Roads

Newington Dover

Dover, NH

UNITED STATES

Owner
New Hampshire Department of Transportation

Engineer
NHDOT - Soils Department

General contractor
Severino Trucking Company

Dates of work
2016/11 2019/09

Main figures

Wick drains
43366 EA. (2,715,040 LF)

Controlled Modulus Columns (CMC)™
269 EA. (8,296 LF)

Description

The New Hampshire Department of Transportation proposed a 10-year, $287 million project to widen the Spaulding Turnpike and build a new bridge between Exit 1 in Newington and the Dover tollbooth beyond Exit 6. This multi-phase endeavor would create four lanes of free-flowing traffic over the southbound side of the Little Bay Bridge and three lanes of traffic over the northbound side. A fourth lane on the northbound side would be dedicated to pedestrian/bicycle crossing over the water where the Piscataqua River meets Little Bay between Dover and Newington. A primary objective is to enable merging and exiting traffic to have their own lanes for getting on and off the highway, eliminating pinch points that back up traffic along the route. Due to the compressible nature of the soils along the highway and beneath the proposed bridge, Menard Group USA was contracted to provide ground improvement – the selected techniques were wick drains and Controlled Modulus Columns (CMC)™ rigid inclusions.

Ground conditions

The soil consisted of soft clays, marine deposits and a water table 10 ft below ground surface. A unique characteristic of the soil was the existence of “sensitive clays” – which liquefy upon disturbance.

Solution

Auger cast piles were originally considered for support of the abutment. However, Menard provided an economical and time-saving solution with a CMC-supported Mechanically Stabilized Earth (MSE) wall. For Menard, this was its first true abutment-supported project. The CMCs eliminated the need for handling and removing large amounts of spoils generally created through the process of auger cast piles. The CMCs also terminated at an average depth of 30.8 ft and a maximum depth of 56.5 ft, significantly less than the predicted depth of the auger cast piles. Wick drains were to be installed through zero blow-count clays, with termination within the glacial outwash or on bedrock. Because of the very soft nature of the soils, Menard faced two challenges: 1) The soils were very soft at the top of the bedrock, which made it difficult to anchor the wick drains; 2) The pore water pressures were such that the wick drain anchor plate was pushed against the bottom of the mandrel (which houses the wick drain material that is hydraulically pushed or vibrated into the ground). To combat these challenges, Menard installed a water injection system at the top of the wick drain stitcher’s mast. This system filled the mandrel with water to equalize the porewater pressures in the soil, enabling the wick drains to anchor. Additionally, Menard installed CMCs to treat the soft clays and marine deposits. The elements terminated within the glacial outwash.

A total of 43,366 wick drains spanning 2.7 million LF were installed in multiple phases over three years. The drains reached an average depth of 58.6 ft and maximum depth of 125 ft. The project design provided for 2 in of post-construction settlement with less than 1 in of differential settlement, meeting the performance criteria. Menard’s solution compelled the GC to award us with three subsequent contracts for wick drain installation.