Supportworks®

COMMERCIAL **CASE STUDY**

Model 450 Helical Piles

Project: Wapato Pump Station
Location: Gaston, OR
Date: September 2020

Challenge

The Wapato pump station is used to control the water level of Wapato lake, which is in the Wapato National Wildlife Refuge. The existing pump station was supported at the top of a concrete box culvert about 20 feet above the culvert floor. The aging pump station building and equipment were in need of an upgrade and were planned to be replaced. The work would include the demolition of the existing pump station facilities and construction of a new pump station on the existing elevated concrete slab of the box culvert. An approximate 20-foot high, 24-foot long, concrete stoplog wall would also be constructed on the south side of the culvert to span the channel width. Stoplogs would then be dropped within slots of the floodgate to control the water level. A temporary dam would be placed on the north (upstream) side of the culvert and pumping equipment would be used to lower the water level and allow access to the bottom of the culvert within the working area. Two soil borings advanced at the site identified very loose to loose silt and sand to depths of about 35 to 40 feet below the proposed stoplog wall footing, where hard, weathered siltstone was encountered. One boring showed weight-of-hammer soil (SPT N-value of 0) above the siltstone. Therefore, a deep foundation system was recommended. Given the limited access within and around the culvert, the deep foundation system would need to be installed from above. The elevated pump station slab was not designed to support heavy installation equipment; therefore, the piling would also need to be installed from one side of the culvert with a machine capable of reaching the 24-foot length of wall.

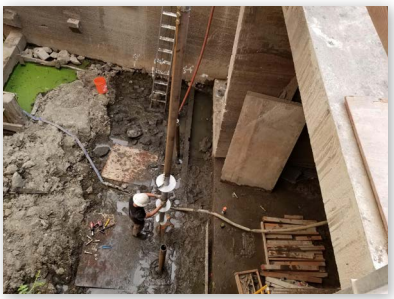
Solution:

Helical piles were selected as the preferred deep foundation alternative since the piles could be installed in the limited access areas at the bottom of culvert with installation equipment located above. The foundation design included seven helical piles with a design working compression load of 46 kips, spaced on 3.5-foot centers along the length of the wall footing. Due to the presence of weight-of-hammer soil in one of the borings, a buckling analysis determined that the Model 450 (4.5-inch O.D. by 0.337-inch wall thickness) shaft would be required. A 10”-12”-14” helical plate configuration was utilized to penetrate into the hard siltstone. The seven piles were installed from the southwest corner of the culvert using a 32,000-pound telehandler with a 42-foot maximum reach capacity. The telehandler was fitted with a 30,000 ft-lb drive head to install the helical piles to a termination torque of at least 19,500 ft-lb (factor of safety of 2.3; torque correlated capacity to design working load). The helical piles were installed to lengths of 40 to 43 feet to bear in the hard siltstone observed at the boring locations. The piles were cut to design elevation, fitted with new construction pile caps, and cast into the concrete wall footing. The helical pile installation was completed within two days.

South side of culvert where stoplog wall would be constructed

North side of culvert with temporary dam in place (on right)

Telehandler with 20 feet of drive tooling and 7-foot helical pile lead section



Installing a 10”-12”-14” helical lead section

Reaching out for the last helical pile installation

Project Summary

Architect/Engineer:	Murraysmith and Peterson Structural Engineers
Geotechnical Engineer:	GeoEngineers
General Contractor:	HP Civil, Inc.
Helical Pile Designer:	Vista Structural
Pile Installer:	TerraFirma Foundation Systems
Products Installed:	(7) Supportworks® Model 450 Helical Piers, 10”-12”-14” Plate Configuration, Design Working Compression Load of 46 kips, Installed Lengths of 40 to 43 feet