STORMWATER

Flood Channel Diversion Project to Benefit from Real-Time, Forecast-Based Controls

CONSTRUCTION recently began on an innovative stormwater management project in Lakewood, California, that may demonstrate how Southern California can begin to simultaneously address its problems of water quality and water supply. Although relatively small, the $11-million effort to divert runoff from a flood channel and use it to irrigate a city park will employ "smart" sensor technology that will allow automated control of key project processes based on weather forecast information. The efficiency gained by the use of real-time, forecast-based controls will boost Lakewood's efforts to remove pollution from an impaired waterway and achieve its state-imposed target for reducing water consumption during California's ongoing drought.

The project will divert water from the Del Amo Channel, a tributary of the Los Cerritos Channel. Owned and maintained by the Los Angeles County Flood Control District, both waterways are open flood control channels lined with concrete and receive runoff from a municipal storm sewer system. Draining an urbanized watershed of approximately 17,700 acres, the larger Los Cerritos Channel empties into Alamitos Bay, which opens to the Pacific Ocean. In keeping with its National Pollutant Discharge Elimination System permit, the City of Lakewood has worked with other nearby municipalities and the Los Angeles County Flood Control District to develop a watershed management program to address dry- and wet-weather flows in the Los Cerritos Channel watershed. The program places an emphasis on removing copper, lead, and zinc from the Los Cerritos Channel because the waterway is subject to a total maximum daily load cap on these metals.

Water will be diverted from the Del Amo Channel at a location approximately one block away from Lakewood's Bolivar Park. The diversion system will take the form of an inflatable rubber dam located slightly downstream of a grated inlet structure that will be constructed within the base of the channel to divert dry-weather flows. During wet-weather events, the rubber dam will inflate, storing water behind it and facilitating the capture of additional flows by the inlet structure. Ultimately, the diversion system is expected to capture on the order of 500 to 700 acre-ft of runoff annually, says Chad Helmle, P.E., M.ASCE, a vice president of Tetra Tech. The firm, which has its headquarters in Pasadena, California, is the design engineer for the project.

The inlet structure will direct captured flows to an adjacent roadway median. There the runoff will pass through a baffle box system that will remove trash and large solids before the water enters a pump station and wet well. The 20 cfs pump station will then convey flows to Bolivar Park, where the water will enter an underground vault made of precast concrete. A watertight section of the vault will be able to store nearly 390,000 gal of water for use on-site, while another section will enable water to infiltrate into the underlying ground. To ensure public safety, the water that is to be used on-site to irrigate landscaping will undergo additional treatment as part of a process that will

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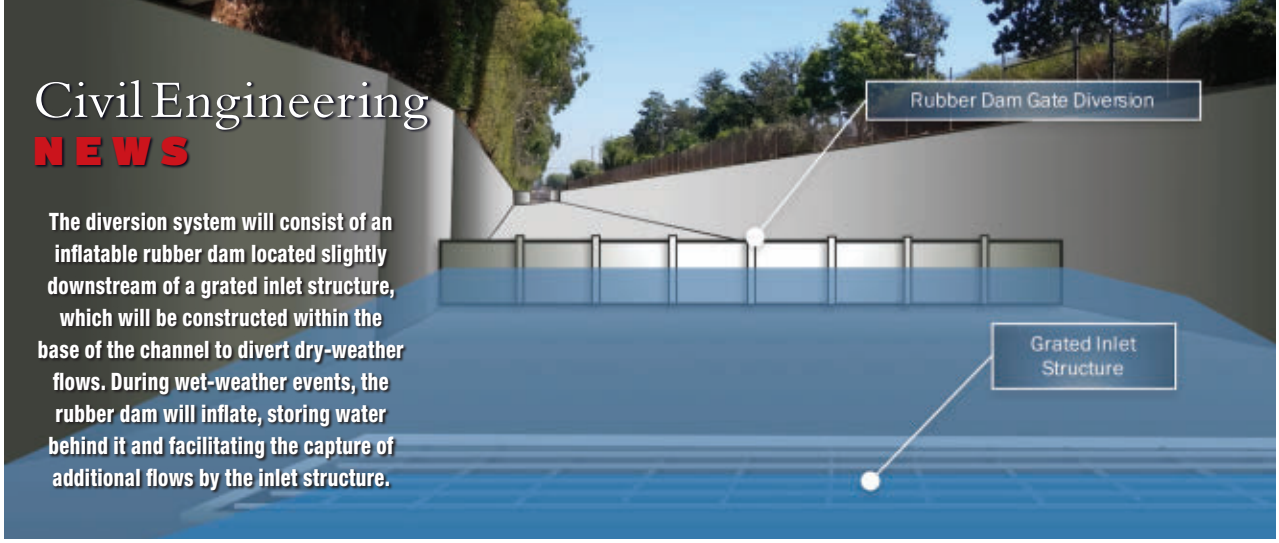

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include ultraviolet disinfection, Helmle says.

Although Lakewood has a system for recycling water, Bolivar Park is not served by it, says Lisa Rapp, the director of public works for the city. As a result, Lakewood currently uses on the order of 9.6 million gal of potable water each year to irrigate landscaping at the park. Once the diversion system is in place, Rapp says, "we think that we can handle almost all of our irrigation needs at the park year-round" using the treated stormwater. This reduction in potable water use represents a "good response to the drought," she says.

Construction began in November, and the diversion system is expected to begin operations late this year or early in 2018, Rapp says. Reyes Construction, Inc., of Pomona, California, is the general contractor. Willdan Engineering—a subsidiary of Willdan Group, Inc., of Anaheim, California—is the construction manager. Richard Watson & Associates, Inc., of Mission Viejo, California, developed the watershed management program for the Los Cerritos Channel watershed. The Lakewood diversion project was wholly funded by the California Department of Transportation as part of its efforts to comply with its own National Pollutant Discharge Elimination System permit requirements.

Faced with competing demands for water quality improvements in the Los Cerritos Channel, the need for treated stormwater for irrigation, and a desire to replenish groundwater supplies, the Lakewood project will rely on a novel technological solution to balance its different objectives. A remote monitoring and control platform developed by OptiRTC, Inc., of Boston, will use data provided by sensors deployed as part of the project, along with precipitation forecast information, to control the system operations in real time. The diversion project will include water-level sensors in the Del Amo Channel, at the diversion pump station wet well, and within the water storage and infiltration galleries to monitor conditions in the channel and throughout the stormwater management system. In addition to controlling operations on-site, these sensors will incorporate weather forecast data to improve system performance.

The data from these sensors will be relayed securely through the Internet to Opti's cloud-based servers and integrated with forecast data from the National Weather Service. Opti's system then will make "algorithmically driven decisions" on a minute-by-minute basis about how the diversion system should operate so as to maximize its performance, says Marcus Quigley, P.E., D.WRE, M.ASCE, Opti's chief executive officer. For example, if the weather forecast for Lakewood calls for rain, the system will check to see how much water is stored in the underground vault. If necessary, the system can take such steps as increasing discharge to the infiltration gallery or discharging treated water back to the channel to free space to store additional runoff from the next wet-weather event. In this way the system will maximize the amount of stormwater captured by the diversion. "This is real-time, adaptive, intelligent, and direct control of stormwater infrastructure," Quigley says. By contrast, stormwater facilities traditionally have operated on a passive basis or required direct intervention by human operators. "That's why this project is so different," Quigley notes.

The real-time active management approach provided by the Opti control system will also help to ensure that the new diversion system captures the heavily contaminated "first flush" of runoff from a wet-weather event, Rapp says. As a result, the diversion system is expected to reduce pollutant loads entering the Los Cerritos Channel to a greater extent than if the system were operated passively.

As an example, the system is expected to reduce zinc loadings within Los Cerritos Channel by an estimated 121 lb per year. "By using the Opti system, there's an expectation that we can actually increase the efficiency of the project by somewhere between 16 and 28 percent as far as zinc removal is concerned," Rapp says. Moreover, because the real-time control system will enable Lakewood to capture more stormwater without requiring a larger underground vault, the city was able to minimize the disruption to its parkland, she says.

Such results bode well for regions that require extensive and expensive retrofitting of existing flood control infrastructure to facilitate the capture and treatment of stormwater. In the Los Angeles region alone, the infrastructure upgrades needed to ensure compliance with water quality regulations are estimated at $20 billion, Helmle says. If smart technology can improve the effectiveness of stormwater management projects by 10 to 50 percent, "the cost of this infrastructure retrofit across the board can be reduced by literally billions of dollars," he notes. —JAY LANDERS

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