



## Emily Nelson

Last summer, I witnessed first-hand how essential careers in hydrology are to the continued progress of city development and agricultural optimization. I was hired as an intern for Ellingson Companies to work on a project related to agricultural subsurface drainage efficiency. To start off my internship, I worked on ArcGIS creating a database for and maps of Ellingson's drainage systems. Unfortunately, the subsurface drainage project that I was hired to work on, got postponed past the end-date of my internship. Instead, my boss decided to

send me out into the field with their environmental division of the company. This division of the company uses horizontal, directed drilling (HDD) technologies to emplace water supply and remediation wells and collect soil samples. I got to work with one of their large-rig crews to install and develop a potable, city water supply well in Colorado. The most essential steps in installing a water well are the actual drilling of the pilot bore and the installation of the well case and screen. During these processes, I was put in charge of the mud machine where I learned how to mix mud to specified properties and track mud loss due to frack-outs. The mud system plays an important role during drilling and well installation. It keeps the bore hole lubricated to allow the pipe to slide through as well as support the bore hole to prevent cave-ins and frack-outs. If the mud is mixed improperly, it can cause large delays in and even stop the drilling and installation processes. I was also able to work by rig, helping load joints and connect the wireline to track the location of the pilot bore, and in the drill cabin to observe how the rig and direction of the pilot bore are controlled.

Once the well was installed, we had to start developing it for production. The development of a potable water well includes many steps: pumping, jetting, airlifting, and more pumping! The goal of the development of the well was to clean out the drilling mud and open the well screen to the aquifer as well as increase the pumping rate and capacity of the well. This stage of the work was very time consuming and hard, but it was so exciting seeing the quality of the water and capacity of the well improve with each continuous day of working. While I helped with all aspects of the development, one job that I particularly enjoyed was testing the water during the pumping process. I took on the job of monitoring the quality of the water while pumping, collecting samples, and field testing the TDS of the water to determine when we were able to move to another section of the well screen. On these days, I would watch the water coming from the well go from looking as dirty as the Shyenne River to being clean, near-drinkable water!

This internship experience allowed me to see first-hand the hard work that goes into providing clean water to a community. I learned about the dire water situation in the western United States as well as saw an extreme drought back in North Dakota last summer. With the demands and stresses on our water resources increasing world-wide and the climate changing to drier conditions with more extreme precipitation events, managing and protecting our water resources is more important than ever! Growing up in North Dakota, I have developed a great love and respect for this area. I intend to pursue a master's degree in agricultural and biosystems engineering with a focus on drainage and irrigation management as well as wetlands design. In doing this, I will be better equipped aid the agriculture industry in their use of this precious resource to improve the industry and our environment.