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| Sponsor | Nominations must be submitted by an AASHTO member DOT willing to help promote the technology | 1. Sponsoring DOT (State): Wisconsin
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| 1. Name and Title: Ryan Luck, SE Freeways Construction Chief
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| 3. Is the sponsoring State DOT willing to promote this technology to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative? Yes or No: Yes |
| **Technology Description (10 points)** | The term “technology” may include processes, products, techniques, procedures, and practices. | 4. Name of Technology:Enhanced Plans, Specifications, and Estimates (PS&E) review process using Autodesk BIM 360 Field |
| 1. Please describe the technology.

WisDOT SE Freeways design and construction teams developed a collaborative process to improve the bid-ability, constructability, and overall plan quality of their Mega program lets through the implementation of an enhanced PS&E review process. This process was successfully implemented on the $1.7B Zoo Interchange Reconstruction Mega Program, an FHWA Project of Corporate Interest (POCI). The effort includes milestone plan reviews by contractors and construction oversight engineers, as well as the continued participation of the WisDOT ad-hoc teams to support the design development. In addition to the expanded participation in the review efforts, the team is also utilizing technology to support the review efforts. 3D model reviews are being conducted within the process effort to detect and resolve conflicts with existing and proposed improvements. Also, Autodesk BIM 360 Field (Field360) is being utilized to track, organize, and document plan review comments and the resulting decisions, to ensure better follow through on addressing critical items in the plans. |
| 6. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the technology. (If electronic, please provide a separate file.) Please list your attachments here.Background files in pdf format include the following:* WisDOT Enhanced PSE Process Exhibit
* WisDOT Field360 – Training Guides
* WisDOT Enhanced PSE Review – Report Exhibit
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| **State of Development** **(30 points)** | Technologies must be successfully deployed in at least one State DOT. The AII selection process will favor technologies that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use. | 1. Briefly describe the history of its development.

Over the past decade, WisDOT SE Region has successfully completed two Mega projects, which included several lets with overlapping and adjacent construction packages being let. As the Zoo Interchange program began, it was evident through review of lessons learned, that better hands on coordination between design, construction, and contractors was critical to future successful project delivery. With the anticipated size of let plans (5000+ sheets), and highly complex staging, sequencing, and construction activities envisioned, WisDOT believed it would be difficult to capture all the value added comments and meaningful changes that the current PS&E review process would accommodate. A process with better coordination had the potential to create better quality projects, while avoiding costly change orders, and ensuring consistency between sequenced lets within the program.As a result, WisDOT developed an enhanced plan review process for their SE Freeways Mega Program with milestones to include key stakeholders early and throughout the project development process, including designers, contractors, and construction oversight staff to ensure that projects being put out for bid would be of the highest quality, are biddable, and constructible. Construction oversight staff with experience in previous and ongoing Mega Projects were included in the review effort, creating a feedback loop that was lacking in the existing process. This feedback loop ensured that any ongoing issues identified in field conditions would be adequately addressed during the plan development process, and helped bridge the knowledge gap that would occur when the project shifted from design to construction. In addition, early availability of the plans sets to the construction industry has enabled contractors to have adequate time to better determine what resources they may need to effectively bid on large let contracts, as well as assist in the identification of alternative solutions to proposed plans and enhance the bid-ability. This approach provides the best possible outcome for a successfully completed project.The Zoo Interchange team leveraged technology in two forms within their process improvement. The incorporation of 3D model technology, and the ability to see design plans while under development, helped the design team to identify any conflicts and enhance the plans, while allowing the construction team to better visualize the staging conditions proposed by the plans. This provided an extra dimension during PS&E review efforts.With the increased participation of construction staff in plan reviews, the team needed an organizational solution to collect, track, and document the large volume of comments (over 1500 per plan set) being provided. This tracking would ensure critical items were addressed as the plan development progressed. The team identified a software solution, Field360, which could be customized to meet the team’s needs for organization, as well as provide efficiency with keeping the review process on a compressed time frame. The cloud based solution allowed the team to make comments in real time, and were accessible to all reviewers. This feature resulted in fewer redundant comments, greater validation of the process by the reviewers, minimized review time, and reduced cost. The combination of the enhanced process, along with the utilization of the technology identified, helped to create a comprehensive and efficient process that allowed integration of plan improvements into the design process. |
| 1. For how long and in approximately how many applications has your State DOT used this technology?

The overall enhanced PS&E review process was introduced in summer of 2013. The incorporation of 3D model reviews and the use of Field360 into the process occurred in fall of 2014. Since implementation, there have been four PS&E reviews that have utilized the process with the software enhancement. In addition to the PS&E reviews, WisDOT SE Region began to utilize Field360 in spring of 2015 for additional tasks including:* punchlist tracking for field review
* issues tracking for other projects and public contacts
* lessons learned database management
* report queries for all items
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| 1. What additional development is necessary to enable routine deployment of the technology?

The enhanced PS&E review process is being continually monitored for improvement, and revised as necessary to maximize the return on investment. Different technology tools are being evaluated to support the PS&E review tracking and documentation, but the enhanced process implementation is continuing within the entire SE Region. |
| 1. Have other organizations used this technology? Yes or No: No If so, please list organization names and contacts.
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| **Potential Payoff****(30 points)** | Payoff is defined as the combination of broad applicability and significant benefit or advantage over other currently available technologies. | 1. How does the technology meet customer or stakeholder needs in your State DOT or other organizations that have used it?

Utilization of the enhanced review process and the implementation of the technology solutions have helped increase communication between the design and construction teams to ensure everyone is working towards a common goal of the best plan set possible. This helped enhance trust, conflict commitment, accountability, and results. Early availability of the plans sets to the construction industry (a step within the enhanced process) has enabled contractors to have adequate time to better determine what resources they may need to effectively bid on large let contracts, as well as assist in the identification of alternative solutions to proposed plans and enhance the bid-ability, which provide the best possible outcome for a successfully completed project. WisDOT adapted out of the box software systems by developing unique workflows to accommodate the software used. The Field360 software was leveraged with the existing interfaces to support the current workflow for the PS&E review efforts. Previous WisDOT projects utilized Microsoft Excel spreadsheets to track and organize the plan comment feedback process. Due to the large scale of the Zoo Interchange project, the number of reviewers participating, and the quantity of comments anticipated, this enhanced process improved the efficiency, quality, and effectiveness of the feedback. An additional benefit of the portability and search functions of the Field360 platform allowed the information to be easily referenced for future projects. The Zoo Interchange design development was completed with full 3D design capability. The process was adapted to include these models in the PS&E review effort. The Field360 workflows were established to provide feedback in both 2D and 3D environments. This technology solution far exceeded the previous process capability.Due to ability for rapid deployment and the availability of mobile applications, the technology for both the 3D modelling and Field360 have served the construction field staff and external users easily. With the Field360 software being used for additional applications as noted above (Q8), it is an excellent tool to track, catalog, sort, organize, and query reports on data needed, allowing faster response time for external questions about specific issues, saving valuable time. |
| 12. What type and scale of benefits has your DOT realized from using this technology? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing technologies.WisDOT is committed to a comprehensive internal plan review process as part of the Zoo Interchange project. WisDOT has found that the return on investment for plan review efforts has been favorable. While it is difficult to quantify what the return on investment is from the process implementation, it is fair to say that this enhanced process has resulted in noticeable improvements in efficiency, quality, and cost for a comprehensive plan review. WisDOT has experienced let savings on projects following implementation of the process, and believes the enhanced process is a contributing factor to these savings. In addition, WisDOT has observed a noticeable decline in change orders on the Zoo Interchange program compared to previous programs, however the projects are currently ongoing, and we are unable to provide any final data until the projects are complete. To put the potential savings in perspective on the Zoo Interchange program, a mere 0.25% reduction in contract change orders on the $1.1B let value of the program translates to a savings of $2.75M.Incorporation of additional construction expert plan reviewers and the use of the 3D model reviews into the process was an added cost to the overall effort. However, as noted above, WisDOT believes that this expenditure was offset by the let savings and reduced change order costs that are occurring on the active projects. However, there were direct cost savings that resulted from the implementation of Field360 which were realized with the coordination of the review comments being developed in a searchable, organized format. Less time was spent compiling, sorting, and organizing comments in a spreadsheet format, which was able to be allocated to reviewing comments for quality and completeness. The comparison is based on the two largest plan reviews, one done with Field360, and the other by compilation of multiple spreadsheets from individual reviewers. It is estimated that approximately 100 hours were saved by the interface engineer (comment coordinator) by utilizing Field360. In addition, there were time savings for the designer, who then spent less time clarifying comments, and responding to duplicative items. It is estimated that approximately 140 hours were saved between the same plan reviews noted above. |
| 1. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?

The implementation of this process and technology has been currently limited to the Zoo Interchange projects within WisDOT. However, it has the ability to be expanded across other Regions within the WisDOT, as well as integration with consultants and contractors, to develop a seamless approach to plan development, review, and implementation. The enhanced process can be utilized for projects of all sizes, and is scalable based on the complexity and available resources. |
| **Market Readiness (30 points)** | The AII selection process will favor technologies that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential. | 1. What actions would another organization need to take to adopt this technology?

The process can be implemented through development of a team structure between design and construction teams, to communicate the shared vision of the projects. This helps enhance trust, conflict commitment, accountability, and results. The key component to implementation of the software tool is to develop a system that fits the needs of the organization to collect, track, and follow through on plan review comments, and provide accessibility of the software chosen to all users. |
| 1. What is the estimated cost, effort, and length of time required to deploy the technology in another organization?

The process integration was developed through coordination of the design and construction management team, and implemented through policy expectations. This was done through several meetings over the course of 4 months with the design and construction management groups, to develop an agreed upon process. Implementation of the overall process to achieve full participation has a limited cost, with greater benefits of communication and coordination. Deployment of the software was completed with hands on training. Following two weeks of training development, users were trained over a one month time frame. Approximately 120 users were required to attend a one hour training session, with staff available during the PS&E implementation for issue resolution. Assumed cost for training is minimal based on the number of users being trained to utilize the software.Assumed costs for software is $2500 per license to utilize Field360 on an individual user basis. This can be a scaled cost based on the size of project, and range of implementation. Strategic partnerships with enterprise licensing agreements allow agencies implementing this process to significantly offset typical single user license costs. This cost reduction, compared to the efficiency, quality, and cost savings of the enhanced plan review process make the payoff potential significant.   |
| 1. What resources—such as technical specifications, training materials, and user guides—are already available to assist deployment?

Documents that outline the enhanced PS&E review process, as well as a basic training manual to provide plan review comments in Field360 are developed, and have been used to train staff for previous efforts. In addition, a flow chart was provided to establish the steps taken during the comment creation. Prior to each PS&E review, a detailed schedule was developed to ensure the efforts met the overall expectations developed for the enhanced process. |
| 1. What organizations currently supply and provide technical support for the technology?

WisDOT has contracted with a construction management consultant to provide support and administer Field360. |
| 1. Please describe any legal, environmental, social, intellectual property, or other barriers that might affect ease of implementation.

The main barriers to implementation of the enhanced process were internal in nature. Implementing a new process was a culture change that requires cooperation. Culture change affected both the reviewers and the designers. Reviewers with varying levels of computer literacy were required to learn a new software to provide their comments. Designers had to be willing to accept a more comprehensive and thorough review that is highly documented. Documented responses to the feedback were required, which validates the reviewers’ time, and documents the incorporation or non-incorporation of the comments. Past culture has been that, at times, there was dismissal of challenging or difficult comments with no record of resolution. This new level of accountability and transparency is in everyone’s best interest, and requires willing participation resulting in enhanced quality. The owner needs to champion the process to sustain trust. |
| ***Submit Completed form to*** | [***http://web.transportation.org/tig\_solicitation/Submit.aspx***](http://transportation1.org/tig_solicitation/Submit.aspx) |