



PROJECT BRIEF

Pleasant Street Bridge Foundations Design

PROJECT PROFILE

CLIENT:

Massachusetts Department of
Transportation (MassDOT)

LOCATION:

Grafton, MA

VALUE:

- Use of computer models to predict deflection allowed for design modifications acceptable to the owner
- Modifications to original design optimized results allowing completion of project in 92 days
- Soil/structure interaction expertise was applied to predict performance under worst-case event scenarios

SERVICES PROVIDED:

- Foundation design
- Predictive modeling

“Geocomp developed a computer model of the bridge foundations to predict the deflections. These predictions demonstrated to the state that the arch design using the existing piles and additional piles was safe and efficient.”



FOUNDATIONS DESIGN & PREDICTIVE MODELING

Geocomp was selected as the geotechnical engineering firm to provide foundation designs for the new twin-arch structure. The bridge was also required to be designed using Load and Resistance Factor Design. The design of the bridge’s pile-supported foundation was complicated by extreme scour concerns. The large horizontal forces and the deep scour resulted in predicted deflections that were unacceptable to the manufacturer of the pre-cast concrete bridge arches. Geocomp identified early in the process that the new foundations could make use of the existing pilings, but they would have to be complemented with additional piles. Geocomp developed a computer model of the bridge foundations to predict the deflections. These predictions demonstrated to the state that the arch design using the existing piles supplemented with additional piles was a safe and efficient design and resulted in significant cost benefits to the client. Geocomp’s engineers used soil interaction methods to optimize the design and allow the design-build team to complete the project in 92 days.



BACKGROUND

Constructed in 1909, the Pleasant Street Bridge spans the Blackstone River in Grafton, Massachusetts. The historic stone-arch bridge is a major north-south corridor for the town and surrounding communities, and handles about 2,500 vehicles a day. After a truck accident left the bridge structurally-deficient, the rebuilding effort began in 2007. During the installation of steel piles, a large lateral movement was detected within the stone arches causing work to halt and requiring revised construction plans. In 2009, the Massachusetts Highway Department (now MassDOT) issued a design-build contract to replace the bridge that called for preservation of the style of the original structure. The challenges of the project included horizontal forces greater than vertical forces on the foundations, very deep design scour depths at the foundations, re-use of existing pilings, and very small allowable deflection for the new pre-cast concrete arch sections.