Bentley
Sustaining Infrastructure

Be Inspired Awards
2012 Winner

Creighton Manning Reduces Plan Set Drafting Time by 20 Percent on Major Intersection Project

Uses InRoads to Leverage 3D Data throughout the Lifecycle of USD 14.5 Million Intersection Reconstruction Project

Project Summary

Organization:
Creighton Manning Engineering, LLP

Solution:
Roads

Location:
Albany, New York, United States

Project Objective:

- Minimize traffic delays, enhance bicycle and pedestrian paths, improve safety, and address pavement deficiencies for the Washington Avenue/Fuller Road intersection.
- Reconstruct a six-lane, at-grade intersection to reduce traffic congestion.
- Design the entire project in 3D to leverage 3D data throughout the project lifecycle.

Products used:
InRoads Suite, MicroStation, ProjectWise

Fast Facts

- The bridge-over-roundabout solution removed about 20,000 vehicles from east-west traffic through the intersection.
- This project was the team's first bridge design using 3D modeling.
- To maximize 3D detailing, the project was divided into 18 corridors, including 4 mainlines, 5 ramps, 3 connectors, 1 roundabout, and 5 paths/sidewalks.

ROI

- Digital files reduced drafting time by about 10 percent
- Associative dimensions ensured automatic updates, reducing drafting time by another 10 percent
- 3D model provided an accurate basis for determining earthwork quantities
- 3D data in the field enabled accurate stakeless grading and machine control, saving time and money

3D Model Automates Detailing

Creighton Manning Engineering, a multidiscipline civil engineering and land surveying firm, served as prime consultant on a USD 14.5 million locally administered federal aid project to reconstruct the at-grade intersection of Fuller Road (CR 156) and Washington Avenue (NY 910D) in Albany, New York. The project goals were to decrease traffic congestion, improve pedestrian and bicycle access, enhance safety, and address deteriorating pavement conditions. Creighton Manning used InRoads Suite, Bentley's civil engineering road and transportation infrastructure design software, to realign Washington Avenue and incorporate two 95-foot-long single-span bridges over a new two-lane roundabout on Fuller Road. This helped to remove approximately 20,000 vehicles from east-west traffic through the intersection.

Using the 3D model, the project team was able to create and update site plans. This reduced drafting time by about 20 percent.

Six-Lane Intersection Delayed Traffic

Funded through a public-private partnership among Albany County; the University at Albany, State University of New York; Fuller Road Management Corporation; and the New York State Department of Transportation (NYSDOT); this project had multiple stakeholders with diverse objectives. More than 60,000 vehicles per day passed through the junction of the state and county highways in New York's state capital, causing significant traffic congestion.

The existing six-lane, at-grade intersection presented a significant engineering challenge. The project site was constrained by Interstate 90 and the site of a new 280,000-square-foot building under construction at the University at Albany's College of Nanoscale Science and Engineering (CNSE). In addition, the location was environmentally sensitive due to the close proximity of Rensselaer Lake Park and Albany Pine Bush Preserve, one of the best remaining examples of an inland pine barrens ecosystem. Creighton Manning was involved in every aspect of the project, from initial traffic studies, existing conditions survey and stakeout, to the complete highway and bridge design, construction inspection, and civil site design for the CNSE building. Throughout the project, relevant data had to be shared among the CAD platforms used by various engineering disciplines.

Integrated Software Enables Seamless Data Exchange

Creighton Manning made the commitment to design the entire highway and bridge project in 3D in order to leverage the 3D data throughout the project lifecycle. InRoads Suite was used for the road and bridge design, while another consultant used Autodesk AutoCAD Civil 3D software for the site design. Using interoperable 3D design tools allowed the project team to exchange engineering data between design products. This integrated approach enabled the team to maintain data integrity while developing an optimal solution and minimizing impacts on the site.

Of the three alternatives considered – an at-grade intersection, an at-grade roundabout, or a grade-separated roundabout with flyover – only the grade-separated alternative would significantly improve the level of service through the corridor. The innovative design relocated Washington Avenue onto a bridge over a new two-lane roundabout on Fuller Road. The flyover reduced east-west traffic through the intersection by approximately 20,000 vehicles. This not only significantly reduced traffic delays but also reduced bicycle and pedestrian conflict points. A continuous pedestrian and bicycle network throughout the corridor further mitigated safety issues for non-vehicular traffic, and bus turnouts on the Washington Avenue ramps introduced transit service at locations that had previously presented safety concerns. The preferred alignment also facilitated a unique land swap with the State University of New York that consolidated the CNSE campus onto a contiguous parcel.

InRoads was used to model the roundabout, and both InRoads and MicroStation were used to produce a compelling visualization that helped communicate the design intent to stakeholders. Extensive survey work yielded data for a highly detailed 3D surface model. Using the InRoads Corridor

"We leveraged the 3D solids bridge model for cutting sections to create accurate details in the plan set. Once we had all the details and plans set up in the 3D data, all the details were updated to reflect what was in the model. This saved time and money by eliminating rework and edits."

— Karl Detrick, CADD Manager, Creighton Manning Engineering, LLP

Modeling tool, the designers divided the project into 18 corridors to apply the 3D surface to the mainline, ramps, connectors, roundabout, and sidewalks. Throughout the project lifecycle, data from the 3D model was transferred between Bentley products and AutoCAD Civil 3D via LandXML, a neutral file format for civil engineering data. The team also used ProjectWise for engineering content management and project collaboration.

Creighton Manning realigned Washington Avenue to incorporate two 95-foot-long, single-span bridges over a new two-lane roundabout on Fuller Road.

3D Model Yields Accurate Plans

This project was the firm's first application of designing a bridge using 3D modeling for solids with volumes. Creighton Manning was able to create and extract 90 percent of the plan details from the data-rich 3D solids model created in InRoads. Once the model section cuts were set up with associative dimensions, any changes to the 3D solids model automatically adjusted the dimensions – or flagged a "broken association" that required review and manual adjustment.

The project team also used the 3D model to produce a vivid 3D visualization of the entire project. Presented at public information meetings, the visualizations were effective tools for explaining what the project would look like and how the new alignment would impact the area. Local media also picked up the images to use in news stories about the project.

Creighton Manning leveraged the 3D design data through the entire life span of the project. During the final design phase, providing digital files instead of hard-to-read site plan details reduced plan set drafting time by about 10 percent. Using InRoads Suite, any drawing dimensions that were updated in the models were automatically changed in the plans, which reduced drafting time by another 10 percent.

The construction contractor ultimately used the 3D data in the field to perform more accurate stakeless grading and machine control grading. They were also able to compare as-built data from the construction and inspection to the model, which saved time and money during the construction phase.

Sustainable Infrastructure Achieved

Initiated in 2010 and opened to traffic in November 2012, this project won NYSDOT's prestigious 2012 Evergreen designation under the GreenLITES (Green Leadership In Transportation Environmental Sustainability) program, recognizing transportation infrastructure projects that minimize their impact on the environment.

Creighton Manning's innovative design included non-standard roadway features that minimized the overall footprint of the facility. These included a reduced horizontal curve radius, reduced shoulder and median widths, and a fill-type retaining wall. The landscaping integrated with native species as well as the master landscape plan at the adjacent University at Albany campus. Native soil removed from the project site was used by the Albany Pine Bush Preserve Commission for habitat restoration in conjunction with the City of Albany's landfill mitigation. Lastly, asphalt from the original alignment was re-used to pave the parking lot for the new CNSE building.

The application of data-rich 3D modeling enabled Creighton Manning to achieve the project goals of multiple stakeholders with accuracy and efficiency, and deliver sustainable infrastructure solution for an environmentally sensitive region.

Bentley
Sustaining Infrastructure