Volume 38 / Issue 1
January / February 2015

world water

Toxic algae blooms
Global problem, local response

wef publishing uk ltd.

A Supporting Publication of
weftec the water quality event

WATER'S WORTH IT
A trademark of the Water Environment Federation

Control-treatment system reduces contaminant migration risk

An innovative dewatering and groundwater treatment system installed in a commercial development in the expanding Cherry Creek business district in the Central US state of Colorado, significantly reduces the risk of contaminant migration from adjoining sites. David Giles of TerraFirma Earth Technologies explains how the system works.

The US-based TerraFirma Earth Technologies, a groundwater control contractor founded in 2004, installed a groundwater control system and innovative groundwater collection and treatment system, designed by the geotechnical consultant Terracon, that averted delays and minimized costs for 100 Saint Paul, LLC. The construction project is located in the busy Cherry Creek business district in Denver, Colorado, United States. 100 Saint Paul, an office and retail development, is scheduled for tenant occupancy beginning the summer of 2015.

When ground was broken in February 2014, neither the general contractor GE Johnson, the owner 100 Saint Paul, nor Terracon, could predict unforeseen conditions that would require on-the-spot installation of additional dewatering features than were originally designed. TerraFirma worked congruently with the owner, general contractor, and design consultants to come up with an innovative, supplemental dewatering system to resolve site challenges.

Headquartered in Houston, Texas, TerraFirma works in both temporary projects and permanent installations, including deep-excavation projects ranging from athletic stadiums, hospitals, and high-rise facilities; to transportation and energy facilities, tunnels, and waterways; to municipal infrastructure sites; as well as sewer and gas pipelines.

The original design for the 100 Saint Paul construction project included widely-spaced deepwell dewatering wells meant to maximize drawdown, while minimizing the rate of groundwater flow, in an effort to prevent migration of potentially contaminated groundwater from adjacent properties. The modified system meant adding mini-vacuum wells directly adjacent to the building's elevator pits and a permanent dewatering sump pit that TerraFirma was able to custom design on the job, making for a unique hybrid of dewatering methods to better suit the actual soil and job-site conditions.

Usually when water is pumped from the ground, it is piped directly to a storm sewer drain. However, there was concern that this groundwater was contaminated from three sources: chemicals from a dry cleaning business, hydrocarbons from a previously demolished fuel station, and dissolved metals, which occur naturally in the earth. TerraFirma saved time and reduced costs by isolating the supplemental dewatering to just a few areas identified as possibly contaminated. With this strategy, during the investigative phase of the project the company also reduced the risk of drawing in contaminants identified on adjacent properties by reducing the required amount of groundwater pumped.

"The project is situated in the heart of Cherry Creek, with very little or no laydown," GE Johnson Superintendent Brian Lawrenson explained. "TerraFirma worked with us during the logistical challenges we faced daily." Challenges included, according to Lawrenson, complex site excavation and ever-changing conditions. GE Johnson asked TerraFirma to install two areas of vacuum-well assemblies to provide additional localized dewatering to help resolve these challenges. "TerraFirma reacted quickly to these unforeseen conditions and was able to minimize the impact to the construction schedule," he added.

The final dewatering system included 11 extraction wells, one injection well, 42 mini-vacuum wells, three perimeter high-density polyethylene (HDPE) groundwater discharge manifold lines, and a groundwater treatment system. Additional project costs were avoided by planning in advance for three possible discharge routes, which they eventually needed – a specific design insight by Terracon.

The groundwater collection and treatment system design is the most unique ever seen in the author's 28 years in the business. It was much easier and less expensive to design and install at the outset to cover the possibility that it would be needed.

At the end of that phase Terracon's samplings were all within limits, and the water didn't have to be redirected away from the sewer. The injection wells will remain in place after completion of the construction and incorporated into a separate, permanent dewatering system.

Polyvinyl chloride (PVC), mini-vacuum well-assembly installed in the borehole drilled with a track-mounted Geoprobe hollow-stem drilling rig.

Author's Note

David Giles is the president of TerraFirma Earth Technologies. Mr. Giles has 26 years of experience in groundwater control, with 18 years as a geologist for both the construction and remediation sectors. He enjoys collaborating with project teams to find the approach that will yield the highest value. Giles is based at TerraFirma's headquarters in Houston, Texas, United States.