



***E**vacuation
Analysts
for
Geo-Referenced
Locations
and
Events*

***Project Manager**
Justine Williams*

***Assistant Manager**
Joshua Bridges*

***Web Master**
Alexander Nankervis*

***GIS Analysts**
David Smith
Clayton Holbrook*

San Marcos Flood Analysis

Report prepared by:

***E**vacuation*

***A**nalysts*

for

***G**eo-Referenced*

***L**ocations*

and

***E**vents*

Table of Contents

1. Introduction	1
2. Literature Review	2
2.1 San Marcos Flood Report	3
2.2 San Marcos History	3
3. Data	4
4. Methodology	7
5. Results	10
6. Discussion	11
7. Conclusion	14
8. References	15
9. Flowcharts	16
10. Metadata	20
11. Contributions	32
12. Maps	33

1. Introduction

Due to a unique set of geomorphologic and hydrological aspects the residents of San Marcos, TX are always under the possible threat of flooding. In October of 1998, the town received almost thirty inches of rainfall in a two-day period. This caused the San Marcos and Blanco rivers to reach near 100-year flood levels in some areas throughout the city. The rising flood waters proved to be dangerous for citizens and city officials alike. Residents were forced to evacuate their homes and navigate dangerous roadways. The city also received almost two hundred calls for assistance during the flood event, and in some instances citizens and emergency crews were forced to perform dangerous rescues. Also, certain sections of the city were cut off by the food waters, this leaving some residents and emergency crews stranded.

E.A.G.L.E. believes that the GIS analysis and recommendations provided in this report can help city officials and citizens minimize the adverse affects during a major flood event.

2. Literature Review

2.1 San Marcos Flood Report

The City of San Marcos has produced an historical account of the 1998 flood entitled: “October 1998 Flood Report”. This report was compiled in October of 1999. From this we were able retrieve information pertaining to damage assessment, evacuation operations, and rescue operations used to extract victims of the flood. There was also an accurate time-line depicting rain gauge readings for every half-hour to hour for October

17, 1998. We also looked at the San Marcos Road Improvement Plan for details concerning road improvements and alterations.

2.2 History of San Marcos

The City of San Marcos is built upon a transition area between the limestones which make up the Hill Country and Edwards Plateau to the west and the Blackland Prairie to the east. Separating these two areas is the Balcones Fault System. The age of the limestones dates back to the Cretaceous time period or 100 million years ago. The Blackland Prairie is around 25 million years younger (Spearing, 1991). The Balcones Fault System was active in Miocene time around 15 million years ago (http://en.wikipedia.org/wiki/Balcones_Fault, 2005).

During Miocene time or 5-24 million years ago the Balcones Fault System was formed as the area west of the fault began to uplift, resulting in the formation of the Hill Country and Edwards Plateau. This geologic event was part of a larger one that raised the Colorado Plateau and began the Rio Grande Rift (Spearing, 1991).

This uplift event was essential to the future settlement along the San Marcos River. The faulting resulted in the formation of springs along the Balcones Fault System. The springs of importance in this study are San Marcos Springs. This spring is the headwater for the San Marcos River, which has been attracting people to this area for thousands of years. The history of San Marcos itself is much younger.

While searching for the French explorer LaSalle, the group lead by Alonso de Leon came upon what would be called San Marcos Springs. This was on St. Mark's Day in the year 1689, which is the namesake for San Marcos Springs (www.sanmarcosriver.org/sanmar.htm, 2005).

In 1844, the Vice President of the Republic of Texas, General Edward Buleson decided to create San Marcos as a settlement. In the year 1848, San Marcos was designated the county seat for Hays County. In 1851, San Marcos was a 640 acre area close to the San Marcos River. From the beginning San Marcos has had to deal with the threat flooding (www.sanmarcosriver.org/sanmar.htm ,2005). As time has gone by and more land has been turned to impervious cover, the threat of flooding has increased.

3. Data

1. San Marcos DOQQs (Digital Ortho Quarter Quadrangles) and city limit
Available from TNRIIS (<http://www.tnris.state.tx.us/digital.htm>)
2. Census 2000 Hays County TIGER/Line data (census blocks, roads network)
Available from ESRI (http://www.esri.com/data/download/census2000_tigerline/)
3. Census 2000 block group data
Available from the U.S. Census Bureau (<http://factfinder.census.gov>)
4. San Marcos 100 and 500 year flood planes, 1998 flood damage, neighborhoods, and Hays County streams
Acquired from City of San Marcos
5. Low water crossings
Digitized based on map available from Hays County Office of the Road Engineer (<http://engineering.co.hays.tx.us/dwc/WaterCrossingMaps.php>) and through field investigation of known sites around San Marcos
6. San Marcos schools, fire stations, hospital, and shelter locations
Digitized with the assistance of aerial photographs

Software:

1. ESRI ArcGIS 9.1
2. Microsoft Office 2003
3. Microsoft Windows XP

4. Methodology

Our goals for data analysis were to locate road segments that may be underwater during a major flood and then determine fire rescue service areas and evacuation shelter coverage. Also, additional consideration was given to the correlation between race and flood damage, as well as areas of poverty in San Marcos.

In our analysis we considered the 100- and 500-year floodplains, as identified by FEMA, and their interaction with the San Marcos road network. To determine the roads that would potentially become inaccessible during a flood event, we used the 100-year floodplain to remove sections of the road network that overlapped into flooded areas. This provided us with a road network that contained only roads that would be safe for use during a major flood event.

Using the safe roads network, we were able to analyze the availability of both fire rescue and evacuation services for the residents of San Marcos. We determined that San Marcos is divided by the floodplains into four major regions of service. One region in particular, the northeast section of the city, is lacking service from both fire stations and evacuation centers. Based on this discovery, we proposed the placement of a new fire station, as well as a new evacuation center. The proposed fire station location was decided based on

availability of land and access to the northeast service area. The evacuation shelter was located based on the availability of a large structure outside of the floodplains, in this case Bobcat Stadium.

The service area analysis also revealed that some sections of the city can become isolated during a major flood. Using the roads network, floodplains, and knowledge of water crossings in the area, we identified several locations that, during a major flood, can prevent access to an area of the city. Road improvements at these locations might prevent the lack of access that results from a severe flood event.

In addition to our analysis of service areas in San Marcos, we also investigated the correlation between race and damages from the 1998 flood. To do this, we first calculated the percentage of each race per census block. We also calculated the total and average amount of flood damage per census block, based on damage severity values that we assigned to the qualitative damage values from the 1998 flood. From these two values, we calculated the correlation between race and flood damage by multiplying the race population percentage by the average damage. Higher resulting values indicate a higher correlation between race and flood damage.

We also attempted to find a correlation between poverty and the lack of fire rescue and evacuation service in the northeast section of the city. The most detailed poverty status tables available were only at the census block group level, which is not suitable for all areas of the city due to the generality and overlap between neighborhoods within block

groups. Despite this, the data was still usable enough in the northeast section of the city to draw some preliminary conclusions.

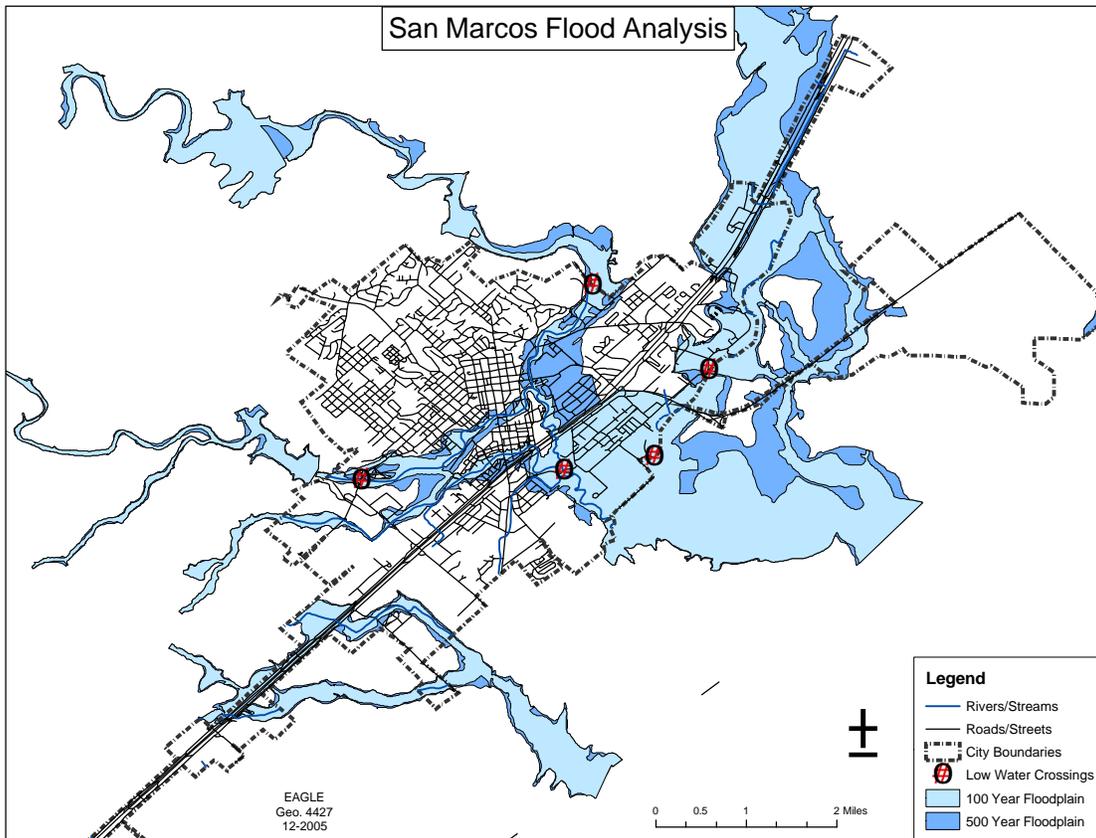
5. Results

The results of the analyses that were performed will be very useful to the City of San Marcos or anyone concerned with the welfare of the community and the mitigation of damage to property in the event of a flood. The ultimate goals of reducing loss of life and property, while identifying dangerous road intersections with flood waters, were realized by applying the tools and techniques available to EAGLE through GIS software at Texas State University. We have compiled a variety of maps that spatially display our findings, such as dangerous low water crossings and emergency rescue service areas. With GIS it is easy to see where there are “trouble” areas in the city during flooding. It also allows an analyst to see inconsistencies in the service areas of emergency rescue crews, accessibility to evacuation shelters and where there might be potentially correctable dangerous areas in the city during flooding events.

The first thing we did was to look for and research any comparables that might relate to or fall within the scope of the project. After searching the internet and the University and Public libraries for publications, we found some literature that provided information on the nature of flooding in and around the city. We were able to locate and obtain an historical report produced by the City of San Marcos that detailed the events that occurred on October 17, 1998. This was a day that San Marcos and the surrounding Hill Country experienced intense rainfall levels and flash flooding. The report contained no

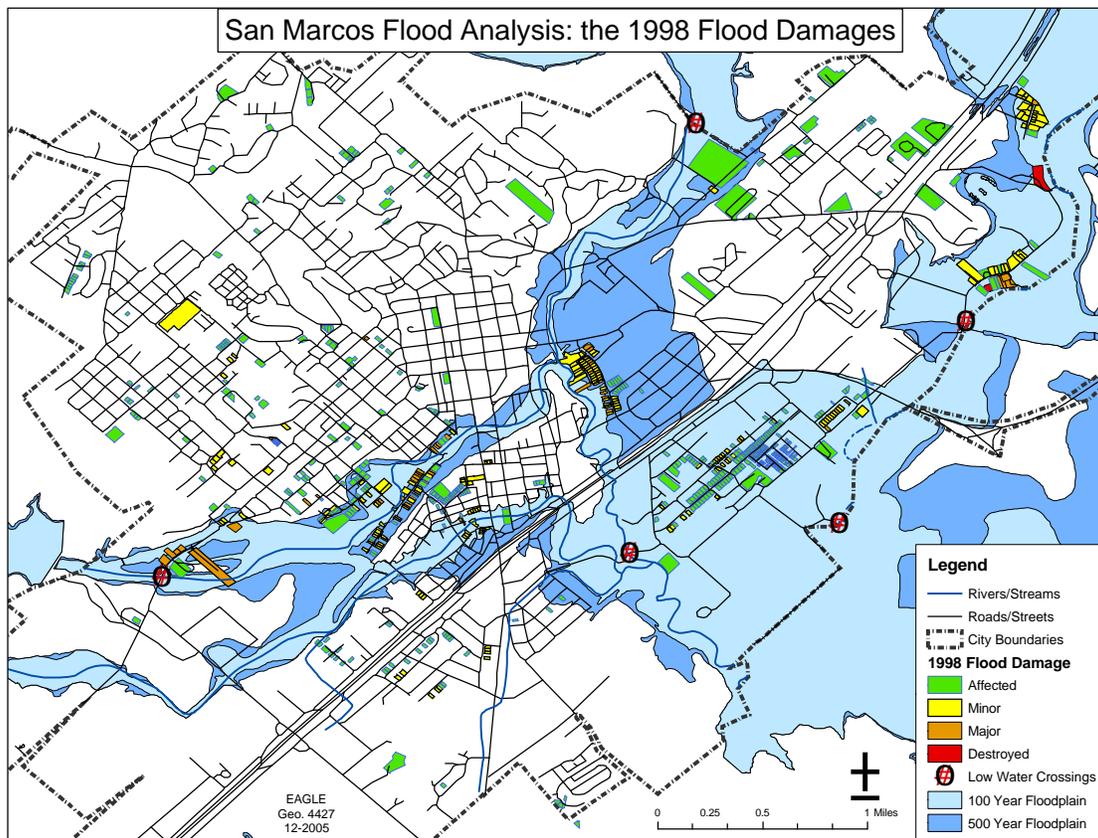
maps but had several narrative accounts listing, among other things, major search and rescue operations, evacuation operations, and rain gauge information. The report was well organized into four phases; Planning, Response, Recovery and Mitigation. This information was instrumental in understanding the severity of flooding in San Marcos. We were able to base a large part of the project on the findings and information made available by the city report. The library was aware of the project that we were doing and has requested a copy of the EAGLE reports to add to the city report. By using the historical information provided by the report, we were able to conduct an analysis of our own using spatial information to expand on the available knowledge in this area of disaster management.

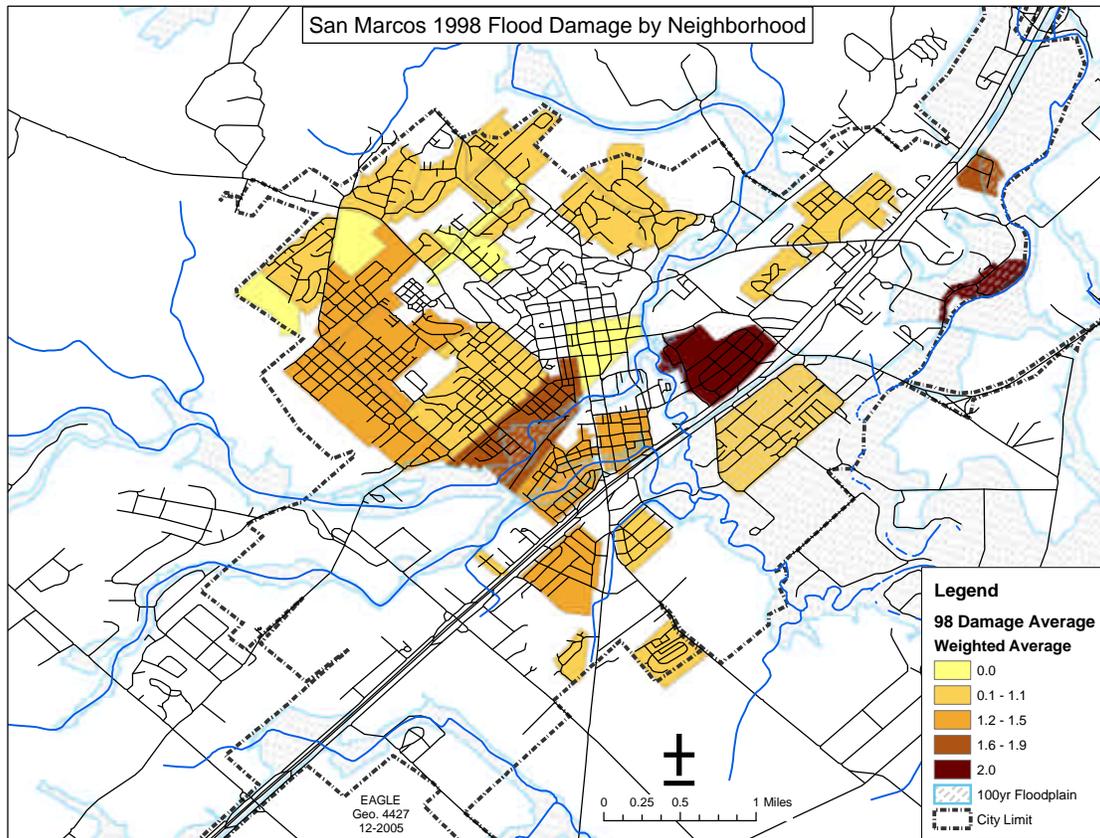
The first step was to create basic spatial representations with the data and information that had been collected through our research efforts. With respect to the goals of our desired results, using methods previously discussed, we created a basic map of the floodplains in relation to the city, the roads and low water crossings (see figure 1).



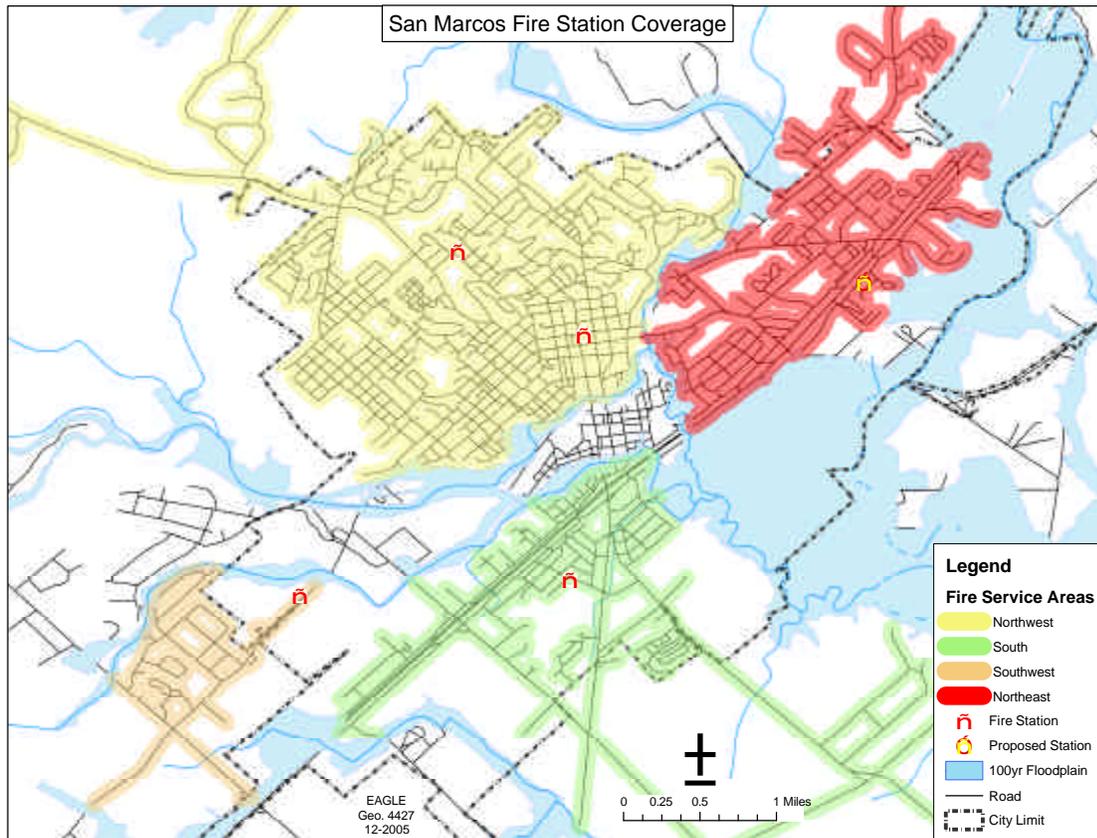
The objective of this map was to show where the floodplains intersected the city roads and low water crossings. This would show what parts of the city were inaccessible or isolated during flooding, while pointing out dangerous underwater roads that would need to be avoided by drivers and emergency crews.

The second map combined the results of the first map with data on reported flood damage to property in the October, 1998 flood. We assigned numerical values to the qualitative flood damage levels (1-4) based on the severity of the damage. A value of 1 would mean that the damage was very weak or low and a value of 4 meant that the structure was destroyed. We reclassified these numerical values on the legend of the map as (1-4) being: Affected, Minor, Major and Destroyed, respectively. This allowed us to calculate the average totals of damaged property for each neighborhood and census block.





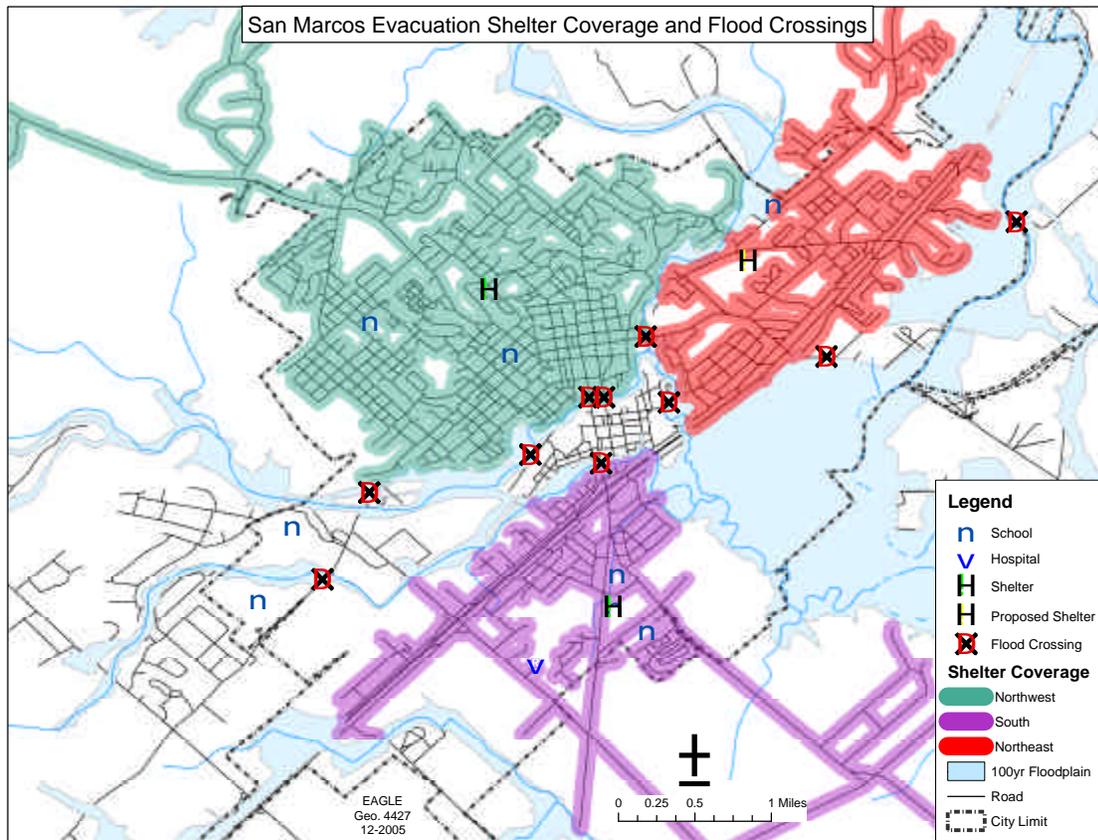
The results of the final maps that we created were key in exposing areas of the city that lack coverage by emergency crews. With the San Marcos Fire Station Coverage map we were able to show where there were “holes” in the rescue crew’s service areas. To evacuate people from these neighborhoods safely, there needed to be adequate coverage of the city for rescue crews to be able to enter and extract those in need of help. According to our network analysis we discovered that a large portion of the northeastern part of San Marcos was isolated from nearby fire rescue stations (outlined in red).



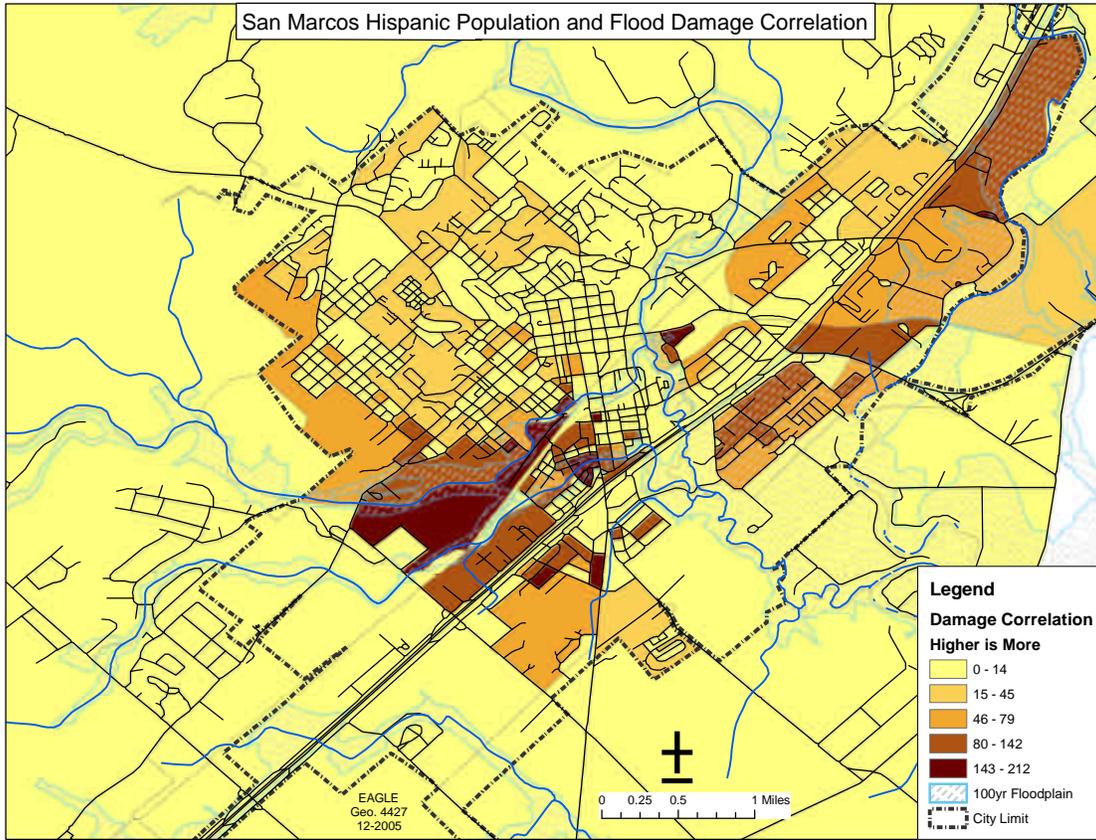
With this information, we were able to propose a new fire station on a lot owned and maintained by the city that is currently vacant along IH-35. A fire station in this location would service the area in northeast San Marcos that is cut-off, as of now, whenever a flood occurs. This would create the ability for a crew to respond effectively to a call originating on both the east and west sides of IH-35, to include the neighborhoods that border Aquarena Springs Drive.

The second map we created using the network analysis was of the evacuation shelters. To better facilitate evacuation during flooding, there need to be shelter in all of the areas of the city. The analysis was based on the same road network that the fire station analysis

was based on, so the areas lacking coverage (accessibility) to shelter were the same. It was thought that the most appropriate location for a northeastern evacuation shelter would be at Bobcat Stadium, considering that it has public restroom facilities and the capacity to hold evacuees (inside of the Jim Wacker field house). The area of coverage is outlined in red.



We also found that there was a correlation between areas of high Hispanic population and areas of high flood damage. We did not find any such correlation for the white and African American populations.



When we looked at the correlation between the percentage of the population living below the poverty level and the lack of fire rescue and evacuation center coverage in the northeast section of the city, we found some evidence that there is a relationship between the two. In order to say more conclusively that there is a correlation between the lack of service and poverty, we would need to perform analysis on a more detailed table of poverty status. The most detailed table available only has statistics for the census block group level, which is too general and influenced by overlapping neighborhoods in some areas of the city.

6. Discussion

The method for approaching these problems outpaced any other attempt to analyze this issue. The comparables that we found were just too basic to be of any use in proactively reducing the damage that occurred and chaos that ensued in October of 1998. There were virtually no maps ever made to explain, on a spatial level, the factors that created the disastrous conditions that crippled San Marcos when flash flooding is happened. If we had the opportunity to repeat or continue this project, we would attempt to build our own “flood model” to ensure more accuracy of the floodplain. Also, we would rethink the proposed locations for new fire station and evacuation shelter to service the northeastern part of the city. We would hold these proposals to a more analytical approach so that these locations would more effectively serve those in need of them the most. We could look more closely at population density to discover areas that might be disadvantaged when it comes to rescue operations and uncover the reasons that these areas are “behind” the rest of the city.

We would also like to speak with city officials and engineers to attempt to improve roads and low water crossings that pose a threat to life or that simply isolate areas of the city. With the help of an expert in this subject, we could use the locations that have already been identified by our analysis and develop a plan to fix, reroute, or rebuild roads to eliminate these problems all together. With advice from city officials we could create a tentative budget to make such road alterations a reality, thus improving the quality of emergency response in situations similar to the October flood of 1998.

7. Conclusion

The City of San Marcos will flood again, and city officials and residents will have to cope with the consequences of the flood. Emergency operations plans will be implemented and momentary decisions will be made that will directly affect the safety of citizens and their property. E.A.G.L.E. believes that our analysis can help both the emergency operations planning and the decisions that are made during a flood event in the City of San Marcos, and as a result reduce damages in terms of loss of life, displacement of residents, and lack of equity among citizens.

8. References

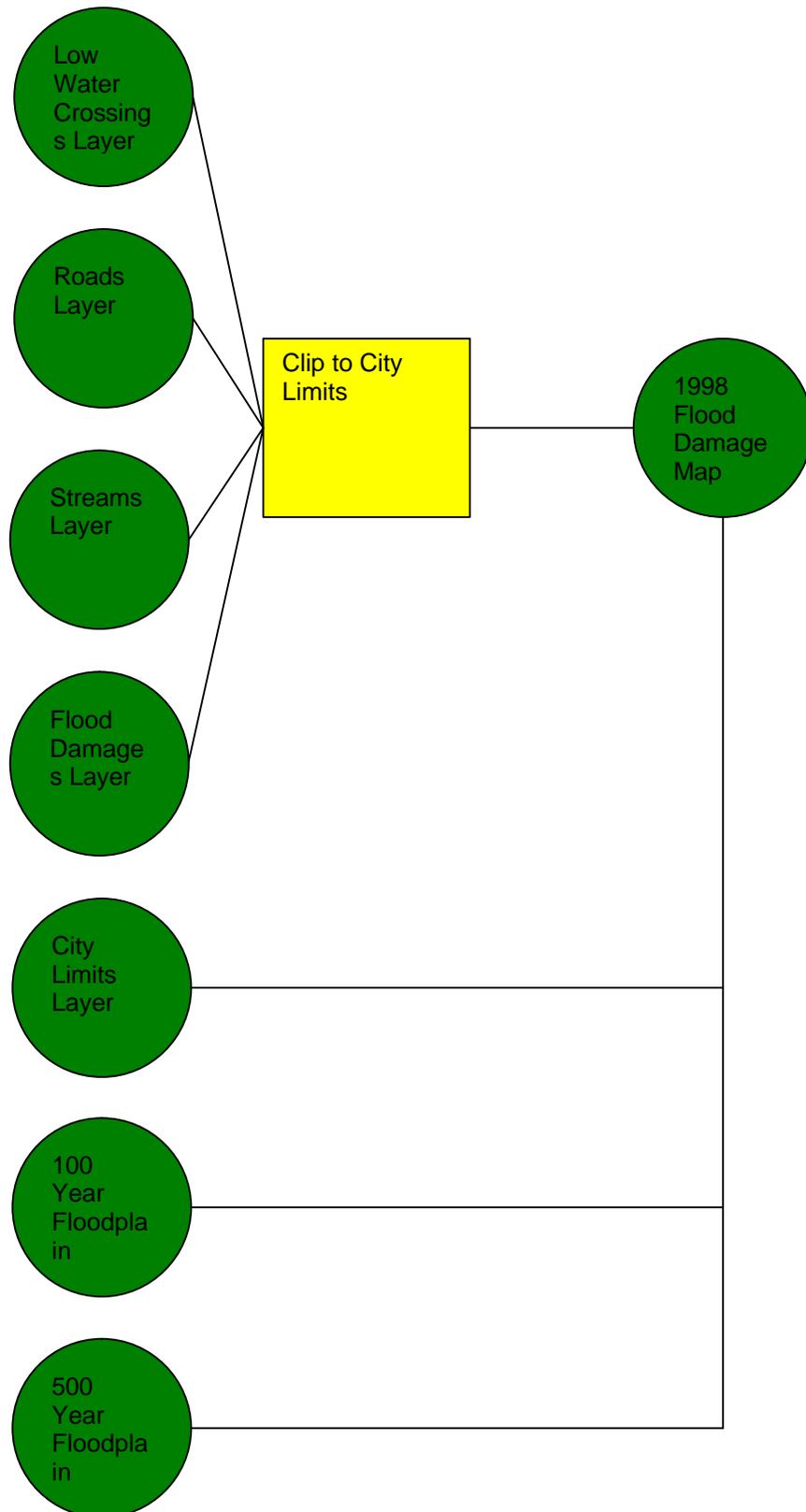
Balcones Fault. Wikipedia. http://en.wikipedia.org/wiki/Balcones_Fault, 2004.

October 1998 Flood. San Marcos, Tx., October, 1999.

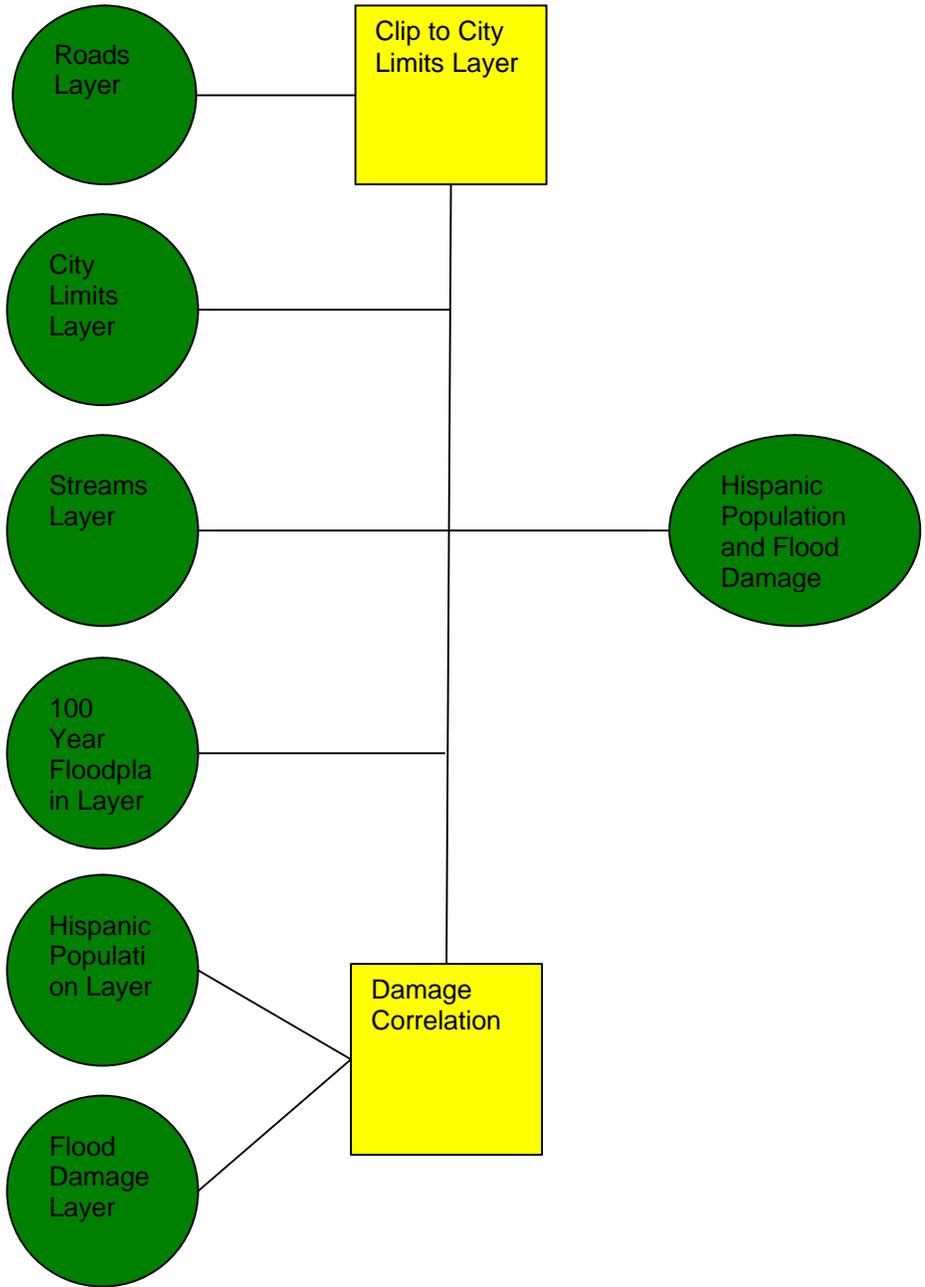
Roadside Geology of Texas. Darwin Spearing. Mountain Press Publishing Company, Missoula, Mt. 1991, page 85.

San Marcos City Profile. San Marcos River Foundation.
www.sanmarcosriver.org/sanmar.htm, 2005.

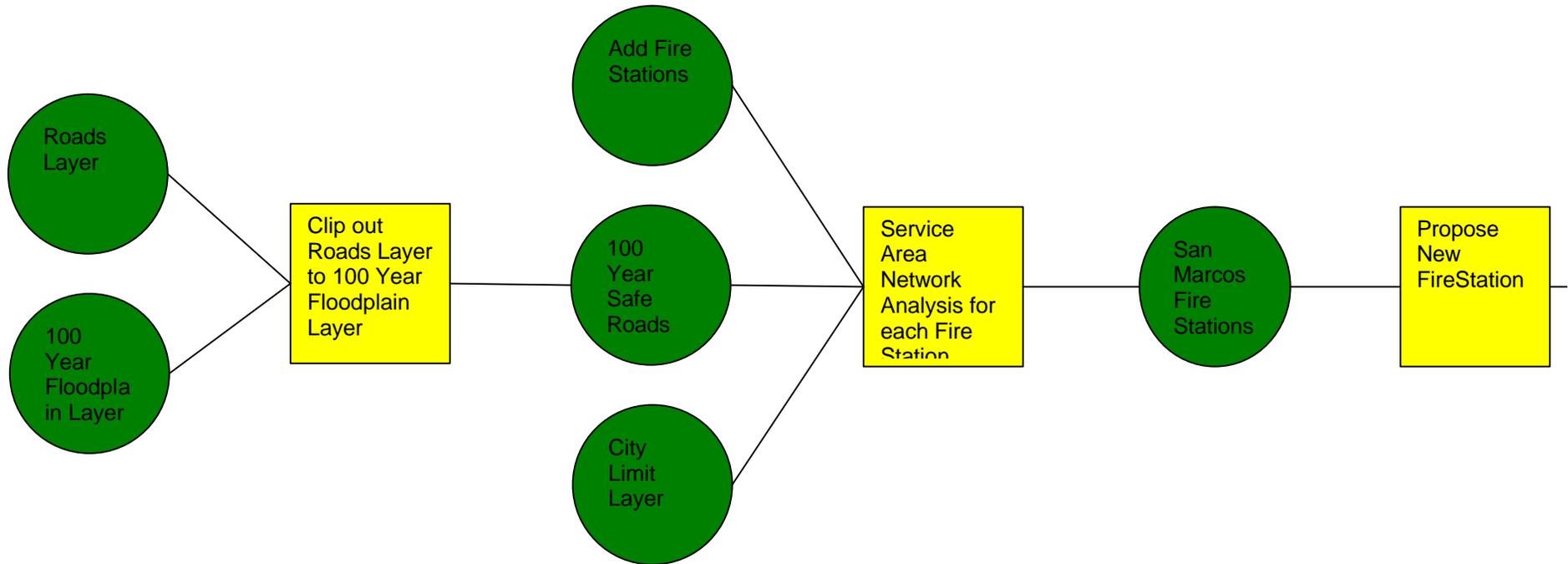
San Marcos Flood Analysis: The 1998 Flood Damages



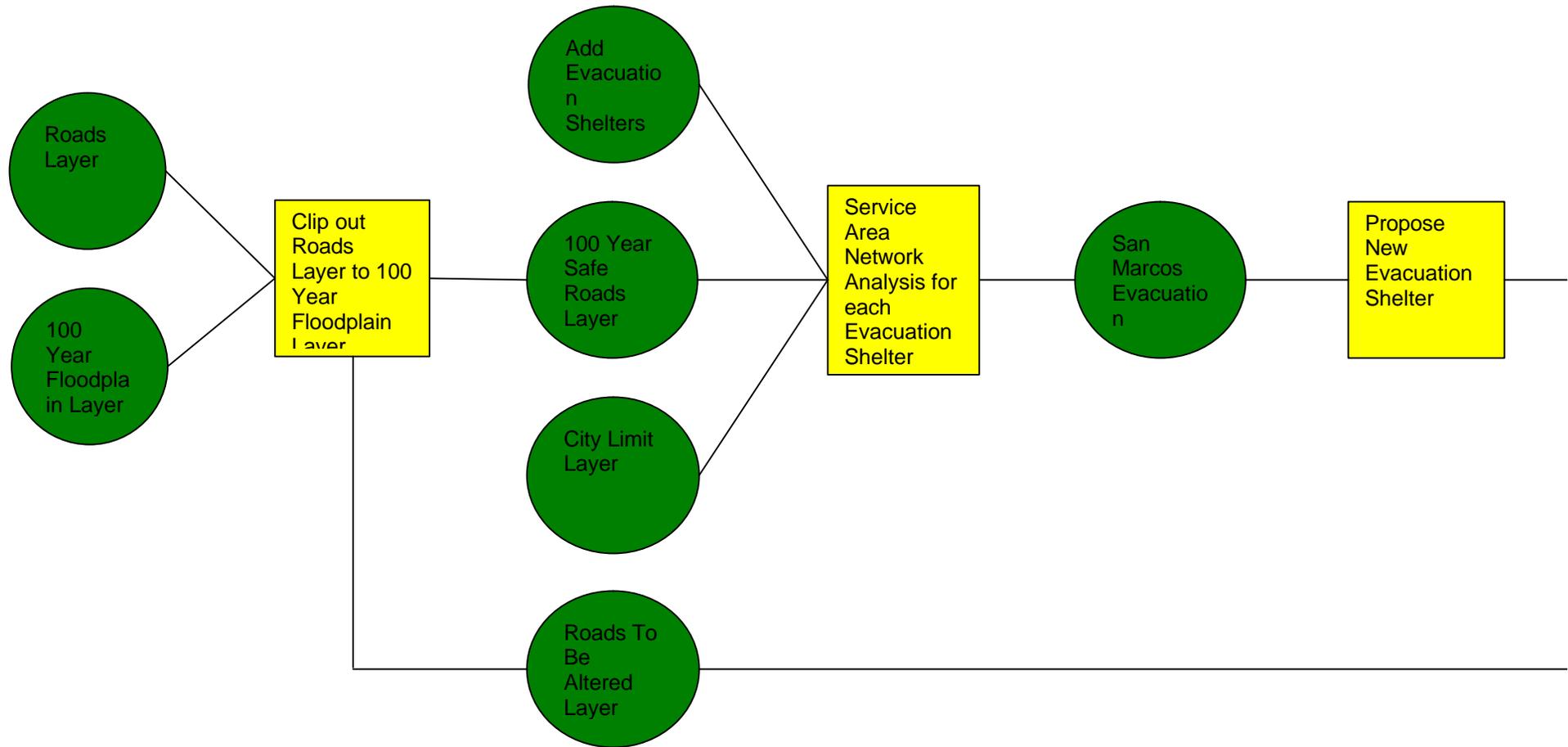
San Marcos Hispanic Population and Flood Damage Correlation



San Marcos Fire Station Coverage



San Marcos Evacuation Shelter Coverage and Flood Crossings



Metadata:

Identification_Information:

Citation: Hays_Streams.shp

Citation_Information:

Description:

Abstract: Texas Streams

Purpose: Graphic Representation of Texas streams.

Supplemental_Information:

Time_Period_of_Content:

Time_Period_Information: *Beginning date and time:* January

Ending date and time: December

Currentness_Reference:

Status:

Progress: Complete

Maintenance_and_Update_Frequency:

Spatial_Domain:

Bounding_Coordinates:

Data_Set_G-Polygon:

Access_Constraints: This data has been prepared for internal use within the Texas Department of Transportation. Accuracy is limited to the validity of available data.

Use_Constraints: This data is for mapping and planning purposes only. It is not to be used to develop any engineering products.

Point_of_Contact:

Contact_Information:

Information Systems Division - GIS

Texas Department of Transportation

mailing address:

125 E. 11th Street

Austin, Texas 78701-2483

USA

512-465-3618 (voice)

512-465-7668 (fax)

ISD-GIS-Support@dot.state.tx.us

Hours of service: 8:00-5:00

Data_Set_Credit:

Security_Information:

Security_Classification_System:

Security_Classification:
Security_Handling_Description:
Native_Data_Set_Environment:
Cross_Reference:
Citation_Information:

Data_Quality_Information:

Attribute_Accuracy:
Attribute_Accuracy_Report:
Quantitative_Attribute_Accuracy_Assessment:
Logical_Consistency_Report:
Completeness_Report:
Positional_Accuracy:

Horizontal_Positional_Accuracy: This data has been prepared for internal use within the Texas Department of Transportation. Accuracy is limited to the validity of available data.
Estimated accuracy: +/- 100 Feet

Vertical_Positional_Accuracy: This data has been prepared for internal use within the Texas Department of Transportation. Accuracy is limited to the validity of available data.

Lineage:

Source_Information:
Source 1: Stream
Currentness of this source
Date and time: 2002
Source 2: Stream

Process_Step:

Process step 1

Process description: Metadata imported.
Source used: D:\DOCUME~1\allardy\LOCALS~1\Temp\xml30C.tmp

Process step 2

Process description: Dataset copied.
Source used: Server=KIOWA; Service=SDE_KIOWA; User=AALLARDY;
Version=SDE.DEFAULT

Process step 3

Process description: Metadata imported.
Source used: d:\Temp\xml11F.tmp

Process step 4

Process description: Dataset copied.

Source used: Server=comanche; Service=sde_comanche; Database=ISD; User=ISD;
Version=ISD.ISD_GIS

Process step 5

Process description: Dataset copied.

Source used: Server=COMANCHE; Service=sde_COMANCHE; Database=ISD;
User=ISD; Version=ISD.ISD_GIS

Process step 6

Process description: Dataset copied.

Source used: Server=apache; Service=sde_apache; User=water;
Version=SDE.DEFAULT

Cloud_Cover:

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference:

Direct_Spatial_Reference_Method:

Point_and_Vector_Object_Information:

Raster_Object_Information:

Raster_Object_Type:

Row_Count:

Column_Count:

Vertical_Count:

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic: GCS_North_American_1983

Planar:

Local:

Geodetic_Model:

Horizontal Datum Name: North American Datum of 1983

Ellipsoid Name: Geodetic Reference System 80

Semi-major Axis: 6378137.000000

Denominator of Flattening Ratio: 298.257222

Vertical_Coordinate_System_Definition:

Altitude_System_Definition:

Resolution: 1.000000

Encoding Method: Explicit elevation coordinate included with horizontal coordinates

Depth_System_Definition:

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Attributes:

Overview_Description: Geodatabase Feature Class

Entity_and_Attribute_Overview:

Entity_and_Attribute_Detail_Citation:

Distribution_Information:

Metadata_Reference_Information:

Metadata_Date: 10/7/2005

Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: Neighbor.shp

Citation_Information: City of San Marcos

Description:

Abstract: City of San Marcos Neighborhoods

Purpose: geographic representation of San Marcos neighborhoods

Supplemental_Information:

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference:

Direct_Spatial_Reference_Method:

Point_and_Vector_Object_Information:

Raster_Object_Information:

Raster_Object_Type:

Row_Count:

Column_Count:

Vertical_Count:

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic: GCS_North_American_1983

Planar:

Local:

Geodetic_Model:

Vertical_Coordinate_System_Definition:

Altitude_System_Definition:

Depth_System_Definition:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005

Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: Flooddamage.shp

Citation_Information: City of San Marcos

Description:

Abstract: buildings that reported damage from the 1998 flood

Purpose: geographically show damaged buildings and classify there level of damage

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic: GCS_North_American_1983

Planar:

Local:

Geodetic_Model:

Vertical_Coordinate_System_Definition:

Altitude_System_Definition:

Depth_System_Definition:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005
Metadata_Contact:
 Contact_Information: E.A.G.L.E. fall 2005, Texas State University
Metadata_Standard_Name:
Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: FEMA_Hays.shp
 Citation_Information: City of San Marcos
Description:
 Abstract: Hays County flood plains
 Purpose: geographical show Hays County flood plains

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:
 Geographic: [GCS_North_American_1983](#)
 Planar:
 Local:
 Geodetic_Model:
Vertical_Coordinate_System_Definition:
 Altitude_System_Definition:
 Depth_System_Definition:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005
Metadata_Contact:
 Contact_Information: E.A.G.L.E. fall 2005, Texas State University
Metadata_Standard_Name:
Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: pl48_d00.shp
 Citation_Information: Texas Natural Resource Information System
Description:

Abstract: City of San Marcos, TX boundaries

Purpose: geographically show City of San Marcos, TX boundaries

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference:

Direct_Spatial_Reference_Method:

Point_and_Vector_Object_Information:

Raster_Object_Information:

Raster_Object_Type:

Row_Count:

Column_Count:

Vertical_Count:

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic: GCS_North_American_1983

Planar:

Local:

Geodetic_Model:

Vertical_Coordinate_System_Definition:

Altitude_System_Definition:

Depth_System_Definition:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005

Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: DOQQ

Citation_Information: TNRIS

Description:

Abstract: Digital ortho quarter quad photo of City of San Marcos

Purpose:

Supplemental_Information:

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference:
Direct_Spatial_Reference_Method:
Point_and_Vector_Object_Information:
Raster_Object_Information:
 Raster_Object_Type:
 Row_Count:
 Column_Count:
 Vertical_Count:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005
Metadata_Contact:
 Contact_Information: E.A.G.L.E. fall 2005, Texas State University
Metadata_Standard_Name:
Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: crossing_points.shp
 Citation_Information: Hays County Office of Road Engineer
Description:
 Abstract: Road river crossing points to geographically show
 Purpose: to geographically show road river crossing points

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:
 Geographic: [GCS_North_American_1983](#)
 Planar:
 Local:
 Geodetic_Model:
Vertical_Coordinate_System_Definition:
 Altitude_System_Definition:
 Depth_System_Definition:

Metadata_Reference_Information:

Metadata_Date:12/7/2005
Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University
Metadata_Standard_Name:
Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: [tgr482091kA](#)
Citation_Information: esri census tiger/line data
Description:
Abstract: Hays county roads
Purpose: geographical show hays county roads

Metadata_Reference_Information:

Metadata_Date: 12/7/2005
Metadata_Contact:
Contact_Information: E.A.G.L.E. fall 2005, Texas State University
Metadata_Standard_Name:
Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: [tgr48209blk00.shp](#)
Citation_Information: esri census 2000 tiger/line data
Description:
Abstract: Census block groups for Hays County
Purpose: geographically show Census block groups for Hays County

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference:
Direct_Spatial_Reference_Method:
Point_and_Vector_Object_Information:
Raster_Object_Information:
Raster_Object_Type:
Row_Count:
Column_Count:
Vertical_Count:

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Attribute:

Overview_Description:

Entity_and_Attribute_Overview:

Entity_and_Attribute_Detail_Citation:

Metadata_Reference_Information:

Metadata_Date: 12.7/2005

Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: [tgr48209grp00.shp](#)

Citation_Information: esri census 2000 tiger/line data

Description:

Abstract: Census 2000 Hays county block group

Purpose: geographically show Census 2000 Hays county block group

Metadata_Reference_Information:

Metadata_Date: 12/7/2005

Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: [fire_stations.shp](#)

Citation_Information:

Description:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005

Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: schools.shp

Citation_Information:

Description:

Abstract: City of San Marcos schools

Purpose: geographically show City of San Marcos schools

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference:

Direct_Spatial_Reference_Method:

Point_and_Vector_Object_Information:

Raster_Object_Information:

Raster_Object_Type:

Row_Count:

Column_Count:

Vertical_Count:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005

Metadata_Contact:

Contact_Information: E.A.G.L.E. fall 2005, Texas State University

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: hospital.shp

Citation_Information:
Description:
Abstract: Central Texas Medical Center
Purpose: geographically show Central Texas Medical Center
Supplemental_Information:

Metadata_Reference_Information:

Metadata_Date: 12/7/2005
Metadata_Contact:
Contact_Information: E.A.G.L.E. fall 2005, Texas State University
Metadata_Standard_Name:
Metadata_Standard_Version:

Metadata:

Identification_Information:

Citation: campus_rec.shp
Citation_Information:
Description:
Abstract: Texas State Student Activity Center
Purpose: geographically show Texas State Student Activity Center

Metadata_Reference_Information:

Metadata_Date: 12/7/2005
Metadata_Contact:
Contact_Information: E.A.G.L.E. fall 2005, Texas State University`
Metadata_Standard_Name:
Metadata_Standard_Version:

Contributions

Josh Bridges

He collected data from the internet and sources within the City of San Marcos. He worked on the budget part of the proposal. He assisted in creating all powerpoint presentations, and assisted with the network analysis by offering his opinion on how each map should appear. For the final report Josh prepared the discussion and results sections. He also edited all written products and the poster.

Clayton Holbrook

He worked on collecting data from the internet, City of San Marcos, and the River Institute on campus. He worked on the network analysis and picking the right map symbols for each map. He edited each piece of written material. He wrote the introduction and conclusion for the proposal and assisted with producing all the powerpoint presentations. Clayton also did the metadata for the final report along with the introduction and conclusion.

Alex Nankervis

He also worked on collecting data from the internet and City of San Marcos. He assisted the group in creating all powerpoint presentations. He worked on the network analysis. For the final report Alex produced the methodology and data sources sections. He assisted on the proofing of the poster design and also created the website. He provided valuable technical advice to all members of the group.

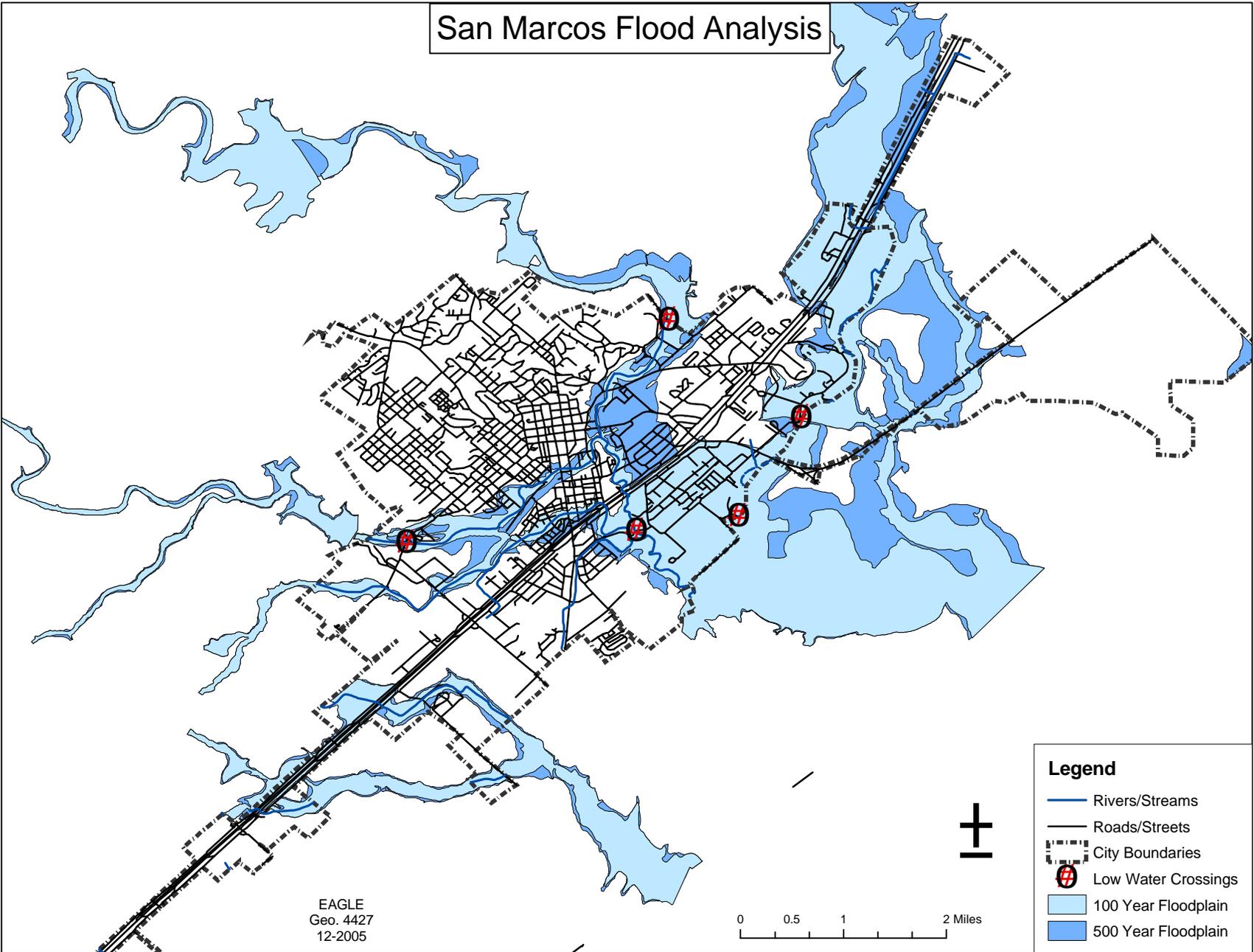
David Smith

He collected data from the internet, the City of San Marcos and also did library research. He constructed the timetable for the group. He assisted in creating all the powerpoint presentations. He assisted and produced maps. He also edited all written documents and the poster. He created the progress report. For the final report, David constructed a brief history of the San Marcos to be used in the introduction and constructed Appendix II.

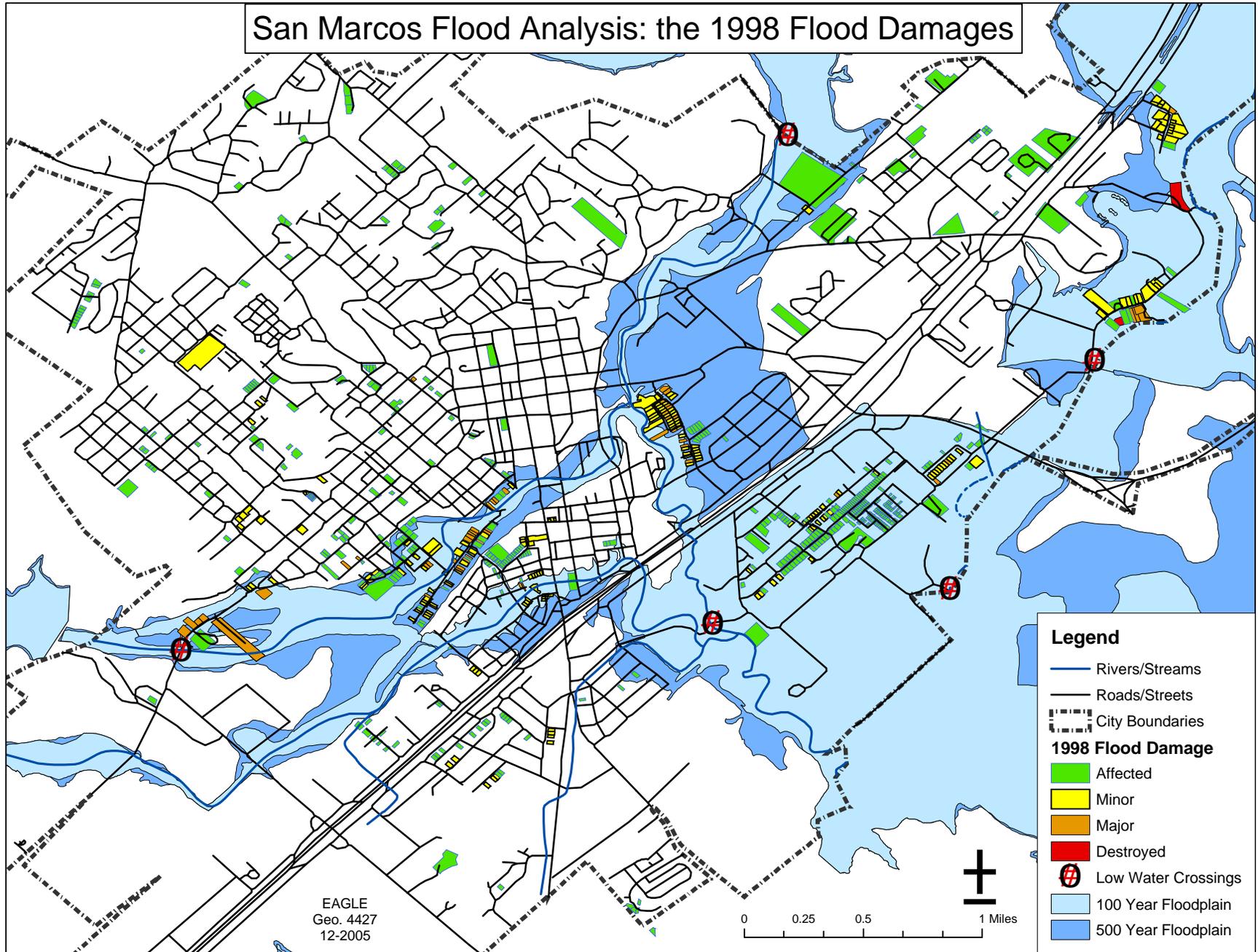
Justine Williams

She collected data on the internet and talked to people in the City of San Marcos, FEMA, and TxDot. She also did library research. She worked on keeping the group on schedule. She assisted and produced maps. She consulted with Dan about the best program for designing the poster. She then created the poster. She edited all written products. For the final report, Justine constructed the title page and table of contents.

San Marcos Flood Analysis

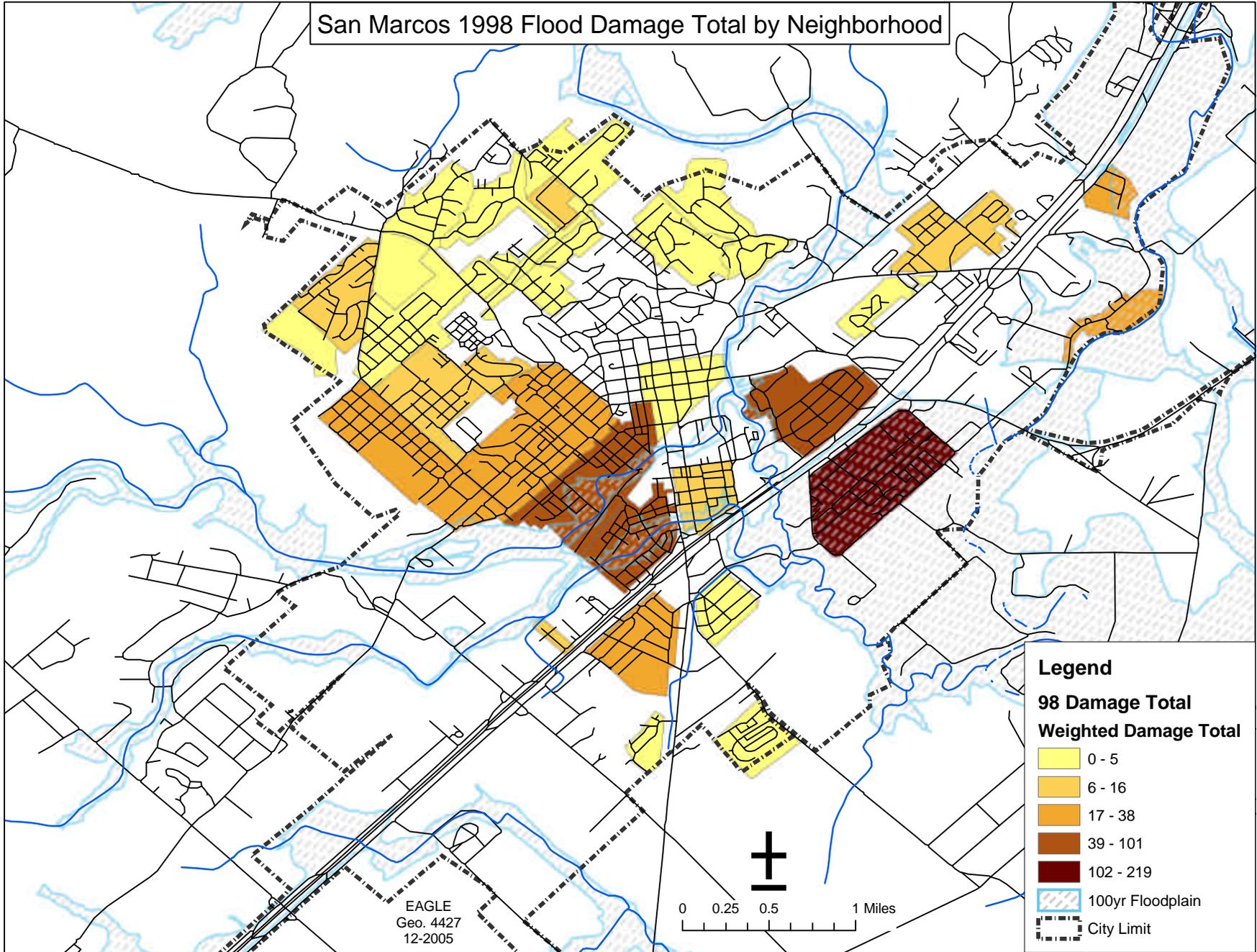


San Marcos Flood Analysis: the 1988 Flood Damages

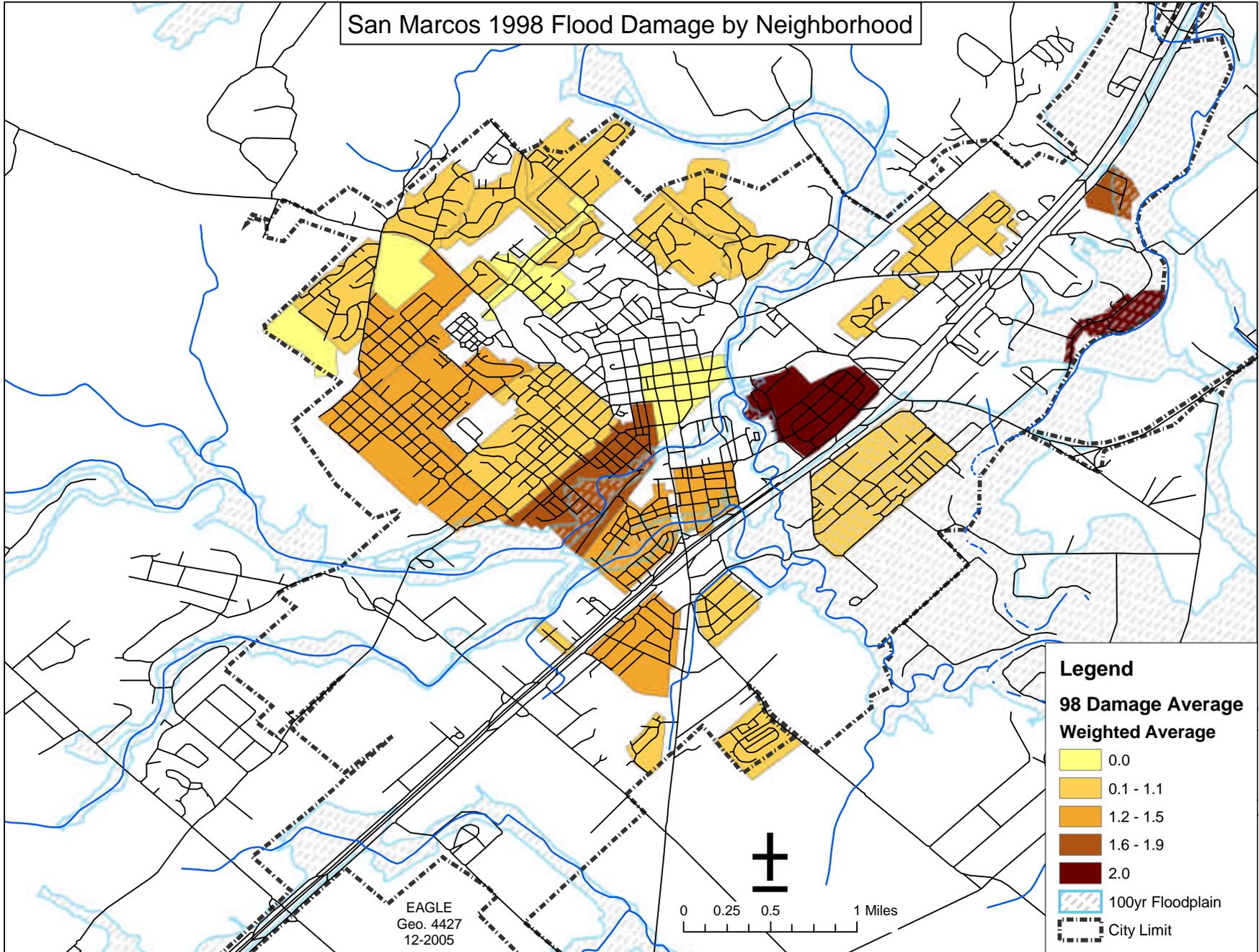




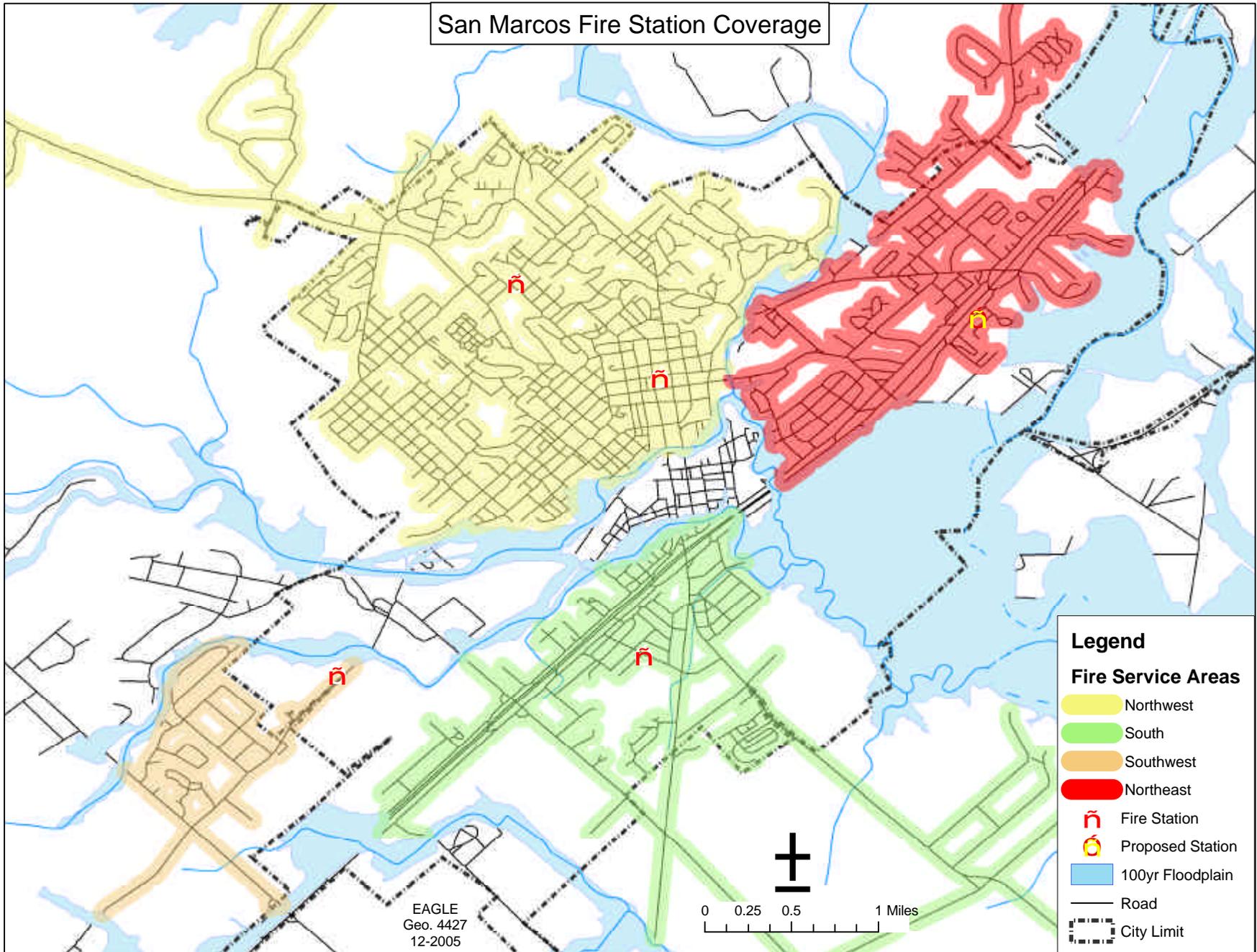
San Marcos 1998 Flood Damage Total by Neighborhood



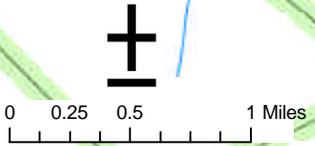
San Marcos 1998 Flood Damage by Neighborhood



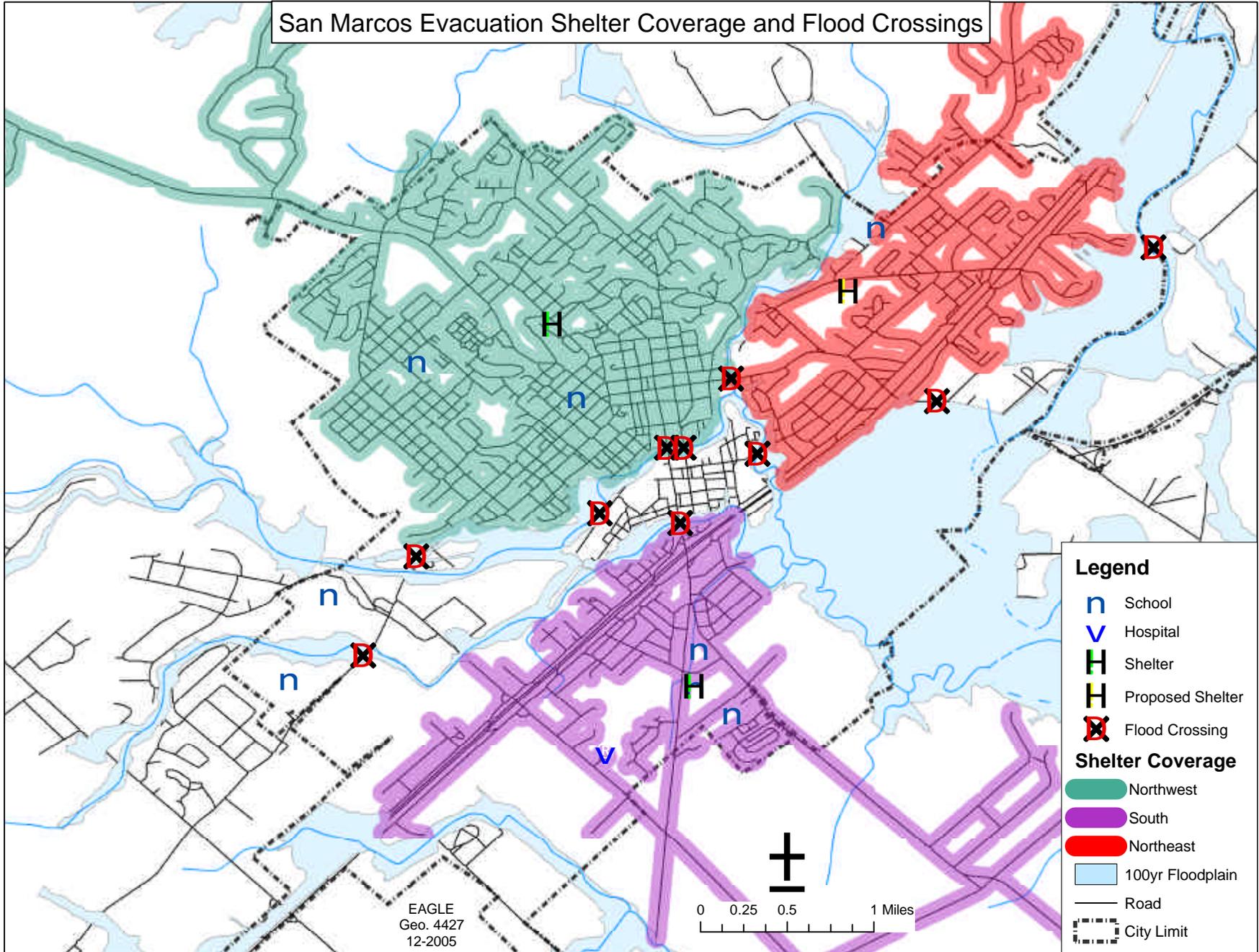
San Marcos Fire Station Coverage



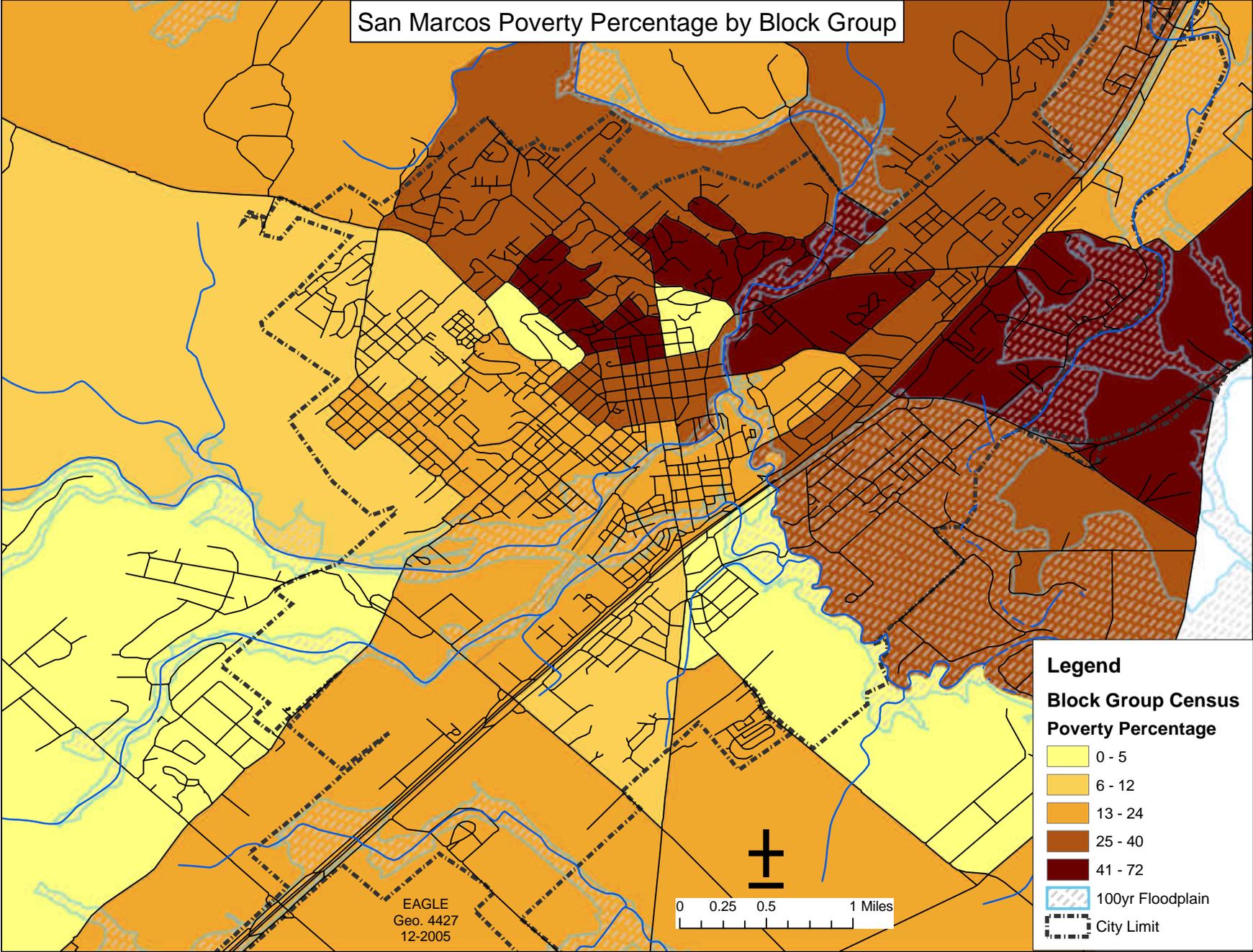
EAGLE
Geo. 4427
12-2005



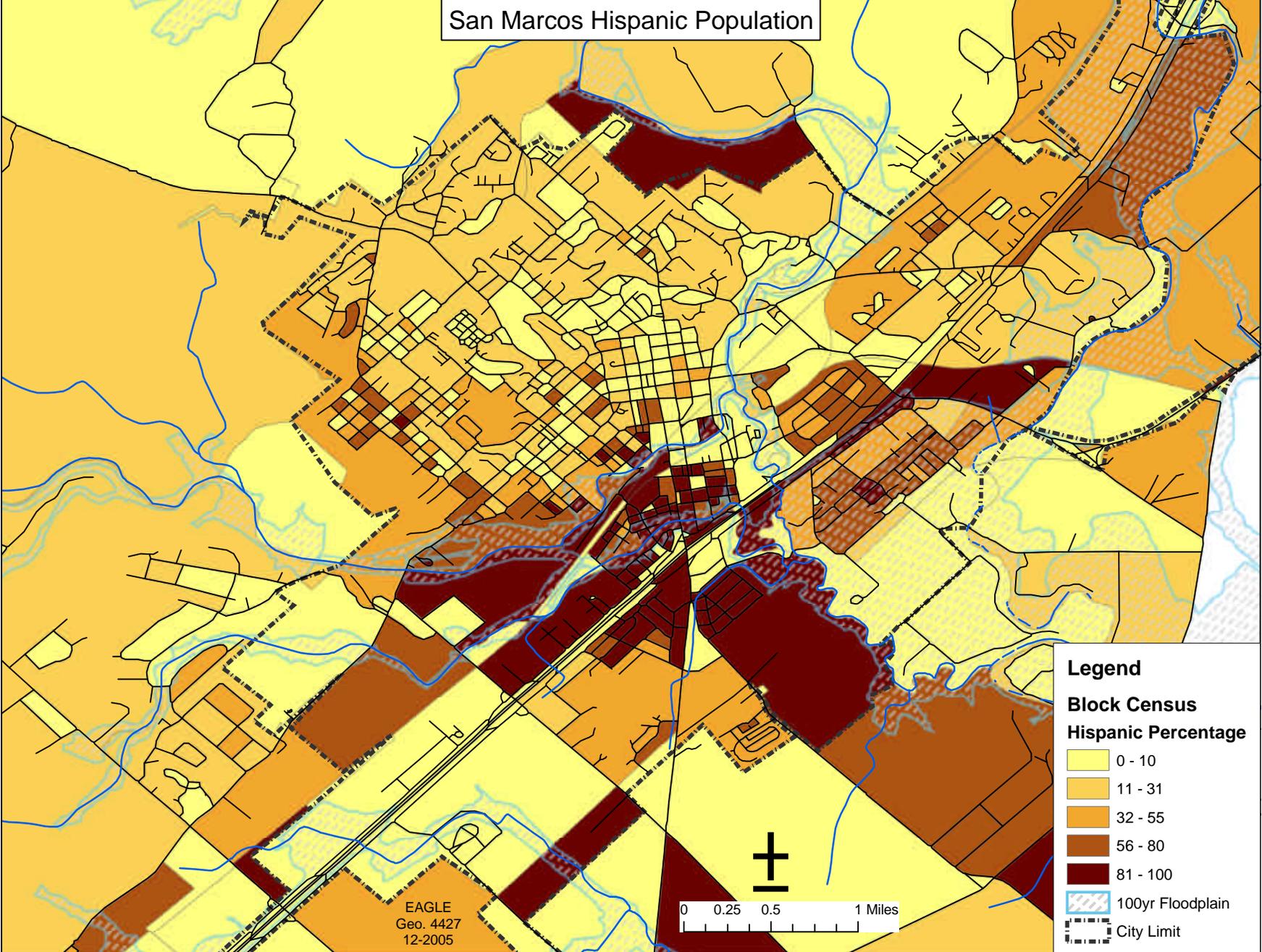
San Marcos Evacuation Shelter Coverage and Flood Crossings



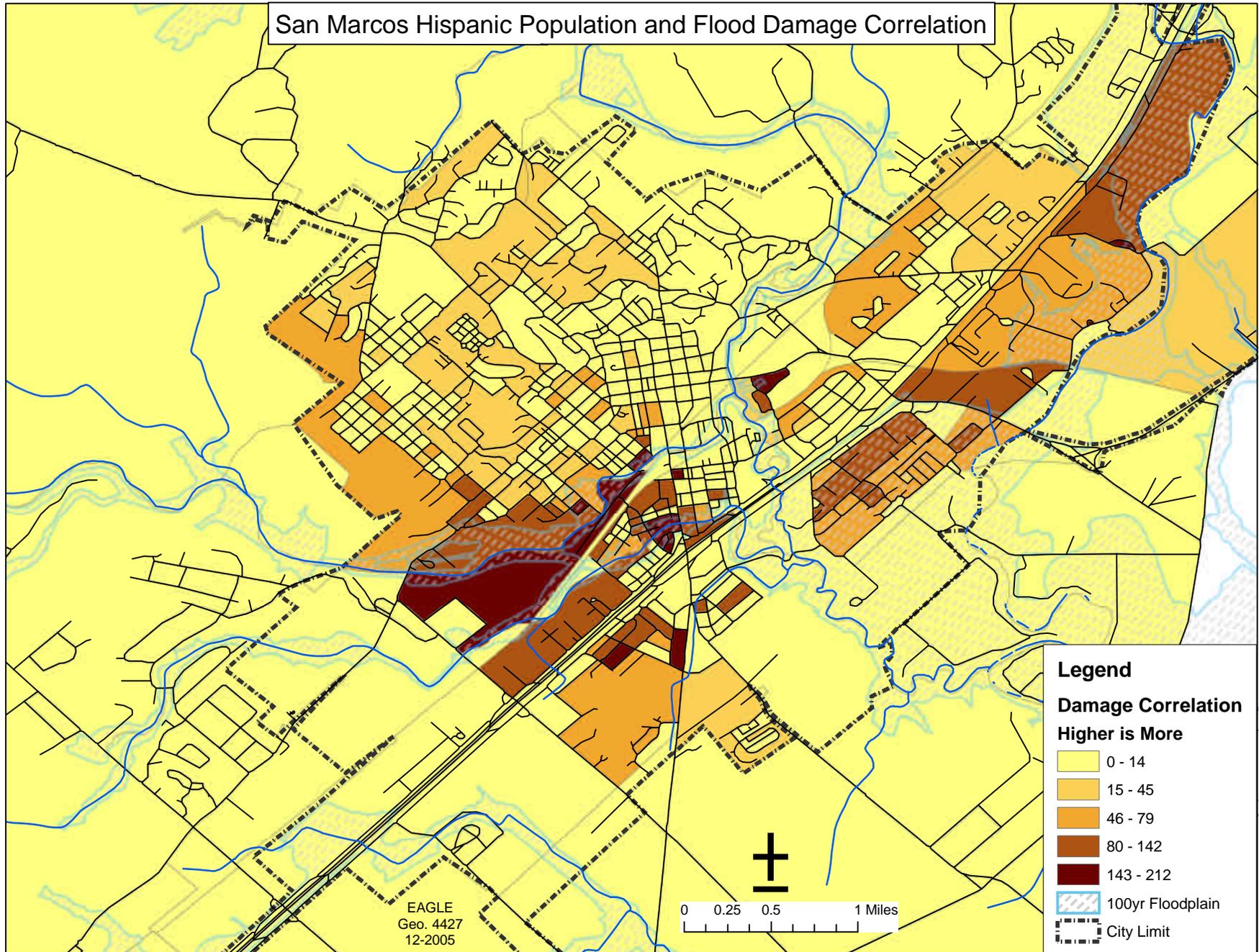
San Marcos Poverty Percentage by Block Group



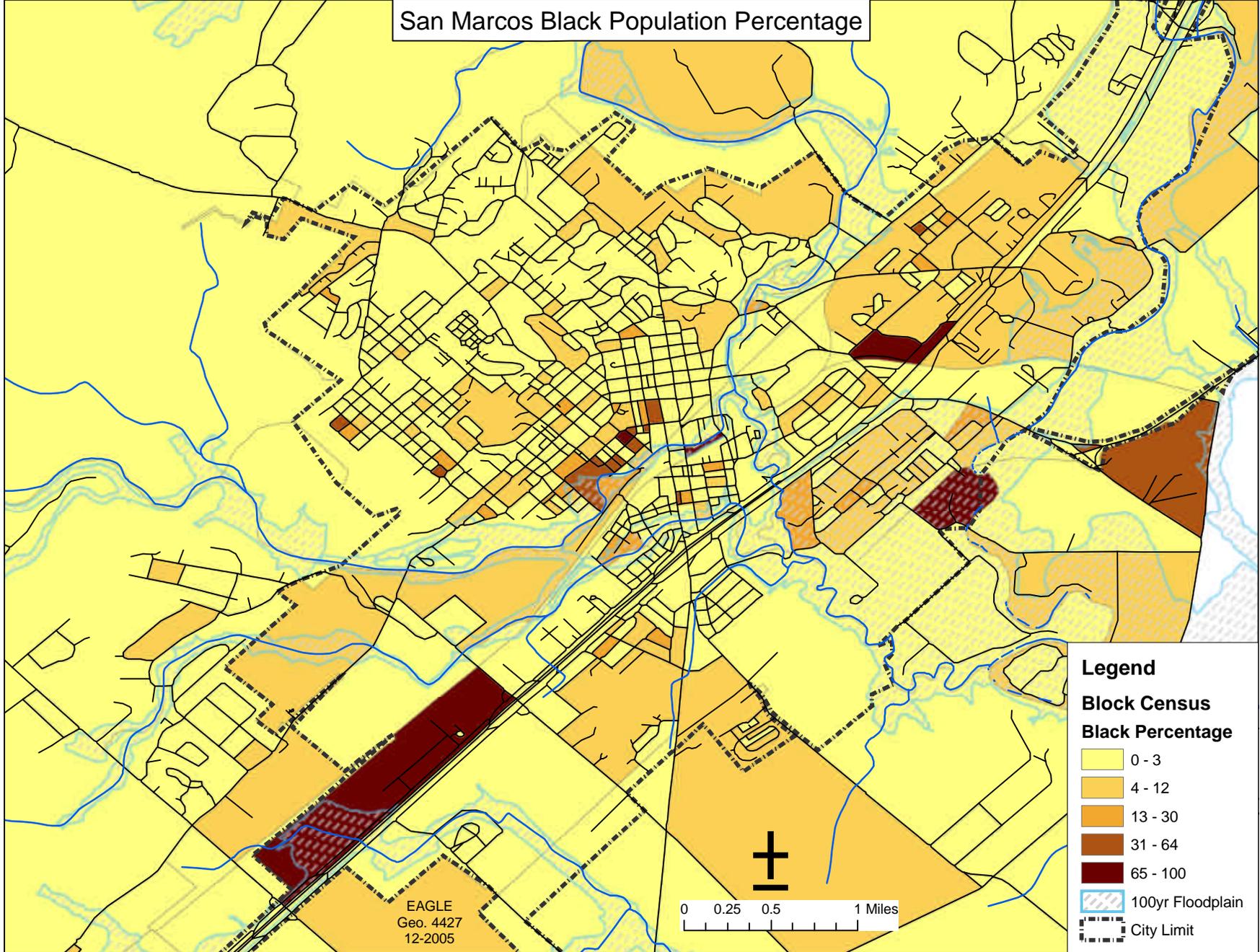
San Marcos Hispanic Population



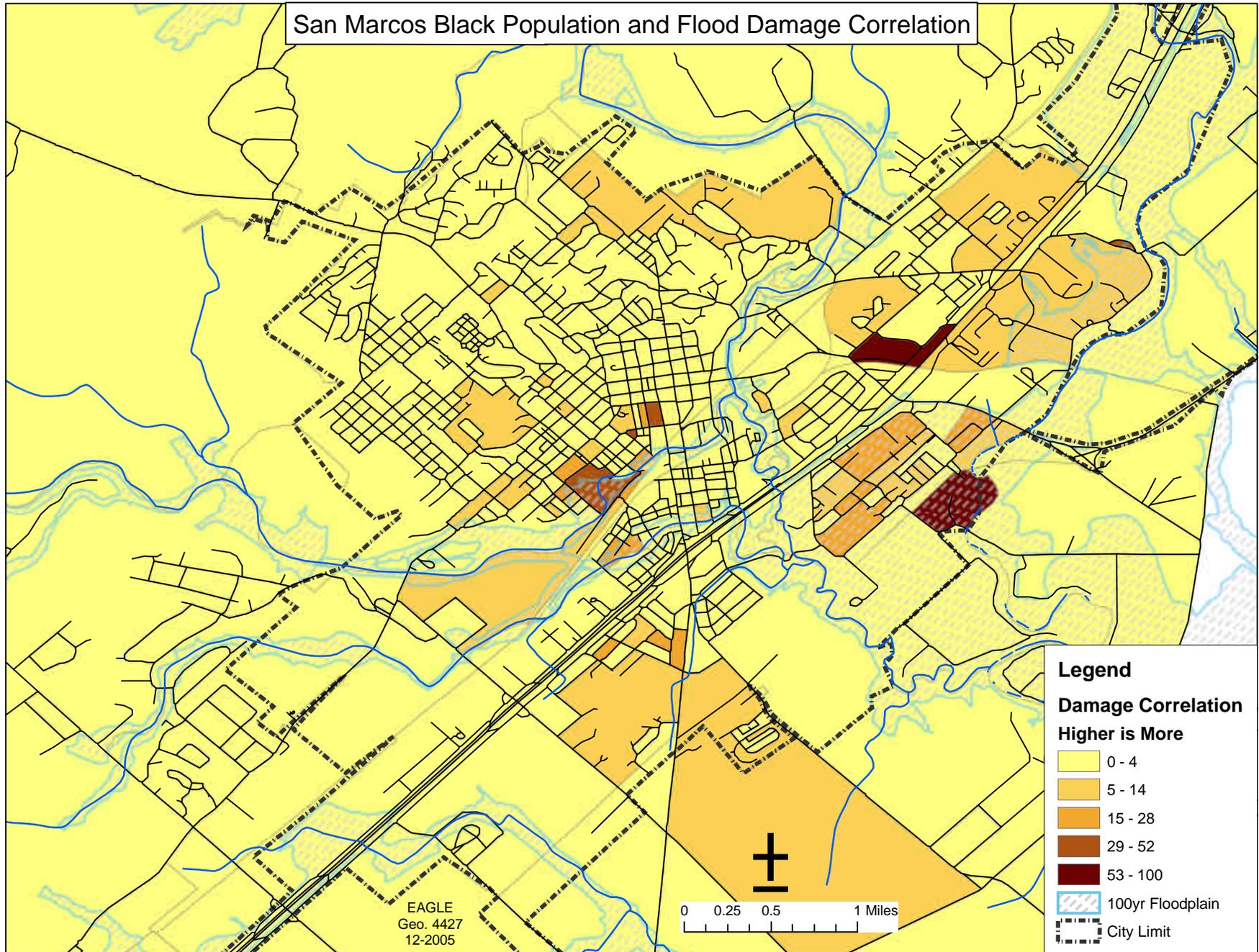
San Marcos Hispanic Population and Flood Damage Correlation



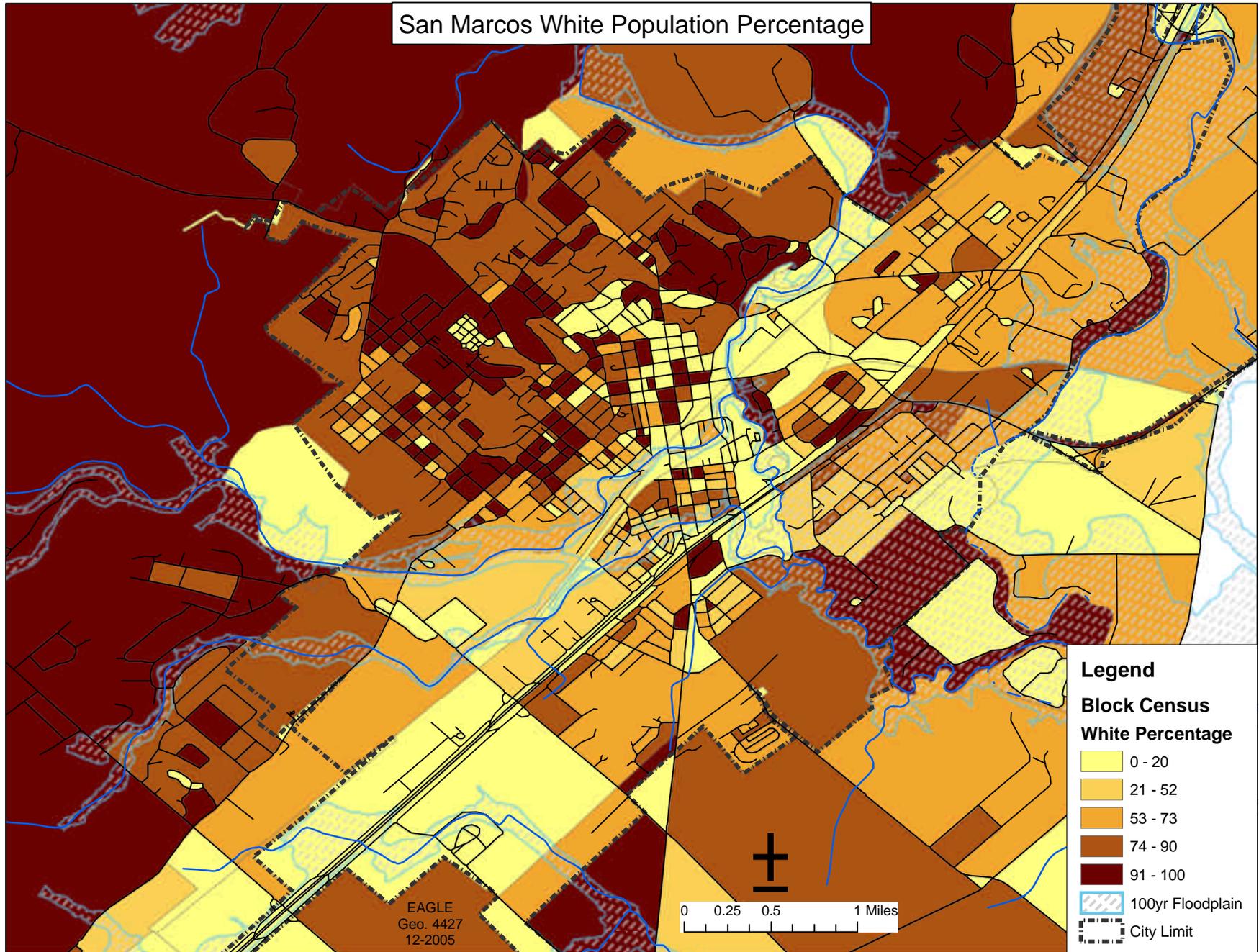
San Marcos Black Population Percentage



San Marcos Black Population and Flood Damage Correlation



San Marcos White Population Percentage



San Marcos White Population and Flood Damage Correlation

