



# San Marcos Buildings Evacuation Routes

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SAN MARTIAN EVACUATORS (SME)

PROJECT MANAGER: LIVY ROCHA

PROJECT MEMBERS: SAM MCLENNON, GREG ROLLMAN, SAM NIEMEYER, NOAH HANSON

CLIENT: CITY OF SAN MARCOS (COSM)

CLIENT STAFF: JESSICA NEUNER, REESE MARTIN, EMILEE FREEMAN

# Outline

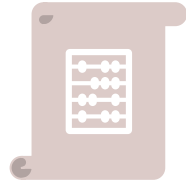
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INTRODUCTION



DATA



METHODOLOGY



RESULTS



DISCUSSION



CONCLUSION



Q/A

# Introduction

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## Key Objectives

- (1) Develop standards for emergency preparedness maps
- (2) Create updated and accurate maps and data
- (3) Produce static maps for display in building

## Problem Statement

- Previous maps and data are outdated and inaccurate.
- To ensure safety and efficient navigation through City of San Marcos (CoSM) facilities

# Project Overview

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- Data collection through Field Maps and Field Maps Designer, utilizing ground truthing
- Created standardized workflow and symbology
- Produced static and background data for facilities viewer application

# Study Area for Evacuation Routes



## San Marcos Buildings

- City Hall
- Grant Harris Building
- Municipal Building

- |                                                                                       |                     |
|---------------------------------------------------------------------------------------|---------------------|
|  | Buildings of Focus  |
|  | San Marcos Building |





**MUNICIPAL BUILDING**  
**1st FLOOR**  
• FINANCE  
• TECHNOLOGY SERVICES  
• UTILITY PAYMENTS  
**2nd FLOOR**  
• CAPITAL IMPROVEMENTS  
• DEVELOPMENT SERVICES

Data

# CoSM Provided Data

Seven features from given data

All data standardized in excel document

Minor quality issues:

- Door data acting as barriers for exit route creation
- Certain walls no longer exist, or need to be added
- Doors placed in middle of rooms

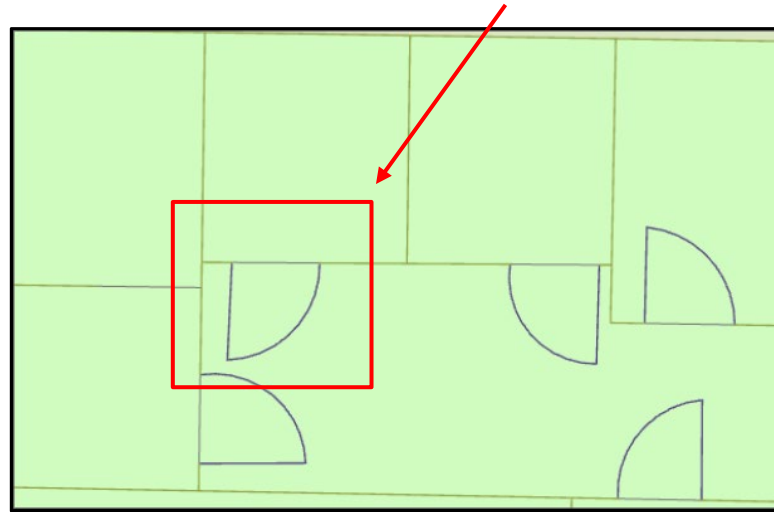


Figure 1. Closed Walls with No Gap for Doorways

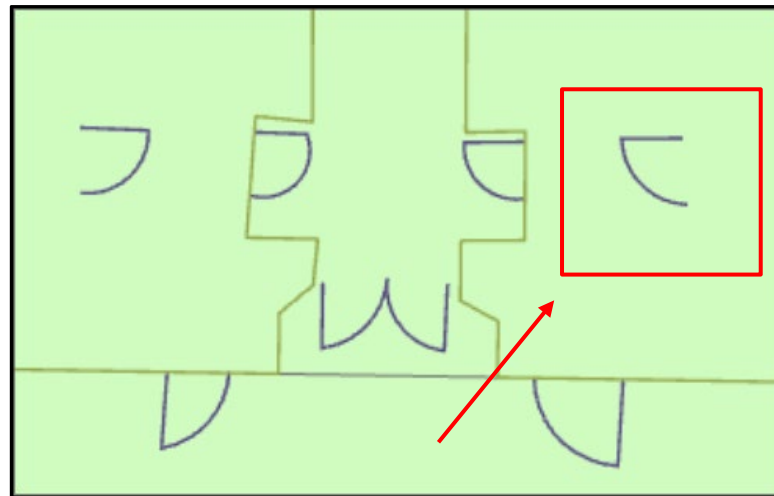


Figure 2. Walls Placed in the Middle of a Room



Figure 3. Group Member in the Field Collecting Data and Ground Truthing

# SME Collected Data

- Fifteen features were collected in March 2026
- Implemented the standard fire safety plans from the 2024 International Code
- Used Field Map Designer to create forms and collected point data with Field Maps app
- Created polygon features using the Esri imagery Base Map
- Data was cleaned up and their attributes were standardized. These features were given a standardized symbology set

Table 1. Master data list: SME

| Feature Layer          | Spatial Object | Attribute                                                                                         | Symbology                                                                           |
|------------------------|----------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Defibrillator<br>(AED) | Point          | Floor Level, Asset Number, Building, Access Type, Relative Location, Additional Information       |  |
| Doors                  | Point          | Floor Level, Asset Number, Building, Access Type, Lockset Type, Door Type, Additional Information |  |
| Elevator               | Point          | Floor Level, Asset Number, Building, Access Type, Additional Information                          |  |
| Emergency Exit Signage | Point          | Floor Level, Asset Number, Building, Access Type, Relative Location, Additional Information       |  |

**404.2.2 Fire safety plans.**  
Fire safety plans shall include the following:

1. The procedure for reporting a fire or other emergency.
2. The life safety strategy including the following:
  - 2.1. Procedures for notifying occupants, including areas with a private mode alarm system.
  - 2.2. Procedures for occupants under a defend-in-place response.
  - 2.3. Procedures for evacuating occupants, including those who need evacuation assistance.
3. Site plans indicating the following:
  - 3.1. The occupancy assembly point.
  - 3.2. The locations of fire hydrants.
  - 3.3. The normal routes of fire department vehicle access.
4. Floor plans identifying the locations of the following:
  - 4.1. Exits.
  - 4.2. Primary evacuation routes.
  - 4.3. Secondary evacuation routes.
  - 4.4. Accessible egress routes.
    - 4.4.1. Areas of refuge.
    - 4.4.2. Exterior areas for assisted rescue.
  - 4.5. Refuge areas associated with smoke barriers and horizontal exits.
  - 4.6. Manual fire alarm boxes.
  - 4.7. Portable fire extinguishers.
  - 4.8. Occupant-use hose stations.
  - 4.9. Fire alarm annunciators and controls.

Fire Extinguisher

Floor Level  
  
(e.g., Floor One, Floor Two)

Asset Number

Building  
☒ No value  
☐ City Hall  
☐ Grant Harris  
☐ Municipal Building  
☐ San Marcos Activity Center  
☐ San Marcos Public Library

Access Type  
☒ No value  
☐ Public Area  
☐ Faculty Area  
☐ Limited Faculty Area  
☐ Outside Area

Figure 3. Fire Safety Plan Feature Reference for Standardization

Figure 4. Map Viewer Designer Form Template for Fire Extinguisher



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|---------------|----------------|-----------|-----------|
|               |                |           |           |

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| De            |                | Fire Extinguisher                                |  |
|               |                | Floor Level                                      |  |
|               |                | (e.g., Floor One, Floor Two)                     |                                                                                     |
|               |                | Asset Number                                     |  |
| Eme           |                | Building                                         |  |
|               |                | <input checked="" type="radio"/> No value        |                                                                                     |
|               |                | <input type="radio"/> City Hall                  |                                                                                     |
|               |                | <input type="radio"/> Grant Harris               |                                                                                     |
|               |                | <input type="radio"/> Municipal Building         |                                                                                     |
|               |                | <input type="radio"/> San Marcos Activity Center |                                                                                     |
|               |                | <input type="radio"/> San Marcos Public Library  |                                                                                     |
| 404           | Fire           | Access Type                                      |                                                                                     |
|               |                | <input checked="" type="radio"/> No value        |                                                                                     |
|               |                | <input type="radio"/> Public Area                |                                                                                     |
|               |                | <input type="radio"/> Faculty Area               |                                                                                     |
|               |                | <input type="radio"/> Limited Faculty Area       |                                                                                     |
|               |                | <input type="radio"/> Outside Area               |                                                                                     |

Figure 3. Fire Safety Plan Feature Reference for Standardization

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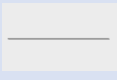
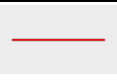
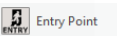
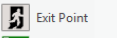
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Table 2. Final Master data list

| Feature Layer              | Spatial Object | Attribute                                                                                                     | Symbology                                                                                                                                                                                                                                                                                                      |
|----------------------------|----------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fixed Walls with Door Gaps | Line           | Floor Level, Building                                                                                         |                                                                                                                                                                                                                             |
| Primary Evacuation Route   | Line           | N/A                                                                                                           |                                                                                                                                                                                                                             |
| Secondary Evacuation Route | Line           | N/A                                                                                                           | Multi-Color Lines                                                                                                                                                                                                                                                                                              |
| Defibrillator (AED)        | Point          | Floor Level, Asset Number, Building, Access Type, Relative Location, Additional Information                   |                                                                                                                                                                                                                             |
| Doors                      | Point          | Floor Level, Asset Number, Building, Access Type, Lockset Type, Door Type, Additional Information             |                                                                                                                                                                                                                             |
| Elevator                   | Point          | Floor Level, Asset Number, Building, Access Type                                                              |                                                                                                                                                                                                                             |
| Emergency Exit Signage     | Point          | Floor Level, Asset Number, Building, Access Type, Relative Location, Additional Information                   |                                                                                                                                                                                                                             |
| Entry Exit Points          | Point          | Floor Level, Asset Number, Building, Access Type, Entry Type, Lockset Type, Door Type, Additional Information |  Entry Point<br> Exit Point<br> Stairwell Point |
| Fire Alarms                | Point          | Floor Level, Asset Number, Building, Access Type, Relative Location, Additional Information                   |                                                                                                                                                                                                                           |
| Fire Alarm Control Panel   | Point          | Floor Level, Asset Number, Building, Access Type, Relative Location, Additional Information                   |                                                                                                                                                                                                                           |



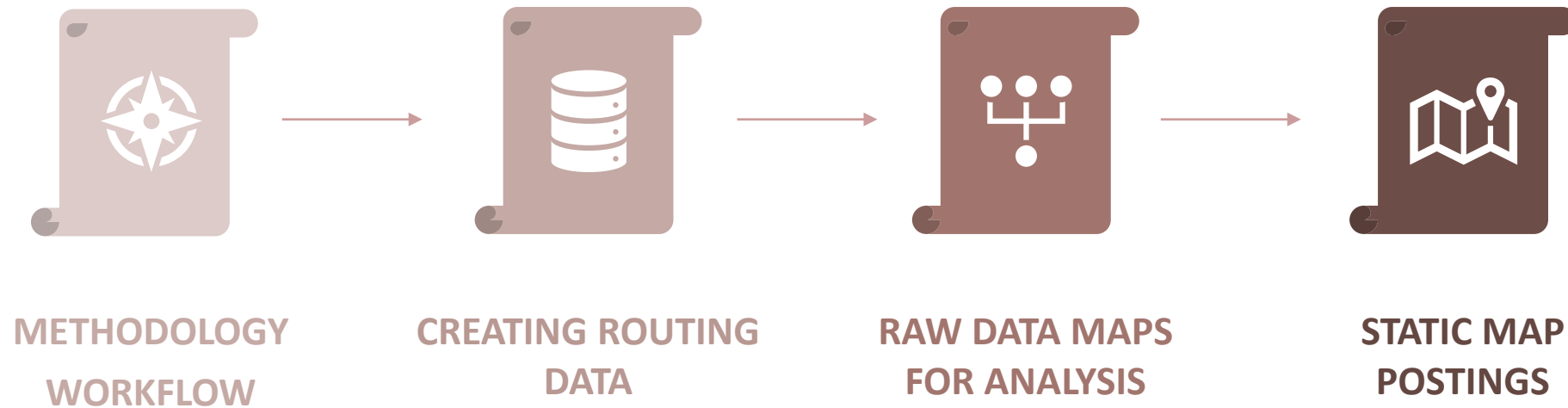


# Methodology



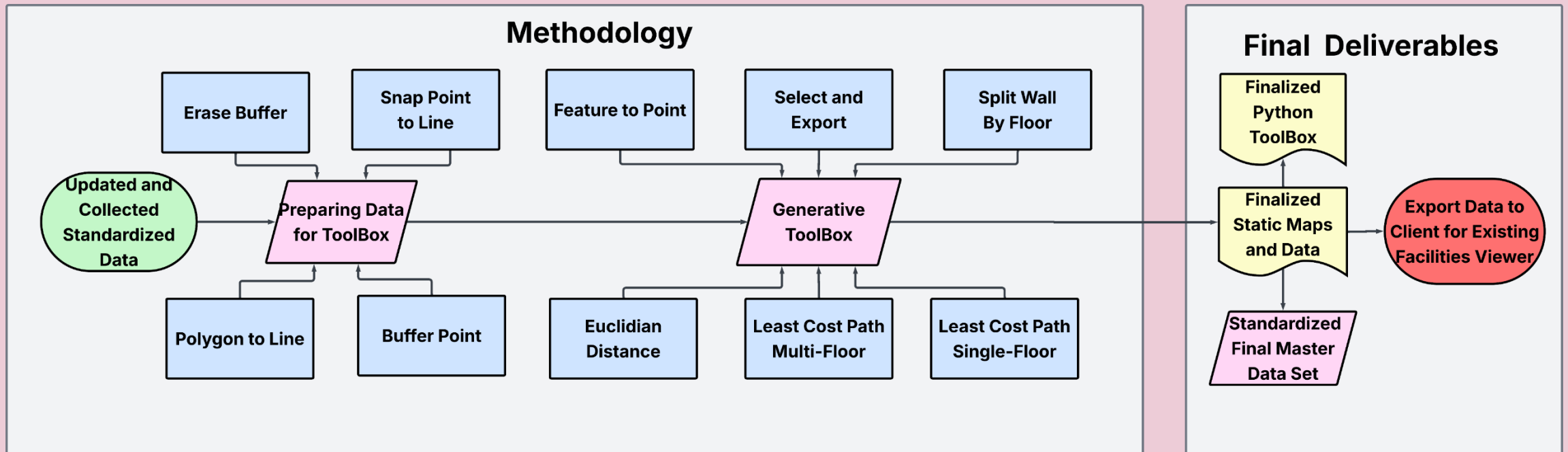
# Methodology

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# Methodology: Workflow

## Flow Chart Methodology



# Methodology: Creating Routing Data

Toolbox Generation

 New Python Toolbox.pyt

-  1 - Select and Export
-  2 - Split by Floor
-  3 - Feature to Point
-  4 - Euclidean Distance
-  5 - Least Cost Path

- Runs Routing data for buildings

Geoprocessing

5 - Least Cost Path

Parameters Environments

\* Working GDB

\* Room Points FC

\* Destination FC (exits or stairs)

\* Wall Barrier FC

\* Room Polygon FC (sets extent)

\* Output Label

Exit Filter Field (optional)

Exit Filter Value (optional)

Cell Size 0.5

Run



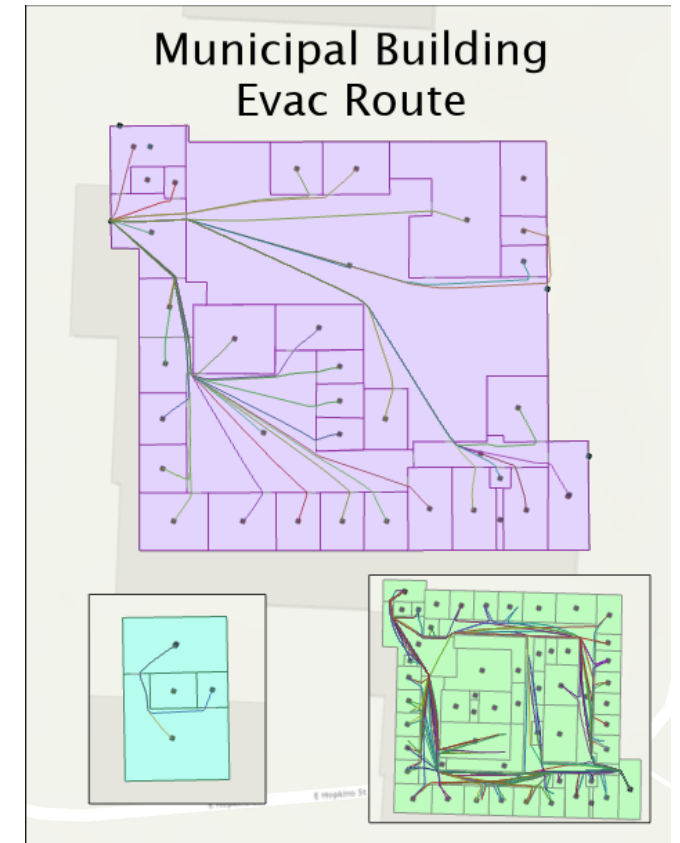
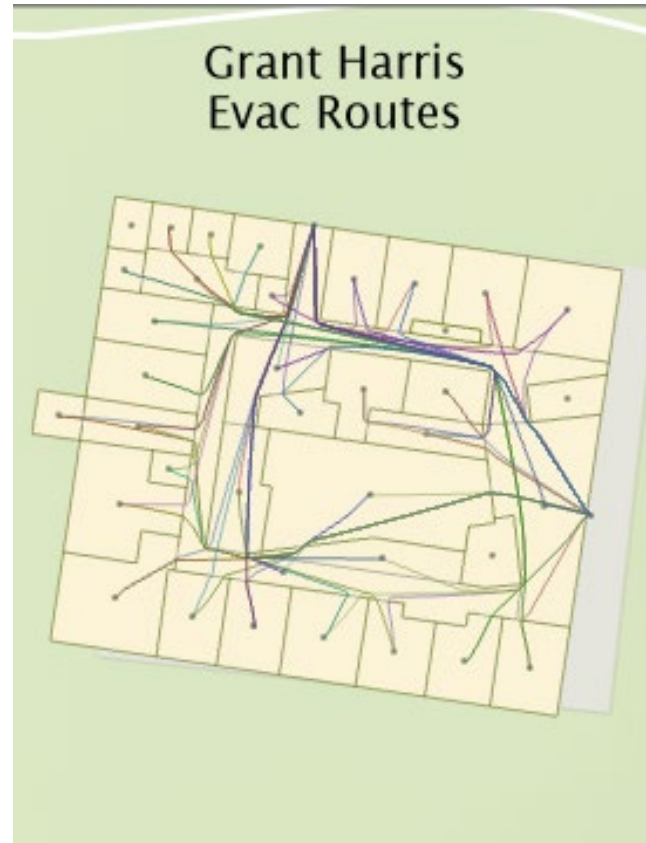
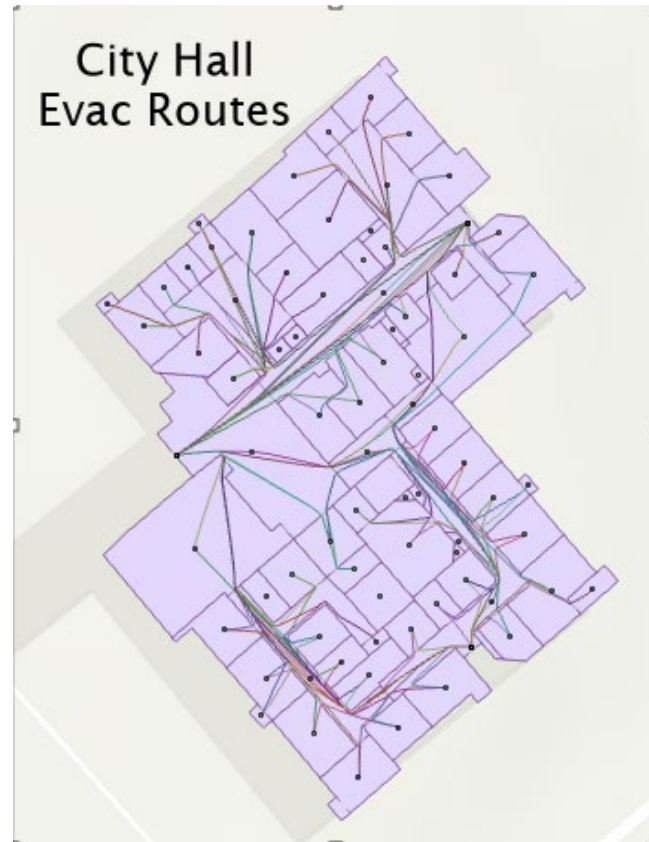


# Results



# Results: Raw Data Maps

## Map Generation From Toolbox

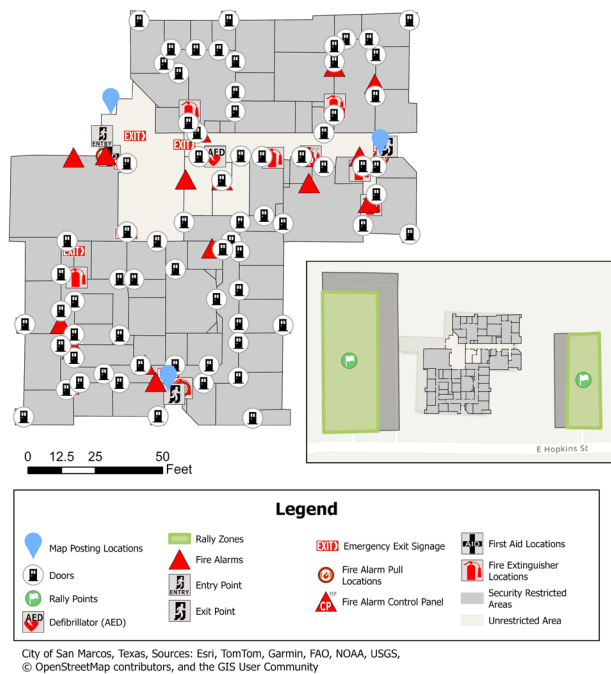




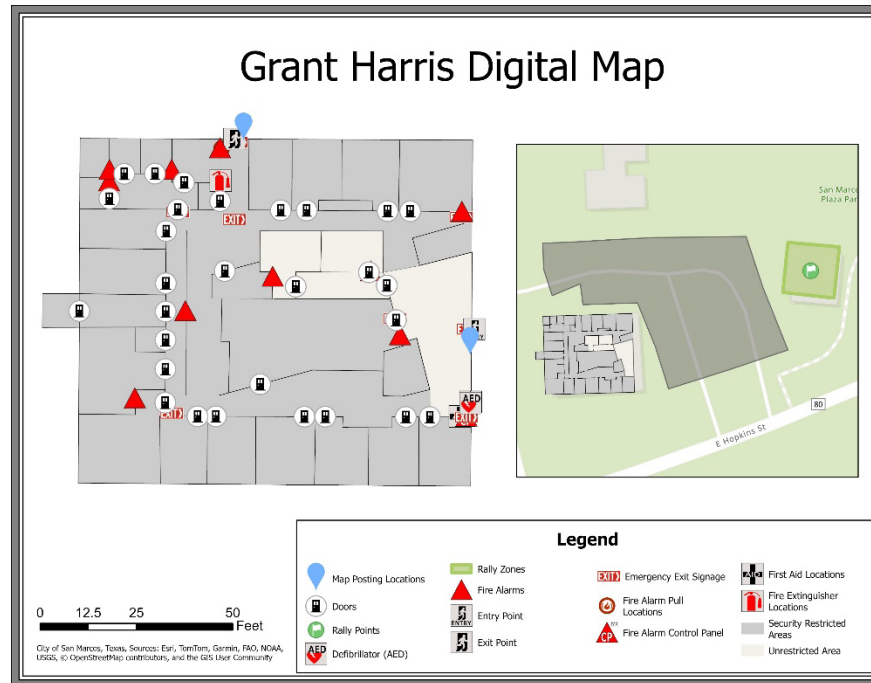
# Results: Digital Map

## Preview of Facilities Viewer Application

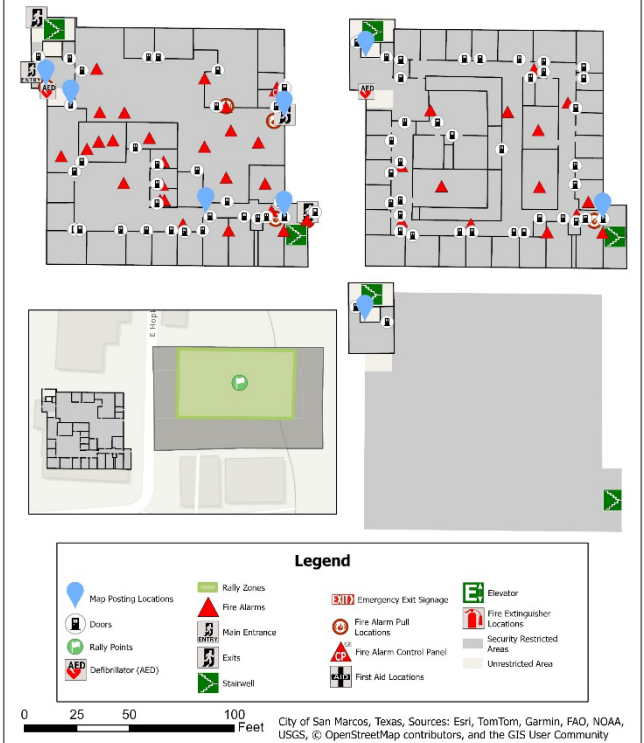
### City Hall Digital Map



### Grant Harris Digital Map



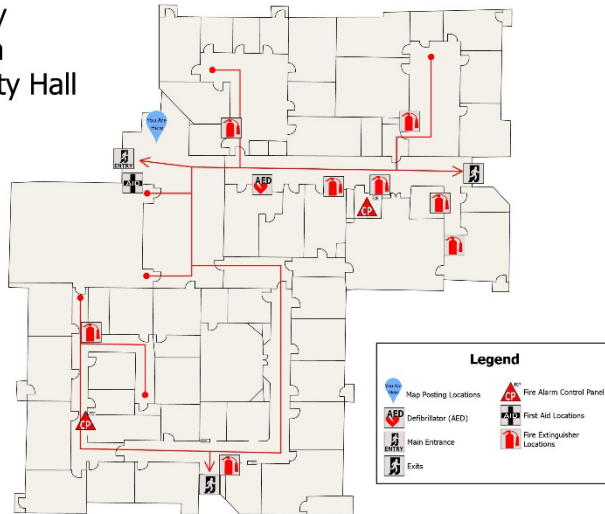
### Municipal Building Digital Map



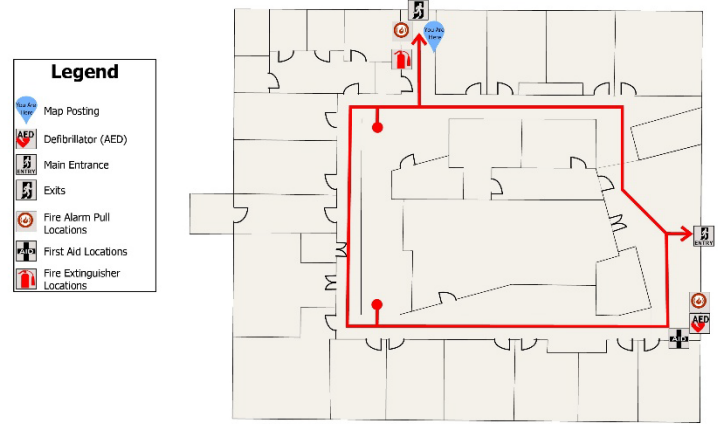
# Results: Static Map Postings

## Map Generation Through Adobe

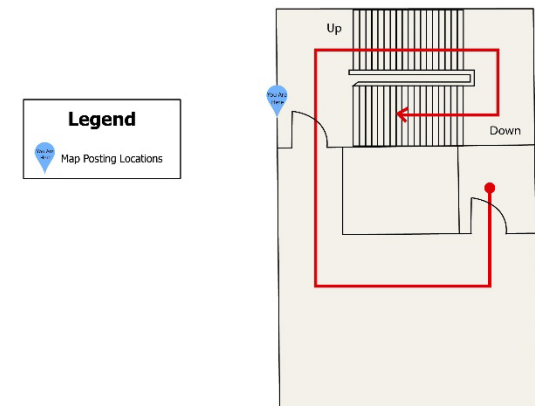
Emergency  
Evacuation  
Routes: City Hall



Emergency Evacuation Routes: Grant Harris



Emergency Evacuation Routes: Municipal Building  
Floor Three

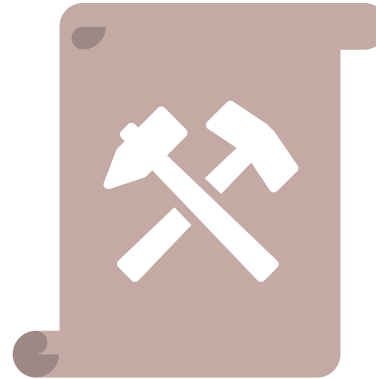


# Results:

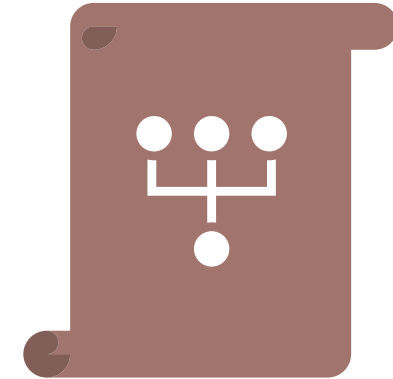
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**SOP WORKFLOW  
REPRODUCIBILITY**



**PYTHON TOOLBOX  
CREATION FOR EVAC  
ROUTE MAPS**



**STANDARDIZED  
SYMBOLLOGY FOR  
COSM MAPS**





**MUNICIPAL BUILDING**  
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Wrapping Up



# Discussion:

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Data challenges due to outdated or inaccurate building floorplans



Ground truthing is required for future mapping



Recommendation to follow Standard Operating Procedure



Future Python code could be developed to automate the pre-processing of the tool box



More efficient placement of static maps in CoSM buildings

# Limitations:

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Accessibility to full study area

Project scope larger than anticipated

Human error impact



Deputy Marshall Room in Grant Harris

Ground Truthing



Proper uniform  
evacuation standard  
and efficient navigation  
amongst all CoSM  
buildings



Safety for the Citizens  
and Staff of San Marcos  
in Emergency Situations



Data validity allows for  
timely and Safe  
emergency evacuation

Conclusion:



Question / Comments