



CENTER FOR HERITAGE CONSERVATION

Terrestrial Laser Scanning and Historic Building Information Modeling of the Caudill House in College Station, Texas

Keywords: Digital Heritage, Laser Scanning, HBIM, Architecture, Heritage Conservation

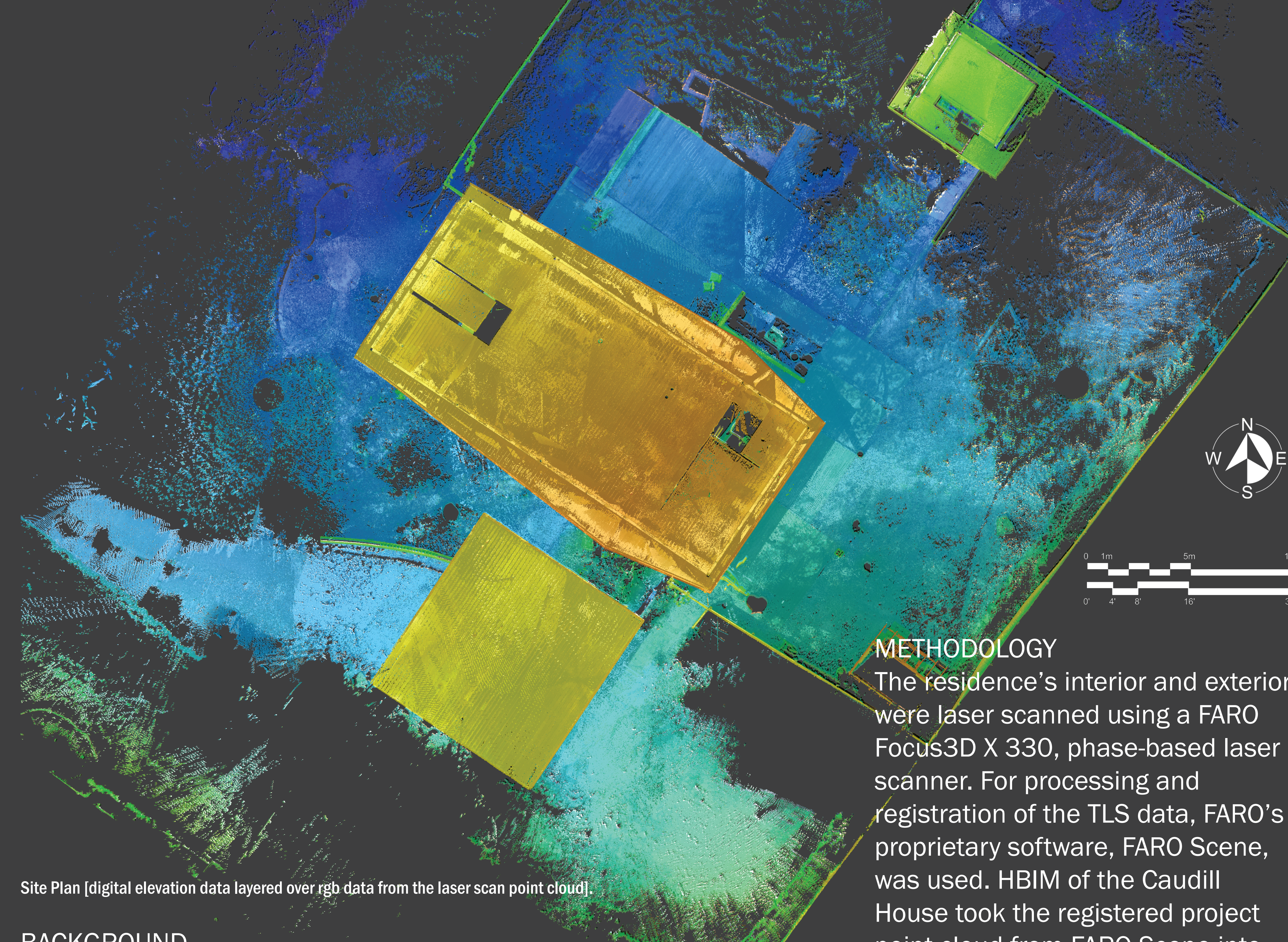


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ABSTRACT

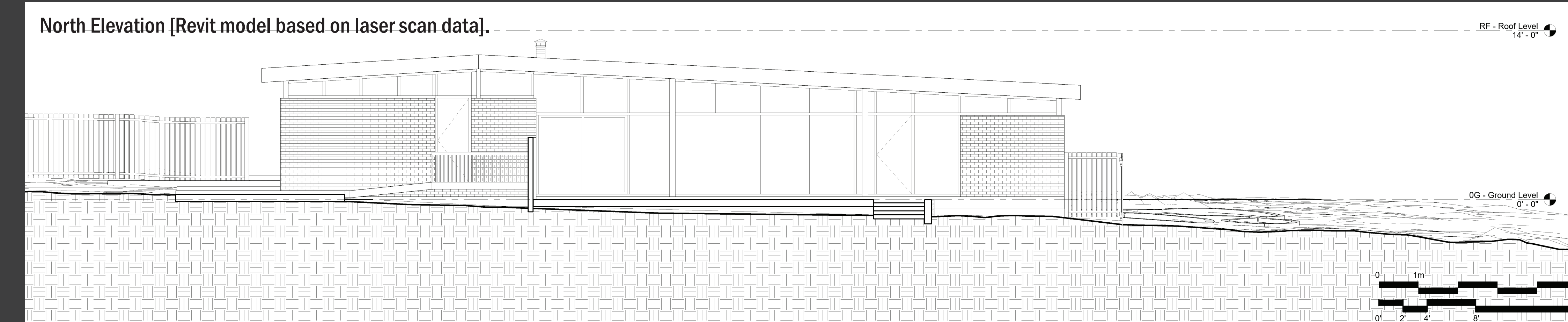
The Caudill House is a Mid-century Modern residence in College Station, Texas. William (Bill) Caudill (1914-1983) designed the residence while working as a founding partner of the architectural firm, Caudill, Rowlett, and Scott (CRS). In order to facilitate renovation planning of the Caudill House, terrestrial laser scanning (TLS) and historic building information modeling (HBIM) were conducted at the Mid-century Modern residence in College Station, Texas. Both the residence's interior and exterior were laser scanned for the production of an HBIM. This model serves as a 3D as-built to better plan renovation on the historic residence. TLS survey of the home reinforced issues in documenting modern buildings, as well as their solutions both in terms of preparation and execution.



Site Plan [digital elevation data layered over rgb data from the laser scan point cloud].

BACKGROUND

The Caudill House was designed by William (Bill) Caudill in 1953. Not only did Caudill design the house, but he lived here as well. This house sits about a mile southeast of Texas A&M University in College Station, Texas.



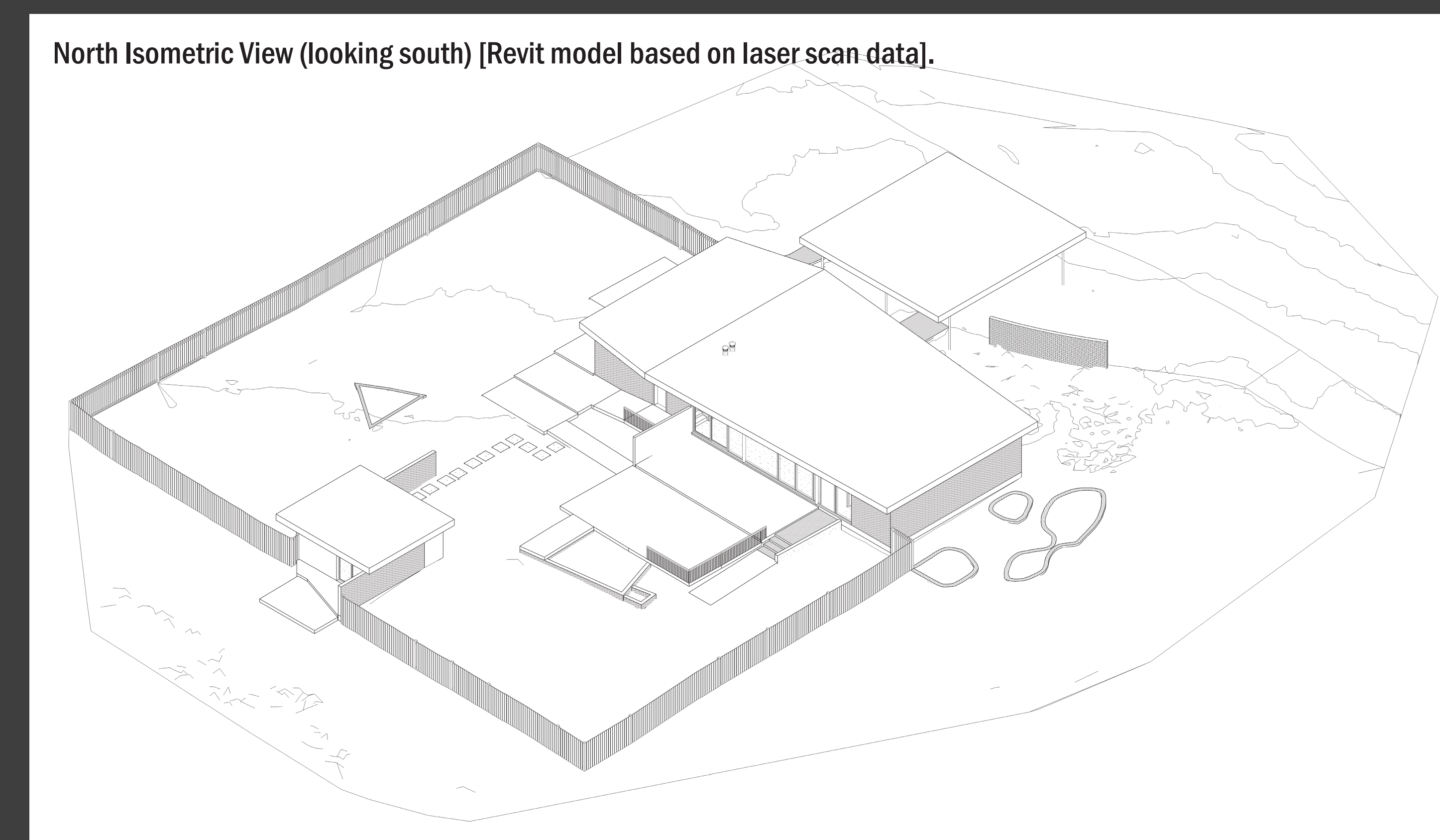
North Elevation [Revit model based on laser scan data].

METHODOLOGY

The residence's interior and exterior were laser scanned using a FARO Focus3D X 330, phase-based laser scanner. For processing and registration of the TLS data, FARO's proprietary software, FARO Scene, was used. HBIM of the Caudill House took the registered project point cloud from FARO Scene into Autodesk ReCap, which was then linked to Autodesk Revit for modeling based on the point cloud data.

DISCUSSION

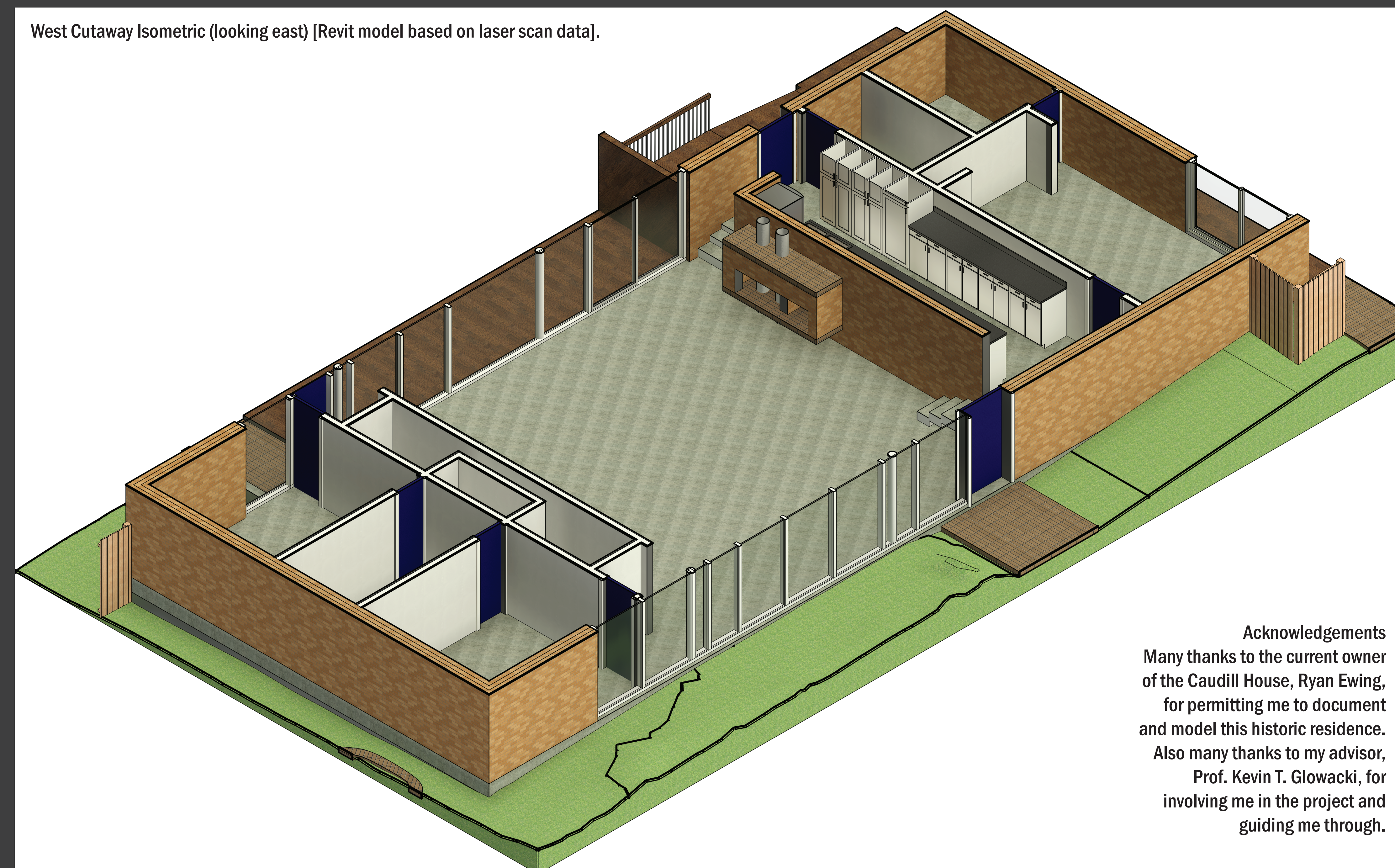
Documentation issues of material reflectivity and transparency of the house's considerable amount of glass curtain wall reinforced the notion that registration targets are highly recommended for buildings with such materials. Similarly, documentation of terrain and highly vegetative areas cannot rely on the more automated cloud-to-cloud registration method in TLS. If relying on cloud-to-cloud registration, opaque, rough materials are desirable. The Caudill House has a considerable amount of curtain wall, making up a high percentage of its envelope. In order to address this issue with the Caudill House, a combination of reference planes and markers between adjacent scan positions were used. These provide more specific common reference points and planes for registration. The registration was then refined by adjusting the subsampling for



North Isometric View (looking south) [Revit model based on laser scan data].

cloud-to-cloud registration. Once scan positions are registered to one another, adjustments to subsampling can reduce noise in order to tighten registration. Despite these solutions, this project advocates for careful preparation and use of registration markers e.g., checkboards and spheres, when documenting heavily glazed (or highly reflective) architecture and natural terrain.

The HBIM can be further developed to include more specific building information for performance simulation. Models like this can also be used experientially, developing immersive virtual/augmented reality experiences that return the home to a mid-century modern aesthetic.



West Cutaway Isometric (looking east) [Revit model based on laser scan data].

Acknowledgements
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