

Reality Modeling Enables Infrastructure Project Success

Infrastructure projects are complex. Whether they encompass road, rail, utilities, or water, it is challenging for design and construction teams to work together. The challenges they face include managing the number of vendor applications that might be used, adopting and learning new technologies, data accuracy, and delivering these projects on time and on budget. To address them, Bentley Systems' ContextCapture reality modeling software automatically creates 3D models of infrastructure projects from drone or aerial photography. This helps design and construction teams to work with a shared digital view of their project.

Joint Effort Delivers Accurate Engineering Model

A recent example of how ContextCapture helped a project team is on a large-scale road project in central Pennsylvania in December 2016. The team needed accurate data to compare expected design values with as-built progress. It turned to the joint team of Bentley Systems, a global leader in providing engineers, architects, geospatial professionals, constructors, and owner-operators with comprehensive software solutions for advancing the design, construction, and operations of infrastructure; Topcon Positioning Group, a developer of positioning instruments for survey and construction; and CEDARVILLE Engineering, a civil and environmental engineering technology company to assist with capturing and processing initial data. The reality capture was completed using a Topcon Sirius Pro fixed-wing drone to capture images of the site, and the 3D model was processed with ContextCapture to deliver an accurate engineering model. OpenRoads Designer, Bentley's 3D construction-driven design software, was leveraged to perform analysis, surface modeling, volume calculation, and cross sections of existing conditions. The project team used the accurate 3D model to verify volumes at defined stages and to control specific areas more readily to determine the paramount within a transportation design.

ContextCapture Center provided a three dimensional, multi resolution reality mesh that allowed for easy movement and manipulation within OpenRoads. Because the model was spatially referenced, the team could attach combined machine control and LiDAR surface provided by the contractor, and overlay that information in the design. Moreover, using the terrain capability in OpenRoads allowed them to extract unwanted asset data from the design (e.g. vehicles, trees, buildings), and ultimately create a cut-and-fill volume for the surface. This 3D engineering-ready reality mesh can be published to ProjectWise® ContextShare and web viewer by project stakeholders, keeping them well-informed of the true construction progress.

"The use of ContextCapture on a large-scale construction project far exceeded the initial expectations on the usefulness of a 3D reality mesh," said Mike Barkasi, senior application engineer with Bentley Systems. "Reality modeling gave the team access to current and accurate information to better understand and estimate the actual amount of material that was moved compared to the design value, which will help save time and costs compared to traditional methods. ContextCapture Cloud Processing Service on Microsoft Azure enabled us to deliver the model in the time scale required by the project."

ContextShare Enables Secure Management of Data

A year later, in December 2017, the joint team captured the road project and used ContextCapture Cloud Processing Service to quickly generate a 3D reality mesh powered by Microsoft Azure. With the flexibility of ContextCapture Console, the team work with previously registered blocks allowing for the performance of more complex tasks, such as merging blocks on a desktop application, then submitting the more time-consuming task of the reconstruction to ContextCapture Cloud Processing Service to process the 3D model more quickly.

ProjectWise ContextShare, a data sharing service, allowed team members to securely manage and store, then quickly share and stream large amounts of reality modeling data that is synced instantly, across project teams and applications. It allowed team members immediate access to the 3D models and civil design data that would become part of the successful use of the 3D model in a civil project environment.

Bentley's Reality Modeling Cloud Service allowed for a more flexible multi-resolution format (3sm) to be used for ground extraction command used. Additionally, the team used ContextCapture Editor to compare the new 3D reality models with those generated earlier in the project. The new volume analysis feature was used to target areas defined between alignment stationing providing volumes in between specified station ranges. This process along with the sharing and streaming capabilities of ProjectWise ContextShare allowed for better team collaboration. The reality data was easily accessible by the team for analysis by survey, engineering, and design teams. Issues concerning balancing of earthworks could now be easily addressed and managed in a timely manner, and with more accuracy than standard methods.

REALITY MODELING CLOUD SERVICE PROJECT INFORMATION:

ContextCapture Cloud Processing Service quickly generated a **3D reality mesh using 3,000 images** tied to **over 30 ground control points**

ProjectWise ContextShare **securely stored reality data** including additional survey and engineering data in the form of DYM, ALG (geometry) and DGN files.

▶ PROJECT PLAYBOOK: (Click any of the products to view product page)

- [ContextCapture Center](#)
- [ContextCapture Cloud Processing Service](#)
- [ProjectWise ContextShare](#)
- [OpenRoads Designer](#)

▶ EXPLORE 3D MODEL