AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. **Sponsoring DOT (State):** California Department of Transportation (Caltrans)

2. **Name and Title:** Joaquin Pedrin, Senior Landscape Architect & Branch Chief; Jeanne Gorham, District Landscape Architect; Wesley Bexton, Landscape Associate; Adrienne St John, Landscape Associate

   Organization: California Department of Transportation (Caltrans), District 4

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Innovation Description (10 points)

The term "innovation" may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

360 Tours

4. Please describe the innovation.

360 Tours are an interactive, web-based interface that allow stakeholders to explore a project in 360 degrees. No specialized software or skills are needed. Visitors to the site can zoom in to areas of interest and turn on layers of information. They can view simulations of impacts like sea-level rise and see the inundation of the existing roadway. They can even fly through design alternatives with video simulations that clearly illustrate the design proposal. With 360 Tours, we've created a dynamic and interactive experience that helps community members, transportation partners, and regulatory agencies truly visualize not only the NEED for a proposed project, but also the SOLUTION.

We invite you to explore three examples of 360 Tours that we have recently created. The SR37 360 Tour highlights the impact of sea level rise on a critical highway corridor, and allows users to explore a conceptual design solution from various locations: SR37 360 Tour. The Caltrans Material Lab tour provides a concise overview of a proposed lab facility in its context: Material Lab 360 Tour. The Gleason Beach tour illustrates the extent of current and expected coastal erosion, making clear the reasons for realigning this segment of coastal Highway 1. The embedded videos in this tour explain the proposed design and pose questions for the public about their preferences for the design details: Gleason Beach 360 Tour.

5. What is the existing baseline practice that the innovation intends to replace/improve?

As a state agency, we have an obligation to inform the public of our projects. But project simulations aren't typically made available in a format or a timeframe that allows for meaningful engagement with the proposed design alternative. Historically, the visualizations our agency developed were static exhibits buried within environmental documentation, and they were used to assess a project's visual impacts. This documentation was typically developed and released after design alternatives are selected, either in a PDF or in a one-time in-person public meeting. This process gave stakeholders little chance to fully understand a project through simulations. This lack of understanding has often resulted in a lack of support; and broad public support is essential to getting high-profile projects built on time and on budget.

6. What problems associated with the baseline practice does the innovation propose to solve?

360 Tours make a project proposal available and understandable to diverse stakeholders. The engineering plans and project descriptions that we typically share with local agencies and the public are difficult for a layperson to access and read, and often don't elicit meaningful feedback. Recent research by the FHWA on Virtual Public Involvement (VPI) has shown that mobile devices are the most common way stakeholders access project information. The research further showed that mobile technologies were the most equitable way to reach and interact with our stakeholders. This innovation takes our simulations out of a lengthy document and puts them into a mobile-friendly interactive format that is available 24 hours a day to agencies, the public, and our own project development teams. Partner agencies have been able to access our 360 Tours while developing their staff reports, which deepened their understanding of project details. We were also able to add topography, aerial imagery, and supplemental visualizations as staff requested information and improvements to address public and agency concerns. In addition to these advancements in external communication, 360 Tours have also enhanced our internal collaboration. We have used 360 Tours to rapidly prototype project alternatives for our internal teams to efficiently select design alternatives at the least expensive phase of project development.

7. Briefly describe the history of its development.

Our use of visualizations has evolved from the creation of static before & after images, created in-house or by consultants, to the development of 3d models embedded in interactive 360 Tours. As we have seen how effective simulations are in developing design solutions and building public support for projects, we have begun producing visualizations earlier in the project development process - at the planning or early environmental study phases, instead of the end of the project approval & environmental study phase. Landscape Architects in our agency have advanced their process to take advantage of modeling, rendering, and photosphere software to build, render, and share these models in an easily accessible format. The platform is scalable and has allowed us to add layers of information (like GIS map data), additional viewpoints (for expansive project corridors), and embedded videos (to provide narrated explanations). Today we are able to provide understandable and interactive visualizations, scaled to the complexity of a project, as we are seeking feedback and support from the public and our public partners.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

We have seen that Landscape Architects already possess the skills needed to implement this innovation, and when project managers allocate resources to develop visualizations early in the design process, our Landscape Architectural staff has the capacity to produce them. Landscape Architects, unlike Professional Engineers, are trained in visual communication in the course of their professional education. With these skills and the use of various software packages, our staff has developed 3d models and renderings, and ultimately shared them through photosphere hosting software. Implementation of this innovation is possible with an incredibly lean team - one staff person with a software package is capable of creating interactive 360 Tours for numerous projects. With the collaboration of public affairs officers and project managers, these visualizations can be easily disseminated for team collaboration and public engagement. Three of our recent 360 Tours are available online at these links:

SR37 360 Tour (explores sea level rise threats to state route 37),

Material Lab 360 Tour (shows a proposed Caltrans Materials Lab in its context), and

Gleason Beach 360 Tour (illustrates coastal erosion, highway realignment, and design options with embedded maps and videos).

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.
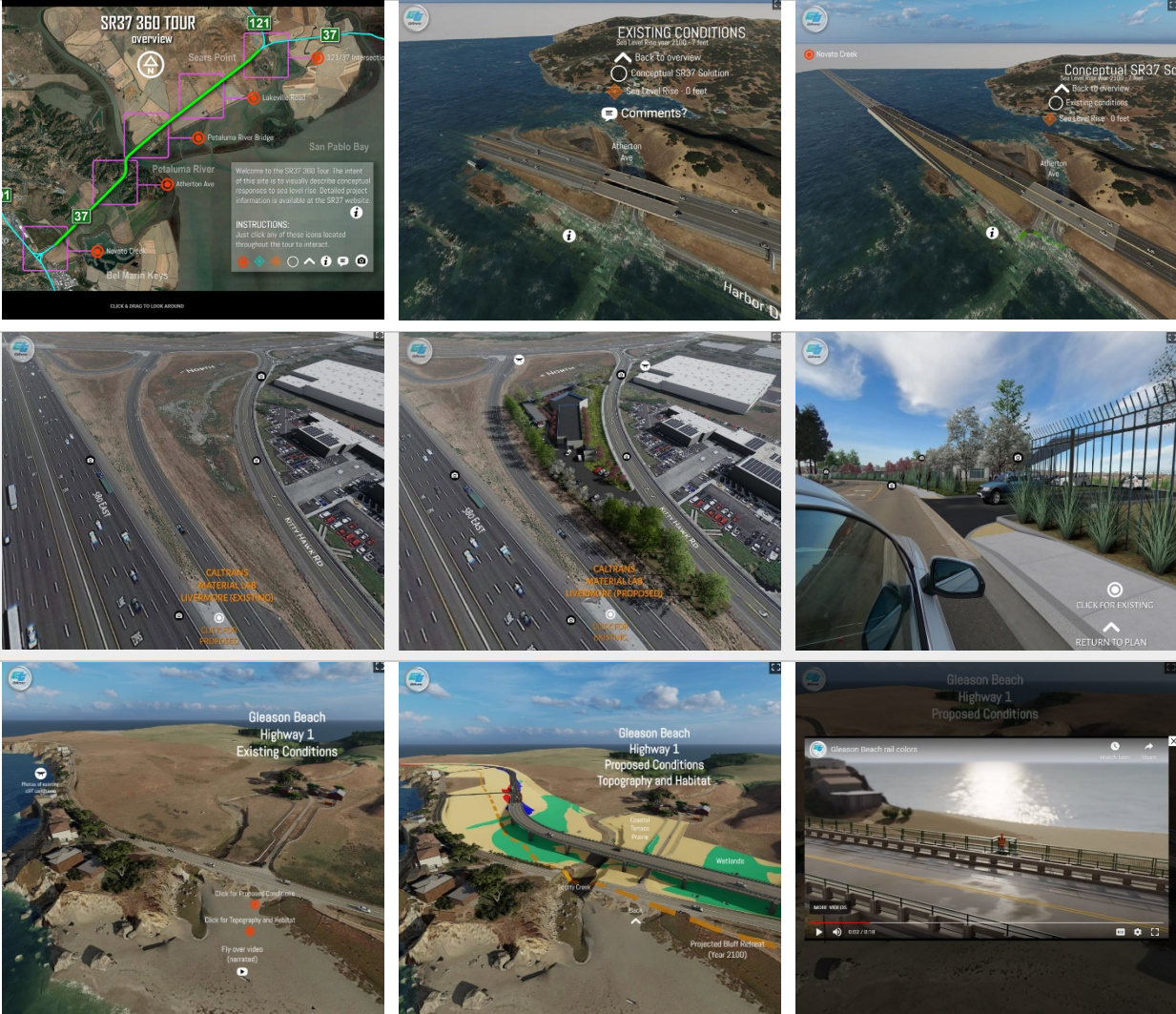
The images in the top row are taken from the SR37 360 Tour.
The middle row shows views from the Materials Lab 360 Tour.
The bottom row shows scenes from the Gleason Beach 360 Tour.
Captioned high-resolution images have been included on additional pages.

Innovation Images: 360 Tours

Sample Images from 360 Tour of SR 37
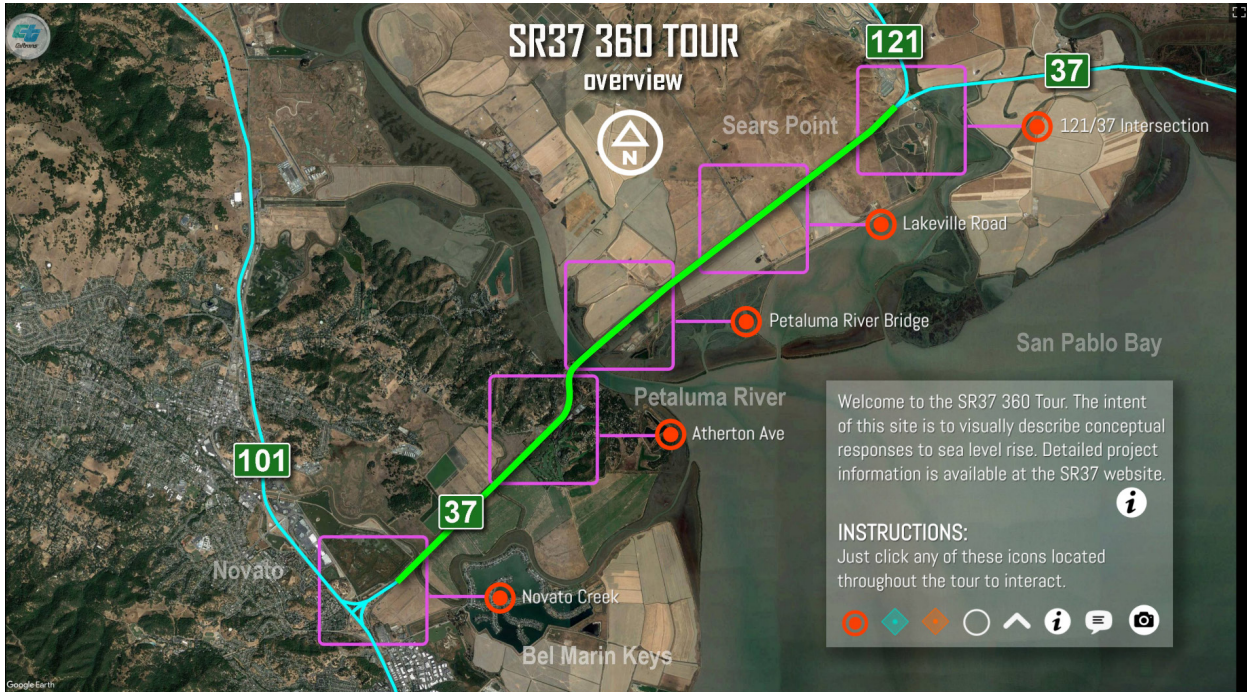
Overview Map

Embedded link to interactive Sea Level Rise Map

Sample Images from 360 Tour of SR 37

Existing Condition

Projected Sea Level Rise over Existing Highway

Proposed Elevated Highway over Projected Sea Level Rise

Sample Images from 360 Tour of Caltrans Materials Lab

Aerial View of Existing Condition (camera icons represent links to ground-level viewpoints)

Aerial View of Proposed Design

Sample Images from 360 Tour of Caltrans Materials Lab

Ground-level View of Existing Condition (camera icons link to other viewpoints)

Ground-level View of Proposed Design

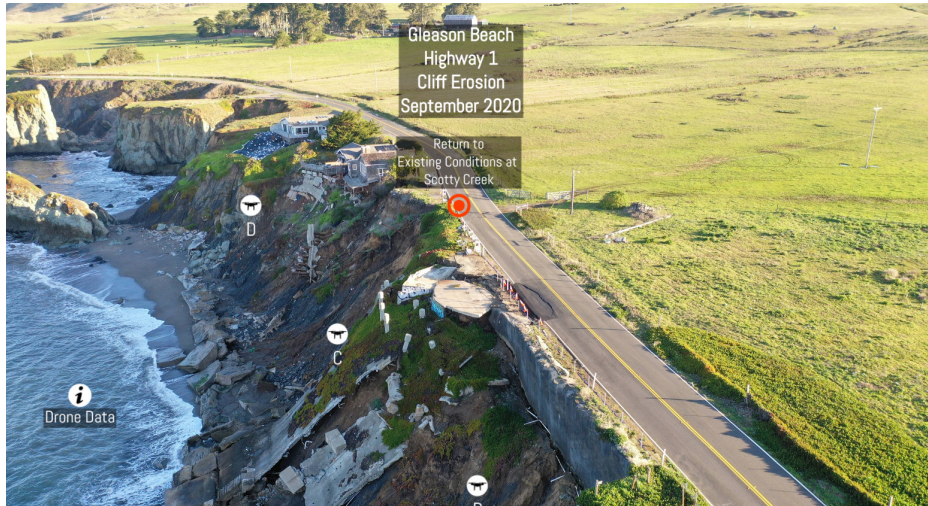# Sample Images from 360 Tour of Gleason Beach Highway Realignment

Aerial View of Existing Conditions

Aerial View of Topography, Habitat, Projected Bluff Erosion, and Proposed Highway Realignment
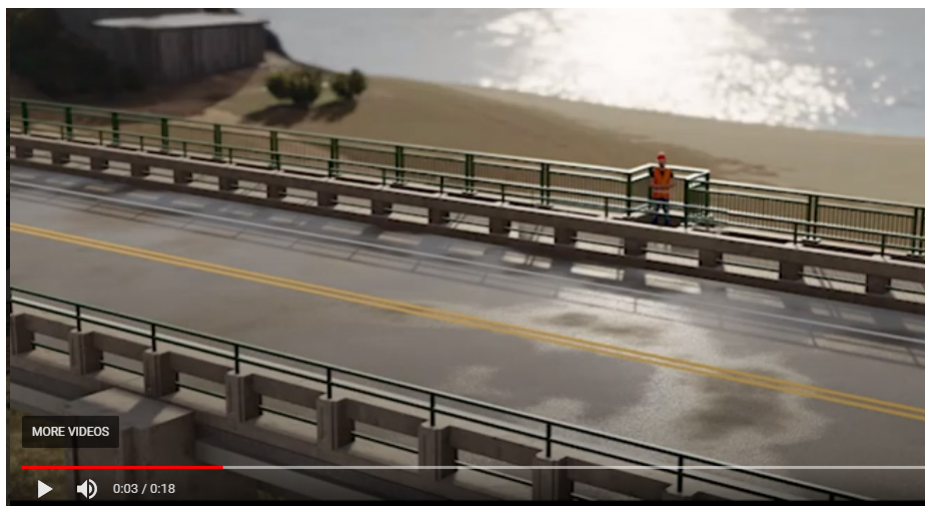
Sample Images from 360 Tour of Gleason Beach Highway Realignment

Embedded Drone Imagery of Current Bluff Erosion

Embedded Video explaining Proposed Design

Embedded Video illustrating Proposed Bridge Rail

State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The AII selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

☐ Prototype is fully functional and yet to be piloted

☐ Prototype has been piloted successfully in an operational environment

☐ Technology has been deployed multiple times in an operational environment

☒ Technology is ready for full-scale implementation

360 Tours are now being developed regularly for large-scale and high-visibility projects within our district. The SR37 tour was deployed in September 2020, the Materials Lab tour was deployed in January 2021, and the Gleason Beach tour was deployed September 2020.

10. What additional development is necessary to enable implementation of the innovation for routine use?

No further development is necessary. Resources are currently being allocated for implementation of 360 Tours on high-profile projects, and broader implementation is forthcoming.

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology?? ☒ Yes ☐ No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
FHWA	Jeffrey Zaharewicz, Acting Director, FHWA Center for Accelerating Innovation	(202) 366-1325	Jeffrey.Zaharewicz@dot.gov
TRB	Ilir Bejleri, Associate Professor, University of Florida, on behalf of the TRB Interactive Visual Simulation Sub-Committee	(352) 294-1489	ilir@ufl.edu
HNTB Corporation	Tami Podesta, Senior Project Manager, Planning	(213) 403-1079	tpodesta@hntb.com

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice.

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

360 Tours provide state of the art visualization to our customers and stakeholders with the public, partner agencies, and within our own internal project development team. The quality of the information and the ease with which it is understood make our project proposals easier than ever to understand, access, and share. The SR37 tour has been shared with partners in four counties and with members of the public to illustrate the pressing need to address sea level rise and to catalyze support for the project design. The Gleason Beach tour was referenced extensively by local and statewide agencies, allowing them to develop staff reports and recommendations, and to request additional information. Due to the scalable nature of the platform, we were able to add layers of information to address both agency and public concerns. This provides unparalleled quality of information, available at any time on any device, to support collaboration with our stakeholders.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Improved Customer Service	360 Tours make our proposed projects easier than ever for the general public to understand. While we regularly share project descriptions and plans and request public comment, the feedback we get is only as good as the content we're able to communicate. 360 Tours help the layperson understand not only the need for the project with videos, maps, and overlays; they also allow our customers to explore our proposed solution. Our Tours are not only informative, they are also fun to view. An interactive model is easy for public information officers and engaged citizens to share on social media, helping us to spread the word and even create a buzz about upcoming projects.
Organizational Efficiency	Easy-to-understand simulations are as informative for our partners as our customers. By making these Tours available early in the environmental study phase of the project, our project development team members and partner agencies are able to identify environmental issues at a point when we still have plenty of time to

	coordinate solutions. The tours also serve as an information hub for reviewers, providing a shareable project overview and allowing us to add requested information in one convenient location, without tracking circulation lists or managing versions.
Other (please describe)	360 Tours have been an innovative application of technology that our DOT was already investing in. We were able to leverage a combination of existing software packages and already-approved licenses, to create a new visualization product, with minimal capital costs or bureaucratic approvals.

Provide any additional description, if necessary:

One of the promises of early outreach and better communication is the ability to reduce risks. While no two projects are alike and savings are difficult to quantify, we are anticipating that the use of these Tours will help us to avoid the schedule delays that can stem from incomplete environmental reviews and legal challenges. By making the project design simpler to understand, we are making it easier for stakeholders to identify concerns. Publishing this information before we move into detailed project design also helps us address and resolve issues before we commit more resources. We are looking forward to using 360 Tours to help us shift our collaboration work to the phases where it is most efficient in both time and resources.

14. How broadly might this innovation be deployed for other applications in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

360 Tours offer benefits for all types of site-specific development projects. Similar visualizations are already being employed by the real estate industry, but we have found a way to repurpose the tools to support virtual public involvement in state transportation projects. We have adapted our models to showcase not only a design proposal, but also to illustrate the constraints - from sea level rise, to bluff erosion, to existing and anticipated wetland ecosystems - that inform and shape our design. The educational layers we have integrated offer potential for broader use in supporting the analysis of environmental impacts under NEPA and state guidelines, and provide opportunity to use simulations as educational resources, as well.

Market Readiness (20 points)

The AII selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
☐	Gaining executive leadership support	Click or tap here to enter text.
☒	Communicating benefits	It is essential that the project management team understand the benefits of developing and sharing project simulations at the early planning and environmental study phases. Allocating resources to Landscape Architecture staff at the proper time allows us to share information when it is most useful and most effective.
☐	Overcoming funding constraints	Click or tap here to enter text.
☐	Acquiring in-house capabilities	Click or tap here to enter text.
☐	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
☐	Resolving conflicts with existing national/state regulations and standards	Click or tap here to enter text.
☐	Other challenges	Click or tap here to enter text.

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

Cost: The primary capital outlay involved in developing these Tours is for the software tools involved. There are numerous software packages on the market, and most DOTs already license some version of these products. The specific software we employed was: Sketchup (for modeling) $300/year, Lumion (for rendering) $3,500, and Kuula (360 photoshpere hosting) $200/year. Thus, our combined capital costs for all three of the featured 360 Tours was a total of $4,000.

Level of Effort: The level of effort involved in creating these tours is typical of the scope of simulations required for complex or high-profile projects.

Time: The staff hours involved in creating 360 Tours has averaged approximately 300 hours per tour. Of course, this varies with the complexity of the design and the scope of the tour.

17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

Most DOTs already employ Landscape Architects with the skills, aptitude, and training to develop 360 Tours, although these tours can also be developed by consultants. There are various software developers that offer programs with modeling, rendering, and photosphere hosting capabilities, and many DOTs already license these software packages.