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FROM CONCEPT TO REALITY: Understanding Photo Simulation Visualization

A photo simulation blends a ground or aerial photograph with a 3D model to create one static visualization. In most cases, we use this technique to insert a proposed project's 3D model into an existing photo, allowing stakeholders to clearly visualize and evaluate how the project would appear from the captured viewpoint.

Why Photo Simulations?

- Shows project with site context
- Saves time/money versus doing a complete 3D model

NEEDED ITEMS

Project Linework & Data (Provided by Project Requestor)

During the kickoff meeting with the project requestor and Visual Communications (Viz Comm), the team reviews the project design to determine what the final photo should include and the best angle/viewpoint. This is based on project drawings, aerials, terrain information, and visualization goals.

Required materials:

- CAD drawing(s) in Autodesk Civil 3D (C3D)
- Aerial image
 - » Typically, everything needed is already in C3D
- Terrain model
 - » Ideally, a C3D surface from a survey or other best-available data

Photography Process (Viz Comm's responsibility)

Visualization specialist + photographer coordination:

- Review visualization goals discussed during the kickoff
- Determine photo angles
- Decide optimal time(s) of day
- Select appropriate lens(es)
- Plan camera settings

On-site photography:

- Photos are captured by professional photographers using professional-grade cameras to ensure accurate composition, focus, depth of field, and lighting.
- **Documentation collected on site:**
 - » Photo coordinates via GPS
 - » Time/date of each photo

Important:

- Camera phones should not be used—they produce low-quality images that cannot be reliably matched in 3D.

3D Model Development

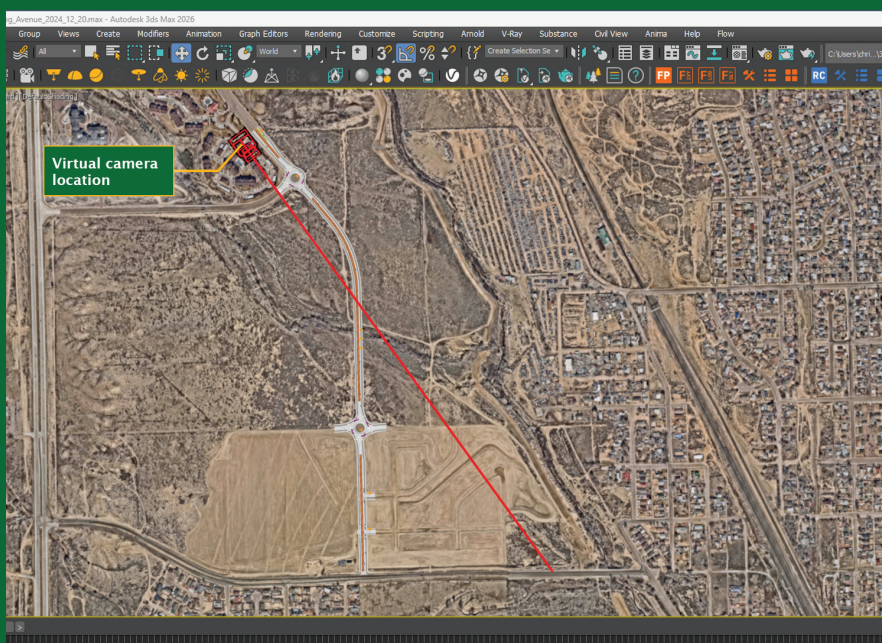
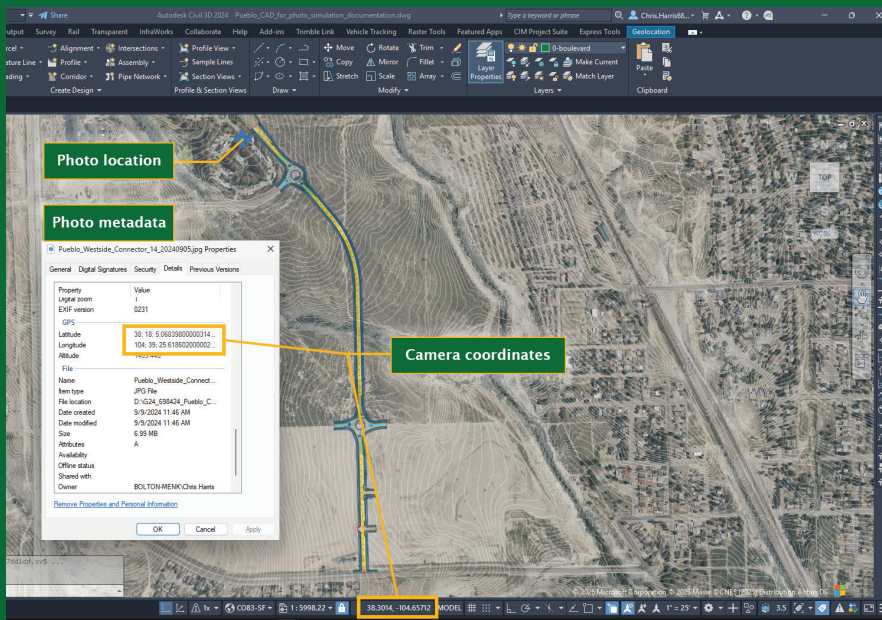
The visualization specialist builds the 3D model using:

- The provided project linework
- Information gathered during the kickoff meeting



PROCESS OVERVIEW

In 3D, a visualization specialist recreates the lighting and spatial relationships captured in the photograph. They begin by draping an aerial image over a surface model, then set up a virtual sun to match the real-world lighting. A virtual camera is placed at the exact location and angle where the photo was taken. The model is then rendered from that virtual camera's perspective, composited with the original photograph in Adobe Photoshop, and refined so the 3D elements blend seamlessly into the scene.



Lighting

- The lighting is matched with a physically accurate virtual sun that gets located at the same coordinates, time, and date as the selected photo, so the virtual shadows match the direction of the real-world photo's shadows.
- The settings from the photo's metadata are entered into the virtual camera's settings, so the rendered image is exposed just like the photograph.

Perspective and Scale

- To match a photo's perspective, a virtual camera is positioned in a 3D model of the site at the same coordinates and looking in the same direction as the captured photo. The virtual camera and lens match the real-world camera and lens settings.
- The virtual camera is positioned the same distance from objects in the 3D model as the real-world camera was on site, ensuring the scale remains accurate.

Rendering

- Image is rendered from the matched virtual camera perspective with the virtual camera settings matching the real-world camera settings.

Compositing

- The photo and rendered image are opened in Adobe Photoshop and combined into the same file.
- The rendered image will need to be edited to match colors, exposure, and scene context.
 - » An example of scene context editing would be when the proposed project is obstructed by an object, we edit the rendered image, so it appears behind the object doing the obstructing.

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