

# Everything Old is New Again: Using Archived Photography to 3-D Model Previous Excavations in Faynan, Jordan

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## Introduction

This poster explores the possibility of using archived excavation photographs to produce 3-D models using photogrammetry. Specifically, we used previous excavations into a slag mound at Khirbat en-Nahas (KEN), an Iron Age smelting site in Faynan, Jordan, as a case study. The slag mound (Area M) was excavated in 2002 and 2006, and these excavations were well-documented with digital photographs. Due to its depth (~6.5 meters), the edges of the sounding eroded over time, filling the excavation and partially destroying the stratigraphic sections (Fig. 1). Thus, the excavation photographs provide a critical record of the completed excavation prior to its collapse.



Fig. 1: Photograph from 2014 of collapsed Area M slag mound excavation.

Using the workflow described here, we successfully created a digital 3-D model of the Area M excavation using these photographs. Moreover, by combining the model of the slag mound with a new site-wide model of KEN created in 2014, the Area M excavation could be situated within the larger context of the site in 3-D (Fig. 2). Finally, we explored one method for sharing this 3-D data in virtual reality using Sketchfab.

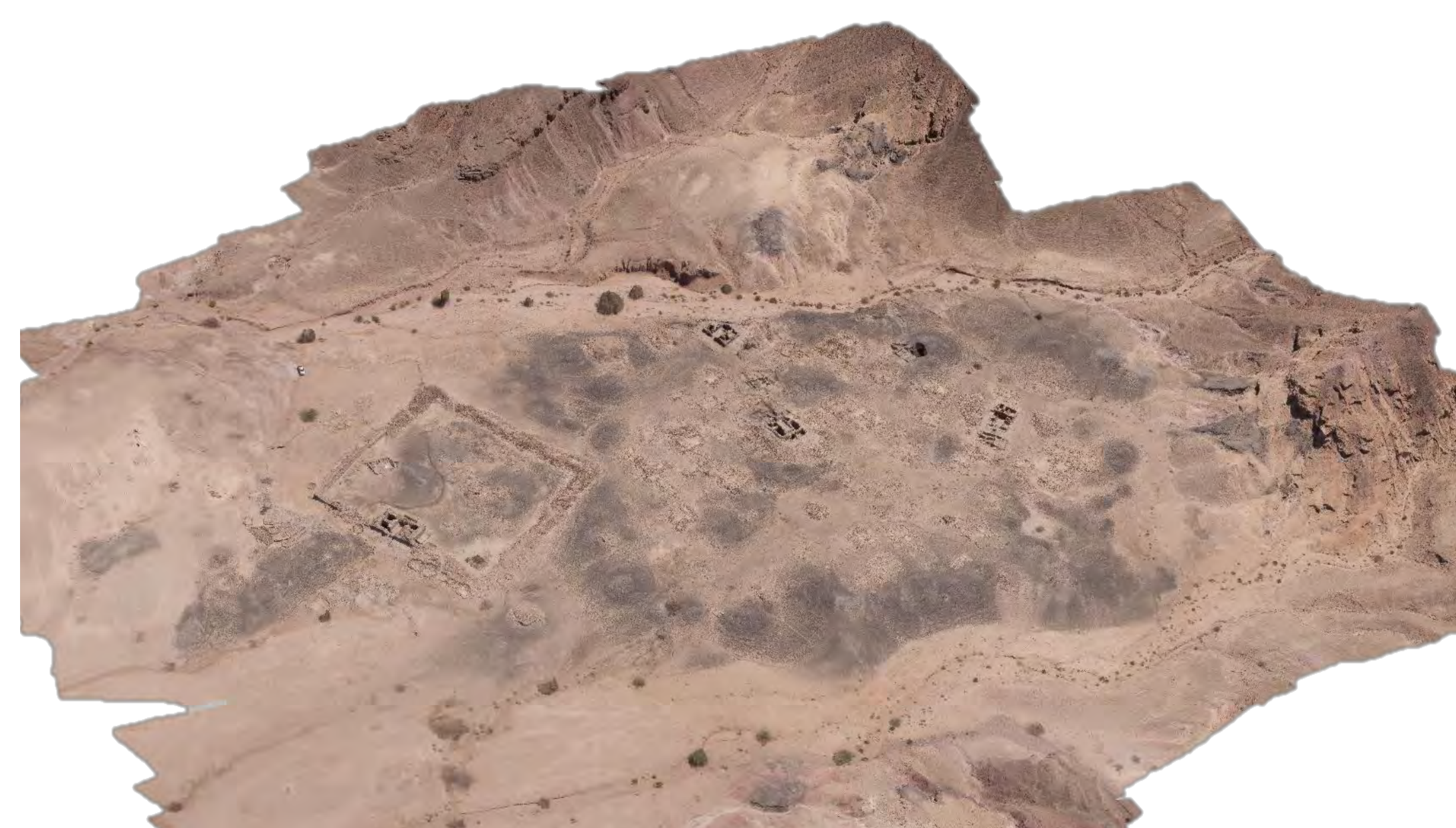


Fig. 2: Site-wide model of Khirbat en-Nahas produced in 2014 (photography and model by Matthew D. Howland).

## Workflow & Methods

-Collected archived photographs of the Area M slag mound excavation from the lab server in the UCSD Levantine and Cyber-Archaeology Lab.

-Converted all available photos to TIFs and imported into Agisoft Metashape software to produce textured 3-D model of Area M. Exported as .obj file (Fig. 3).

-Imported 3-D model of Area M and site-wide Khirbat en-Nahas model (previously produced) into Blender software.

-Aligned Area M model with site-wide model using points of similarity (in this case, the edges of the excavation and the remaining architecture) (Fig. 4).

-In Blender, cut Area M from the site-wide model to remove the collapsed area (Fig. 5).

-Smoothed the intersections of the two models by adjusting the polygons of the mesh to fill any gaps or unnatural angles.

-Saved the new combined model before decimating the file to reduce its size. Exported decimated, combined model as single file.

-Downscaled resolution of texture image files in Photoshop to match Sketchfab restrictions.

-Uploaded final combined model to Sketchfab (which includes 3-D functionality – see QR code in bottom right).

## Before



Fig. 5: Before and after screenshots showing Area M as it appears in the 2014 site-wide model (Before) and after it was replaced by the Area M model produced using the archived excavation photographs (After).



Fig. 3: Area M model produced using archived excavation photographs.

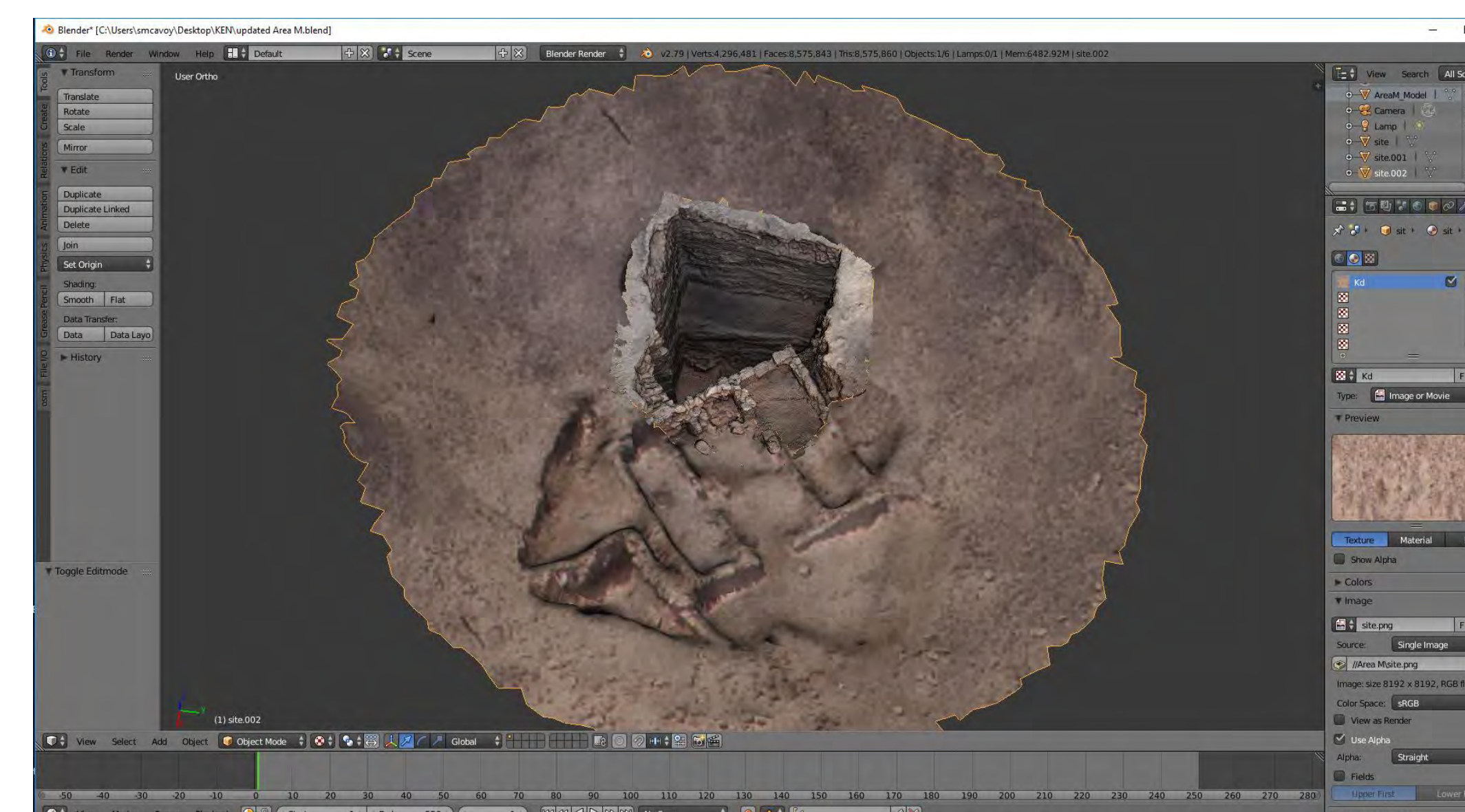


Fig. 4: Screenshot of models being aligned/combined in Blender. The site-wide model was cut down (circular portion) to reduce computational strain.

## After



## Results & Conclusions

-Archived excavation photographs were an excellent resource for photogrammetry.

-The rigorous photography strategy used during the excavation provided enough photographs (251 total) and overlap for producing a 3-D model.

-The new 3-D model provides a valuable, high-quality record of the excavation prior to its collapse.

-Combining the new Area M model with the site-wide model contextualized this excavation area in 3-D for the first time.

-The combination of Agisoft Metashape and Blender allowed for easy production, editing, and combining of 3-D models.

-By uploading the model to Sketchfab, the Area M excavation and site-wide KEN model can now be revisited and visualized in 3-D by scholars, the general public, and other stakeholders (see below).

-This project provides a case study for applying a similar method to any project with archived excavation photographs.

-The entire process could be improved by georeferencing both models which should automate their combination and would also allow for including other geospatial data such as artifact locations.

Check out the model on your phone!



Scan this QR code using your phone camera or QR app.

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