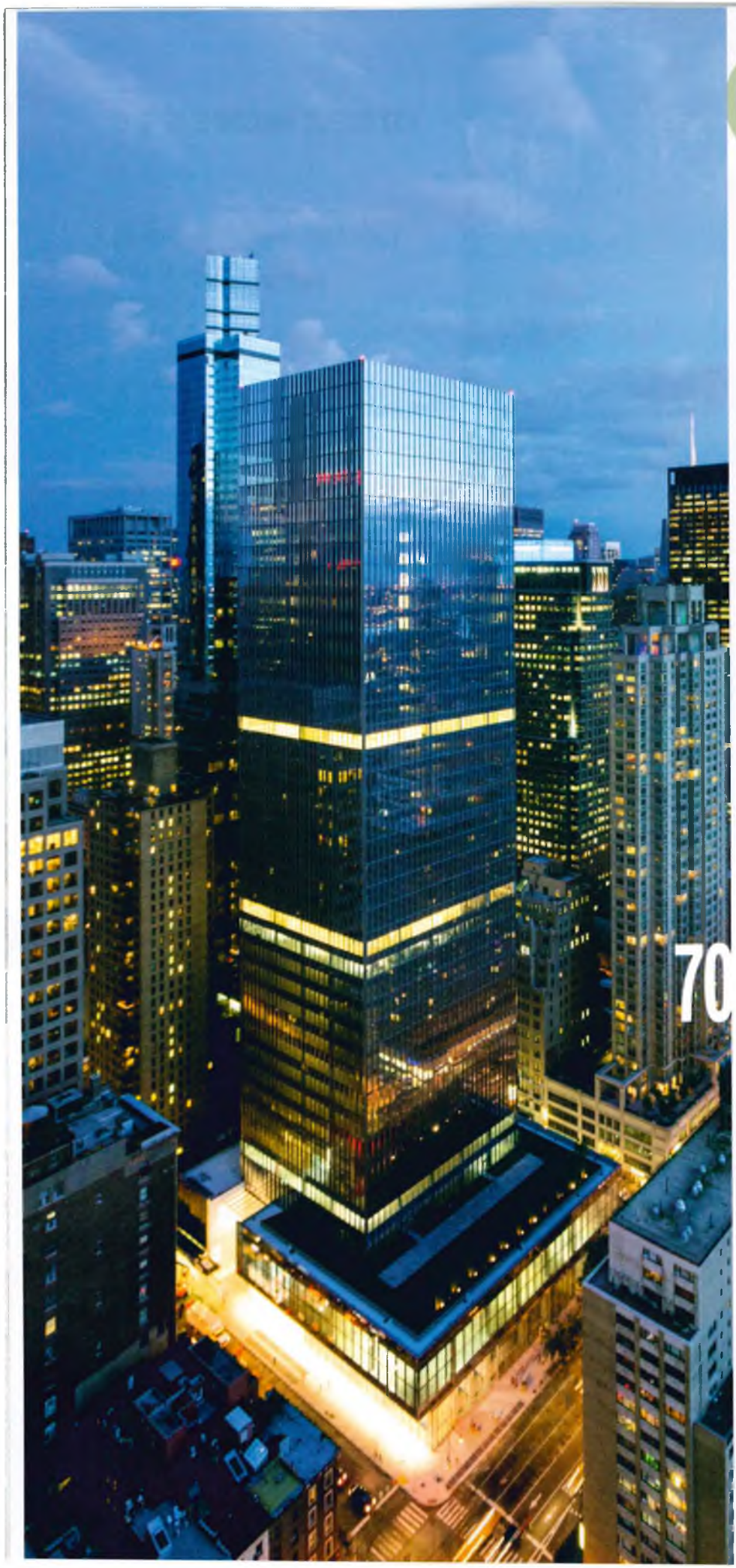

KEVIN CHU/BOSTON PROPERTIES

Civil En

INVESTING IN INNOVATION

A new report calls on U.S. water and wastewater utilities to transform the way in which they do business, particularly by adopting innovative technologies and approaches that foster sustainability and improve performance.

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U.S. ARMY CORPS OF ENGINEERS, *ABOVE*; VASILY KLYUKIN, *LEFT*

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'as-builted' the field," Wachs says. The data provided the team with an image that showed exactly where each of more than 8,000 stakes should be driven to provide a physical outline of the illustration. Clark surveyors then used Topcon's mobile GPS receivers, which Wachs refers to as rovers, to determine the precise locations of each stake.

"The rovers are poles that have GPS computer screens on them, and the screen has the design loaded onto it," Wachs explains. "At the top is a GPS receiver that can tell where the rover is in the world within one-quarter-inch accuracy. For us to build it, all we had to do was hold up this little rover and bring up the design. Topcon and Jorge had already programmed where the design would be in the world. So when we had the rover identifying where it was in the world, we could then look at the image in the background, line it up point by point, and know that we needed to drive a stake right there."

Wachs says all of her field engineers were working on other projects at the time and could spare only a day or so each to help, so the ease with which her engineers were able to learn to use the rover system—a process that took them only about 30 minutes—was critical. "It's almost like carrying your phone around and using Google maps but far, far, far more accurate and more quick to react," she says.

Clark's engineers and laborers were able to plant more than 1,000 stakes per day over a period of eight days, which was one day less than projected. Once about half of the stakes were planted, material began rolling in. Crews had already cleared the site and added a layer of sand, which was donated by Chaney Enterprises, of Waldorf, Maryland, and delivered by the local trucking firm Bulldog Group. The sand provided a clean, smooth working surface. The eyes of the portrait, made of gravel donated by Stancills, Inc., of Perryville, Maryland, were constructed first, since they were the most complicated element. Bags of gravel were brought in on small loaders and the stones were laid in position before line-by-line placement of the topsoil began.

The soil, donated by AH Hatcher, Inc., of St. Leonard, Maryland, was staged from the top of the site, in the "hair." From there it was carefully moved to those few locations throughout the portrait that needed it. Wachs says most of the shading evident in the portrait involved tricks of light and shade on the sand, part of Rodríguez-Gerada's "genius." After the few soil lines that were required had been placed, the remainder was spread evenly to create the hair.

But determining exactly which locations were to stay as sand and which were to receive the topsoil was tricky. The computer-aided design images didn't display subtle shades of color. "We literally had to look at a black-and-white drawing with points on it, then look at drawings Jorge had made for us, and identify [where to place soil] based on the shape of the piece," Wachs says. As if putting together a jigsaw puzzle, her team searched for unique shapes and edges to demarcate the borders between sand and soil. "But we got a system (going), and once we got it, it got easy," she says.

The exhibit remained on display until October 31, after which it was bulldozed back into fertile planting ground for the mall. Bermuda grass is to be planted on the site to create a recreational field. "I definitely feel like there [is a] wide diversity of projects to work on at Clark," Wachs says, "but still, this is one of the most unique projects I or anyone at Clark [has] ever worked on. It's more art than architecture." —LAURIE A. SHUSTER

VASILY KLYUKIN

WHITE SAILS inspired the design of a hospital and spa that will form part of Tunisia Economic City, a commercial zone that is being developed in that north African country. Designed by the Russian billionaire Vasily Klyukin, a banker who has designed yachts and is planning to take a trip into space soon on a Virgin Galactic ship, the White Sails Hospital and Spa will have a form suggesting a sailing ship and will be constructed at water's edge. In a written statement provided to *Civil Engineering*, Klyukin said that he is required to have his health checked regularly prior to his journey into space but faces anxiety each time he enters a health facility having a conventional design. This inspired him to design a hospital that would convey a sense of calm and rest rather than dread. "We would like to build the world's first hospital [that] no one will be afraid to visit," he explained. Though fanciful in design, the project has already received partial funding from the Saudi Arabian firm Lalei Al Barakah Est., and the New York City and Moscow offices of Thornton Tomasetti, Inc., have been commissioned to handle the structural engineering, according to Leonid B. Zborovsky, P.E., S.E., a senior principal in Thornton Tomasetti's New York City office. Klyukin said that the interior design will lend itself to the needs of the medical community and will incorporate the latest medical advances.