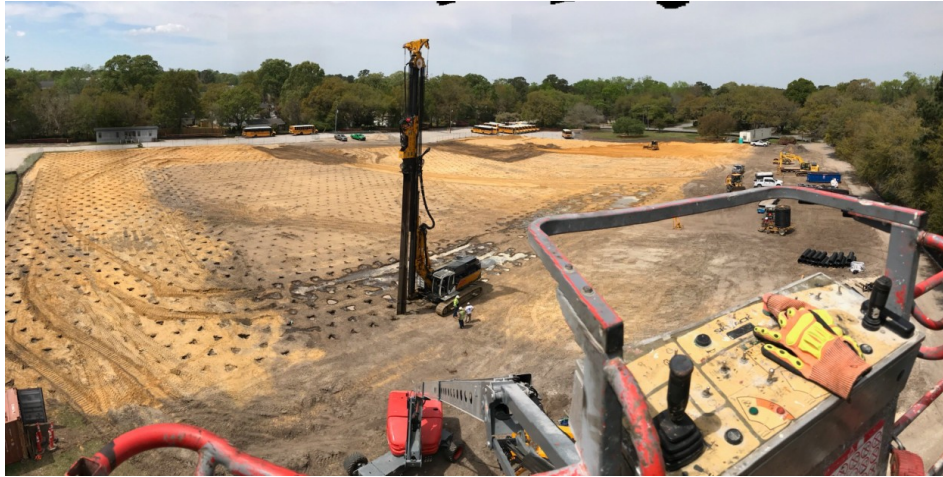




UNITED STATES

Camp Road Middle School Charleston SC



Owner
Charleston County School District

Engineer
S&ME, Inc.

General contractor
Hill Construction

Dates of work
2018/03 2018/03

Main figures

Wick drains
4500 LF



Description

In an effort to consolidate the Fort Johnson and James Island Middle Schools, the Charleston County School District proposed the construction of Camp Road Middle School. The new building would measure 137,000 square feet and have an initial capacity to serve 900 students, with a core and expansion space for a future capacity of 1,200 students. The new school would offer Project Lead the Way engineering classes, chorus, French and Spanish among its core curriculum.

Built on a historic site where the first high school was built on James Island in 1953, the proposed two-story, masonry building was scheduled to be completed for the 2020-21 school year. Because the site required liquefaction mitigation, US Wick Drain, part of Menard Group USA, was enlisted to install earthquake (EQ) drains to support the new structure.

Ground conditions

The site soils included up to 4 feet of uncontrolled fill, underlain by very loose to medium dense sand with silt up to 21 feet deep, overlying loose to medium dense sand and interbedded firm to stiff clay up to 35 feet deep. Below these layers, medium dense to very dense sand was encountered to the top of the Cooper Marl, which ranged between 52 and 60 feet below grade. The water table was encountered between 4 and 6 feet below grade.

Solution

Among the challenges faced were liquefiable soils, including saturated, clean to silty sands at least 40 feet in thickness. Liquefaction occurs when a saturated or partially saturated soil substantially loses strength and stiffness in response to an applied stress such as shaking during an earthquake or other sudden change in stress condition, in which soil behaves like a liquid.

The project Geotechnical Engineer, S&ME, predicted up to 5 inches of free-field, liquefaction-induced settlements as a possibility without ground improvement. The Liquefaction Potential Index (LPI) was greater than 15, suggesting severe liquefaction and foundation damage if liquefaction would occur.

S&ME recommended either EQ drains or vibro-replacement stone columns from the outset for liquefaction mitigation. EQ drains – which mitigate liquefaction by providing a drainage path and reducing excess pore water pressure generated by earthquake loading – would prove to be the most economical solution.

USW designed and installed 4,491 EQ drains covering 105,761 linear feet. USW designed the EQ drains to mitigate liquefaction and to limit liquefaction-induced settlements to less than 2 inches. USW also performed pre- and post-install CPTs to study the densification of the site soils, which is a corollary benefit of this ground improvement technique and helps to reduce the risk of liquefaction by increasing the soil's cyclic resistance ratio.

To support the construction of a new, two-story middle school in Charleston, SC, USW installed 4,491 EQ drains to mitigate liquefaction. All work was completed in one continuous phase and USW met the client's requirements for safety, quality and schedule.