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Carving Out Our Past: Photogrammetry for the Study and Preservation of Cleveland's 20th Century Inscribed Graffiti

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CARVING OUT OUR PAST: PHOTOGRAMMETRY FOR THE STUDY & PRESERVATION OF CLEVELAND'S 20TH CENTURY INSCRIBED GRAFFITI



Scan this code to view the 3D model on Sketchfab

Andrew R. Mancuso; Nina Herzog; Charlie Harper
Kelvin Smith Library, Case Western Reserve University

INTRODUCTION

- Doan Brook is a small, seemingly insignificant, creek in the midst of a city. And yet, Doan Brook has claimed the attention of the people around it for over two hundred years. It has been a focus of the community ever since 1799, when Nathaniel Doan settled his family by the stream and built a tavern at a ford.
- The area we imaged is but a small piece of this larger range of shale rock faces that contain inscribed graffiti from the early through mid-nineteen hundreds, possibly earlier in areas we have not yet surveyed.
- Much of this historic graffiti has already been lost to the rapidly eroding gorge walls; this was the impetus for capturing it through photogrammetry in order to preserve and study the writings.

OBJECTIVES

- Preservation**
- The main objective of this project was preservation of these carvings. There are already sizeable chunks that have broken off, fallen into the brook, and obscured the carvings that were on them, never to be seen again.
- Research & Study**
- The resulting three-dimensional models provide scholars a digital access point for studying these inscriptions to inform local history, genealogy, and art history.

METHODS

- What is photogrammetry?**
- Photogrammetry is the technique of taking multiple overlapping photographs and deriving measurements from them to create 3D models of objects or scenes. The basic principle is quite similar to the way many cameras these days allow you to create a panorama by stitching together overlapping photographs into a 2D mosaic. Photogrammetry takes the concept one step further by using the position of the camera as it moves through 3D space to estimate X, Y and Z coordinates for each pixel of the original image; for that is also known as structure from motion or SfM.

Table 1. Camera & Settings

| Camera | Lens | Aperature | ISO | Focus |
|----------|------|-----------|-----|-------------------|
| Canon 5D | 50mm | f8 | 100 | Manual, unchanged |

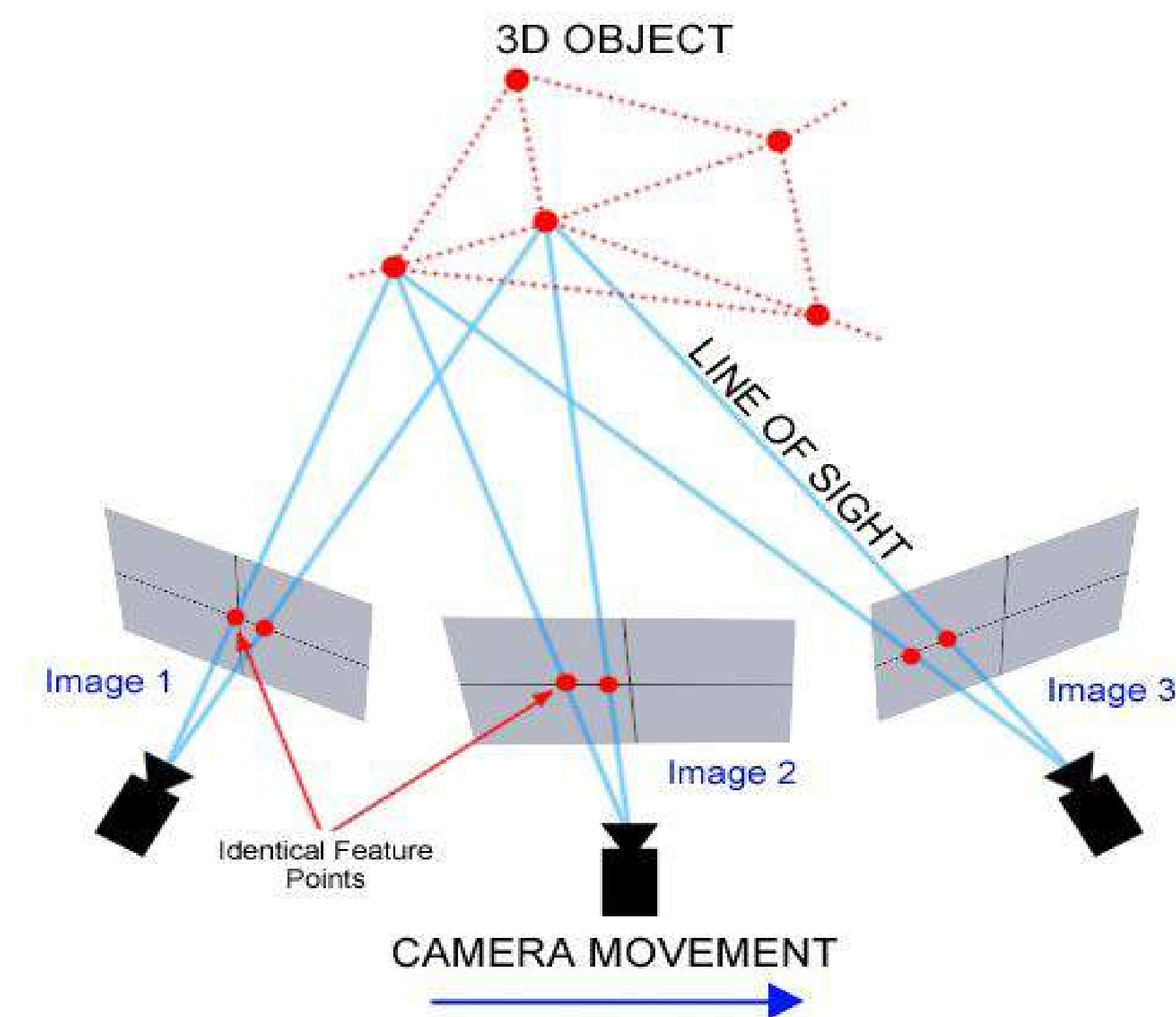
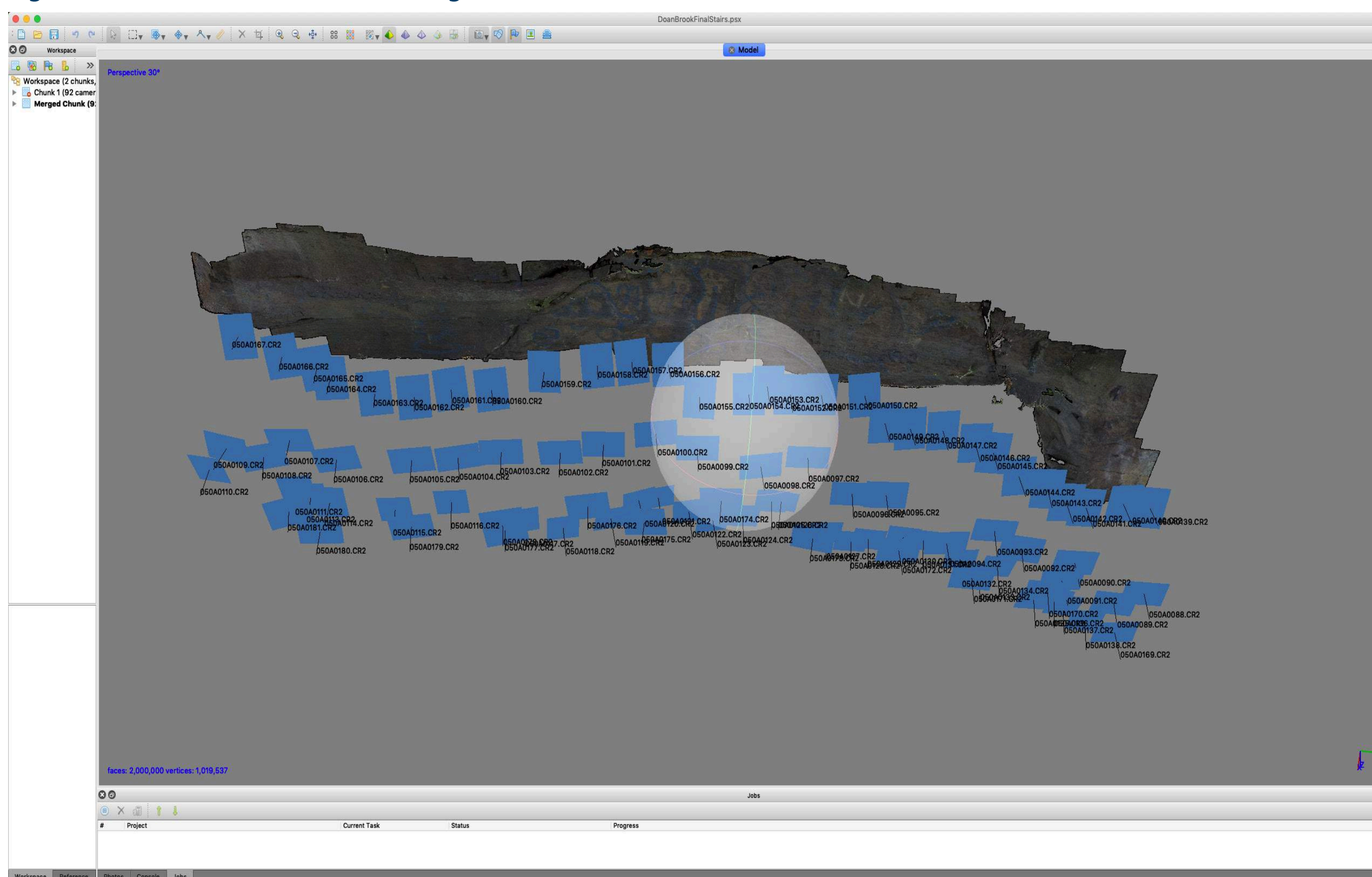


Figure 1. All camera views of model in Agisoft PhotoScan Pro

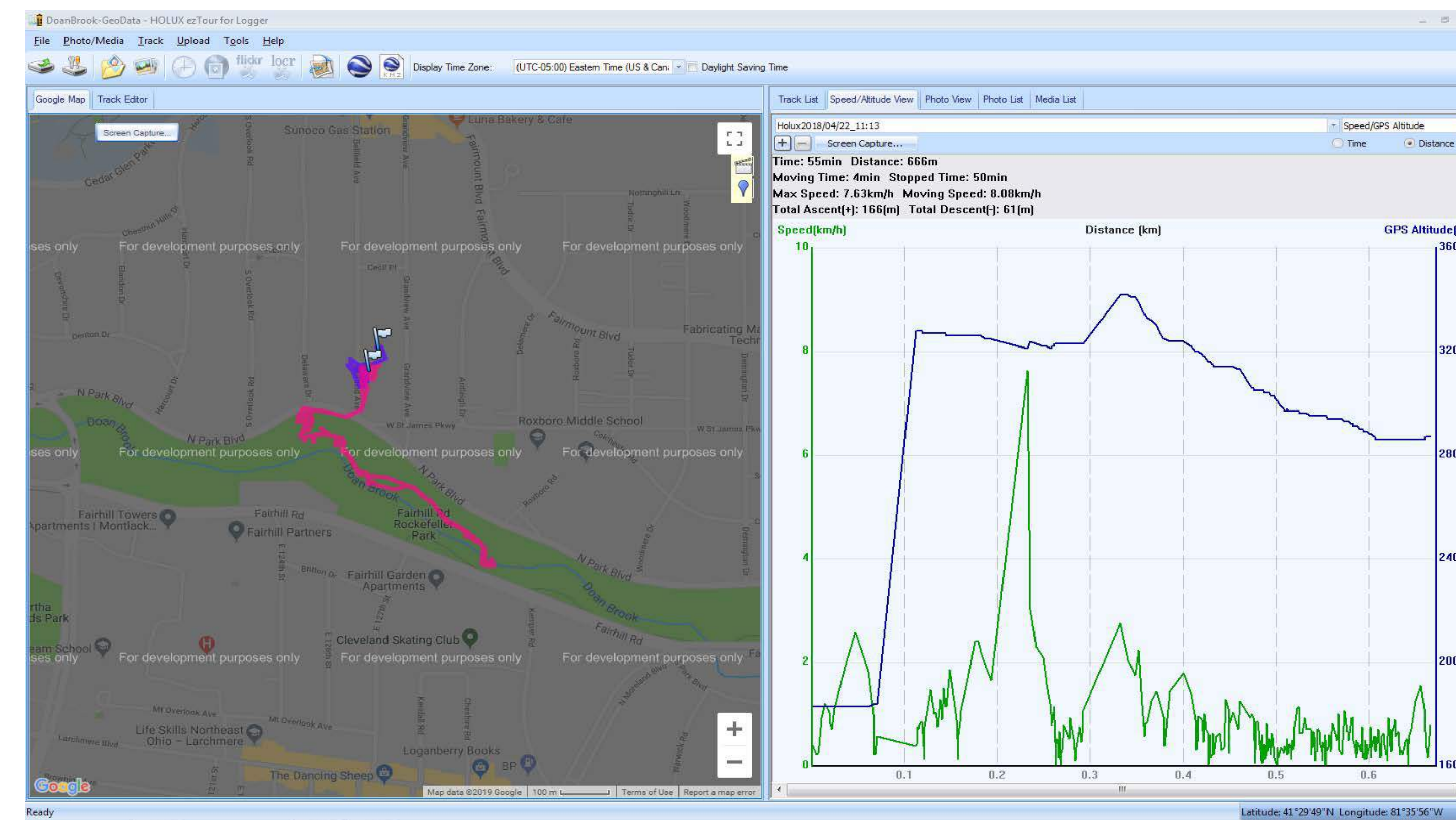


RESULTS & ENHANCEMENTS

The results of this research project include:

- A high resolution 3D model that captured the current state of one of the walls of the gorge, specifically a stair-wall off of North Park Avenue in Cleveland Heights.

Figure 2. Geographic area captured using HOLUX ezTour



- Enhanced legibility of hidden inscriptions through the application of radiance scaling in MeshLab.

Figure 3. MeshLab model before radiance scaling application

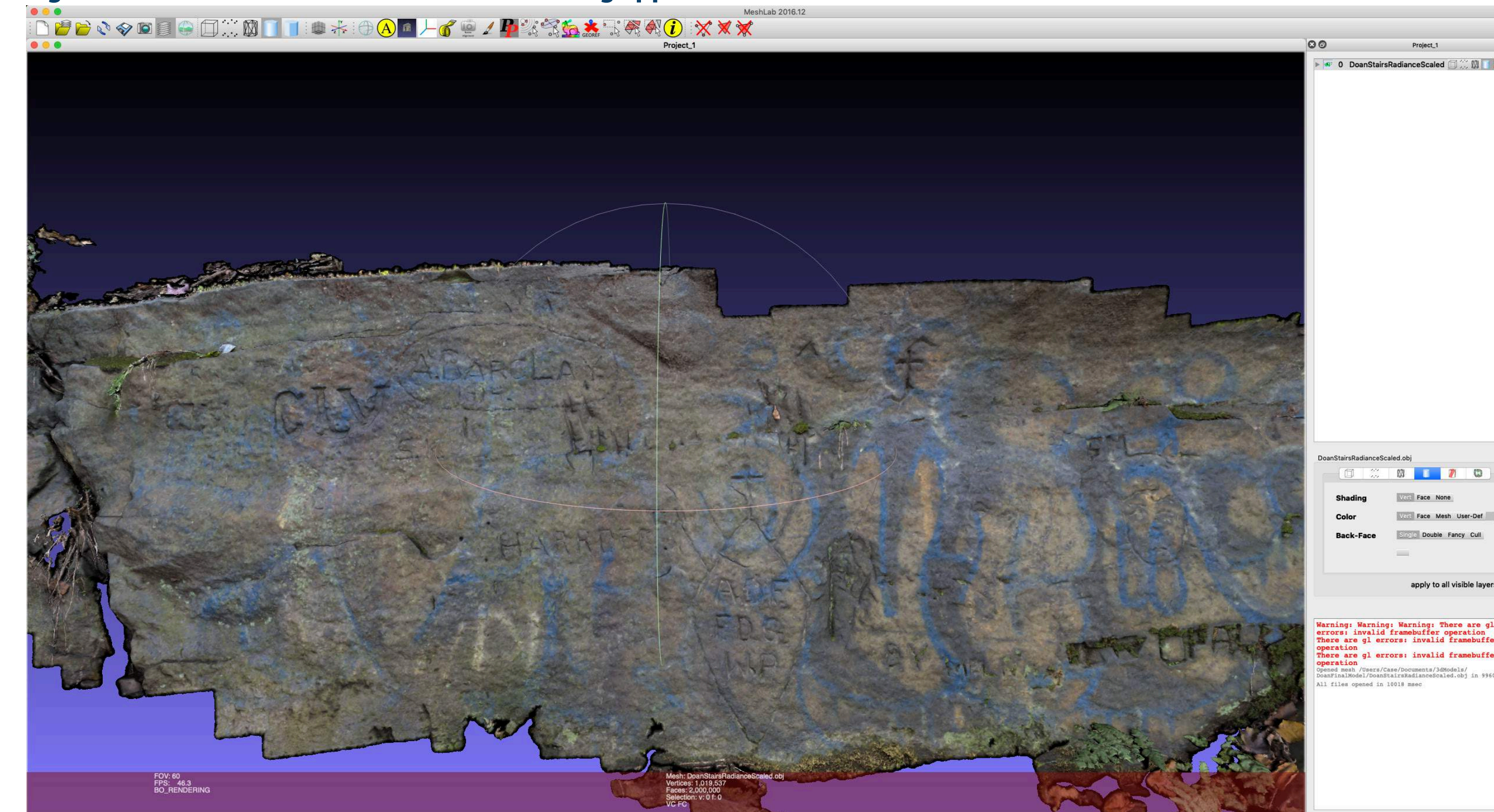
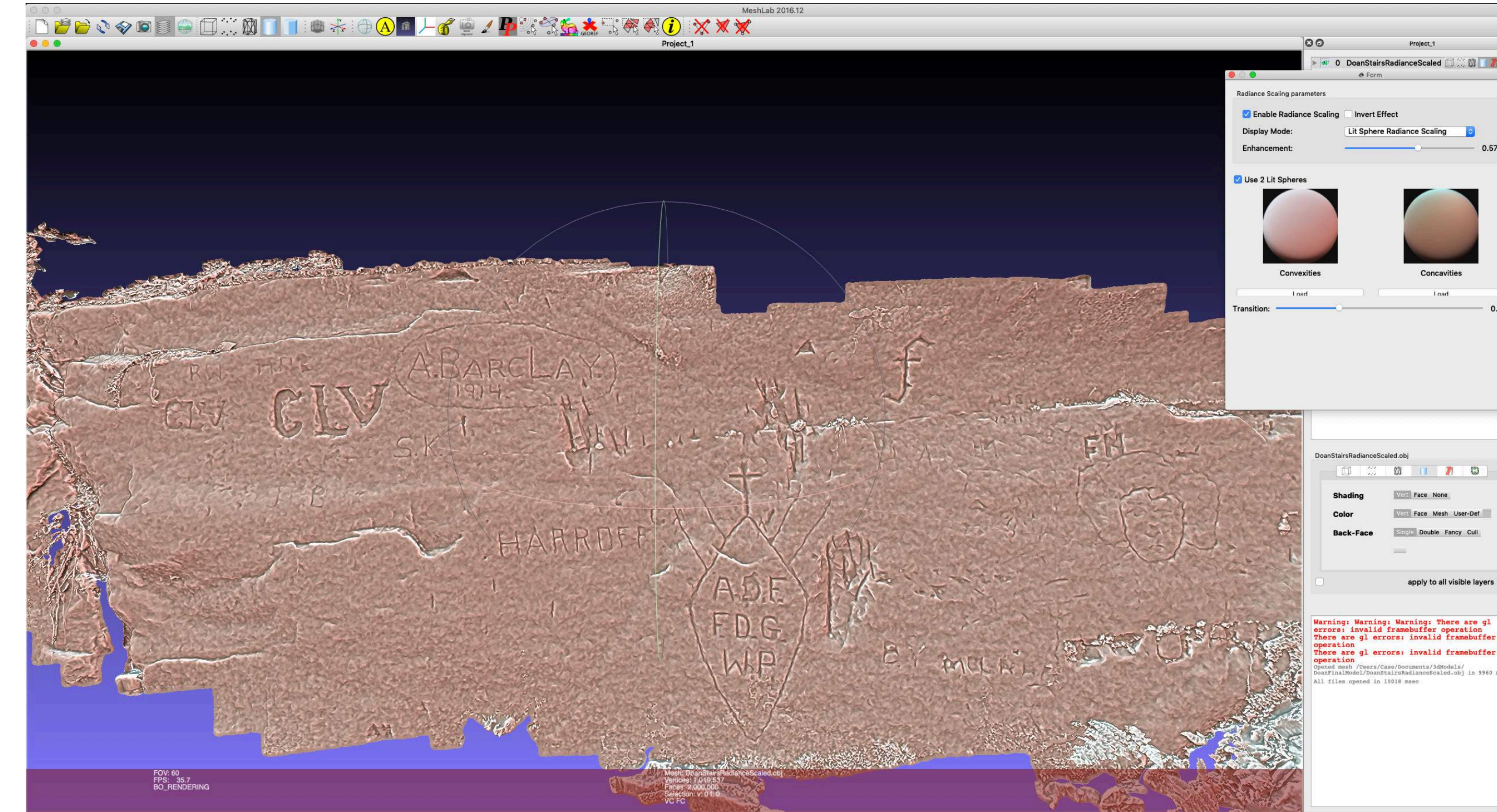


Figure 4. MeshLab model after radiance scaling application

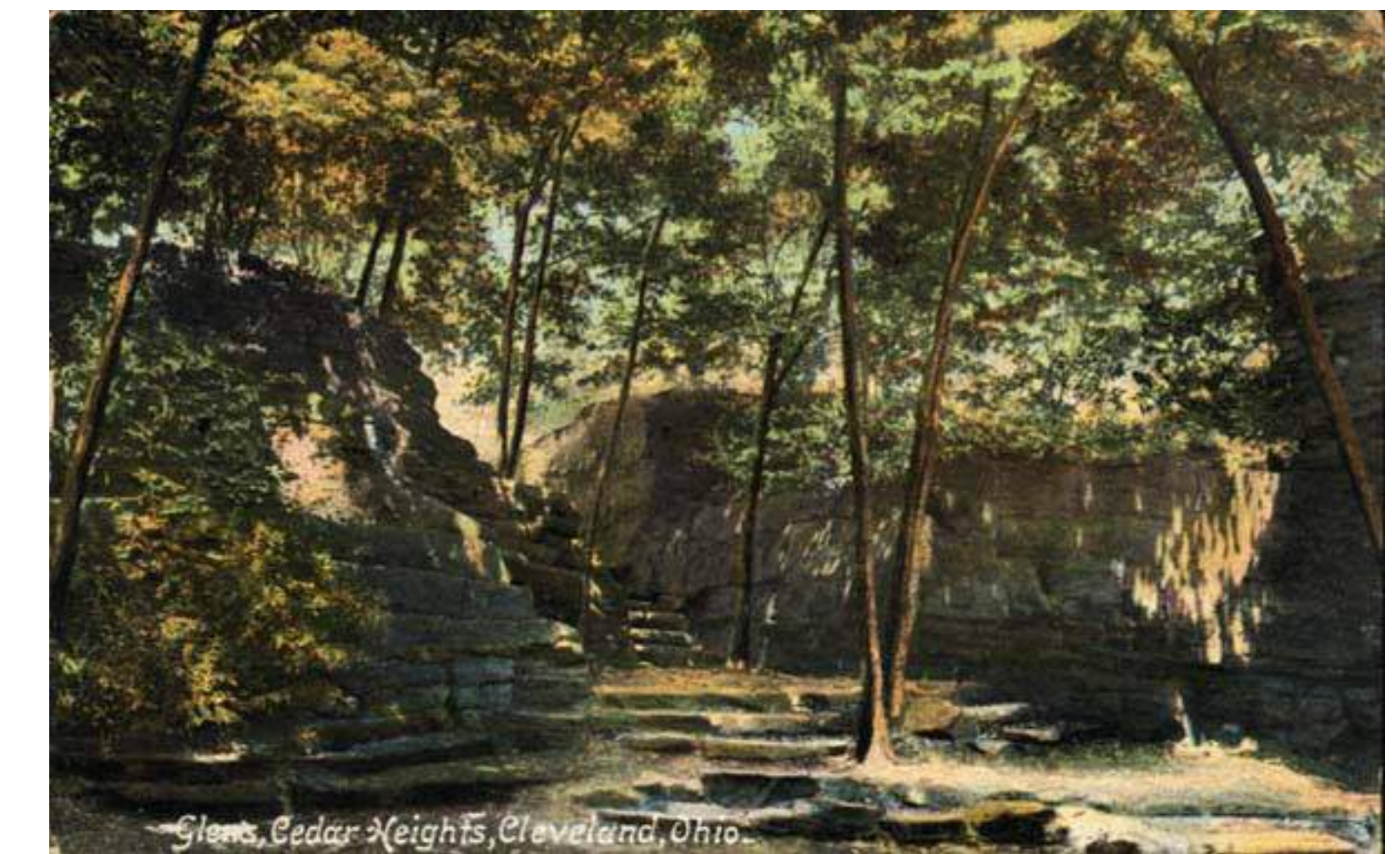


- A workshop that compared the classical archeology technique of making 'squeeze' impressions of inscriptions and digital preservation of these local inscriptions through photogrammetry. See the items on our table.
- Successful piloting of photogrammetry in the field to be used in student and faculty instruction and collaboration with other University Circle institutions to digitize 3D artifacts and spaces.

FUTURE RESEARCH & EXPERIMENTATION

- Deeper dives into the creators of the graffiti. Cleveland at this time was rife with Italian stone masons and artisans, some of them going on to become famous artists.

Figure 5. Photo shows the glens in Cedar Heights. Cedar Heights was the subdivision of Grandview and Bellfield Roads, immediately adjacent to the Shaker Lakes park. Courtesy of Cleveland Memory Project.



- Local research into the development of the Doan Brook area and the inhabitants most adjacent to the inscriptions.

Figure 6. 1898 Map of Doan Brook Area



Figure 7. 1912 Map of Doan Brook Area

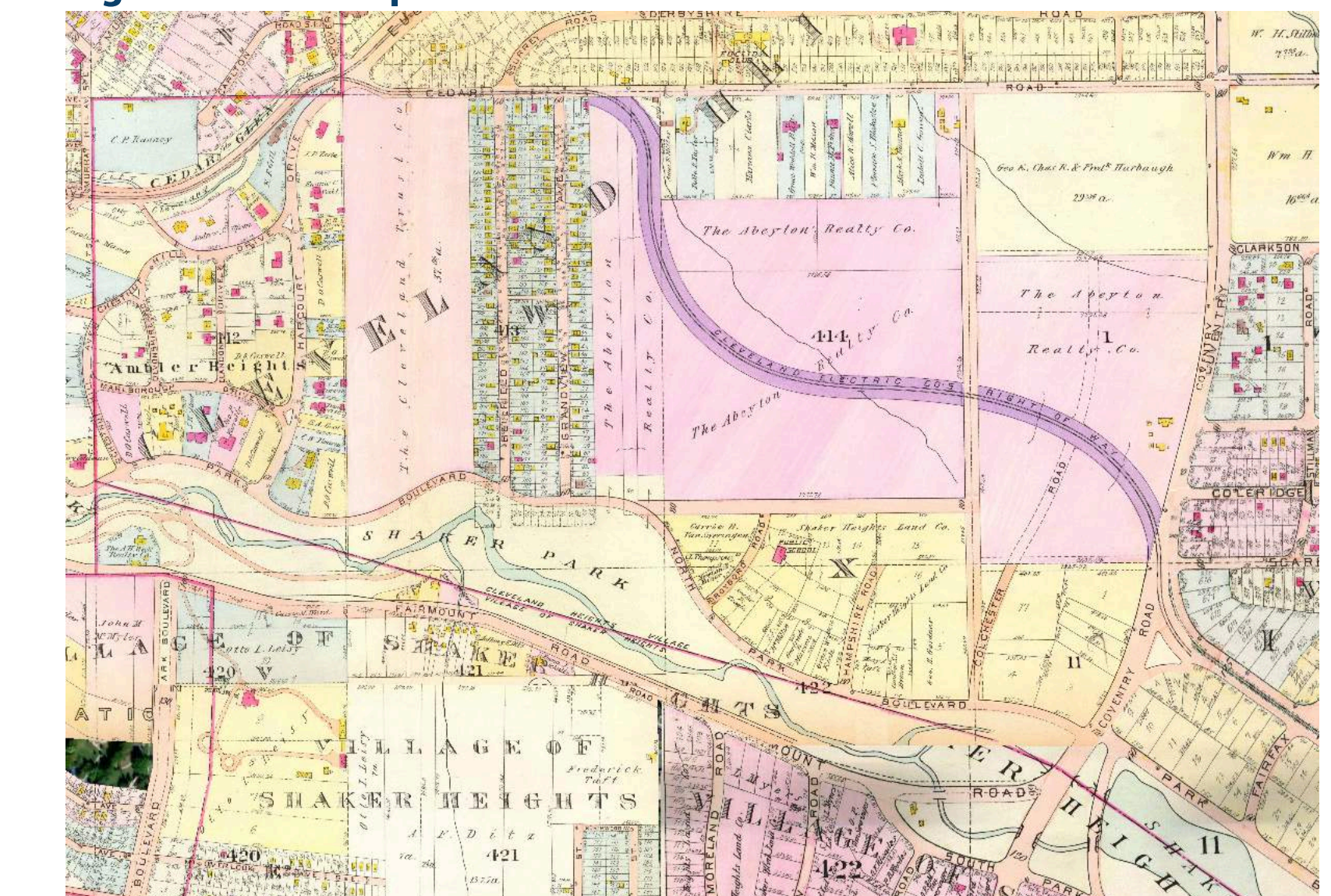
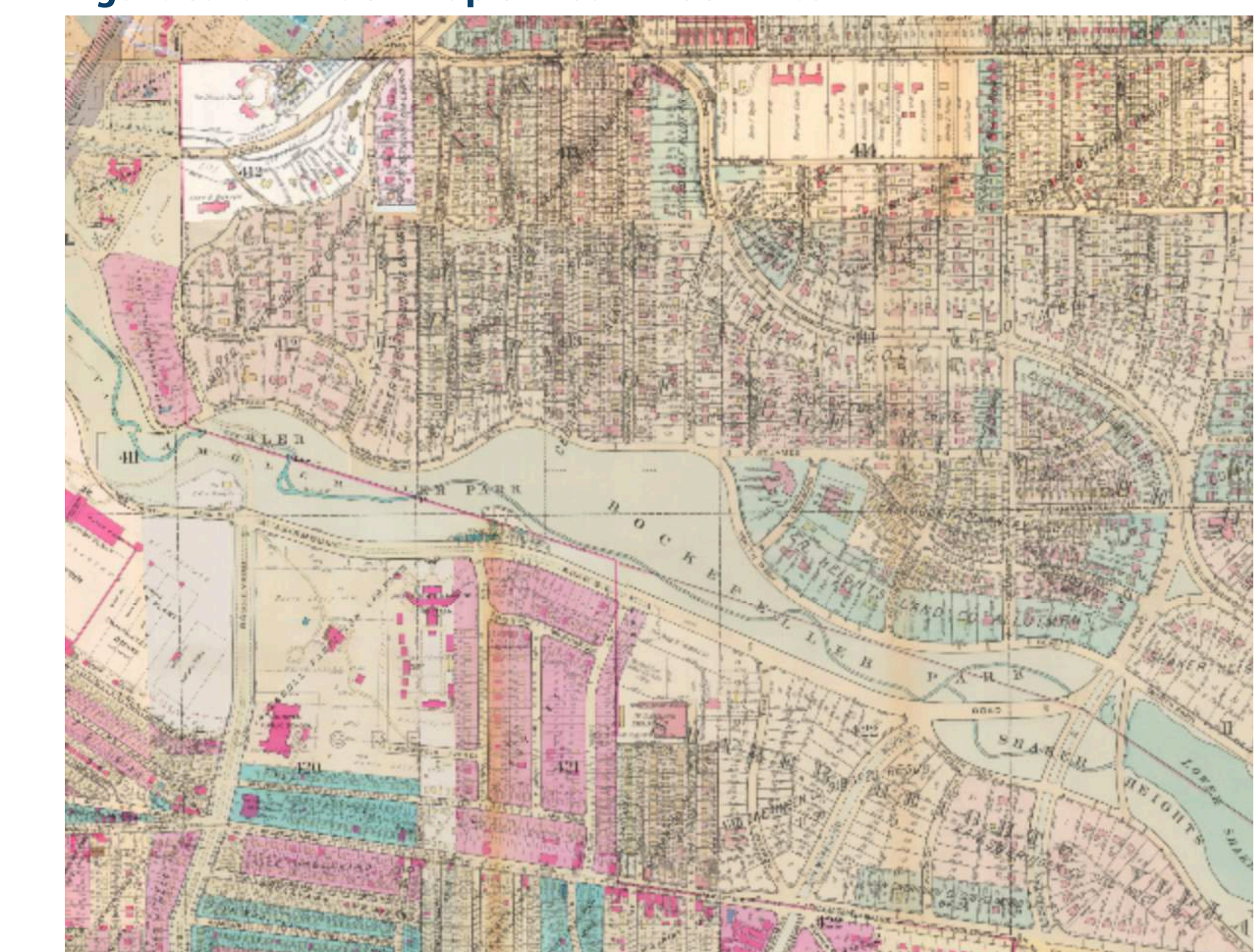


Figure 8. 1927-1937 Map of Doan Brook Area



- Exploration of the creation of a built environment for immersive VR experiences