

ASHE NATIONAL PROJECT OF THE YEAR Dominion Boulevard Improvements Projects Over \$20M in Construction Cost

INTRODUCTION

WSP served as the prime consultant to the City of Chesapeake throughout the planning, design and construction of the Dominion Boulevard Improvements that involved conversion of four miles of a two-lane rural roadway to a four-lane divided toll road from Interstate 64 to Grassfield Parkway in Chesapeake, Virginia. Improvements within the corridor included widening of the existing two lane roadway; replacing the existing drawbridge over the Atlantic Intracoastal Waterway (AIW), with a high level fixed bridge providing 95' of vertical clearance (Veterans Bridge); and construction of three complex urban interchanges. It is the largest locally administered VDOT project ever completed in Virginia.



The budgeted construction cost for the project was \$265M and it was completed six months ahead of schedule at a cost of \$205M. A team led by MBP provided construction engineering and inspection services directly to the City of Chesapeake.

COMPLEXITY

Due to the tightly constrained corridor and the desire to minimize impacts to surrounding communities, the interchanges needed to have as compact a footprint as possible. The configuration of these interchanges included complex geometry and structural systems including post-tensioned, spliced girders at Cedar Road; a braided ramp utilizing a post-tensioned integral pier cap at Great Bridge Boulevard; and integral abutments at Bainbridge Boulevard. The interchanges incorporated a significant amount of MSE retaining walls to minimize their footprint.

Another significant element of the project that added complexity to its planning, design and construction was the variability of the subsurface soils throughout the project area. Chesapeake is a very flat and low-lying area covered in wetlands with poor underlying soil conditions. These conditions created design challenges for the team regarding concerns with settlement of the roadway and bridges. To evaluate soil treatment options, a risk based, cost benefit analysis approach was developed that compared the goals of the City, construction phasing, long term settlement impacts and locations of unsuitable material. The results of this analysis led to the development of a comprehensive ground improvement program for the project corridor.

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For areas of unsuitable soils where construction was on the critical path, or in “high risk” areas such as bridge abutments or utilities, a pile supported embankment was utilized. For areas of construction not on the critical path, a more cost effective wick drain and surcharge program was established. The pile supported embankment option, which consisted of precast concrete piles and caps on a grid, were more expensive than the wick drain option, but could be constructed quickly and provided greater certainty in predicted long term settlements. The wick drains, while less costly, required significant wait times and greater potential for long term settlement. The use of this approach and the resulting ground improvement program reduced the construction schedule and provided significant life cycle cost savings.



NEW APPLICATION OF EXISTING TECHNIQUES / ORIGINALITY / INNOVATION

Since the roadway is located within a narrow corridor, locations for the overhead gantries for supporting the electronic toll collection components were limited. After evaluating several options, locating the gantries on the mainline bridges was chosen as the preferred option. This created a challenge in that the vehicle classification system (VCS) could not utilize typical “in lane” components embedded in the roadway due to interference from the reinforcing steel within the bridge deck. An all overhead, laser based VCS was selected. The system options were evaluated and performance specifications were prepared for the contractor to install a fully overhead system. The system has been installed and has operated virtually flawlessly since its installation.

The major bridges carrying Dominion Boulevard over the AIW, also presented opportunities for innovation. Because the piers for the main channel crossing needed to be located behind the existing drawbridge piers, the main bridge span needed to be nearly 300 feet long. Following a type, size and location study conducted during the preliminary design, a spliced bulb-tee girder option was chosen for the main span crossing.



Design of the spliced bulb-tee girder option incorporated several innovations that reduced cost and construction. The plans included a detailed construction sequence that utilized a “strong-back” system that allowed for accurate placement and temporary support of the girders until post-tensioning could be completed. The specifications also included the latest advancements in the materials and procedures for grouting of the post-tensioning ducts. In addition, the design included a two stage post-tensioning system to eliminate the need for bridge deck replacement for the life of the structure. These innovations not only saved the City time and money during construction, but will minimize long term maintenance requirements.

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SOCIAL / ECONOMIC CONSIDERATIONS

Given the multiple land uses adjacent to the corridor, an extensive stakeholder involvement program was conducted from preliminary design through construction. Although the coordination effort with regulatory agencies was significant, the more extensive effort involved coordination with communities impacted by construction.

The City of Chesapeake conducted three formal Citizen's Information Meetings, a formal Location/Design Public Hearing and numerous targeted information meetings with specific stakeholders. These meetings provided the public with opportunities to review project documents and graphical illustrations of the corridor improvements and to provide comments. Through these meetings the design was refined to address comments.



The public involvement effort ramped up as the project entered the construction phase. The designer and contractor provided support to the City staff who actively maintained a project website and social media sites to provide continual project updates to the local citizens. The City also regularly coordinated with local media outlets to provide press releases for major milestone achievements. The team went well beyond the standard public information process by participating on local radio programs that allowed citizens to call with questions about the project, meeting regularly with businesses and churches in the area, and sponsoring a food drive for the childcare business impacted during construction. These efforts led to strong public support with overwhelmingly positive comments received at public meetings.

SAFETY

The existing roadway consisted of a narrow two lane road with heavy truck traffic and a high accident rate. The new high level fixed bridge provides a safer, four lane road that relieves heavy traffic congestion and provides a more reliable hurricane evacuation route.

During the design process, one of the key comments received from the public was the desire to safely accommodate the large number of pedestrians and bicyclists that regularly utilize the roadway. Through coordination with the City, VDOT and FHWA, the design was refined to include a 12-foot-wide multi use path that was physically separated from vehicular traffic. The multi-use path connects to local streets at each end, incorporating the path into the citywide bicycle/pedestrian trail system.

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AESTHETICS AND SUSTAINABLE FEATURES

As the project traverses through an area that is characterized by residential, commercial and industrial uses, sustainable design was an important consideration. Impacts to communities and businesses adjacent to the corridor needed to be minimized, while still meeting the purpose and need for the project cost effectively. To achieve this goal, the team evaluated numerous options for the location of roadway components to balance impacts between the natural and built environments. Approaches used to minimize impacts included:

- Shifting of the main-line alignment to avoid impacts to adjacent neighborhoods
- Providing compact interchange configurations that included a single point urban interchange at Cedar Road and tight diamonds at Great Bridge and Bainbridge Boulevards
- Extensive application of mechanically stabilized earth retaining walls to minimize the project's footprint

To address impacts to the natural environment, a wetland mitigation site was created adjacent to the project. This site provided mitigation credits greater than those required by regulatory agencies for the impacts associated with the project.

From an aesthetic standpoint, the key project feature of note is the main bridge crossing of the Southern Branch of the Elizabeth River. Although industrial facilities are located directly adjacent to the bridge, consideration was given to the appearance of the bridge. The haunched spliced girder for the main river span, fit the industrial context of the area while providing a sleek, graceful appearance.

MEETING AND EXCEEDING OWNER'S / CLIENTS NEEDS

WSP provided comprehensive support to the City in throughout development of the project from design through construction. This included assistance with development of the innovative financing plan that was needed to bring the project to fruition. During construction, WSP and MBP worked closely with the City and the contractor to ensure that construction was completed on time in accordance with the plans and specifications. The project was delivered nearly six months ahead of schedule and \$60M below the budgeted construction cost.



As the largest locally administered project in the history of the Commonwealth of Virginia, the Dominion Boulevard Improvements project was under intense scrutiny from the transportation industry, the public and elected officials. Given the complex nature of the project and the drastic transformation of the corridor, there were numerous opportunities for the project to be delayed or derailed all together. The team overcame all challenges and the project was delivered on time and under budget, successfully meeting the needs of the City.