Dewatering System Design

Summary

Kilduff Underground Engineering, Inc., (KUE) has more than 20 years' experience with the planning, design and implementation of dewatering systems for underground projects. On the design side, the firm has performed geotechnical investigations for site characterization including hydrogeological evaluations for dewatering purposes. KUE has designed dewatering systems for shafts, tunnels, cut and cover pipelines, and deep excavations. Utilizing soil test data, KUE staff are experienced in performing calculations to estimate hydraulic conductivity (k), total and partial system flow (Q), drawdown (h), and radius of influence (r). Additionally, KUE has evaluated project sites for potential settlement as a result of dewatering the ground. System designs have been performed with anticipating the use of deep wells, well points and jet educator systems as well as sump pumping. On the construction side, KUE has worked with reputable dewatering contractors, helped facilitate dewatering system installations and overseen the construction, maintenance and decommissioning of various dewatering systems.

Key Projects

Weld Cty., CO | WCR 13/34 Intersection Improv. | Mersino Dewatering | Greeley, Co | May - Oct 2019

Kilduff Underground Engineering (KUE) designed a well point dewatering system in highly variable ground condition consisting of sand, silt, and clay. The system successfully provided a dry and stable working condition for the installation of a 16-foot wide, 5-foot-tall, and 231-foot long pre-cast concrete box culvert at the intersection of Weld County Roads (WCR) 13 and 34 in Colorado.

Denver Water | Conduit 16 Central Segment | Kelley Dewatering | Golden, Co | Jan - May 2019

The Conduit 16 project involved the installation of approximately 7 miles of 84-inch pipeline from Ralston Reservoir in Golden to the Moffat Water Treatment Plant (WTP) in Lakewood. The Central Segment consists of 2 miles of open cut trench extending from Hwy 93 to Hwy 58 in Golden. KUE prepared individual dewatering design submittals for 5 separate work areas for the Dewatering Contractor, Kelley Dewatering, and supported the construction efforts throughout the project. Each Design consisted of deep wells with 2 to 5 HP submersible pumps. KUE designed each system to achieve required drawdown and route flow through a header pipe to pre-approved discharge locations. As part of the Contract, KUE was required to perform 13 soil test borings each with observation wells to identify soil conditions, initial ground water levels and to verify required drawdowns were achieved for each dewatering system.

CO Parks & Wildlife | Adobe Creek Dam | Moltz Construction | Las Animas, Co | Sept - Nov 2018

The outlet works replacement at the Adobe Creek Dam in Bent County required a dry and stable open-cut section with deepest portions extending 30 feet below grade. KUE was retained by the Prime Contractor, Moltz Construction, and dewatering Subcontractor, Kelley Dewatering, to prepare design submittals for a deep well dewatering system to achieve required drawdown of an 8-10 foot thick confined aquifer. KUE performed calculations and determined the required spacing, screen depths, and appropriate filter pack material to dewater the excavation.

City of Greeley | Bellvue WTP Improvements | Kelley Dewatering | Greeley, Co | Jan - March 2018

KUE was retained by the Prime Contractor, Hydro Excavation, and dewatering Subcontractor, Kelley Dewatering, to prepare design submittals for a deep well dewatering system to achieve required drawdowns for an approximate 25,000 SF plant expansion with the deepest portions extending 25 feet below grade. KUE performed calculations and determined the required spacing and screen depths to dewater the excavation to depths of 30 feet. KUE sized the required header and detailed instrumentation to monitor the system.

Key Projects (Continued)

Denver Water | Conduit 16 Replacement Pipeline | Kelley Dewatering | Golden, Co | 2017 - 2018

The Conduit 16 project involved the installation of approximately 7 miles of 84-inch pipeline from Ralston Reservoir in Golden to the Moffat Water Treatment Plant (WTP) in Lakewood. A majority of the pipeline was founded in saturated sand and gravel requiring drawdowns at shafts and open cut trench sections ranging from 5 to 30 feet. KUE prepared dewatering design submittals on 10 separate work areas for the Dewatering Contractor, Kelley Dewatering, and supported the construction efforts throughout the project. Designs mainly consisted of deep wells with 2 to 5 HP submersible pumps. KUE designed each system to achieve required drawdown and route flow through a header pipe to pre-approved discharge locations. Additional scope by KUE included the installation of 22 monitoring wells to confirm required drawdowns were achieved and for monitoring each system.

City of Parker | Ridgegate Pipeline - Happy Canyon Trenchless Crossing | UIT | Parker, Co | 2017

KUE was retained by the Contractor, UIT, to conduct a site investigation, perform a hydrogeological evaluation of the site and provide recommendations to facilitate tunnel installation. Prior to mobilizing, KUE evaluated the dewatering system already in place and back-calculated hydraulic conductivity (k) at the site from flow measurements at the discharge line. KUE mobilized, advanced three borings and installed three observation wells at the site. We collected samples for grain size analysis and performed rising and falling head tests within the observation wells to estimate (k) and confirm estimates from the discharge line. KUE performed calculations to evaluate the wells size and spacing that would be required to dewater the launch and reception shafts and determined it would take deep wells with 15hp submersible pumps on 6-foot spacing to reach the required drawdown. These findings eventually led the Contractor and Owner to decide to re-design the shaft and tunnel alignment at a shallower grade to avoid additional costs associated with dewatering.

City of Woodland, NY | Catskill Aqueduct | D'Annunzio & Sons | Highlands, NY | 2015 - 2016

KUE was retained by the Contractor, D'annunzio & Sons, to evaluate dewatering options for four shafts that were constructed through glacial outwash deposits and bedrock. KUE estimated hydraulic conductivity utilizing grain size tests and performed seepage estimates into the shafts. Due to the anticipated quantity of seepage into the shafts it was recommended water be controlled utilizing multiple sump pits within the subgrade of each shaft.

City of Tarrytown | Tarrytown Force Main| Northeast Remsco | Tarrytown, Ny | 2015

KUE was retained by the Contractor, Northeast Remsco, to evaluate potential dewatering options for open cut trench operations. The Contractor was retained to install a 36-inch gravity RCP sewer that ran to an upgraded treatment facility. KUE performed flow, drawdown, well spacing and radius of influence calculations and provided recommendations for the contractor to implement a well point dewatering system.

City of Carlsbad | Poseidon Desalination Plant | Kiewit-Shea Desalination JV | Carlsbad, Ca | 2014

KUE was retained by the Contractor, Kiewit, to perform a geotechnical investigation at the site to facilitate shaft and tunnel design options. As part of that scope, we collected samples from the field, performed grain size test and performed rising and falling head tests within four observation wells installed at the site. The data was utilized to perform seepage estimates into a 100 foot deep shaft that would be founded within alluvial silty sand and cemented sand deposits. Results of the analysis led to the Contractor choosing a water tight secant pile shaft design. Additionally, KUE performed seepage estimates into the tunnel and our analysis resulted in the selection of a slurry microtunnel system to install a 72-inch diameter tunnel.