

Forensic Mapping Analysis



05-R-71-CASO

Wisconsin State Patrol Academy

Education / Training

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Technical Reconstruction Unit
Wisconsin State Patrol Academy

Objective of Analysis

- Forensically map (measure) the locations and terrain in and adjacent to the Avery Salvage Yard located on Avery Road in Manitowoc County, Wisconsin.
- Based on measurements recorded at the location, prepare scaled scene diagrams of the property.
- Where applicable, generate three dimensional scene models and subsequent animations.

Request for Services / Timeline

- The Wisconsin State Patrol received a request on November 5, 2005 from local law enforcement officials to provide security services and forensic mapping assistance at the Avery property.
- Forensic Mapping activities continued until November 12, 2005, with later evidentiary items being measured in 2006 and 2007 at the Calumet County Sheriff's Department.
- In total, over 4100 measurements were recorded either manually or with the assistance of electronic measuring devices.

Geodimeter 610 Total Station

Electronic Distance
Measuring System

Theodolite (Angle
Measuring System)

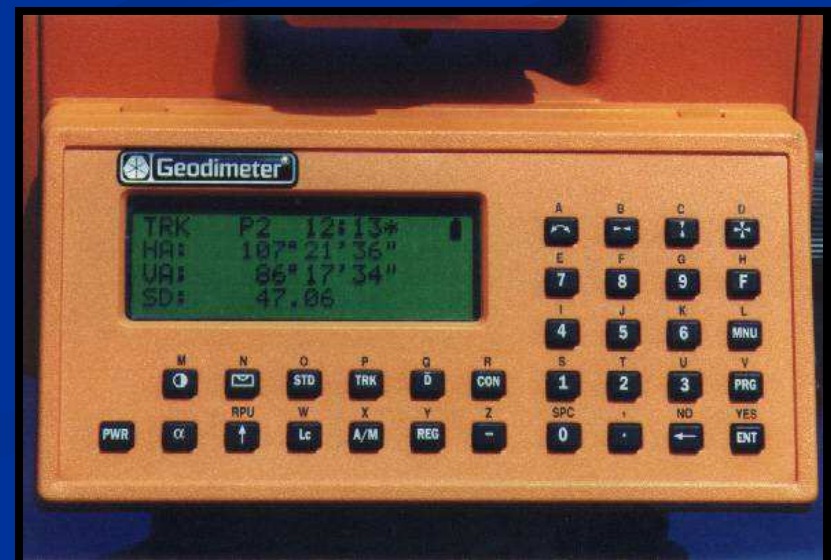
Data Collector

Prism



Forensic Mapping – Incident Scene

- Total Station measures the distance, vertical angle, and horizontal angle to the prism, thereby measuring in three dimensions.
- Information is then stored in the data collector for later retrieval.



Total Station Data Retrieval



- Total Station data collector is connected to a laptop computer, where recorded measurements are retrieved.
- Raw data is then transferred to a Computer-Aided Drawing (CAD) software program for the creation of scaled scene diagrams.

Total Station Accuracy

- Maximum Total Station induced angular error is given as 3 seconds.
- Maximum shot distance was approximately 1200 feet, which calculates to a maximum induced error of less than .5 inch.



Forensic Mapping Location(s)



Forensic Mapping Location(s)

Avery Auto
Salvage Yard



Forensic Mapping Location(s)

Avery Auto
Salvage Yard

“Deer Camp”



Forensic Mapping Location(s)

Avery Auto
Salvage Yard



“Deer Camp”



Kuss Road
Cul-de-Sac



2-D Orthogonal Views

- CADZone professional drawing software was utilized to generate two-dimensional diagrams of the entire Avery Auto Salvage Yard property.
- Two-dimensional views look directly down on the location to show positions or buildings, vehicles, or items of evidentiary value.
- With the entire property being mapped and drawn, it is possible to look at specific locations in detail.

2-D Orthogonal Views



2-D Orthogonal Views



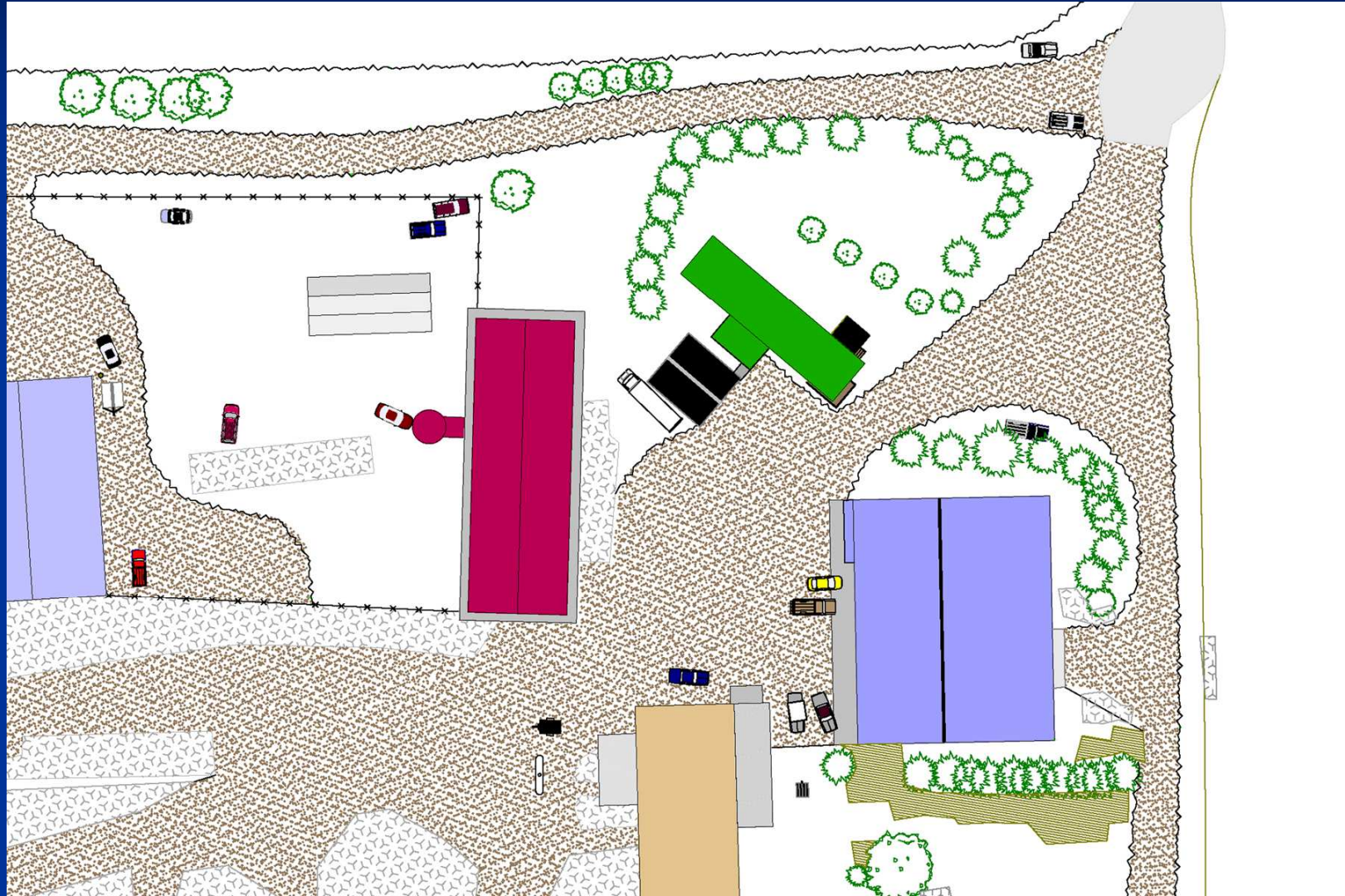
2-D Orthogonal Views



2-D Orthogonal Views



2-D Orthogonal Views



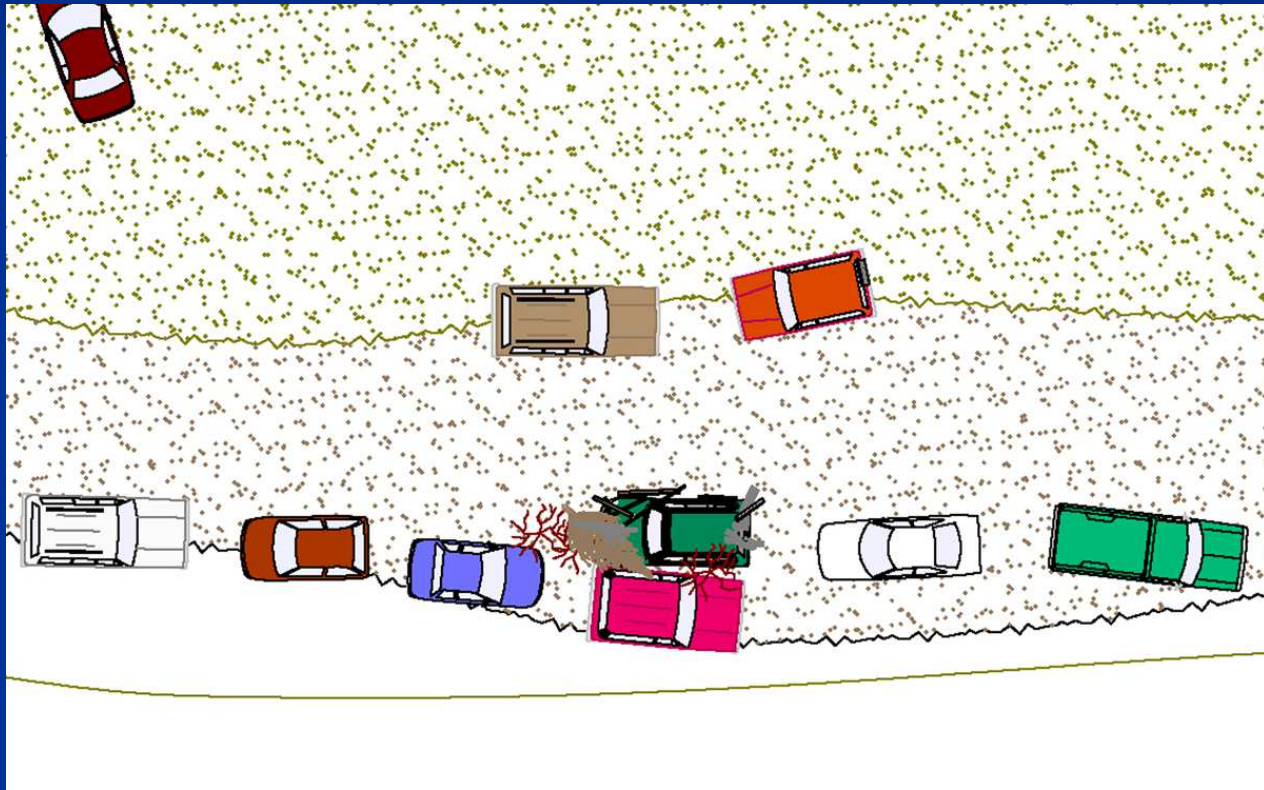
2-D Orthogonal Views



2-D Orthogonal Views



2-D Orthogonal Views



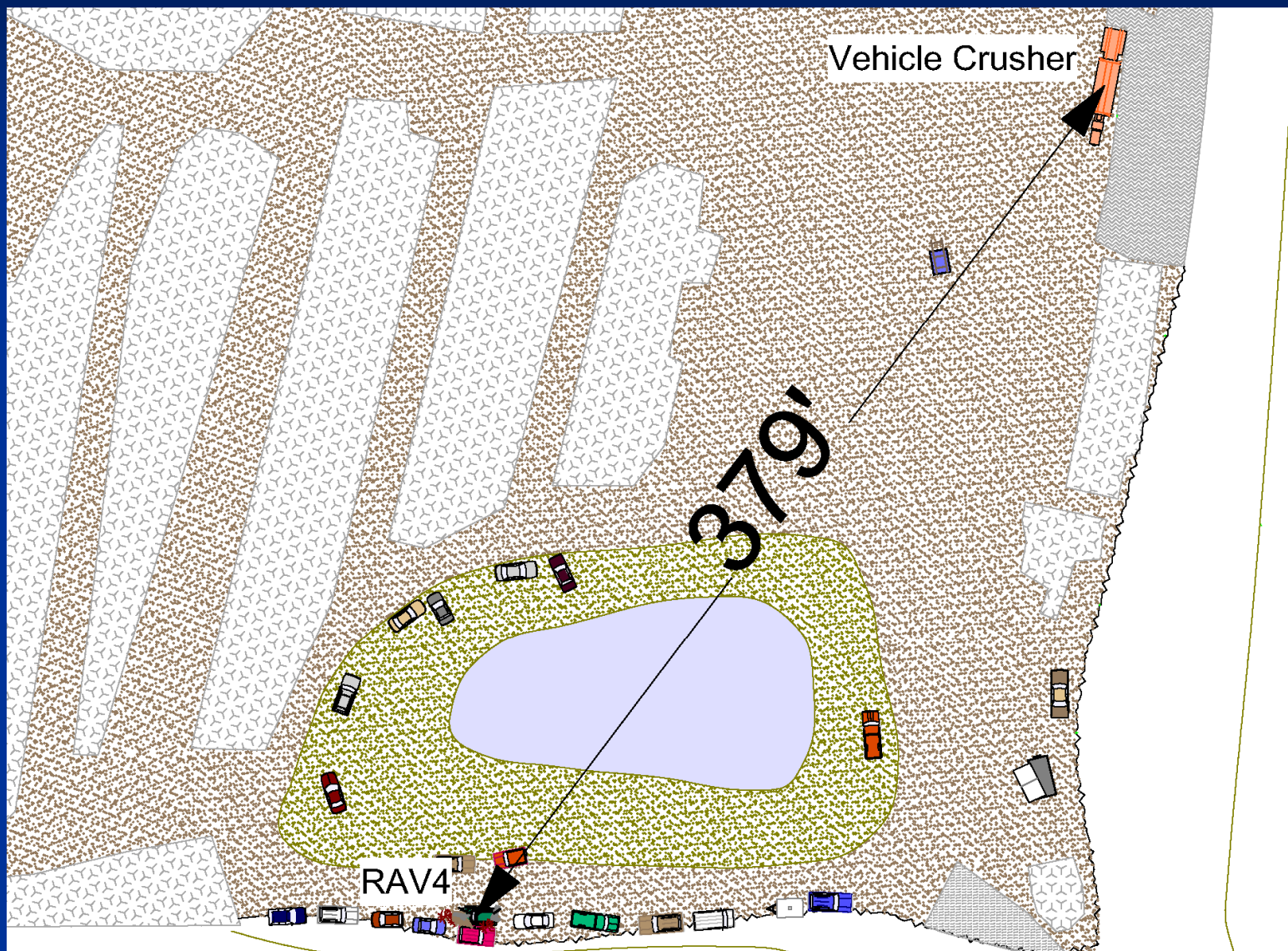
2-D Orthogonal Views



2-D Orthogonal Views



Distance – RAV4 to Crusher



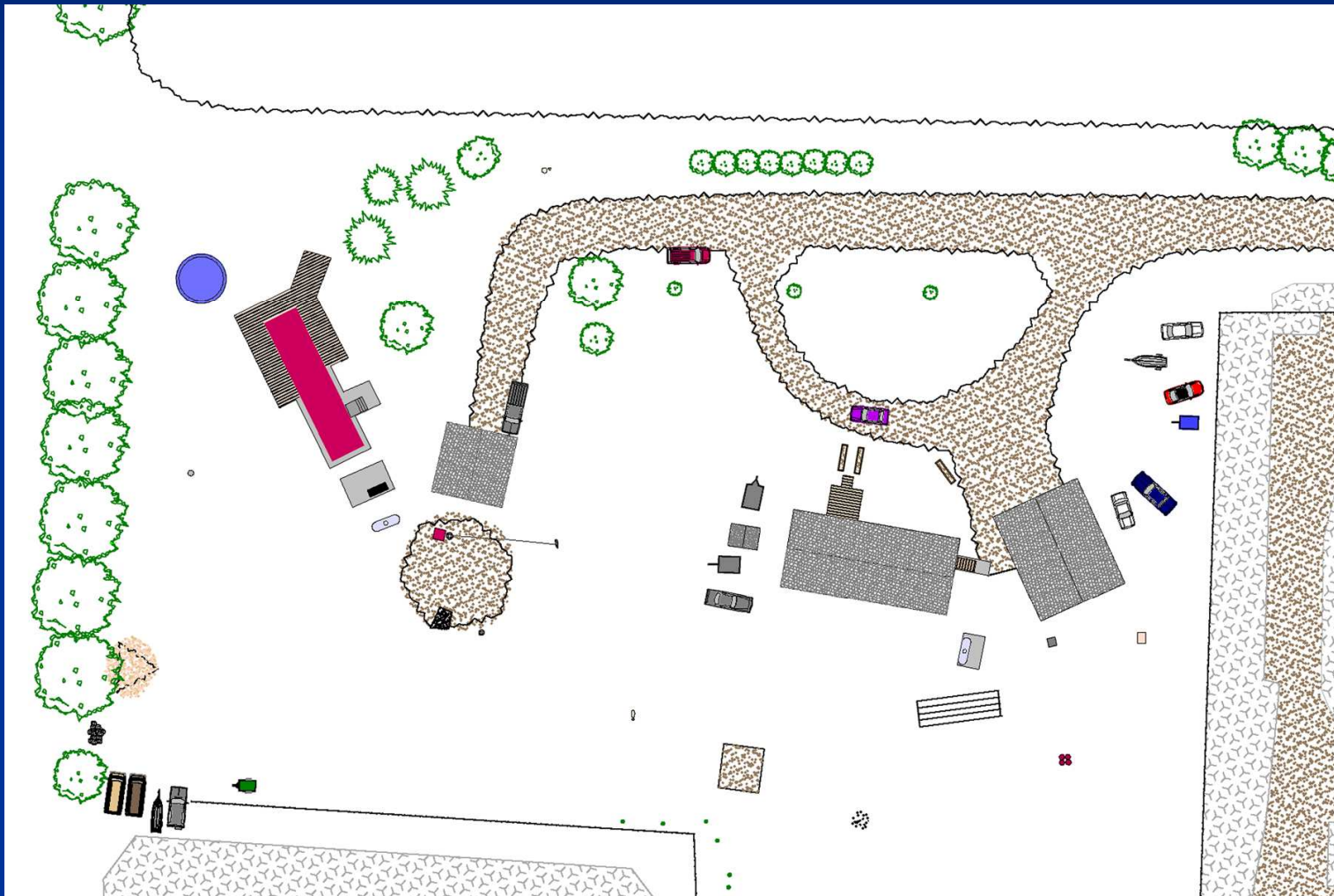
2-D Orthogonal Views



2-D Orthogonal Views



2-D Orthogonal Views

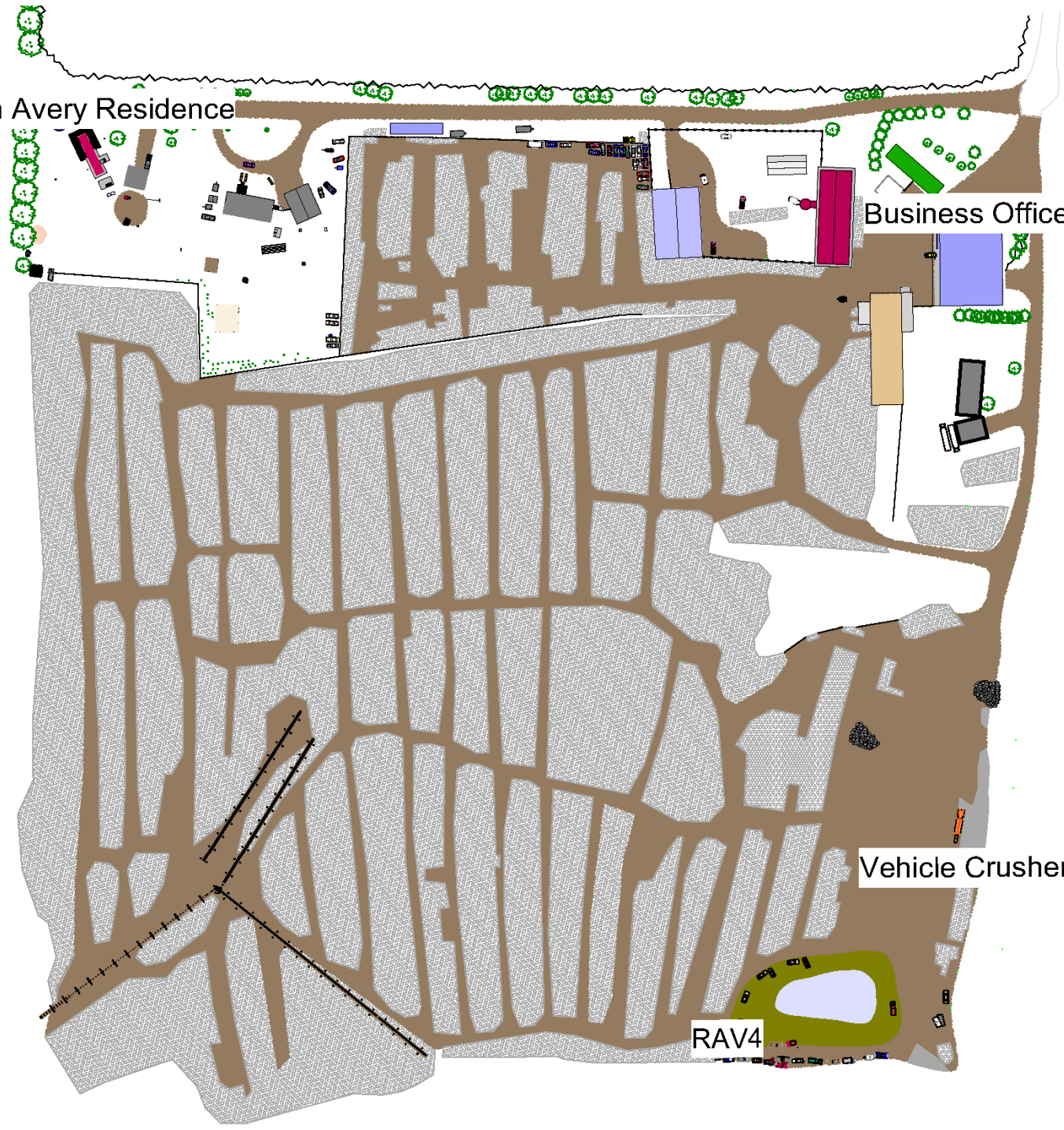


Steven Avery Residence

Business Office

Vehicle Crusher

RAV4



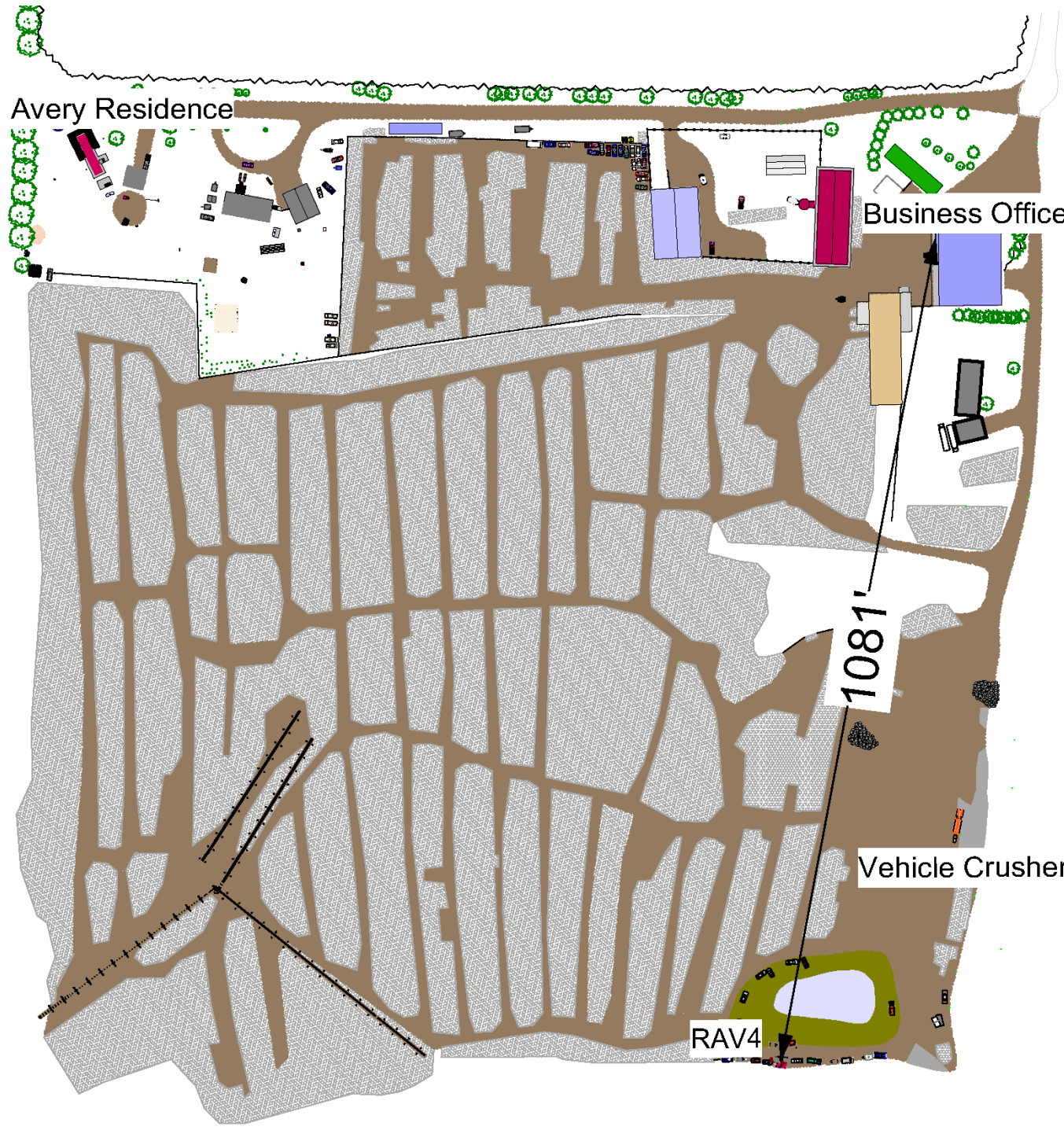
Steven Avery Residence

Business Office

1081'

Vehicle Crusher

RAV4



Steven Avery Residence

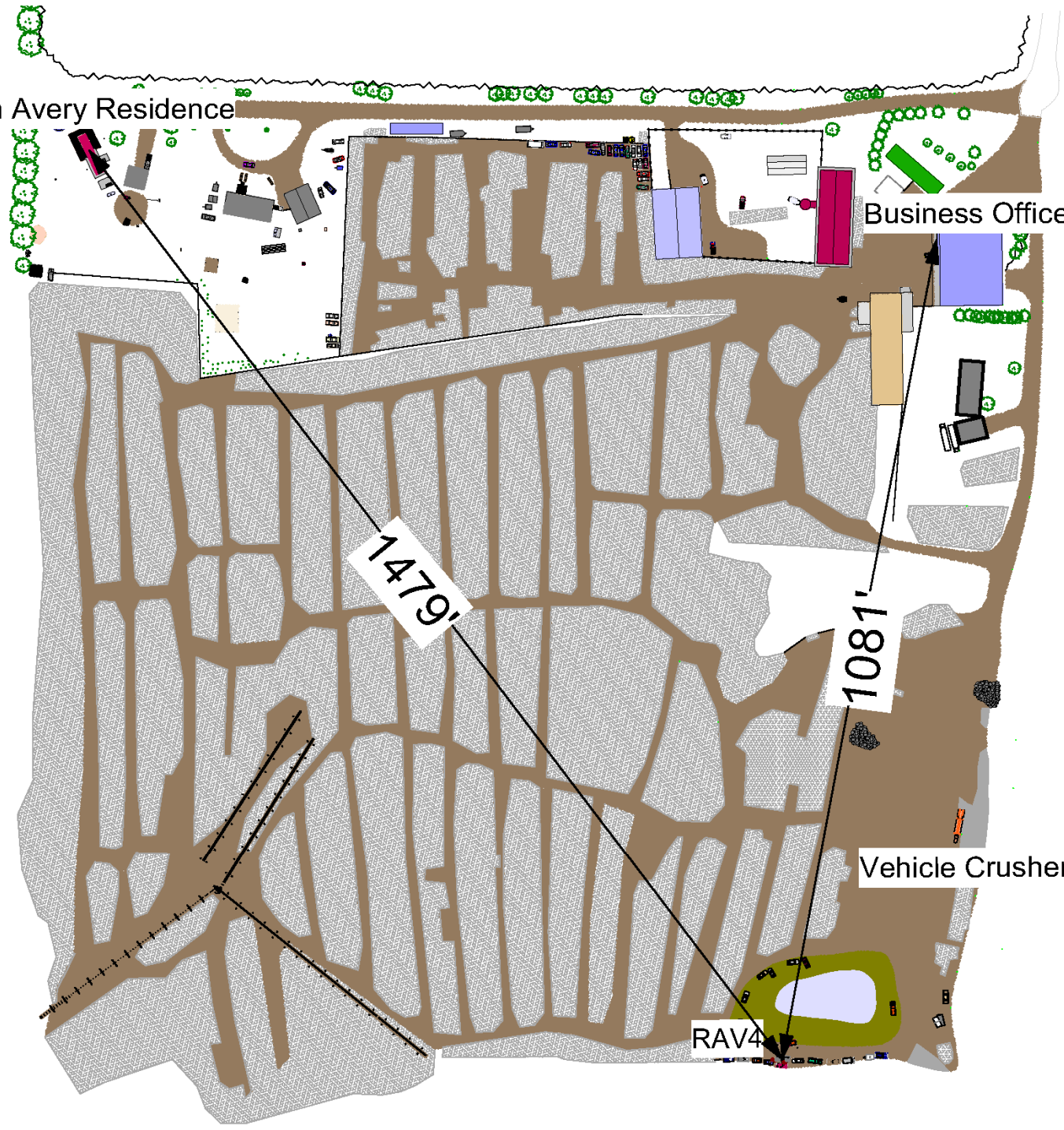
Business Office

1479'

1081'

Vehicle Crusher

RAV4



Steven Avery Residence

1103'

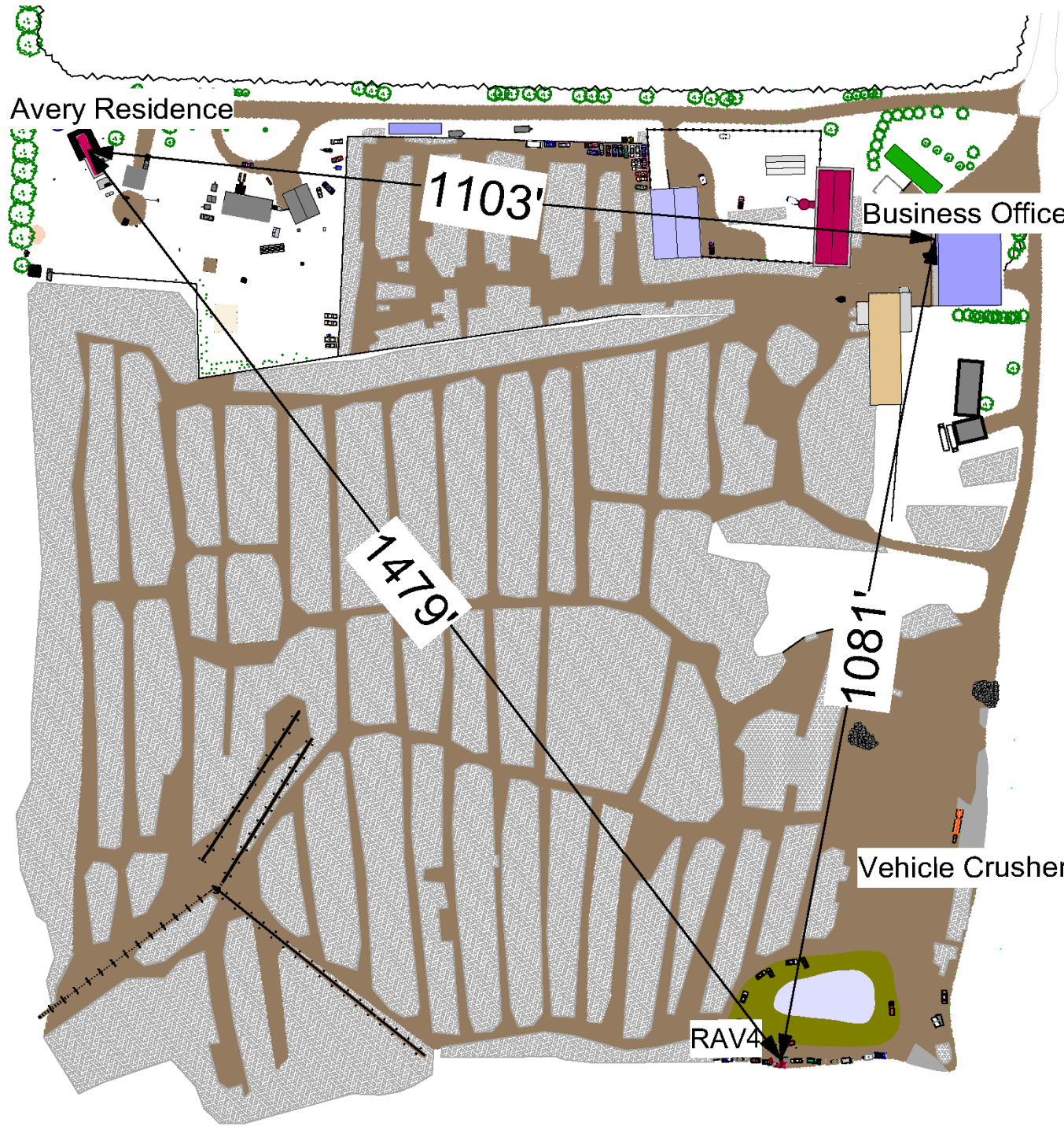
Business Office

1479'

1081'

Vehicle Crusher

RAV4



Steven Avery Residence

1103'

Business Office

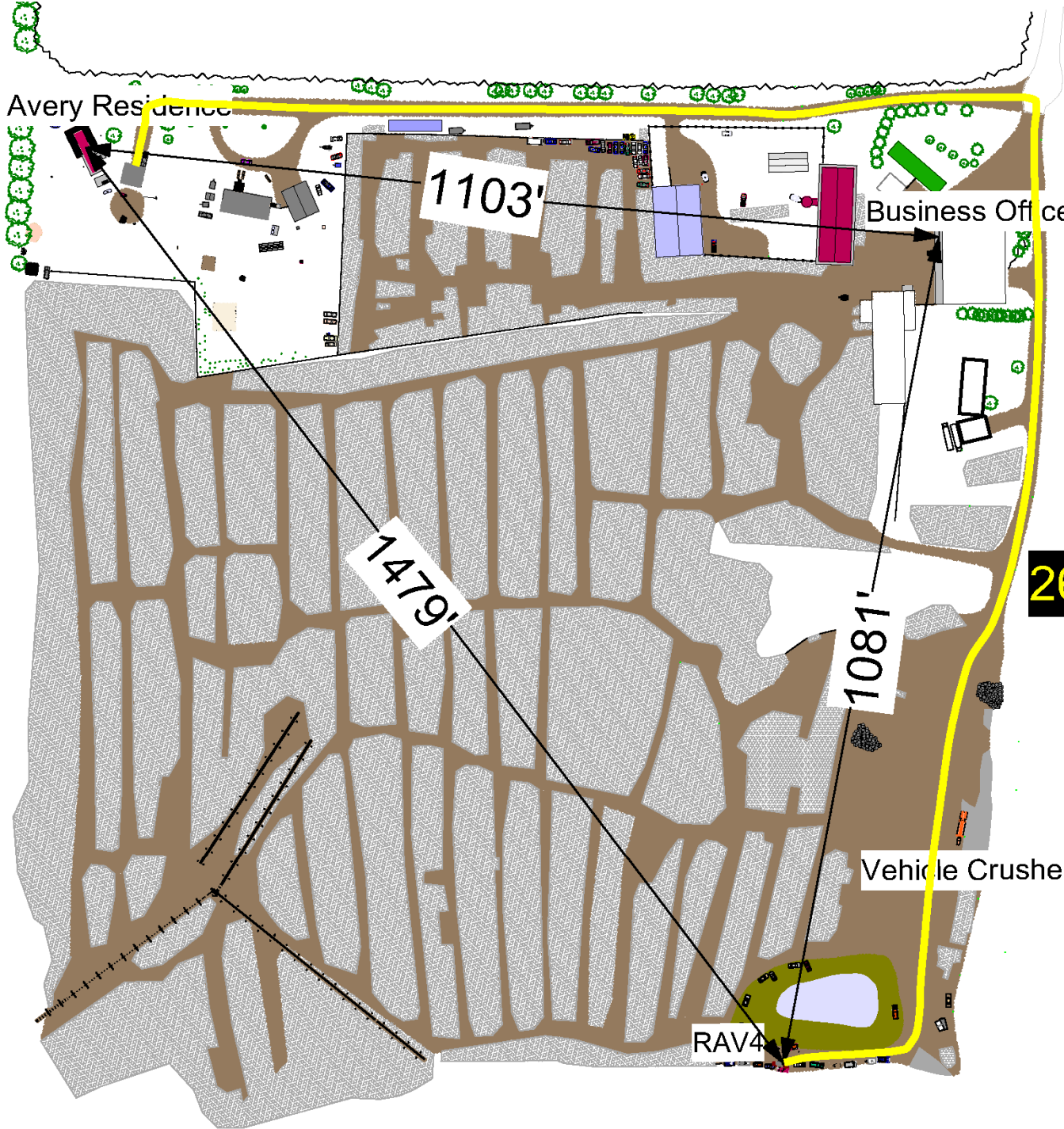
1479'

2623'

1081'

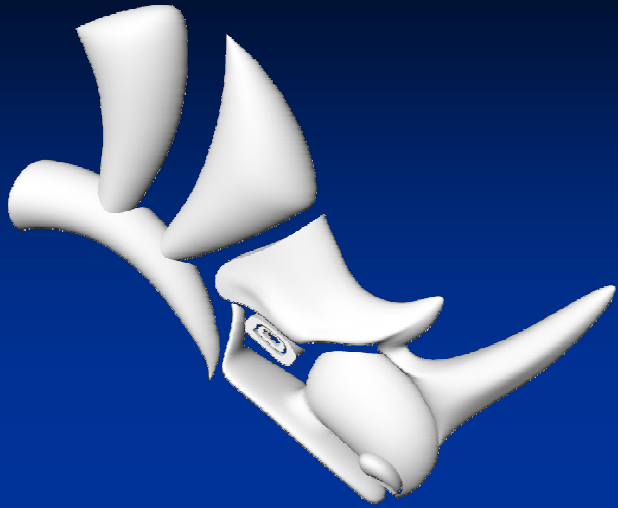
Vehicle Crusher

RAV4



2-D Orthogonal Views

- 2-D views are limited in that we cannot examine various perspectives other than directly overhead.
- Because the total station measures in three-dimensions, it is possible to add height to the objects depicted in the orthogonal drawings.
- The Forensic3D software package was therefore used to prepare scaled scene models in three dimensions in order to supplement the original 2-D drawings.



Forensic3D & Rhinoceros

- Rhinoceros allows the user to create three dimensional models by diagramming in 3D space.
- By adding height data to the diagram, it is easier to see and understand the spatial and geometric relationships between objects.
- Forensic3D also allows the user to assign texture maps to three dimensional models.

Texture Mapping



3D Modeling Locations



3D Modeling Locations



Incident Scene Model(s)



Incident Scene Model(s)



Incident Scene Model(s)



Incident Scene Model(s)



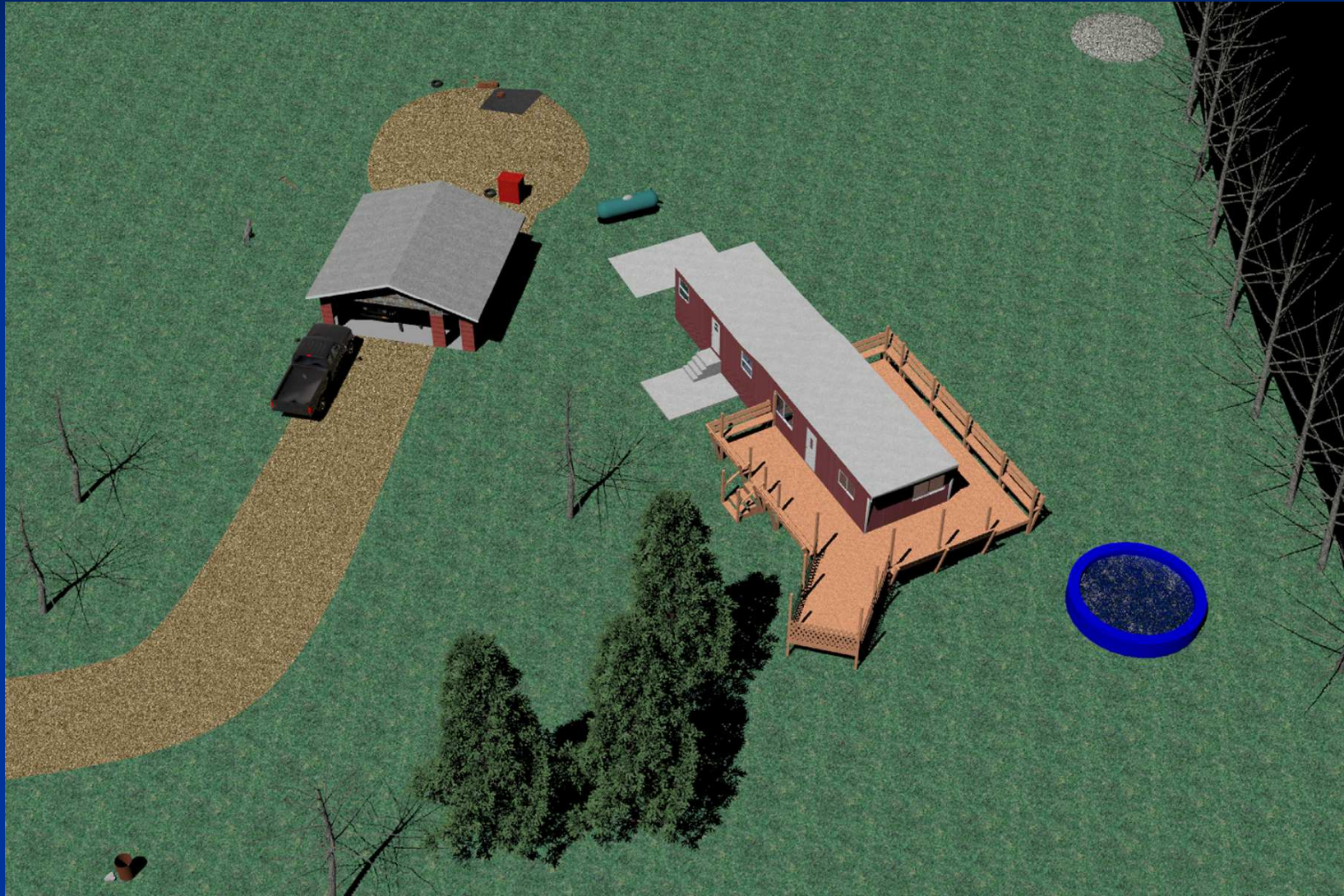
Incident Scene Model(s)



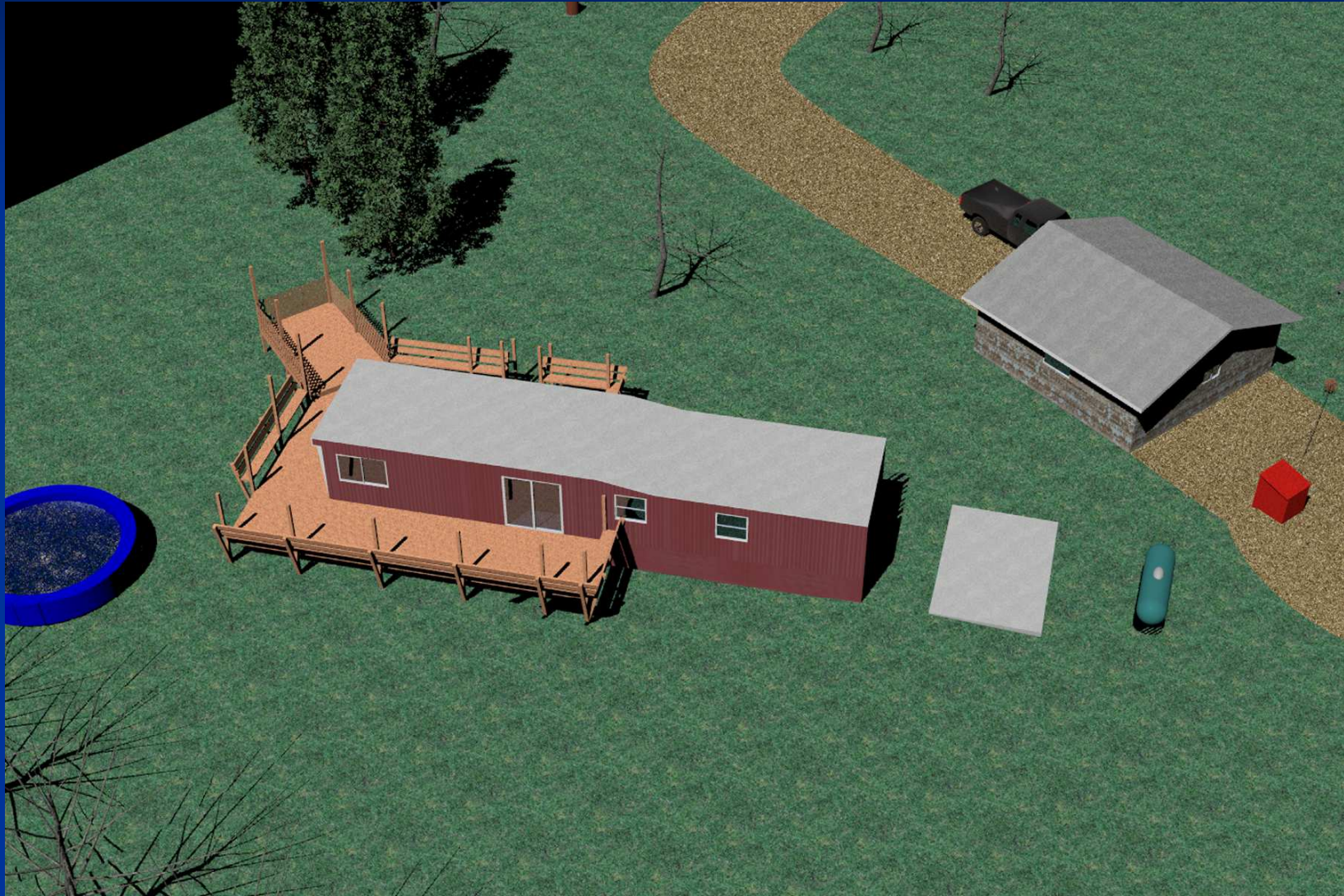
Incident Scene Model(s)



Incident Scene Model(s)



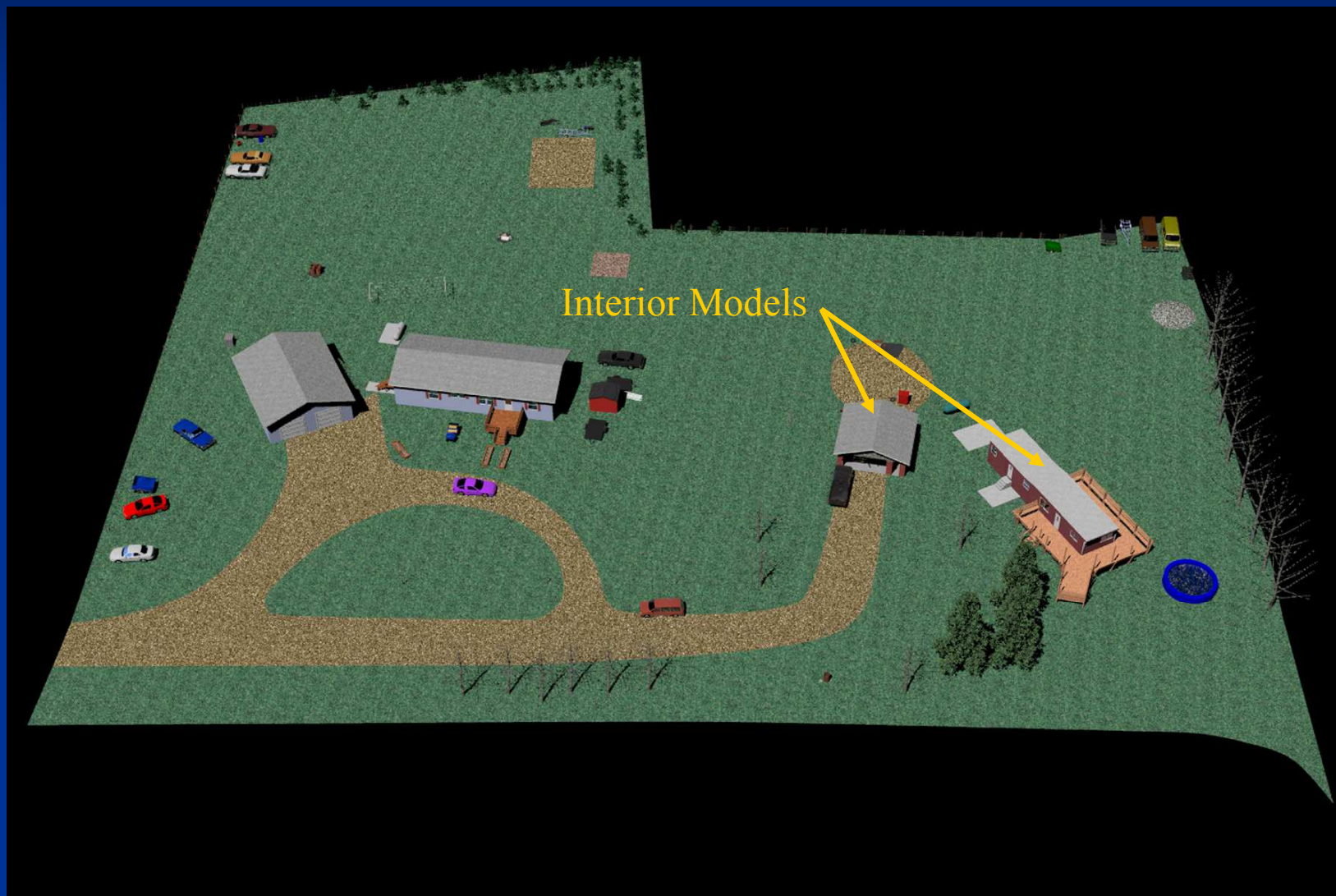
Incident Scene Model(s)



Incident Scene Model(s)



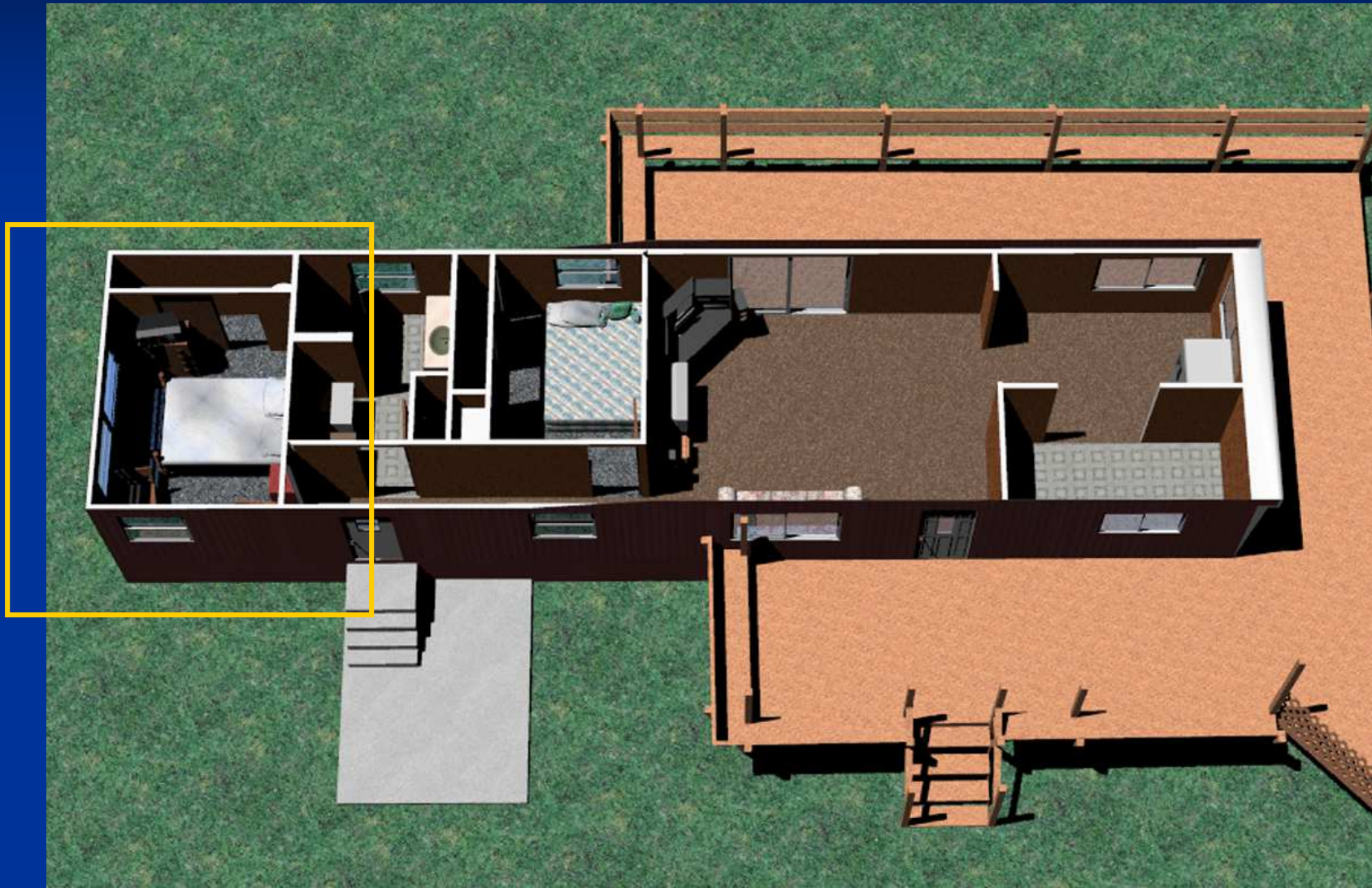
Incident Scene Model(s)



Incident Scene Model(s)



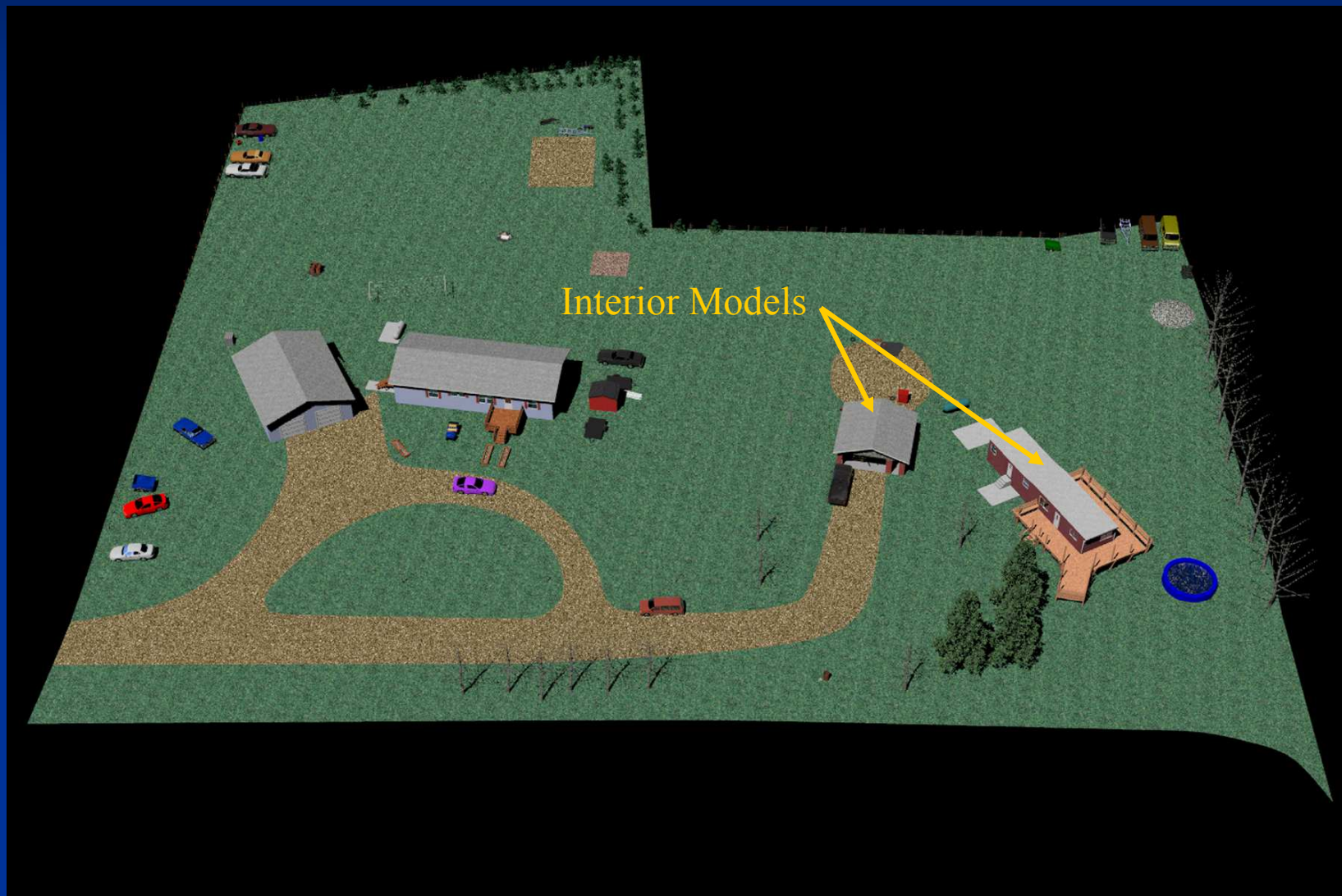
Incident Scene Model(s)



Incident Scene Model(s)



Incident Scene Model(s)



Incident Scene Model(s)



Additional Garage Measurements

- Additional measurements concerning the garage were provided by the Calumet County Sheriff's Department.
- In a report documenting activities between March 1, 2006 and March 2, 2006, Deputy Steier recorded measurements of specific items seized by law enforcement officers.
- Items listed included:
 - **Evidence Marker 9:** a bullet fragment located 14'10" west of the east wall and 20'6" north of the south wall.
 - **Evidence Marker 23A:** a bullet fragment located 8'9" west of the east wall and 12" north of the south wall.

Incident Scene Model(s)



3-D Models vs. Photography

- A photograph is an accurate representation of the scene as it was observed when the picture was taken. A 3-D model is a map (diagram) of the scene showing a scaled geometric perspective.
- 3-D Models show spatial relationships that photographs cannot:
 - Removing roofs such as that on the Steven Avery residence.
 - Hiding or “turning off” objects such as the air compressor over Evidence Tag 23A in the garage.
- A photograph offers a limited view, while witnesses and investigators can see angles in 3-D models not otherwise available to them.

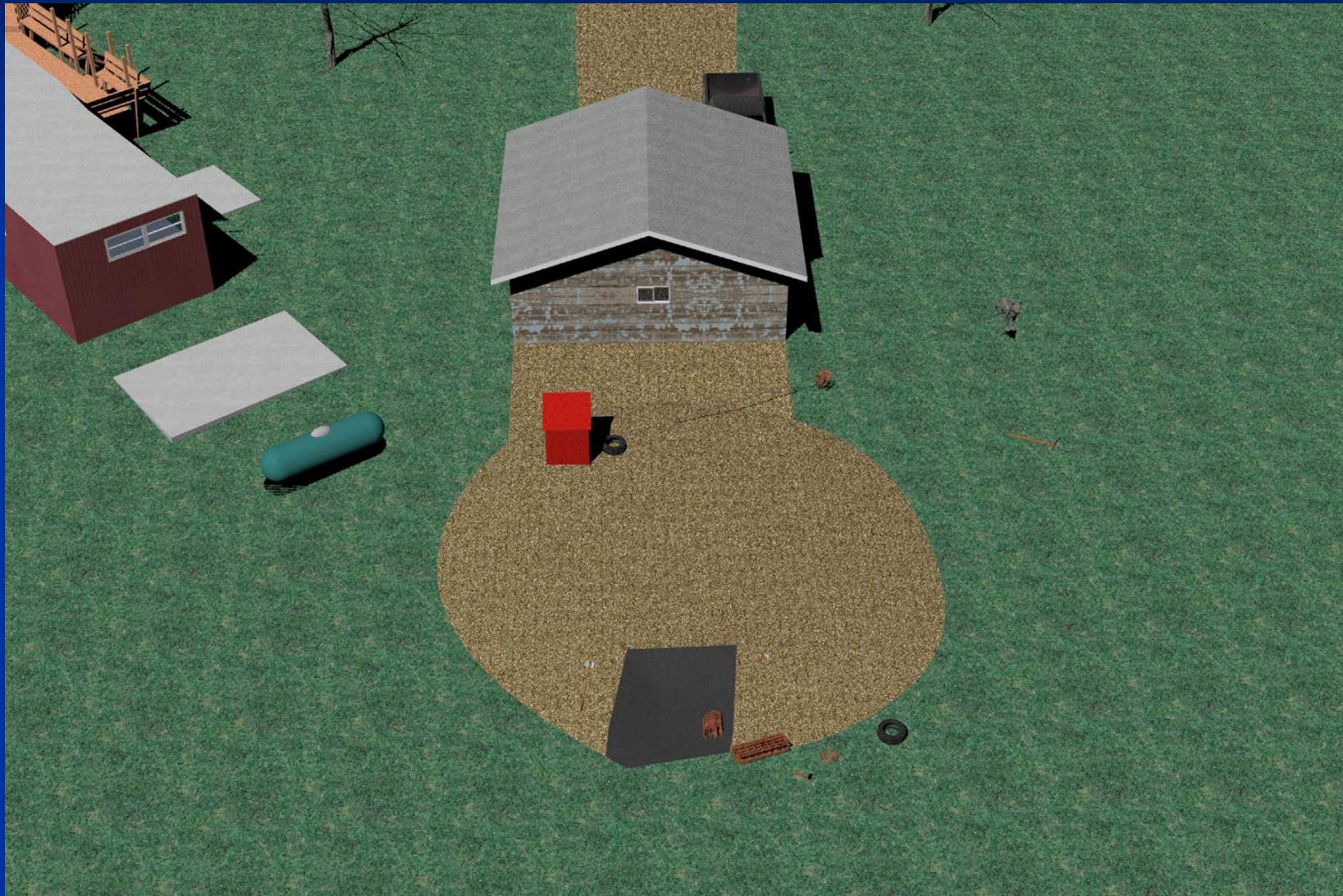
Incident Scene Model(s)



Incident Scene Model(s)



Incident Scene Model(s)



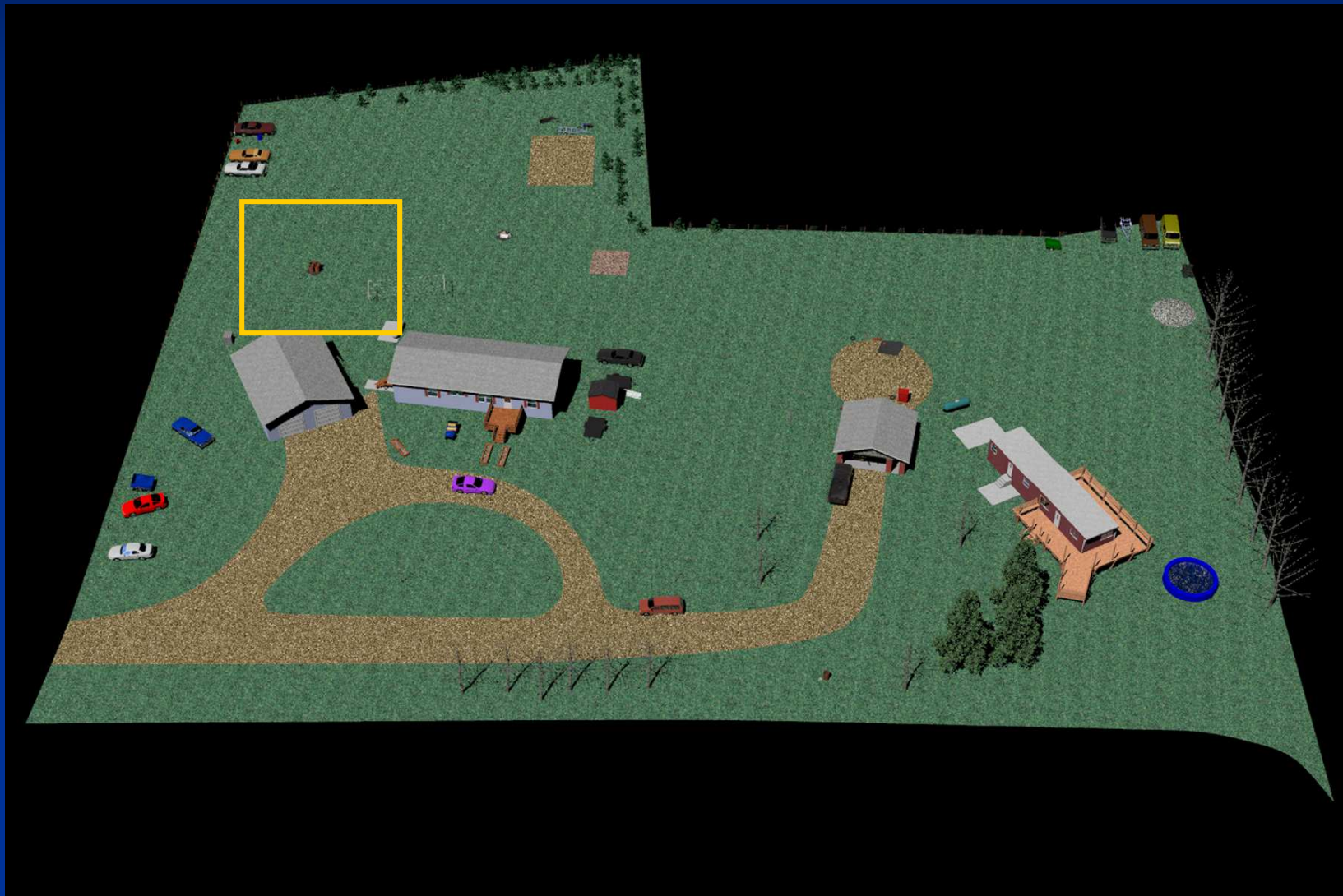
Incident Scene Model(s)



Incident Scene Model(s)



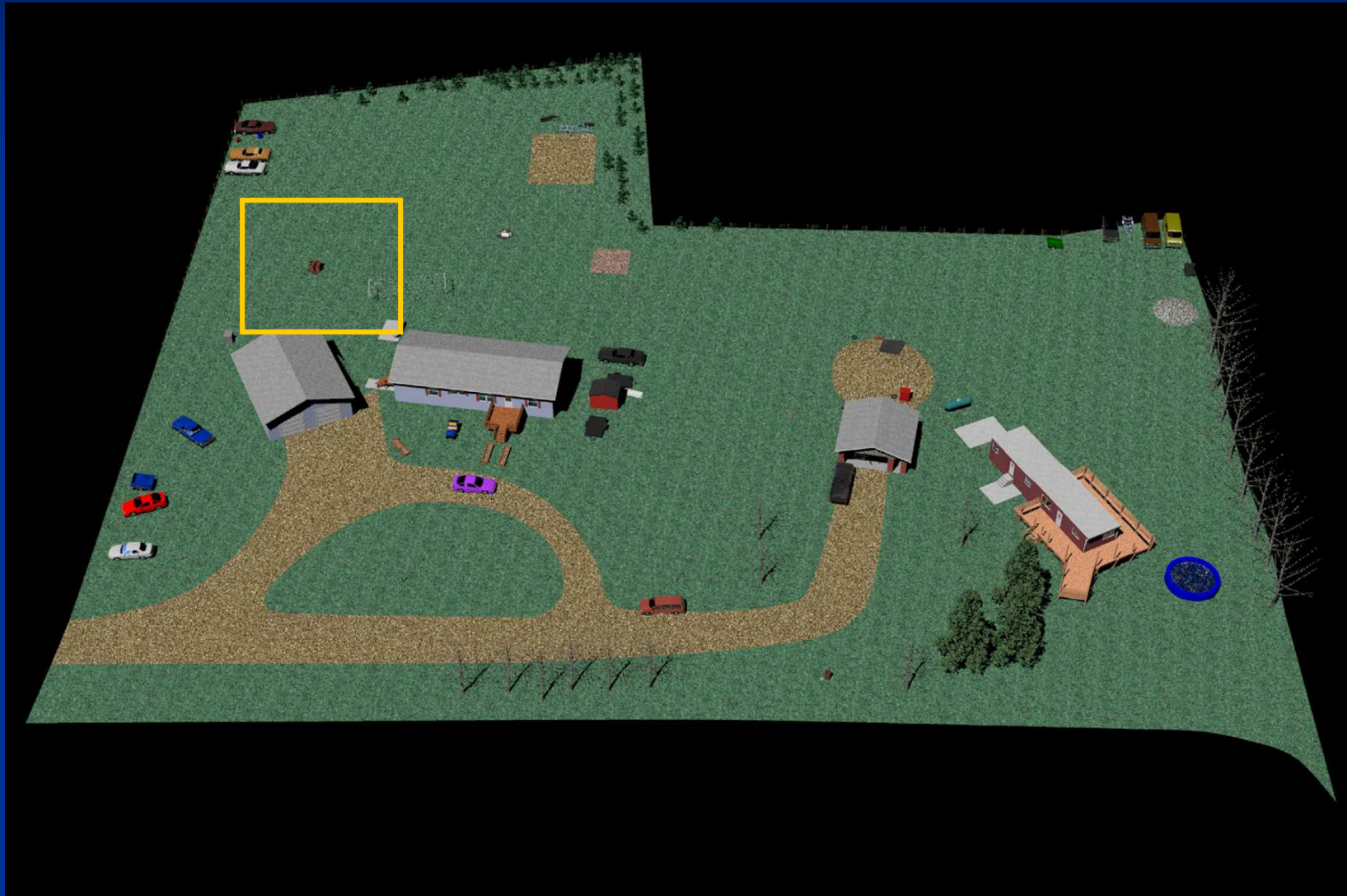
Incident Scene Model(s)



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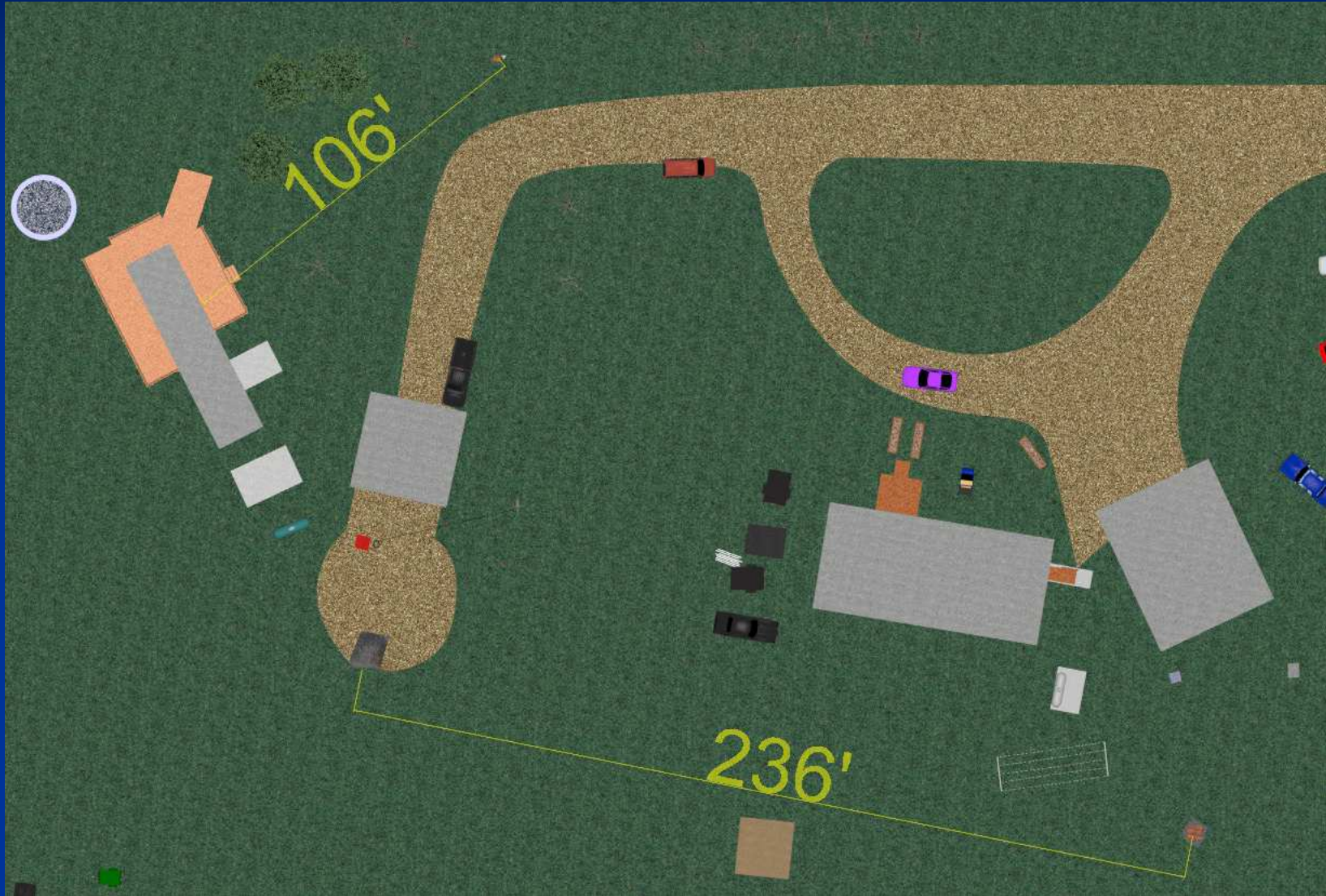
Incident Scene Model(s)



Measurements



Measurements



Skeletal Models

- Using a CAD file of a female skeleton provided by the FBI, a series of skeletal models were created using the Forensic3D software package.
- All skeletal models were created under the direct supervision of Forensic Anthropologist Dr. Leslie Eisenberg.
 - Meeting with Dr. Eisenberg at the Dane County Coroner's Office in Madison.
 - Electronic submission of skeletal models for approval by Dr. Eisenberg.

Animation

- Movement in a scene is shown through a series of still images (30 per second).
- To create an animated “walk through” of the areas modeled in 3-D, over 5250 rendered images were used.
- Final animated files were saved for DVD format and playback.



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