

EXPERIMENTAL PROJECTS WORK PLAN

The Use of Autodesk products for Project Delivery

Location: Cascade and Choteau Counties, MT

Project Name: Carter - South

Project Number: NH 10-1(33)11; UPN 9555000

Experimental Project: Autodesk Platform Project Delivery

Type of Project: Reconstruction

Principal Investigator: Craig Abernathy: Experimental Project Manager (ExPM)

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Description

As part of MDT's BIM (Building Information Modeling for Infrastructure) initiative, the Department is updating business processes to better support electronic project delivery. MDT has experienced challenges (project inefficiencies and delays) resulting from issues related to our existing CADD platform, which further affects interoperability with other products in the environment, such as Trimble Business Center (TBC).

MDT has undertaken one functional-area-specific pilot project in the Bridge Bureau, which has yielded impressive results thus far. Other functional areas, such as hydraulics and survey have expressed interest in and plan to initiate their own pilot projects to evaluate the advantages to their areas using Autodesk products for design and survey procedures. A major focus of these pilot projects is data sharing, collaborative design work flows, and evaluation of interoperability with our existing CADD platform.

The Department has planned and proposes an experimental project to evaluate production of an entire project, from design through construction. This will involve the use and evaluation of multiple Autodesk applications for potential workflow efficiencies, quality enhancements, and resilience to project changes in several functional areas within preconstruction and construction.

The project will use the Autodesk AEC Collection of software and BIM 360. The AEC

Collection includes approximately 22 software applications integrated amongst themselves. The solution is anticipated to provide seamless and efficient sharing of electronic project data and minimization or elimination of rework and file redundancy, benefitting preconstruction and construction workgroups and reducing project risk. It is expected that MDT's external project partners/stakeholders will also be able to more easily use the electronic data produced, potentially reducing overall project delivery and construction costs.

MDT also does not currently have a modern, robust, or effective document management system, nor will the existing solution accommodate Autodesk files. As such, this Civil3D pilot project will evaluate the use of Autodesk's BIM360 product for CADD document management and collaboration during design and construction (including facilitation of milestone reviews and model review).

Finally, for MDT staff to be able to design and produce plans in Autodesk software, a workspace based on Montana's design and plan production standards needs to be created and tested. Because of our current lack of staff depth of knowledge with Autodesk products, MDT proposes to engage our existing CADD mentoring and training consultant, EnvisionCAD to provide review of the State Kit product to ensure that it is complete and correct. EnvisionCAD will also serve as an advisor to MDT through the State Kit development process to provide MDT with the benefit of their experience with other states that use Autodesk products as well as their history with and in-depth knowledge of MDT CADD workflow and standards.

Experimental Design

MDT has selected the Carter – South project as the Civil3D pilot project. This project is relatively early in the design process, but also contains enough data generated on our existing CADD platform and using our existing processes to allow evaluation of the feasibility of and work effort associated with converting such a project to the Autodesk platform. Further, there is enough design yet to be performed, including obtaining pick-up survey, to allow a thorough evaluation of all aspects of the Autodesk suite. In addition to survey, the project involves environmental, hydraulics, and right of way functional areas, so will provide a test of all the primary components of the Autodesk suite. Finally, the project has a schedule that can accommodate the initial additional time required for start-up (conversion and staff training).

MDT's hypothesis is that production with the Autodesk Suite will provide the following benefits relative to existing software and processes.

- Automation of plans production and labeling, resulting in fewer plan errors and time savings;
- Time-savings and increased quality of cross sections due to cross-section updating functionality specific to Civil3D;
- Better interoperability between the software packages in the suite, resulting in streamlined workflows, reduction or elimination of information duplication, and reduction of the time required to make revisions associated with design/scope changes;

- Improved communication and efficiencies between disciplines through leveraging automatic updates of design information between disciplines and products and the cloud collaboration features of both the AEC Collection and BIM360;
- Automation of quantities estimates, providing time savings and improved accuracy;
- Improved efficiency of conveyance of high-fidelity 3D models and model data to MDT's selected survey platform, Trimble Business Center (TBC), facilitating the use of this design data by MDT construction and survey as well as 3rd party contractors for Automated Machine Guidance (AMG);
- Improved staff acceptance and adoption of paperless reviews of both PDF plans and model data using BIM360, which is anticipated to require minimal setup/management effort on the part of design staff and has a simple and intuitive interface;
- Increased trust among staff and stakeholders of the project design information due to integrated and transparent tools such as automatic, dynamic quantity calculations and plan labeling; automated, real-time design checks; and ability for a wider range of staff to access and review all design products (such as models) through BIM360 without needing to be proficient in the design software; and
- Increased efficiency due to the modern, cloud-hosted, product-integrated document management capabilities of BIM360, which includes review workflows that can be leveraged for currently-manual processes such as milestone report reviews/approvals.

Evaluation Procedures

In order to validate or refute these hypotheses, project performance will be monitored in both quantitative and empirical ways, such as comparison of the project schedule to baselines and similar projects; and surveys of the project staff and functional area reviewers. Interoperability with construction will be assessed within the initial evaluation timeframe in a test environment, because the project is not scheduled for letting until 2022.

In addition to evaluations focused on the anticipated benefits, the following activities will also inform the evaluation:

- Documentation of recommended workflows for all functional areas and comparison of these with existing processes;
- Evaluation and comparison of the usability of electronic, plotted, and stored files by testing the use of the files produced with current Bentley software;
- Evaluation of impacts of software version updates upon file usability and workflows
- Collaborative testing of State Kit functionality with design and survey consultants, to include conversion workflows, file submittals, plotting, and DMS performance;
- Testing of the performance of BIM 360 in MDT's technical environment;
- Evaluation by construction field staff of quantity accuracy through comparison to TBC outputs;
- Evaluation of the overall quality and adherence to current MDT CADD standards;
- Review of the plotting processes and outcomes for Autodesk files as a replacement for MDT's existing, outdated DocUPlot software; and

- Confirmation of satisfaction of all needs of the functional areas, as documented through discovery workshops.

Evaluation Schedule

- Mid-May 2019: delivery of beta State Kit from Autodesk to MDT
- Mid-June 2019: completion of review of State Kit by EnvisionCAD and finalization of State Kit by Autodesk in response to any issues identified; pilot project team provided with training/demonstrations
- Mid-July 2019: completion of project conversion and checking of converted files and data – design begins
- End of September 2019: initial evaluation
- Following Plan-in-Hand (PIH) review: second evaluation
- Following PS&E review: third evaluation
- Four months after construction NTP (current let date 2022): fourth evaluation (focused on construction usability/quality)
- After construction completion: final evaluation