Using VR to Step Inside Tomorrow's Infrastructure Projects

By Nicholas Tucker, KBA, Inc., *ntucker@kbacm.com*, Co-Chair – APWA Washington Publications Committee

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In the process of putting together this article, I had the privilege of riding Sound Transit's Tacoma Dome Link light rail extension nearly 10 years before the project is scheduled to be opened to the public and four years before construction begins. I was able to see the view from both sides of the train as it went from Federal Way to Fife to Tacoma. And I got to see the view from the driver's cab.

Because of the title of this article, you know this ride was virtual, but the point stands that it is becoming possible to visualize public works projects years before they are delivered, in increasingly personal and intuitive ways. Where in the past we would only get still renders and top-down diagrams of planned infrastructure, now we can see, from a first-person perspective, what the world will look like with the completed project in place.

Prospective transit riders wearing a VR headset can look out the windows of a light rail car and see what their ride will be like a decade from now. Stakeholders can

play with real-time traffic models in a fully rendered 3D environment to understand exactly how a new interchange design will relieve congestion. And agency leaders can use these tools to demonstrate to the public what they will be getting from their tax dollars.

The Tacoma Dome Link Extension is currently being designed by Parametrix, and the virtual ride I took is the product of their Visualization team, led by Visualization Project Manager Wayne Sullivan. He's been producing infrastructure visualizations for almost 30 years and has personally been a part of the sector's evolution.

Sullivan's use of VR for visualization began in 2015 during the design phase of Project Neon in Las Vegas. He and his team were tasked with creating a 3D model of the project for interactive project management and public outreach, and to create videos using the model to show the public what the finished project would look like. They built the model and put a virtual 360-degree camera into a virtual helicopter that flew along a pre-set track, letting viewers click and drag to move the view around like they would on Google Maps Street View.

Though they weren't contracted to do so, Sullivan and his team decided to bring a VR headset to the first outreach meetings as an added bonus. It helped make the viewing experience more intuitive and immersive. Not all members of the public grew up using video game controllers or a mouse and keyboard to maneuver in a 3D space, but wearing a headset, they can just look around.

"We included instructions and a countdown, we didn't want to freak anybody out, we were worried about people getting sick," Sullivan said. "And we were amazed, nobody got sick, everyone understood it immediately. We were able to show 'look what you're gonna get, your kids will be able to ride their bikes all the way to the store on a protected lane. We could show someone in a wheelchair how accessible a design would be.'"

Since then, the models have only gotten better, both in utility and in realism, as raw computing power has increased. Sullivan's team now combines data from the Google Maps Tiles API with custom elements made using the Unreal Engine modeling software, which is most commonly used in the development of video games. Because of this, it's no surprise that much of his team has a background in video game development and modding.

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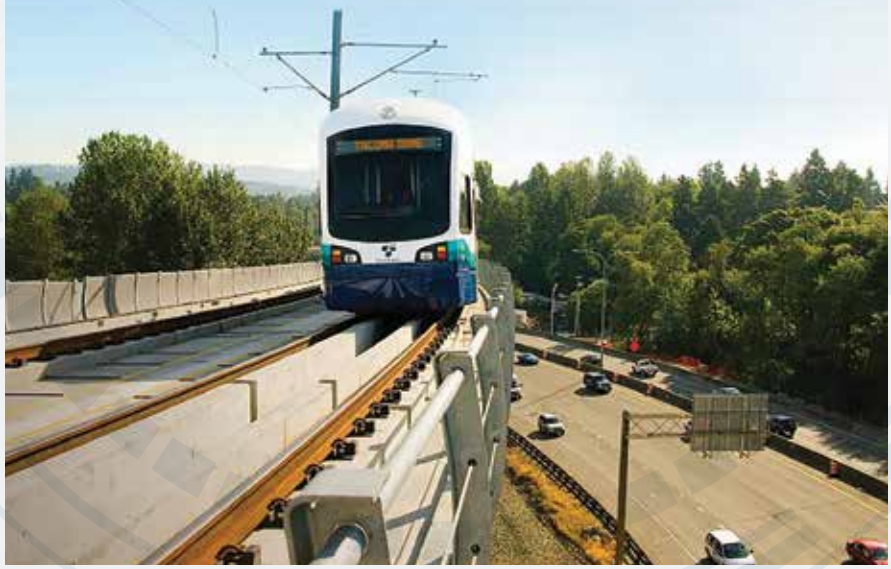

"It's a lot easier to teach them what a DTM is or how to model super elevations and stuff like that, than it is to try and get someone whose and engineer or a CAD person to understand about modeling and UV mapping," Sullivan said.

Along with increasing fidelity, Sullivan believes the future of visualization will be in the accessibility of models. Pixel Streaming is a method of accessing high-quality visualizations that run on a high-powered server somewhere in a data center, and can be streamed and interacted with on more modest user hardware like a phone, tablet, or laptop. VR headsets are also becoming more affordable and powerful every passing year. Some don't need to be plugged into a computer, and many can run programs in 8K at 120 frames per second.

It's all a far cry from the days of drafting tables and 2D images rendered from simple polygons. While infrastructure projects often take a tremendous amount of time and money to reach completion, at least we have ways of seeing and getting excited about the future more than ever before.

Check out the VR Visualization Tools: