assistance from the federal government as part of pandemic-focused economic stimuli.

In California, for instance, the Los Angeles County Metropolitan Transportation Authority (a countywide entity also known as L.A. Metro, which covers the city of Los Angeles and more than 80 other communities) faced considerable challenges to extend the region's Purple Line subway service beneath portions of Wilshire Boulevard in Beverly Hills. That's because Wilshire Boulevard is "one of the most congested, busiest streets in the whole country if not the world," notes Cris Liban, D.Env, P.E., ENV SP, F.ASCE, the L.A. Metro's chief sustainability officer. Although the new subway tunnels themselves are being constructed by tunnel boring machines deep underground, the work also required that sections of Wilshire Boulevard at street level be torn up via cut-and-cover methods to remove the overburden, access the underground utilities, and complete work on the new subway station, Liban says. Accomplishing that work on the normally traffic-choked route was going to require months of incremental work conducted either only on weekends or at night, which poses its own unique challenges involving noise restrictions and limitations on what equipment could be used and when and where, Liban says.

But when traffic levels dropped precipitously because of

the pandemic, L.A. Metro found itself able to do something that would never have been possible before: it fully closed whole sections of Wilshire Boulevard in the daytime during the workweek. Having such unexpected access to large segments of the street at a time accelerated work on the subway extension project by at least six months, Liban reports.

Elsewhere in the region, Los Angeles's Bureau of Street Services (known as StreetsLA) had planned in the early part of spring to start repaving certain residential streets because normally those streets would be mostly empty of vehicles during the day after the residents had left for work. Instead, the combination of stay-at-home orders and a relaxation on parking restrictions meant that those streets might have 50 or 60 cars parked along the routes, says Adel Hagekhalil, P.E., BCEE, StreetsLA's executive director and general manager. At the same time, the commercial streets that during the day were normally packed with vehicles were suddenly almost empty.

"We decided to rethink what we were doing," Hagekhalil explains. The agency switched its program completely—working on the commercial corridors first while delaying the

paving of residential streets. StreetsLA started with a roughly half-mile-long section of Seventh Street—a heavily deteriorated commercial thoroughfare that was normally so congested "you could walk it faster than driving," Hagekhalil notes. During April's shutdowns, StreetsLA repaved that section of Seventh Street and added a much overdue protected bicycle lane in just two days with only minimal disruption to the people in the area. The project normally might have taken twice as long and caused considerable headaches for commuters, local businesses, and other stakeholders, Hagekhalil says.

The Seventh Street work was just the first part of some 60 to 70 mi of commercial corridor paving that StreetsLA now hopes to work on through September—or longer if

the stay-at-home orders are extended. "We'll adjust and continue to work this way, taking advantage of the less-traveled streets and minimizing the impact on people," Hagekhalil concludes.

SIMILAR EFFORTS are in the works across the nation. The Florida Department of Transportation (FDOT), for instance, announced in April that it would be expediting more than \$2 billion worth of critical infrastructure projects, including "significant portions" of the Interstate-4 Ultimate project in Orlando aimed at reconstructing 21 mi of the interstate in central Florida. "With the ability to increase lane closures and extend work hours because of the reduction in traffic from COVID-19," stated a press release from FDOT, the I-4 work would likely be completed an estimated one to two months sooner than originally scheduled. By mid-May,

LACK OF TRAVEL, STAY-AT-HOME ORDERS, AND OTHER RESPONSES TO THE PANDEMIC MEANT THAT MANY INFRASTRUCTURE PROJECTS COULD BE COMPLETED FASTER THAN ORIGINALLY SCHEDULED.



FDOT reported the completion of five new flyover ramps for the I-4 project three months ahead of schedule, according to FDOT secretary Kevin Thibault, P.E., F.ASCE, who described the work as “the biggest milestone of the project to date, which will undoubtedly transform the heart of our state’s transportation system.”

FDOT also highlighted more than 40 other projects throughout the state that were expedited by at least 650 total contract days because of reduced traffic on Florida’s roads. These included the \$864-million Howard Frankland Bridge project in the Tampa area and an \$802-million reconstruction project involving I-95, I-395, and State Route 836 in Miami-Dade County. Both were accelerated by nearly a month. A project to widen State Route 80 in western Palm Beach County was accelerated by an estimated three months, while the state’s first diverging diamond interchange on State Route 200 at I-95 in Nassau County was expedited by an estimated two months, the agency reported.

Meanwhile, the Delaware Department of Transportation (DelDOT) reported the completion of multiple highway projects worth a total of nearly \$100 million during the first half of 2020. Many of those projects were expedited “by taking advantage of the significant decline in traffic volumes statewide,” explained Jennifer Cohan, the secretary of transportation, in a DelDOT press release. Likewise, the Tennessee Department of Transportation (TDOT) explained that “TDOT crews have been able to take advantage of dramatically re-

L.A. Metro was able to do something impossible before the pandemic: fully close whole sections of Wilshire Boulevard in the daytime during the workweek.

duced traffic volumes on interstates across the state” throughout the crisis to “perform additional maintenance to interstates and state highways and make solid progress on projects in general across the state.”

The Regional Transportation Commission (RTC) of Washoe County, in Reno, Nevada, used the closures from mid-March to mid-May to accelerate work on an \$87-million extension to its bus rapid transit (BRT) service through a narrow stretch along Virginia Street in the city’s midtown region. The work involved the repaving of an approximately 1.3 mi long section of road—just 65 ft wide in places—and the construction of new roundabouts. The RTC also widened sidewalks in an area in which some buildings had zero setback for sidewalks while other places had sidewalks that measured just 18 in. wide, says Jeff Wilbrecht, P.E., A.M.ASCE, a project manager at the RTC, which operates the Reno region’s BRT service. In a once-deteriorated part of town, the Virginia Street segment had more recently become home to numerous bars, restaurants, gyms, and other amenities that had made it a unique and popular destination in Reno, Wilbrecht says. So in addition to extending the BRT service, the project also aimed to improve the area for pedestrians and cyclists, he notes.

The original plan involved a series of phased and segmented work at a relatively slow pace over the course of eight months to get everything done with the least amount of disruption, Wilbrecht says. Before starting that work, the transportation commission had engaged in considerable public

outreach and developed good relationships with many of the businesses in the Virginia Street area, he adds. As a result, when the COVID-19 stay-at-home orders and other restrictions were issued, the transportation commission sought support from those businesses to simply shut down the street entirely and accelerate the operation—a plan that won more or less unanimous approval, Wilbrecht says.

Because no one knew how long the COVID-19 restrictions would remain in place, the acceleration effort started with a certain segment of the paving work that had originally been expected to take two and a half months to complete but which instead was finished in just two weeks, Wilbrecht says. As the closures and restrictions kept getting extended through the spring, the acceleration continued as well. “We kept the road closed the entire time and got essentially eight months’ worth of paving done within that window” of roughly three months of expedited work, Wilbrecht explains. Winning support from the local stakeholders was critical to making the street closure work, he adds. “When we said we’d be done by a certain date, they had confidence we would be done by that day.”

Throughout that period, the transportation commission kept the public aware of the work’s progress through a weekly newsletter and extensive social media efforts. The commission also provided information to the public on how to access the affected area’s shops or restaurants via side streets. To help keep some businesses afloat, the work crews often bought lunch from the local establishments, Wilbrecht notes.

IN SAN FRANCISCO, the California Department of Transportation (Caltrans) had planned to demolish and replace two 800 ft long sections of the bridge deck on U.S. Highway 101 at Alemany Circle, along a major transportation corridor between the Bay area and Silicon Valley. The work was scheduled to take place over an 18-day period. Given the more than 240,000 vehicles that typically travel through the corridor each day, the project was poised to “impact the entire region, creating traffic backups over an hour long on the corridor,” explained Bart Ney, a Caltrans spokesperson who provided written responses to *Civil Engineering’s* questions.

To help complete the project, Caltrans had hoped to reduce traffic in the region by 30 percent by the time the effort got under way in July—a difficult goal, Ney wrote. But when COVID-19 stay-at-home orders resulted in a roughly 40 percent reduction in traffic during the spring, the agency quickly moved up the start of the bridge deck replacements to late April. The light traffic and financial incentives—both rewards and potential penalties—helped work crews complete the work in just under 10 days, Ney reported. Most

critically, perhaps, the reduced traffic volume enabled the contractor to shut down entirely a section of the 101 northbound freeway, detouring traffic onto nearby I-280 throughout the project. I-280 was also used for southbound detours. Together, these detours “gave the contractor more space to work with on the deck and allowed concrete trucks, cranes, and other equipment to stage more efficiently,” Ney wrote. “Concrete trucks could line up in one lane and move in another because the lane closures allowed more space.”

At the same time, the bridge deck project presented some considerable challenges for the engineers, contractor, and communications team because more than three months of planning work had to be condensed and completed in just three weeks, Ney said. Requests for information “between the contractor and the owner had to be turned around swiftly in real time,” he explained. “Schedulers had to work together. The contractor had to hustle and locate suppliers or in some cases step up in line to get building materials to do the job earlier. Communicators had to hold several meetings daily with local city officials and stakeholders to get buy-in on the idea to move everything forward. Design engineers had to come down to the site early to work with the construction team to find the best ways to stage construction.”

In some cases, the reduced usage of transportation resources did not necessarily shorten the schedules of projects but did provide other benefits, including helping complete the work more efficiently. That is what is happening in the San Diego region with a project to construct a second track for the region’s COASTER commuter rail line, explains John W. Haggerty, P.E., M.ASCE, the director of engineering and construction at the San Diego Association of Governments (SANDAG), the area’s primary public planning, transportation, and research agency. With COASTER service cut back by the pandemic shutdowns, the construction crews on the double-tracking of two COASTER projects and an extension of the Mid-Coast Trolley light-rail service pause work to let trains go by only half as often as usual. This helps them install rails, work on bridges, and complete

other tasks more easily on all three projects, Haggerty says. Likewise, other SANDAG projects that involve street closures are achieving greater efficiencies because of the reduced vehicular volumes. “We’re finding significantly more flexibility [regarding the rail lines and the streets] than we had back before COVID hit,” Haggerty says.

Some work improvements related to the pandemic do not involve construction at all. In addition to its accelerated paving program, StreetsLA has also revised its street sweeping schedule. Previously, the agency swept streets in residential neighborhoods during the workday while most cars were gone. But

DURING JUST ONE MONTH OF A NEW PROGRAM, STREETS LA CREWS SWEEPED NEARLY 3,500 MI WORTH OF COMMERCIAL CORRIDORS, REMOVING ABOUT 1,500 CU YD OF WASTE.



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the region's commercial corridors—which generally generate more trash anyway—were not easily swept during the day because they were congested with vehicles. Once COVID-19 flipped that script, StreetsLA refocused its sweeping efforts on commercial streets—an adaptation that not only keeps those streets cleaner but also helps prevent trash from hampering the region's stormwater systems, Hagekhalil notes. During just one month of the new program, he explains, StreetsLA crews swept nearly 3,500 mi worth of commercial corridors, removing about 1,500 cu yd of waste, Hagekhalil says.

The change has been so successful that Hagekhalil intends to continue the commercial street focus even after the pandemic closures are lifted, shifting the street sweeping hours to earlier in the morning before commuters and other vehicles hit the roads. "We've taken advantage of these [pandemic] challenges and turned them into a new opportunity," he concludes.

AS A RESULT OF the pandemic, air travel has also been significantly curtailed, and by extension airports are considerably less busy than usual. It is a dramatic change for an industry that earlier in the year had seemed poised for considerable growth, notes T. J. Schulz, the president of

the Airport Consultants Council (ACC), based in Alexandria, Virginia. ACC is the trade association representing private sector firms, including large engineering companies, involved in the planning, design, and construction of airport infrastructure projects. In late February, ACC had released an airport development outlook report that depicted an "incredibly rosy" future, Schulz says, identifying \$138 billion in planned airport improvement projects over the next five years, more than half of them focused on redeveloping terminals and increasing capacity at terminals. "Earlier this year," Schulz recalls, "many airports were packed with passengers and [felt] they had to build new capacity right away to meet the demand at the time and the expected future demand."

Just a month and a half later, that picture had changed completely. Surveying its members in mid-April, to "get a baseline assessment about how the pandemic was affecting them," Schulz says, ACC reported that more than 90 percent of respondents had experienced delays or cancellations of projects as a result of the pandemic. Nearly 30 percent also anticipated "major challenges with ongoing projects occurring in the near future," he explains. This was especially true for projects aimed at increasing passenger capacity. "There has definitely been a reassessment of the near-term need for terminal expansion projects," Schulz explains. "It will probably take quite a while to get back to the [passenger] levels we were seeing earlier this year."

But the forecasts were not entirely bleak. Work continues on a number of projects at multiple airports, in part because the average age of airport buildings and other facilities is 40 years, Schulz says. "We think there's still a sizable number of projects where airports simply need to keep their facilities up to a state of good repair," he explains. Some airports are also better able to accelerate infrastructure projects right now because the federal response to the economic downturn includes a \$500-million measure to fully fund airport improvements, temporarily eliminating the need for states and local authorities to provide matching funds, Schulz says.

ACC's member survey indicated that many construction projects that were under way at the time of the shutdowns are moving ahead, some projects that were already designed are being delayed but not canceled, and certain projects are even being accelerated because of the current drop-off in passenger travel, Schulz explains. Among the programs being accelerated, Schulz reports, are the plans for a new terminal at Salt Lake City International Airport and the installation of new hydrant fueling infrastructure around certain existing gates at San Diego International Airport. Originally, the San Diego project was proceeding gate by gate, he adds, but the reduced passenger count enabled the airport "to accelerate the work with multiple concurrent gate closures."

Raleigh-Durham International Airport in North Carolina is using the slowdown to close its longest runway and work around the clock on a slab replacement project, Schulz says, while Luis Muñoz Marín International Airport in Carolina, Puerto Rico, switched from working nights on a pavement rehabilitation project for its secondary runway, 10-28, to daytime construction.

At Denver International Airport, a roughly \$1.5-billion

project to construct 39 additional gates was already under way when the pandemic struck, notes Gisela Shanahan, the airport's outgoing chief financial officer. A second project, planned for later, was aimed at rehabilitating the existing, aging concourses. Together, the two projects would take about seven or eight years to complete. But because of the pandemic-induced slowdown, the Denver City Council agreed in May to spend an additional \$560 million to accelerate the concourse work—which means the two projects will be running somewhat simultaneously and thus can be completed in just about three and a half to four years, if passenger volumes remain low, as anticipated, says Stuart Williams, a civil engineer who serves as the airport's senior vice president of airport expansion.

“Despite the challenges due to COVID, we saw an opportunity to get work done quicker and at less cost,” explains Shanahan. This enables the airport to have the contractors who are building the new gates also complete the concourse renewal work, saving time and money because those firms are already on-site and familiar with airport procedures—which during the pandemic can be daunting. “[A challenge] of doing work at any airport is the logistics of security,” Williams notes, “and now on top of that we have the virus.” Thus, the workers must not only pass through normal screening procedures, they now must also have their temperatures checked as they enter the site, wear face-covering protective shields or masks, and travel on buses from the landside to the airfield side of the operation—using two or three times as many buses as normal to enable social distancing.

The Denver airport had been at capacity before the pandemic, Williams adds, which meant “all the gates were busy all the time.” Because the concourse renewal work will require the airport to shut down certain gates, the combined projects will provide greater flexibility. Reduced passenger traffic together with the new gates being constructed—the first should be completed this year and come online in 2021—mean the airport can close more gates simultaneously than would otherwise have been feasible, thus completing the concourse work faster and more efficiently, Williams explains.

IN KENTUCKY, 2018 and 2019 had been two of the busiest years ever at the Louisville Muhammad Ali International Airport. This posed considerable problems in early 2020 for needed work involving parking facilities and a critical taxiway, key elements of the airport's SDF Next capital improvement program, notes Dan Mann, the executive director of the Louisville Regional Airport Authority. SDF is the Louisville airport's International Air Transport Association code designation.

“Our parking lots were bursting at the seams,” explains Mann. The airport wanted to relocate the rental car lot to the ground floor of an existing parking garage and convert the former rental lot into a new facility for ride-hailing services. But finding the right time for that and some other changes was a challenge. The work had been designed, budgeted, and awarded to contractors, Mann notes, but the original schedule was spread out over 18 months to 2 years. As passenger travel decreased, the airport was able to accelerate the changes to a condensed schedule; the projects will be completed this summer, Mann says.

Likewise, the reconstruction of Taxiway Golf, which connects the airfield's parallel runways, was originally not planned to start until after the Kentucky Derby in May and then would be accomplished in phases over the next two years. Instead, when the famed horse race was postponed because of COVID-19, the airport was able to accelerate the taxiway work. It will now be completed in the fall—just in time for the holiday rush expected by United Parcel Service (UPS),

which maintains a major hub at the site. Ongoing paving repair projects were also accelerated, says Mann. Normally, he explains, “We're a 24/7 operation with airlines during the day, UPS at night. [We] have a limited amount of time to get in and fix runways.”

The design of other aspects of the SDF Next program is also accelerating, Mann says, though construction will not begin until passenger travel picks up again. The “must-do” projects—such as replacing elevators, escalators, and moving walkways in the terminal—will move forward, he explains. But other portions, including a planned geothermal energy system, will be designed but delayed. “We'll have all this work designed by this time next year,” Mann says, “so we'll be able to move very quickly once construction can start.”

Drastic reductions in air traffic led San Francisco International Airport to accelerate \$207 million worth of construction projects that had been scheduled over the next three years, mostly at night or over weekends. Now the work is expected to be completed by 2021, subject to funding, because “these projects can be done with a continuous runway closure for an extended period without significant impacts to operations,” says Stephen Engblom, AIA, LEED AP, an executive vice president and global director of cities for the international engineering firm AECOM, a consultant to the airport. The most significant of the airfield projects being advanced involves the rehabilitation of runway 10L-28R, the airport's longest runway at 2.25 mi, plus intersecting taxiways, notes Engblom. During normal times, “closing this runway for any length of time would drastically influence operations and would affect air travel nationwide,” Engblom explains. “When air traffic dropped

DRASTIC REDUCTIONS IN AIR TRAFFIC LED SAN FRANCISCO INTERNATIONAL AIRPORT TO ACCELERATE \$207 MILLION WORTH OF CONSTRUCTION PROJECTS.



so precipitously, this project was placed at the top of the list.”

AECOM also helped Dallas/Fort Worth International Airport accelerate critical work on rehabilitating that facility’s most important runway, 18-R, a decision that is expected to cut 78 days off the construction phase and save the airport \$10 million, Engblom notes.

Elsewhere in Texas, the Goose Creek Consolidated Independent School District, near Houston, had been waiting for the school year to end to start renovation projects at three high school buildings. But when Texas schools closed in late March because of the pandemic, the work crews “mobilized that next Monday,” says Clement Medina, AIA, a program manager at Houston-based Lockwood, Andrews & Newnam Inc. (LAN), an engineering consulting firm working with the school district. Another project involving roof replacements at five district facilities was also moved up—not because of the early school closures, Medina says, but because of the sudden availability of low-interest bonds that the district could sell as a result of efforts by the U.S. Treasury Department to stimulate the nation’s faltering economy.

Other economic aspects of the pandemic closures make it more difficult to continue infrastructure work. L.A. Metro, for instance, has experienced a significant loss of revenue from the decline in riders on buses and trains as well as from the decrease in revenues from the use of L.A. Metro’s ExpressLanes, notes Liban. As a result, “you might be able to accelerate projects, but you don’t have the cash flow to pay for it,” Liban muses. Likewise, some water and sewer utilities are facing

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significant declines in revenue because major industries or universities in their service areas have shut down. And some out-of-work residential customers might not be able to pay their monthly bills, notes Greg Kacvinsky, P.E., a principal and partner at OHM Advisors, an engineering consultant based in Livonia, Michigan, near Detroit. For some of OHM’s municipal or county agency clients, Kacvinsky says, the issue is not accelerating projects but instead “just keeping things working ... putting out their regular fires on a day-to-day basis.” Regarding planned or desired infrastructure improvements, he adds, “Hopefully we’ll get back to that once we get over this hump.”

Millions have been infected by COVID-19 worldwide. At press time, more than 170,000 had died in the United States alone. The global economy is struggling, and the future is uncertain. Thus, no one is likely to consider the early completion of infrastructure projects or the cost savings that result as any sort of silver lining to the pandemic. But by continuing to work on essential efforts, by getting that work done faster, better, and more efficiently, despite all obstacles, civil engineers demonstrate their commitment to improving the built environment and promoting the public welfare even during the most difficult of times. **CE**



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PHOTOGRAPH COURTESY OF STREETS LA