



Architectural and Archaeological Investigations Update

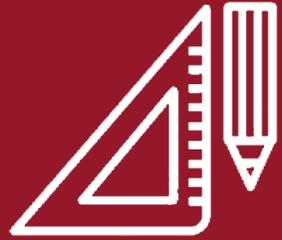
July 9, 2019

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Historic Buildings & Grounds Architectural Investigation

- THC approved the permit in January 2019.
- This is considered the "Comprehensive Assessment" of the two structures
- Historic Evolution & Development
- Clinical History
- Visual Assessment
- Borescope Deployment
- Non-Destructive Evaluation



Church and Long Barrack **Architectural** Investigation Goals

1

Delineate the architectural evolution of the two structures

2

Locate historic building fabric and properly date it

3

Provide a comprehensive architectural assessment

4

Perform a structural assessment

5

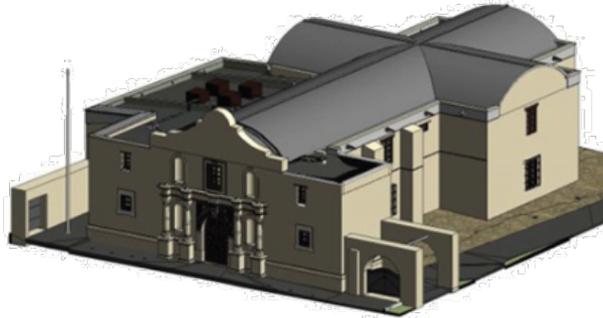
Determine the causes of deterioration

6

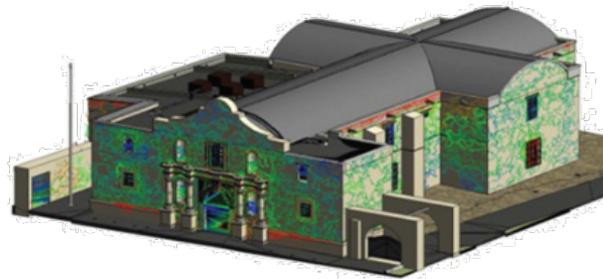
Understand the role of moisture



Exterior Point Cloud of the Church



Base BIM Model of the Church



BIM Contour Mapping of the Church

The Alamo is not only the most significant historic site in the State of Texas, it is truly a National Treasure.

Capturing the current state of the two buildings is important for both the needs of the current project, as well as having a baseline for monitoring the conditions of these historic structures into the future.

The first step was to create a “point cloud” using **state-of-the-art laser scanning technology**. the “point cloud” captures in great detail the current state of the building, from the overall dimensions to accurate representations of building deformations and historic building material deterioration.

The “point cloud” is then translated to a **Building Information Model [BIM]**, which is shared by all experts engaged in the conservation and preservation of the Alamo Church and Long Barrack.

This work was produced by two Texas based entities, **Lanmar Services** and **Pape-Dawson Engineers, Inc.**



Exterior Scanning of the Church



Interior Scanning of the Church



In 1920-1921, the DRT removed the existing wood roofs and replaced them with concrete slabs and two intersecting barrel vaults over the Nave, North Transept, and South Transept.

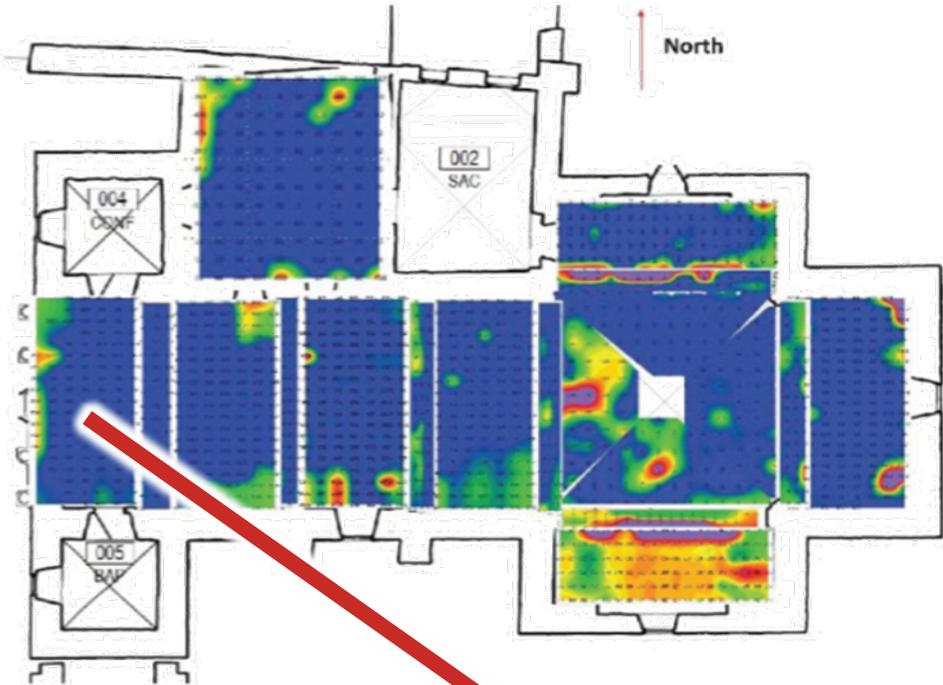
E2chem, a leading expert in assessing conditions of concrete structures, was engaged to:

- Map the location of the reinforcing;
- Determine the condition of both steel reinforcing and the concrete;
- Delineate how the two reinforced concrete systems are connected to the historic masonry;
- Project the life expectancy of the composite reinforced concrete structures.

The age of this construction is approaching 100 years and, as in several early reinforced concrete installations, there is concern regarding:

- its overall condition
- its life expectancy
- How it is connected to the historic masonry walls
- What loads are induced and what stresses are created
- What concealed deterioration may exist

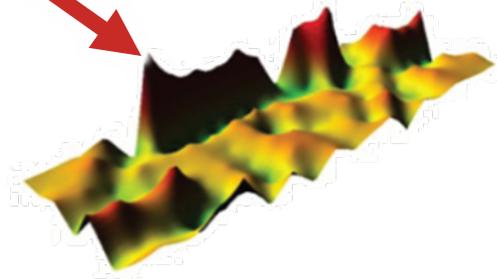
Using **Surface Penetrating Radar [SPR]**, the location of steel reinforcing was outlined and the continuity of the reinforcing was determined. Cores were taken for petrographic analysis and corrosion models were developed that delineated where areas of risk were present. The visible ceiling marks were made to allow the instrumentation to “read” the concrete without any interference of coatings, such as latex paints and other finishes applied over the years.



2-D Mapping of Areas of Corrosion Risk on Reflected Ceiling Plan



In Situ Non-Destructive Testing



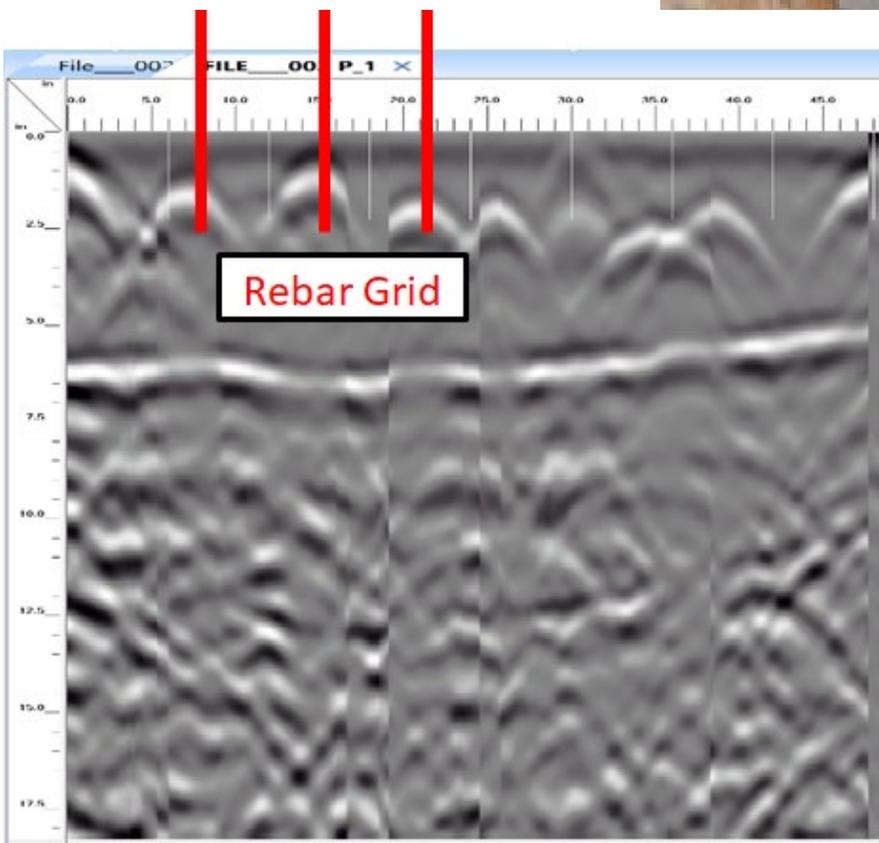
3-D Mapping of Areas of Corrosion Risk at the West

Comprehensive Assessment



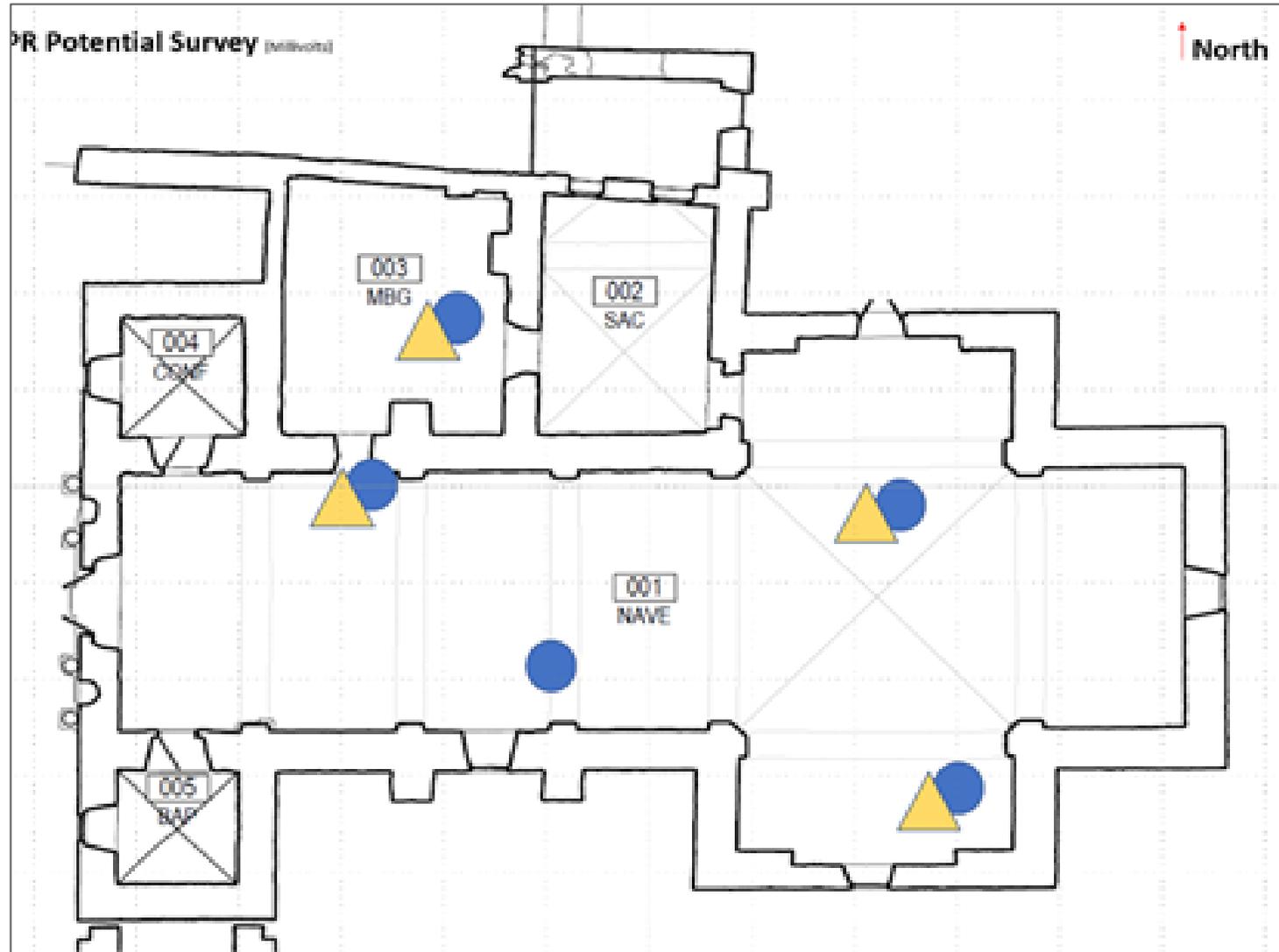
Surface Penetrating Radar

SPR



Concrete Core Extractions

Linear Polarization Resistance Survey



Ultrasonic Pulse Velocity

UPV Testing

Testing the quality of the concrete



SACRISTY PROBES

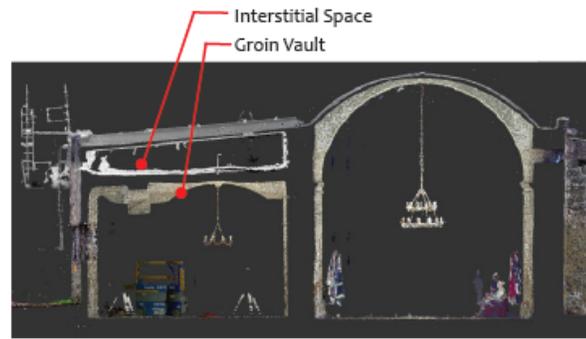
The Sacristy, one of the most important spaces in the Alamo Church, contains masonry vaults from the 1760s. Structural evaluation discovered several cracks.

To determine the severity, size and the current status of the cracks, i.e. whether there is active movement or not, the Design Team has started a systematic assessment which includes among other activities:

- Tracing the cracks both visually and through instrumentation
- Mapping the thicknesses of the stones of the groin vaults of the Sacristy
- Determining what voids exist in the masonry walls
- Understanding the integrity of the binding mortars
- Monitoring moisture movement

In addition, exposure windows were created in the concrete slab above the groin vaults, as well as through the east and north masonry walls, to gain access into the interstitial space between the groin vaults and the concrete slabs to access the back side of the vaults and to confirm their structural thickness.

Atkinson-Noland & Associates is methodically and cautiously assessing the structures to avoid impacting valuable historic building fabric, including colonial period plasters and traces of decorative finishes.



Point Cloud Section Through the Sacristy and Nave, Looking East



East Sacristy Wall Probe in Progress

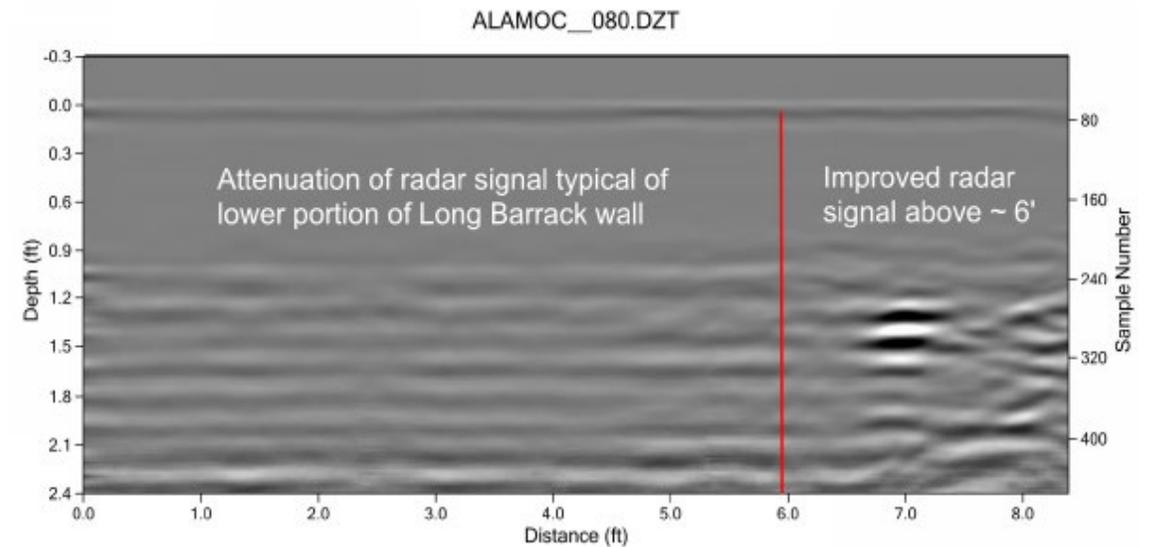


East Sacristy Exterior Elevation with Overlay of Interior Sacristy Groin Vaults



Radar signals are highly affected by moisture and salts.

Radar Scans



The Church as it stood during the Battle of the Alamo was constructed between 1740 and 1772. Until the U.S. Army installed the first roof and constructed the iconic parapet in 1850, the tops of the walls were exposed to the elements.

During past interventions, it became clear that the binding mortar inside the masonry walls had disintegrated and voids were created in several areas of the building. In addition, for over 600 days, the **Black Paper Project** administered by the Alamo Trust collected over **60 pounds of masonry** [stone and mortars] that disintegrated and fell off the surface of the limited areas of the Church.

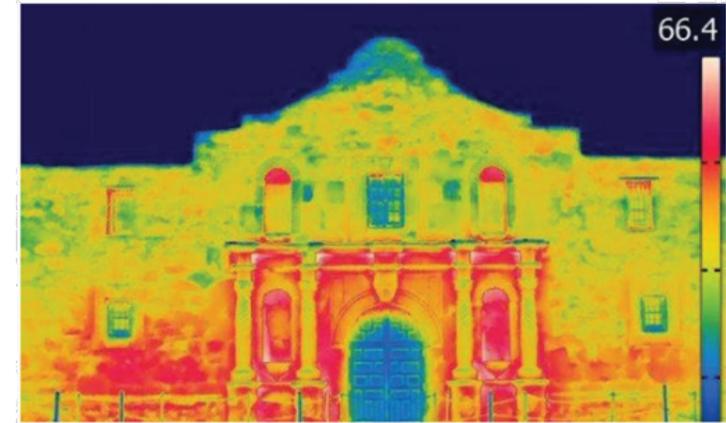
Using 21st century technology, including **Thermal / Infrared** imaging [T / IR], **Surface Penetrating Radar** [SPR] and **moisture meters**, experts are:

- Mapping anomalies, such as discontinuities, voids, and cracks throughout all masonry systems
- Measuring stone thicknesses
- Delineating voids
- Assessing moisture levels
- Determining the presence of salts which may result in deterioration

This process will enable preservation architects, structural engineers, stone experts and building scientists to understand among other items:

- What the condition of the masonry is
- Any interruptions in the paths of the structural gravity loads
- Where deformations exist
- Where moisture is entering the masonry walls
- Where salts exist in the masonry walls

This assessment is being performed on a parallel track with a moisture monitoring system.



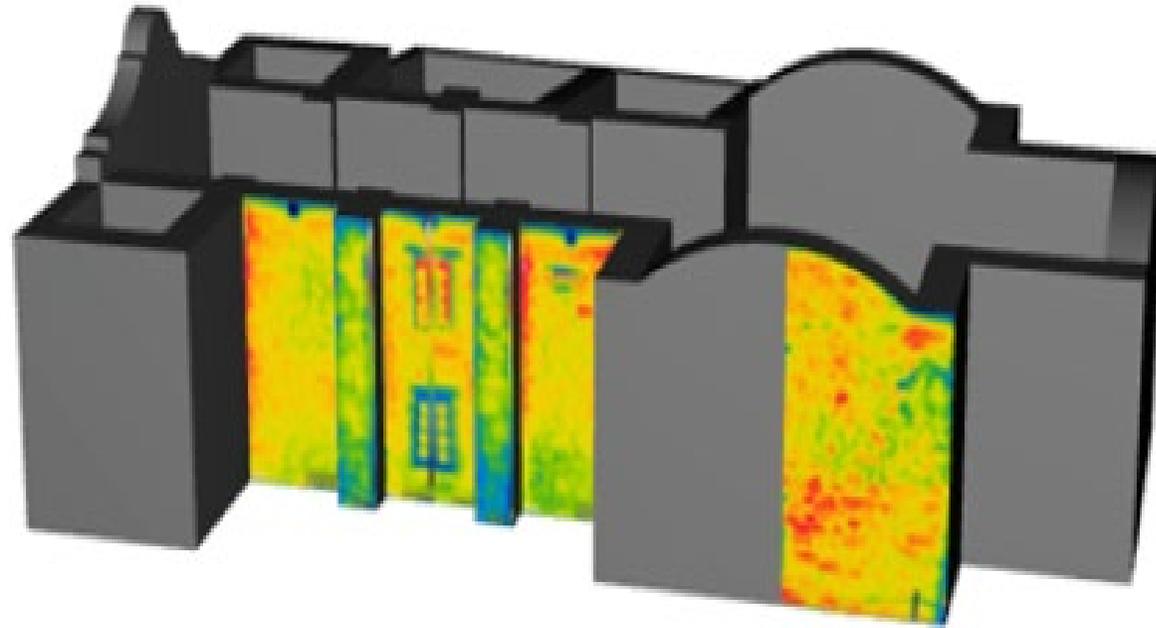
Thermal / Infrared Imaging



Stone Thickness Mapping



Thermal Imaging in Progress



Walls modeled schematically for preliminary visual interpretation

Schematic Processed Grids



Videoscope Observation



Exterior Chancel East Wall

Archaeology Permits

- Two projects were presented to the THC during the January 2019 Quarterly Meeting.
- Permits were issued by THC for the proposed projects.
- RKEI will conduct the archaeological investigations of the Church and Long Barracks.
- UTSA-CAR will conduct the archaeological investigations associated with the Safety Perimeter Project.



Church and Long Barrack **Archaeology** Investigation Goals

1

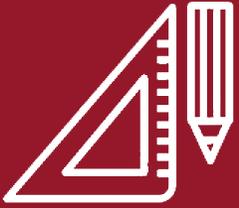
To better understand the construction sequence and construction methods of the historic structures.

2

To better understand the architectural relationship between the Long Barrack and the Church.

3

To allow the historic architects to place equipment below ground to monitor water movement.



Architectural & Archaeology Investigation Goals

1

All investigations will ultimately help identify areas that need to be addressed to ensure the structures will continue to stand for at least another 300 years.

2

Artifacts will be analyzed by archaeologists to help identify patterns or trends in types of materials present, which will add to the knowledge of cultural material from the site.



Pre-field Activities

- Archival Research
- Review of Previous Archaeology
- Location of previous and current utility impacts
- Removal of exhibit from Long Barrack
- Test removal of flagstone and concrete
- Development of Human Remains Treatment Plan



Current Utility Map

Plaza Improvements 1976





Alamo Mission Archaeology Advisory Committee

- Prior to the THC Quarterly Meeting, the Alamo Archaeologist reached out to Federally Recognized Tribal Nations that have a traditional tie to Bexar County and the San Antonio Missions.
- First meeting was held in March 2019.
- ATI and the GLO have agreed to follow the spirit of the NAGPRA regulations throughout the course of the archaeological investigations associated with the Alamo Plan.

Alamo Mission Archaeology Advisory Committee Members

- The Committee is comprised of the THPO from the:
 - Mescalero Apache Tribe
 - Alabama-Coushatta Tribe of Texas
 - Tonkawa Tribe of Oklahoma
 - Caddo Nation of Oklahoma
 - Seminole Nation of Oklahoma
- One member has extensive experience with the legal aspects of NAGPRA, and is a citizen of the Cheyenne and Arapaho Tribes of Oklahoma.



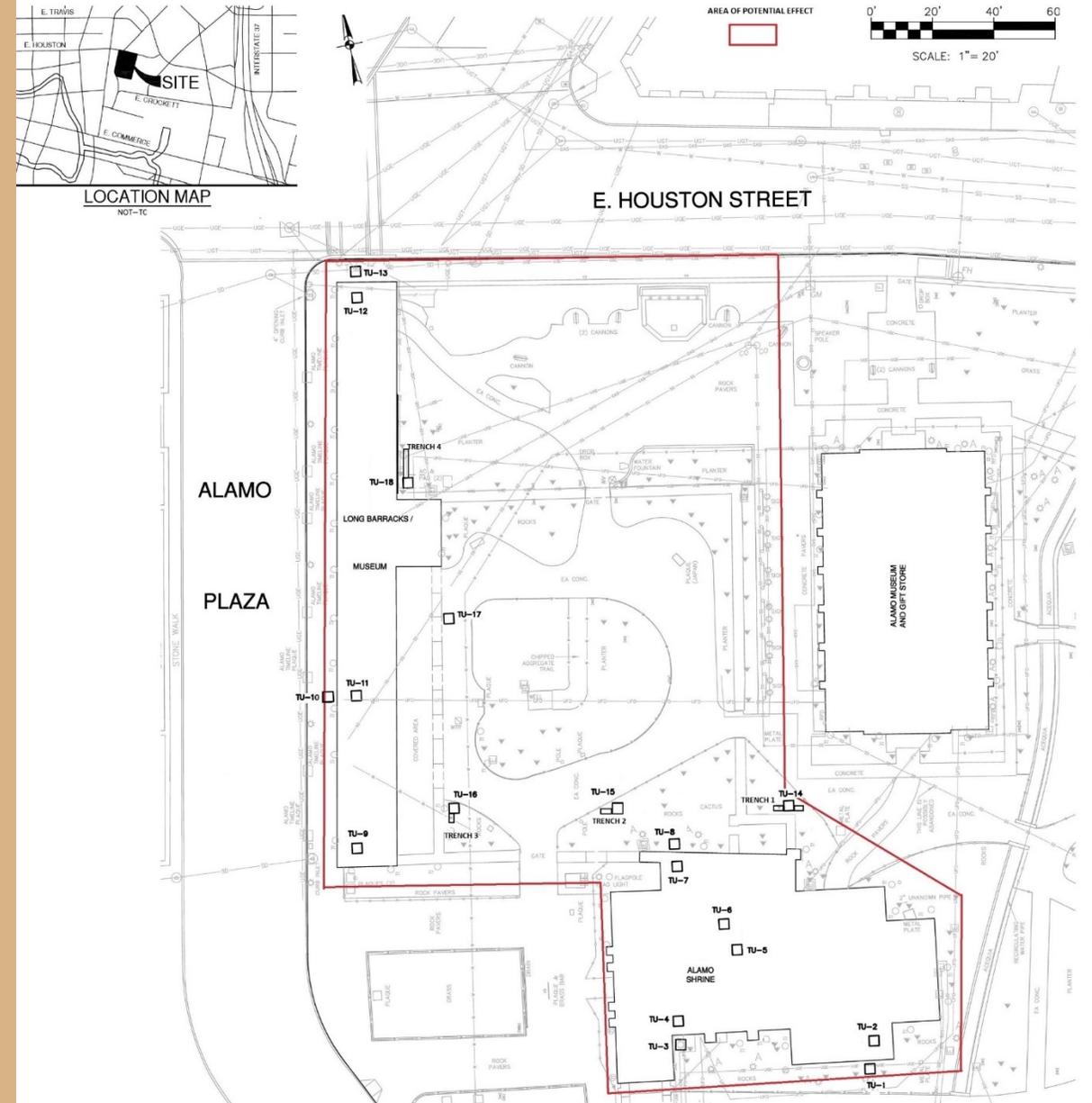
Tribal Monitor

ATI has agreed to have a certified Tribal Monitor selected by the AMAAC on site during the archaeological excavations. Tribal Monitors will have firsthand exposure to field activities so that they may make recommendations to the archaeologists onsite regarding the treatment of culturally sensitive finds, as well as report their observations to their tribal leadership and/or community and the AMAAC.

Church and Long Barrack Investigations

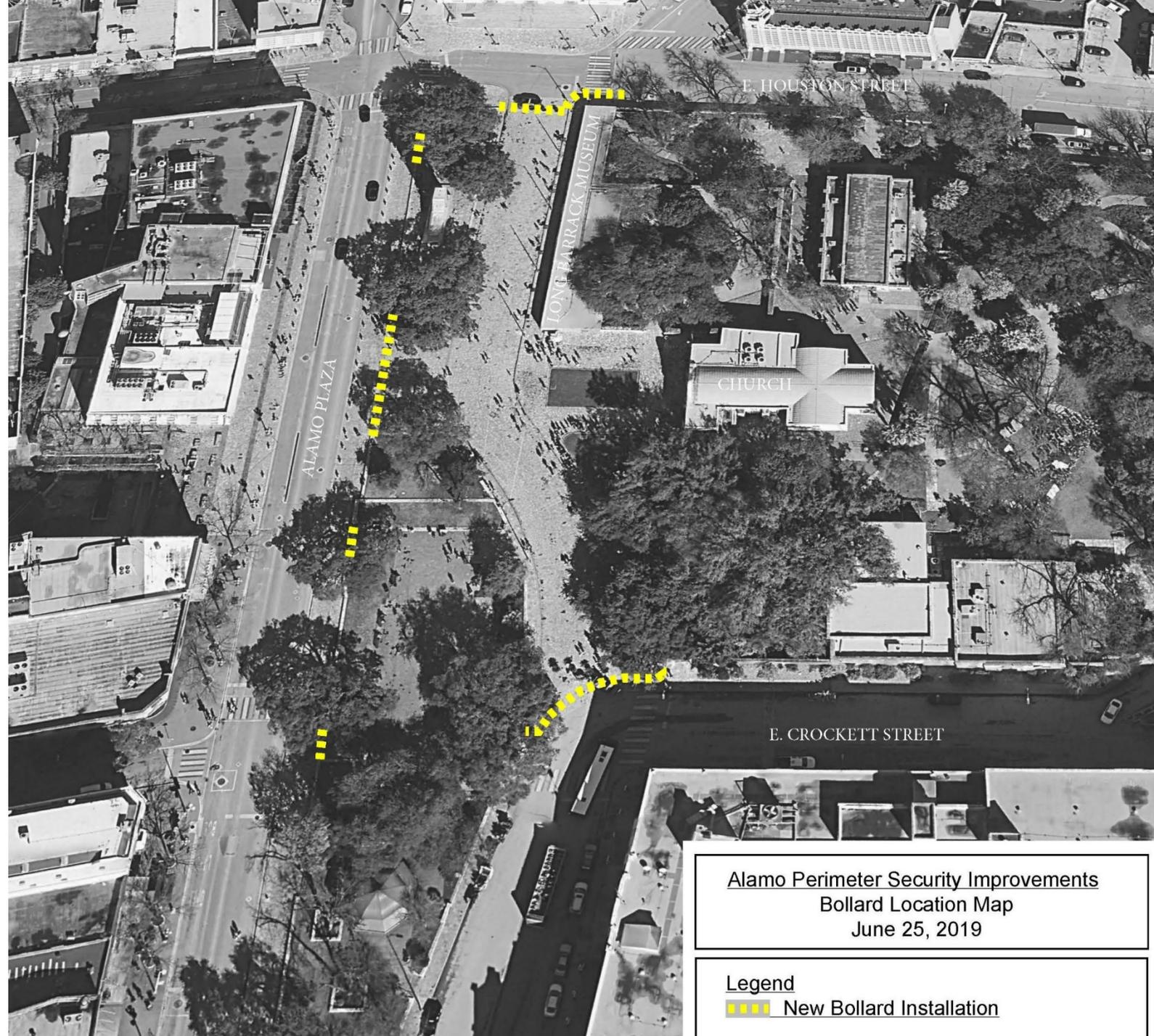
Proposed Unit Placement

- 18 units to be excavated.
- Units placed along the historic structure walls will be excavated in pairs.
- The Alamo will remain open during normal business hours during the investigations.



Safety Perimeter

- Installation of fixed and removable bollards.
- Aid in prevention of vehicular entry into Plaza.
- Will occur in phases throughout remainder of year.
- Alamo will continue to remain open during normal operating hours.



Alamo Perimeter Security Improvements
Bollard Location Map
June 25, 2019

Legend

 New Bollard Installation



Summary

- Historic Buildings & Grounds Architectural Investigation
- THC approved permit January 2019
- Stage One – Comprehensive Assessment of the two structures
 - Historic Evolution & Development
 - Clinical History
 - Visual Assessment
 - Borescope Deployment
 - Non-Destructive Evaluation
- Archaeological Background Review and Research
- Development of Human Remains Treatment Plan

For updates on
the archeology and
architecture projects:

SaveTheAlamo.com





THANK YOU