Texas State University Campus Basemap Geodatabase Development Project:

Phase 1

Final Report Submission to the Texas State Facilities Department

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Abstract

Old Main Geospatial Solutions constructed a foundational geodatabase on behalf of Texas State University. This served as the first phase of a multi-year project migrating from a third-party mapping service to a fully in-house interactive map solution, allowing the university to have full control of data while saving tens of thousands of dollars a year. Using legacy data provided by our client as well as external data such as building floorplans, aerial imagery and TxDOT road data, our team constructed the new geodatabase with a rigorously standardized data schema and relevant attribute fields and domains for the newly created spatial data. Significant topological edits were made to ensure new linear feature classes (roads, sidewalk) were connected and ready for network wayfinding. The cleaned, standardized and topologically connected geodatabase produced through our work represents a substantive asset for the university and provides them with a platform upon which future spatial analysis can be done. Future recommendations include adding ADA relevant attributes to certain layers, integrating real-time parking data, network impedance modeling, and verification of building entrances.

1. Introduction

Old Main Geospatial Solutions was tasked by Texas State University – Facilities Management to create a foundational geodatabase that would be implemented in future creation of a university-owned and operated interactive map capable of wayfinding. This serves as Phase 1 of a multi-year project to migrate control of geospatial data to the university. Currently, the university uses a third-party company that provides mapping services at a premium. This also means that the third-party data provided does not belong to the university. Our finished project will give the university full control of the geospatial data as well as save the university tens of thousands of dollars a year in leasing costs.

With the university's future goal of building an in-house interactive map, our work in building the geodatabase is arguably the most important step. Time spent on geodatabase construction and data standardization is crucial for success in using GIS for analysis (Cao et al. 2024). Our geodatabase was structured into categories so that GIS software can recognize different attributes of the data and use techniques within the software to recognize patterns between data points. Data for the new database consisted of legacy data provided by the client that was cleaned, edited and standardized, as well as new feature layers built using additional resources such as aerial imagery, Google Earth street view, and Texas State University building floorplans.

The scope of the project has remained the same since our proposal, as seen in Figure 1. The order of tasks has changed minimally since proposing our work, and our main objective remains to create a geodatabase that can be implemented for creating a new university-owned campus map that supports wayfinding for users.

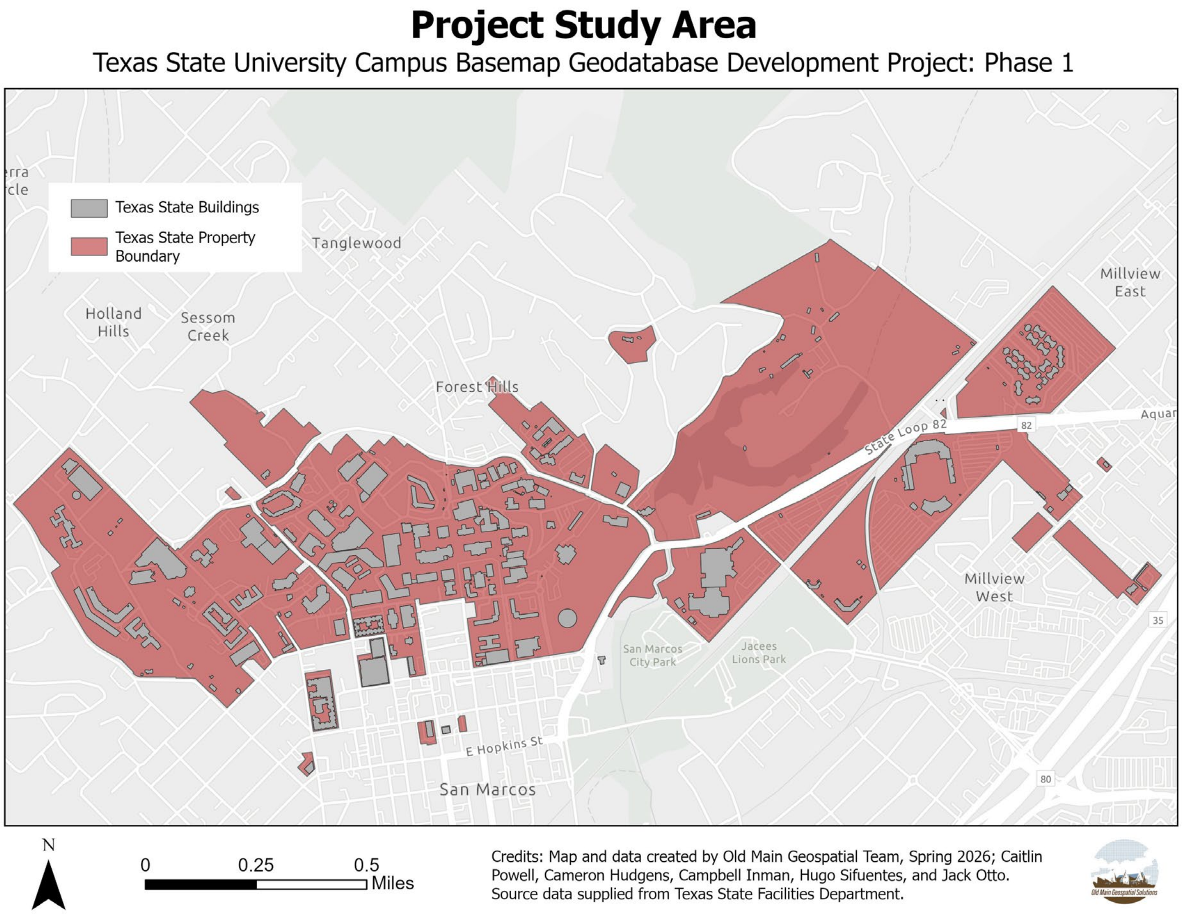

Figure 1: Study area scope for the Texas State University Campus Basemap Geodatabase Development Project: Phase 1.

2. Data

Data for this project was provided to Old Main Geospatial Solutions by the client, the Texas State Facilities Department. The original source data included area footprints, routes, crosswalk points, and reference material (satellite .tif images of Texas State Campus in 2025). This data was combined with additional internal and external sources to clean, organize, and create data. One primary focus of this project was the creation, cleanliness, and functionality of the network dataset. The routing network required stops and a usable route which proved time-consuming to create. This data list includes the file name of the project data output, the data type, description, and source layer from the client.

File Name	Data Type	Description	Client Source Layer
txst_buildings	Polygon feature class	Represent buildings on the Texas State University campus.	Txst_buildings.shp

		Original polygon layer provided by Texas State Facilities, edited and standardized by Old Main Geospatial Solutions.	
txst_roads	Line feature class	Represent roads connecting buildings and parking lots owned by Texas State University. Edited and transformed from the original roads polygon layer provided by Texas State Facilities.	Txst_roads.shp
txst_green_zone	Polygon feature class	Represent green areas maintained or owned by Texas State University. Original polygon layer provided by Texas State Facilities, edited and standardized by Old Main Geospatial Solutions.	Txst_green_zones.shp
txst_crosswalk	Line feature class	Represent crosswalks connecting sidewalks across the Texas State University campus. Digitized from the crosswalks layer provided by Texas State Facilities.	Txst_crosswalks.shp
txst_parking_lot	Polygon feature class	Represent parking lots owned by Texas State University. Original polygon layer provided by Texas State Facilities, edited and standardized by Old Main Geospatial Solutions.	Txst_parking_lots.shp
txst_property_boundary	Polygon feature class	Represent the property boundary of Texas State University. Provided by Texas State Facilities, symbology edited by Old Main Geospatial Solutions.	Txst_property_boundary.shp
txst_building_entrances	Point feature class	Represent digitized entrances to all buildings on the Texas State	N/A

		University, San Marcos campus. Edited and digitized by Old Main Geospatial Solutions.	
txst_sidewalks_dissolve	Line feature class	Represent all sidewalks, paths, stairs, and trails connecting building entrances on the Texas State University property boundary. Original polygon layer provided by Texas State Facilities, edited, digitized and standardized by Old Main Geospatial Solutions.	Txst_sidewalks.shp

All data was reprojected using the WGS 1984 Web Mercator (auxiliary sphere) projection. The data was reprojected to ensure that all features were in their correct location, as the initial datasets provided by the client were using different projections. The team chose WGS 1984 Web Mercator (auxiliary sphere) so that the projection is compatible with Google Earth and ArcGIS Online web mapping, which would be used to assist in digitizing features for the building entrances and sidewalks layers.

Building footprints were used to define building locations and shape, and to establish where entrances should be placed. Green zones and parking lot areas define different types of campus locations. Another polygon layer was a sidewalks layer which connected most parts of the main campus. This was converted into a line layer to support the routing network. Besides the sidewalk layer, a path and utilities map showed edges of structures, power lines, and other utility information, aiding identification of routing network components.

The crosswalks layer linked areas disconnected by asphalt roads with indicator points. These indicators were converted into lines to aid network connectivity. The building entrances file is 1,046 points that were placed around university buildings, delineating start and stop points in students' campus travel. The points are directly on top of the sidewalk line layer to enable network functionality. A satellite image of campus and a box delineating the Texas State campus boundary were reference materials used for data creation and organization.

Additional sources had to be located when initial data was insufficient. These sources filled in gaps caused by the lack of detail in supplied data. The current Texas State campus map was used for interpretable information such as pictures that identified buildings, and descriptions of what buildings are used for. Parking lot information found on the Texas State website described lot types and capacity and matched our lot IDs. Building floorplans were supplied by Ben Buehler, our client, after the initial data was insufficient for identifying where building entrances were. Unfortunately, floorplans were not readily available for every campus building, leading us to use publicly available sources to aid identification. We used the campus map mentioned for details on entrances, along with external sources to complete the entrance file efficiently and accurately.

In addition, Google Earth Streetview was used to identify building entrances using various angles of university buildings. Students' first-hand accounts helped identify the number and location of entrances.

3. Methodology

The methodology was structured around four phases: data review, data editing, data organization and attribute standardization, and network dataset construction and analysis. These four phases can be described in more detail in Figure 2 below. Each phase of the methodology was designed around refining and building upon the legacy data provided by Texas State University Facilities Management, with the goal of building a foundational geodatabase that can support future interactive map applications and campus wayfinding.

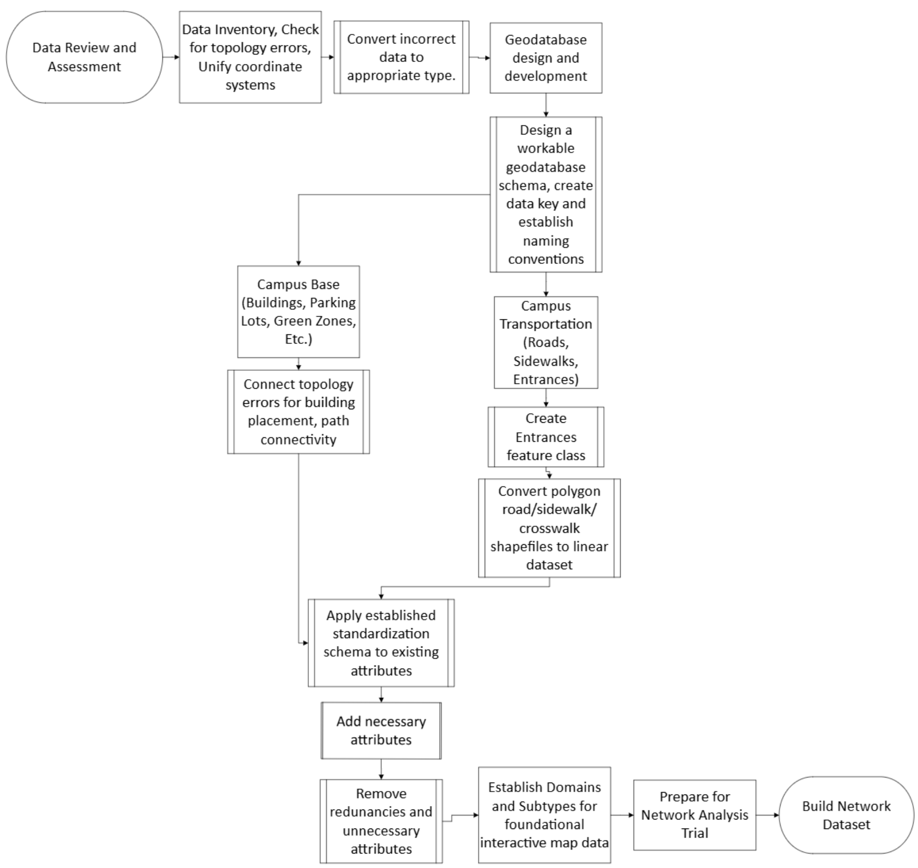

Figure 2: Flowchart detailing our project's order of operations from start to end.

3.1 Data Review

Phase 1 consisted of a comprehensive review of the existing geospatial data provided by Texas State University Facilities Management. All legacy shapefiles and layers were examined in

ArcGIS Pro to assess initial data quality across three primary areas of concern: topological integrity, schema consistency, and attribute field relevance. Topological errors were identified across multiple layers. Attribute tables were evaluated for inconsistencies in naming conventions, unstandardized value entries, and the presence of obsolete or redundant fields. Prior to any editing or organization, all layers were reprojected to WGS 1984 Web Mercator (Auxiliary Sphere) to ensure spatial accuracy and projection consistency across the dataset. The findings of this initial audit directly informed the schema design and data cleaning procedures carried out in subsequent phases.

3.2 Data Editing

Each source layer was then edited according to their respective areas of concern that were identified during review. The source sidewalk dataset was stored as a polygon feature class, which required conversion to a linear dataset suitable for network dataset construction and routing. The Polygon to Centerline tool was applied to automate this conversion. However, the process introduced geometric artifacts into several places in the study area. These included disconnected line segments and lines that intersected campus structures such as buildings or statues. Subsequent manual topological edits were performed in ArcGIS Pro to connect line segments, remove artifacted lines, and establish overall connectivity throughout the layer. Additional sidewalk features that were identified through aerial imagery provided by the client were digitized and incorporated into the layer to fill gaps absent from the legacy dataset.

Following centerline conversion and manual editing, the resulting feature class contained approximately 6,000 individual line features. To reduce redundancy and improve dataset coherence, line features were merged based on proximity to campus building or roadways, and artifact segments with no spatial correspondence to actual sidewalks were deleted. This consolidation reduced the total feature count to approximately 3,000 entries. Sidewalk connectivity was further refined by identifying and correcting dangling nodes and missed connections to ensure full integration with the building entrances and crosswalk layers.

The legacy crosswalk dataset consisted of a point feature class that was unsuitable for integration into a pedestrian network dataset. Each crosswalk point was manually converted to a short linear feature representing the actual crosswalk path, using the provided aerial imagery as the primary reference. In addition to representing crosswalks documented in the legacy data, the imagery review revealed crosswalk locations that were absent from the original dataset. These newly identified features were digitized and incorporated to ensure total coverage of the future campus network.

The roads layer originated from a polygon feature class, showing all roads owned by Texas State University. This layer was converted to a linear dataset using the Polygon to Centerline tool. Roadways connecting to university owned buildings that were absent from the legacy dataset were digitized manually, referencing satellite imagery, Google Earth and TxDOT road data. The resulting roads layer was joined with city road data from TxDOT to produce a comprehensive road network.

The polygon layer for university buildings was checked for overlapping topological errors. Following this, the layer was converted to a point feature class using the Polygon to Point (Centroid) tool. These centroid points were used to geocode addresses for each building via the ArcGIS World Geocoding locator, and the resulting addresses were joined back to the original layer via a table join before the features were exported to their own feature class. The entrances for campus buildings were digitized from satellite imagery and snapped to the completed sidewalks layer using a 30-meter tolerance to ensure future network connectivity.

The parking surfaces layer was originally provided by the client as 105 individual parking surfaces, each identified by a unique parking code. While the original dataset included geometric attributes such as area and centroid, it contained no information regarding permitted parking types or space counts. A supplementary parking statistics table sources from the Texas State University parking website was used to join this information to the existing parking surfaces layer using the shared parking code field. New attribute fields were created for each of the 14 permit types documented in the table. This included permit types such as purple commuter, ADA accessible, restricted, service delivery and EV charging. Each field was populated with the number of spaces available by permit type for each individual parking lot.

3.3 Data Organization, Attribute Standardization and Database Structure

Following the completion of data editing, attribute tables for all layers were structured and populated according to a geodatabase schema established during the project's planning phase. Standardized naming conventions, coded value domains, and defined field types were applied consistently across all feature classes to promote long-term data integrity and support future querying and analysis.

The sidewalk layer attribute schema was comprised of FID, shape length, proximal location and surface type. Proximal location is a descriptive field identifying the nearest campus road or building to each sidewalk segment, providing spatial context for future querying. Surface type is a coded value field populated using a defined geodatabase domain. It classifies each feature by surface material or function. Features were classified as one of the following: Paved, Unpaved, Stairs, Crosswalk, or Other. No coded value domains were applied to the crosswalk layer as the attribute fields were determined to be sufficiently constrained by the limited scope and low feature count of the dataset.

Road attributes were standardized to include the following fields: owner type, road type, number of lanes, speed limit, road name, zip code, county, and length in miles. Coded value domains were established for owner type and road type to distinguish between roads owned by Texas State University, the City of San Marcos, and the Texas Department of Transportation.

Building attributes were standardized to include building name, building abbreviation, building number, reverse-geocoded address, year built, number of building entrances, and building use type. A coded value domain was established for the building use type field (Type) to categorize each structure on campus, including designations such as Res/Life (Residential and Living), Mechanical, and E&G (Academic and Administrative). The number of building entrances field was populated following the completion of the building entrances layer.

Building entrance attributes were standardized using naming conventions derived from the associated building name. A unique entrance number field was created and populated using an SQL sequential number evaluator based on the building name, ensuring that each entrance received a distinct identifier for use in future routing applications.

The green zones layer was organized with standardized attributes for cover type, irrigation status, and maintenance status. Coded value domains were established for all three fields. Polygon areas were calculated and stored in two new geometry fields.

All completed layers were consolidated into a file geodatabase within a new ArcGIS Pro project titled OMGS_TXST_2026. The geodatabase encompasses all feature classes produced during the project: buildings, entrances, crosswalks, sidewalks, roads, green zones, parking surfaces, and university property boundary. A dedicated feature dataset was created within the geodatabase to house the building entrances and sidewalk layers, as these were required for future network dataset construction. A topology layer was created for the building entrances and sidewalks feature classes using the rule that building entrance points must be covered by the sidewalk lines. Following validation, errors were resolved by manipulating existing or creating new sidewalk lines.

3.4 Network Dataset Construction and Analysis

A network dataset was constructed within the feature dataset containing the sidewalks and building entrances layers. The sidewalks layer was designated as the primary network source, with building entrances serving as junction points along the network. Travel attributes were configured for pedestrian use and set to measure distance in feet, in accordance with the standard U.S. unit system. The network was built and tested in ArcGIS Pro by importing stop locations derived from specific building entrance points, allowing for controlled routing trials between campus buildings.

4. Results and Discussion

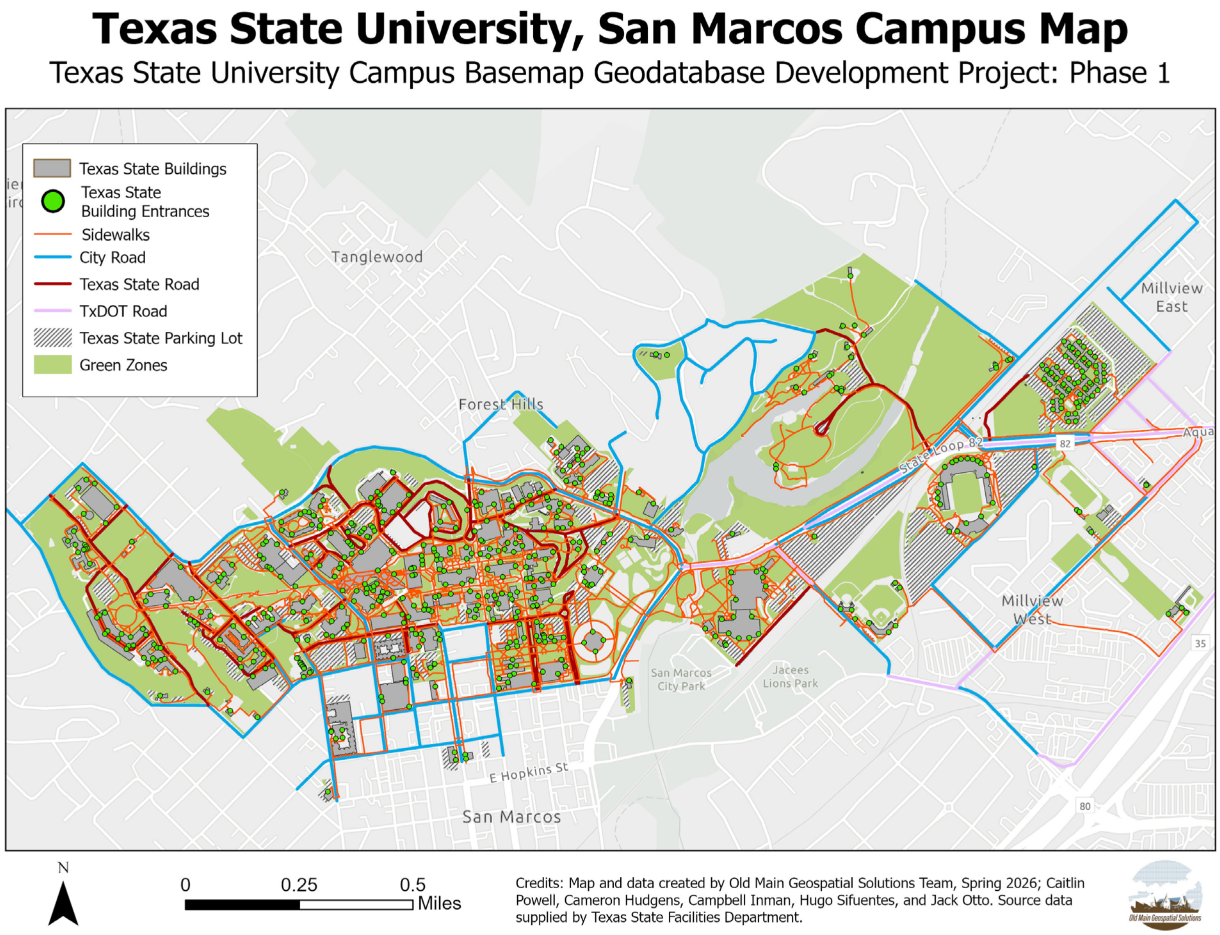

Figure 3: Texas State University static map using the standardized and completed geodatabase.

Initially, our review of the legacy data provided by the client revealed significant data quality issues. With data created over the past 15-20 years in several different formats, our team noticed issues ranging from field naming conventions, non-standardized attribute entries and obsolete fields that were not suitable for current or future university operations. Topological errors were also identified across multiple layers and confirmed our hypothesis that the existing datasets we were provided with would not be able to support future spatial analysis or wayfinding efforts without improvement. Layers that required our attention were the sidewalk and roads layers. The legacy data provided for these layers were stored as polygon feature classes, which are incompatible with network dataset construction. With our team identifying network dataset construction as an objective to be finished towards the end of our project, understanding how these layers would need to be edited in a way that ensured future network compatibility was crucial.

In the case of our sidewalks layer, the automated centerline tool provided a useful starting point but introduced several geometric artifacts across our study area. Lines appeared that were either wholly disconnected from the dataset, or erroneous lines running through buildings, construction sites and other impassible features were identified. Additionally, aerial imagery revealed pedestrian paths that were present on the ground surface that did not appear in the legacy sidewalk shapefile. These newly identified paths combined with the feature class generated after running the centerline tool resulted in a staggering number of attribute entries (~6,000). After several weeks of paring down the feature class by removing unnecessary entries or merging redundant entries, we were able to reduce it by almost 50%. However, there is still significant work needed on this layer. This layer became the biggest bottleneck for our project, and if we were to do the project over, we would have considered using the sidewalk data available on a publicly available resource such as OpenStreetMap. Unfortunately, this was not something we were made aware of until two weeks prior to our project deadline, but the feature class we created for sidewalks serves as a strong foundation for future operations by the facilities team at Texas State University. Additionally, a separate, simplified sidewalk feature class was created for the express purpose of testing network connectivity. This simplified sidewalk layer lacks the descriptive attribute fields of our primary sidewalk layer (proximal location, surface type), and is merged into a single, unified entry, streamlining it for network purposes. Ultimately, we leave it to the client to use both depending on the operational need.

The road layer from our client was spatially joined with municipal street data to produce a unified road layer, with roads owned by Texas State University being differentiated from city owned roads. An ownership type domain was established as part of our schema standardization effort. All attribute fields were cleaned and standardized, with new fields created for speed limit and number of lanes. Additionally, the parking surfaces layer was significantly enhanced through the integration of parking statistics and information from the Texas State University parking website (https://www.parking.txst.edu/about/statistics.html). Our original dataset lacked information regarding permit types or number of parking spaces, so the parking dataset was improved by populating 14 new attribute fields within the layer, with each field representing a distinct permit category.

A network dataset was constructed with ArcGIS Pro using our simplified sidewalks layer. Building entrance points were incorporated into the network as stop locations to simulate pedestrian routing scenarios. By building a simple route between two entrance points, we were able to validate the connectivity of the network. This was done more as a test of connectivity rather than as a full routing application or network analysis. Imported stops were taken from specific building entrance points, allowing us to make trials controlled and short. The routing solutions found routes 50% of the time on 10 trials between different buildings. Despite having a lower success rate than desired, we were able to demonstrate the geodatabase can support future wayfinding applications.

Ultimately, the results of our project addressed each of our client's listed objectives. The data audit and schema redesign established a standardized geodatabase with defined domains, consistent field naming and logical attribute field structures across all feature classes. The fragmented and inconsistent legacy shapefiles were successfully migrated into a geodatabase that will serve as the foundation for future geospatial operations by the university. As also described in the initial RFP, we were able to convert the sidewalk layer into a linear dataset capable of wayfinding, enhance the parking surface layer with permit attributes, and integrate city street data into the roads layer.

Throughout our project, there were challenges or limitations that we faced. As mentioned previously in this section, the Polygon to Centerline tool introduced many geometric artifacts that required extensive manual correction. This, along with the manual crosswalk digitization and building entrance placement required a significant investment of time. For building entrances particularly, the absence of floor plan data for certain buildings required estimation from sources like Google Earth street view. While these estimates were cross referenced against other sources like our aerial imagery, they remain inherently less reliable than having the actual confirmation from floor plans. In the future, sources that are interpretable and reliable such as clearly marked floorplans would be helpful. While multiple sources can do the work of one, it is a time-consuming process. Another future consideration is the network analysis. The analysis conducted in the last phase of the project was constrained to a basic route between two stop locations. While it successfully validated our topological connectivity of the sidewalk layer, it has not been fully optimized for wayfinding applications. More rigorous network validation should be done before the network dataset is deployed. Lastly regarding our network, we used the simplified sidewalk layer created specifically for network testing. We are uncertain if this will be an issue with further network testing, as it lacks attribute fields that may affect pedestrian traversal (surface type, location, elevation, etc.).

5. Conclusion

Working on the creation of the geodatabase that will serve as the cornerstone of the future in-house interactive map served as a masterclass in the importance of having a robust, cohesive geodatabase to support future geospatial functions and analyses. Much of the work on this project was labor and time intensive, but necessary to ensure data quality of the foundational feature classes we have constructed. However, our workflow could have been streamlined by leveraging more external resources. This was particularly evident when working on the sidewalks layer. Sufficient external resources were available for most other layers (entrance points, roads), while data to supplement the sidewalk layer was more difficult to find.

Based on our work on this project, we give the following recommendations for future projects involving this geodatabase:

- ADA compliance attributes: Future iterations of the sidewalk and crosswalk layers should incorporate ADA-relevant attributes (surface condition, presence of ramps, slope). These fields would enable network-based ADA compliance analysis.
- Real-time parking integration: The current parking layer provides static parking capacities, so being able to integrate with a program that shows real-time parking occupancy would be of immense value to students and faculty.
- Building Entrance Verification: Estimated entrance locations should be verified through field surveying or floor plans. The current building entrances layer provides a solid framework for this recommendation.

- Network Impedance Modeling: Further network analysis should incorporate attributes such as surface type, slope, and traversal time to produce more realistic routing outputs. Going back to ADA-compliant wayfinding, having differentiated impedance values for individuals with disabilities would be especially helpful.

In summary, our project has successfully established the foundational geospatial infrastructure required to support Texas State University's long-term interactive campus basemap initiative. The cleaned, standardized and topologically connected geodatabase produced through our work represents a substantive asset for Texas State University, and provides them with a platform upon which wayfinding, ADA compliance and web mapping applications can be developed in the future.

6. References

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7. Appendix I: Group Member Contribution

Caitlin Powell

Reports and Presentations

Caitlin contributed to the writing of all related project reports including the proposal, progress report, and this final report. Her major contributions were the map figures included in this report, the data and metadata tables, and the methodology section. Caitlin also created the readme file and standardized the metadata formats for all layers to match the FGDC metadata standards, then compiled all data files, layouts, and final deliverables. Caitlin helped create the poster, wrote the methodology, data results sections, and created the imagery for the final poster, including the team's logo.

Data Review

Caitlin completed from start to finish the required tasks for the txst_buildings, txst_roads, and txst_green_zones feature classes data review. Each feature class was combed through using ArcGIS Pro to find errors and discrepancies in naming conventions or location.

Data Editing

Caitlin completed (using ArcGIS Pro) from start to finish the required tasks for the txst_buildings, txst_roads, and txst_green_zones feature classes data editing. Each feature class was reprojected to WGS_Mercator_1984, then digitized and manipulated to match satellite imagery provided by the client. Caitlin analyzed the txst_roads layer and the data merged with existing city and state road data to ensure correct locations and names. Caitlin also worked heavily on the sidewalks_dissolve layer to assist in digitizing sidewalks that were converted from the original polygon layer provided by the client to a centerline. This was done by visually referencing satellite imagery to edit the centerline to match real-world sidewalks. This process was iterative, and was returned to several times during the project, even after the geodatabase and network dataset were constructed. Caitlin also contributed to the manual digitization of building entrances with Jack and Hugo. Once again, satellite imagery was used to find building entrances that coincided with the buildings polygon layer. We also used Google Earth to find entrances we could not see using satellite imagery.

Data Organization, Schema Standardization and Database Structure

Caitlin finished standardizing attributes for the buildings, green zones, roads, and building entrances layers, creating domains where necessary and establishing clear naming conventions. Caitlin set up a topology layer between the building entrances and sidewalk layers in the project, researching point and line connectivity, and set the topology rules between the layers Caitlin also ran topology checks and fixed topology errors on the resulting topology layer. Caitlin also analyzed the relationship between building entrances and sidewalks layers, snapping building entrances with analysis tools and manually to meet the sidewalks layers and ensure schema accuracy. Caitlin also set up the geodatabase in a project on ArcGIS Pro using all of the completed layers from the group content on ArcGIS Online.

Network Dataset Construction and Analysis

Caitlin set up the network dataset using the constructed geodatabase and topology layer. She ran many different routes to ensure accuracy in the routing capabilities of the network and researched different methods of fixing errors or routing failures within the network.

Cameron Hudgens

Reports and Presentations

Contributed heavily to writing formatting and editing of the project proposal, progress report and final report. Responsible for collating all members' contributions into cohesive documents. Led the generation, editing and organization of content for the three corresponding presentations. Reviewed and edited methodology flowchart. Assisted in editing and reviewing the project poster. As project manager, responsible for submitting all documents for the group by their respective deadlines.

Data Review

Conducted a thorough review of all legacy datasets provided by the client, carefully examining existing shapefiles and associated attributes to assess data quality, identify inconsistencies and evaluate the suitability of the data for the project.

Data Editing

Created new sidewalk and crosswalk layers using legacy shapefiles as a template. Performed extensive automated and manual editing and digitization of both these layers, reviewing and correcting geometric inconsistencies, gaps, and areas where legacy data was insufficient. Digitization efforts involved editing to accurately represent Texas State University campus infrastructure.

Data Organization, Schema Standardization and Database Structure

Developed a comprehensive data schema for the sidewalk and crosswalk layers, defining and standardizing attribute fields to ensure consistency. Established naming conventions for all attributes and domain values for necessary attributes to support efficient querying.

Network Dataset Construction and Analysis

Assisted in the setup and testing of the network routing functionality. Ensured topological connectivity of the sidewalk and crosswalk layers.

Campbell Inman

Reports and Presentations

Campbell contributed to this project by helping develop the proposal, progress report, poster, and final reports/presentations. Campbell focused primarily on expected results for the proposal, completed work for the sidewalk network in the progress report, and converted the sidewalk polygon layer to a line layer. Campbell also contributed by editing the sidewalk layers, which included fixing topological errors, and creating new lines to connect to the existing sidewalk lines. Finally, Campbell helped format the final report document, and developed the poster by adding text, pictures, and formatting.

Data Review

Campbell helped convert the sidewalk polygon layer into a line layer, which helped cut down the tediousness of digitizing every sidewalk on campus. Campbell helped review the data by searching for topological errors in the sidewalk line layer after the feature layer was converted into a line from a polygon.

Data Editing

Campbell used the polygon to centerline tool to decrease the workload of the project, but there were still many topological errors that remained. Many lines were completely disconnected from the network, and other lines interfered with buildings, statues, and other areas. For example, one of the sidewalk lines ran directly through the horse statue on the quad, which would create many errors in a sidewalk network. To fix this, Campbell helped use the edit vertices tool in ArcGIS Pro to manage these errors, by deleting unnecessary lines, and connecting lines that were disconnected. This task also included creating new sidewalk lines to connect disconnected lines as well. This is necessary because a successful sidewalk network cannot work if there is limited connectivity.

Data Organization, Schema Standardization and Database Structure

Campbell helped organize the data by ensuring that the sidewalk layers were connected and functional. He helped convert the polygon to a line to relieve the workload of digitizing every sidewalk layer on Texas State's campus.

Network Dataset Construction and Analysis

Campbell helped ensure that the sidewalk layers were connected to each other, removed topological errors, and removed redundancies within the line layer. Campbell also made sure that the sidewalk lines connected to building entrances to ensure a successful wayfinding network system.

Hugo Sifuentes

Reports and Presentations

Hugo assisted with the writing and construction of all of the reports and slideshows. His major contributions were creating the Methodology flowchart. The chart was edited iteratively as we refined the aesthetic and as we changed the order of task completion. He has filled in any gaps where chunks of reports or presentations were missing, constructing and presenting them. The most consistent submission to the presentations and report was information on the building entrances file. This file was time-consuming and required substantial modification from the original plan as the project progressed.

Data Review

Hugo reviewed the building entrances and building footprints file for inconsistencies in the attributes or inaccuracies in their spatial plotting.

Data Editing

Hugo plotted the majority of the building entrance points, which was a time intensive procedure. Caitlin and Jack helped plot and organize the building entrances which was vital to the completion of the layer. With their help Hugo was able to plot the majority of the points and mark precisely which points are verified through floorplans. A spreadsheet with all of the buildings was filled out manually, allowing data to be accurately plotted with efficiency. In addition, by manually plotting entrance points Hugo gained reliable knowledge on each building. Through this he could verify which buildings were missing points and which buildings only appeared to be missing points. In addition, throughout many phases of the project points had to be rechecked and cleaned up as errors were located or new data became available. An especially important phase of entrance editing was during the network dataset creation. In this final phase some points were accidentally duplicated, and some had to be verified to ensure accuracy for a final deliverable. This validation and corroboration were important to guarantee the network dataset functioned smoothly.

Data Organization, Schema Standardization and Database Structure

Hugo ensured the building entrance file was complete, with entrances for every walkable building and metadata for the file.

Network Dataset Construction and Analysis

Hugo helped ensure entrance points were plotted to lines correctly. Many of the points were automatically snapped, which required tuning the tool to snap within a specified distance.

Jack Otto

Reports and Presentations.

Jack assisted with the creation of the parking lots and building entrance portions of reports and presentations. He explained the process he took of finding external data from Texas State University parking websites and combining that with existing parking surface layers. By combining this newly found data with the existing parking layers he assigned parking permit type and capacity of spaces for each type of permit for every parking surface on Texas State University campus. Jack also assisted Hugo with the creation of the entrance points layer for all buildings across Texas State University campus. Jack and Hugo explained in reports and presentations the manual process they took to individually plot entrance points for all Texas State University buildings.

Data Review

Jack assisted Hugo with the creation of the entrance points layer for all buildings across Texas State University campus. Jack also cleaned and standardized existing parking surface layers provided by the client.

Data Editing

Jack assisted Hugo with referencing building footprints and sidewalks layer to determine building entrances for all buildings. A series of building blueprints were provided by the client to assist the group in determining entrances. However, the majority of building entrances were plotted by using the existing building layer combined with the sidewalks layer and also utilizing street view on google earth. For parking lots Jack started by cleaning the existing parking lot layer to eliminate unnecessary attribute fields. He then combined the existing parking lots layer provided by the client with a data set found on the Texas State University Parking website to add permit type and capacity for each type of permit for each individual parking lot.

Data Organization, Schema Standardization and Database Structure

Jack ensured the parking lots layer was up to standard with the client's requests. He created new attribute fields containing the capacity for each type of parking permit available to obtain at Texas State University. Jack also assisted Hugo with the initial cleaning of the building footprint layer as well as ensuring building entrances are accurately placed.

Network Dataset Construction and Analysis

Jack assisted Caitlin with testing the routing network and addressing initial problems that occurred. He then helped Caitlin ensure the routing network consistently ran successfully.

8. Appendix II: Metadata

The metadata files for this project are included in the data folder of the zip file: Final_Deliverables_OldMainGeospatialSolutions.

File Name	Description
txst_building_entrances.html	This point feature class contains 1,046 data points representing building entrances for buildings on the Texas State University campus in San Marcos, TX. The points have been snapped to a 30m tolerance to align with the txst_sidewalks_dissolved layer, to enhance routing capabilities between building entrances on the campus. This layer was digitized using satellite imagery from 2025 provided by TXST Facilities. Layer completed by students as part of the project for GEO4427 spring 2026 at Texas State University.
txst_buildings.html	This polygon layer contains 269 building polygons representing buildings on the Texas State University campus in San Marcos, TX. The buildings have attributes for building name, number, building type, built year, number of entrances, and have been geocoded with addresses from the ArcGIS Geocoding Service.
txst_crosswalks.html	Crosswalks line layer on Texas State University campus created by Texas State University students for GEO4427 course.
txst_green_zones.html	Polygon layer showing 2,083 green zone areas owned and maintained by Texas State University in San Marcos, TX. Layer shows cover type, whether area is irrigated or maintained. Includes recreational areas, turf, garden beds, wild areas. Source data from the TXST Facilities department. Layer attributes edited and completed by Caitlin Powell for GEO4427 at Texas State University as part of the Campus Basemap project Phase 1.
txst_parking_lots.html	Parking lot locations and capacities within Texas State University. It includes the number of spaces available for each parking permit type within each lot. Parking lot polygons on Texas State University campus layer created by Texas State University students for GEO4427 course. Layer contains polygon representations of parking lots. Parking surface shape area and shape length are included in the layer attributes. Attributes include total capacity and counts of spaces allocated to different permit

	types. Data was used from the TXST Parking website to assign number of parking spaces for each permit (https://www.parking.txst.edu/about/statistics.html). Layer completed by Jackson Otto for GEO4427 at Texas State University as part of the Campus Basemap project Phase 1.
txst_property_boundary.html	This polygon layer was provided by the Texas State Facilities department for the purpose of the Old Main Geospatial Solutions GEO4427 campus basemap project.
txst_roads.html	Line layer adapted from source data provided by the TXST Facilities department for the purpose of spring 2026 GEO4427 campus basemap project. This layer has been updated to reflect ownership type for different roads around the Texas State University campus in San Marcos. Data was compiled using source data from the San Marcos city Open Data Portal (https://data-cosm.hub.arcgis.com/search) to join attributes on number of lanes, speed limits, road names, and ownership types.
txst_sidewalks_dissolve.html	This line layer was created by students for GEO 4427 spring 2026 at Texas State University. It represents all sidewalks connecting buildings, parking lots, and parking garages owned by Texas State University in San Marcos, TX. The layer was created by converting a polygon layer to centerline, then digitizing using satellite data from 2025 satellite imagery. Sidewalks were connected to building entrances for the purpose of routing using a network dataset. They are part of the sidewalk feature dataset.
txst_sidewalks_fd_dissolve_Topology.html	This topology layer contains topology rules to establish schema connectivity between the sidewalks layer and building entrances layer. Building entrances must be covered by sidewalks. This layer was created by students for GEO 4427 spring 2026 as part of the project for Texas State Facilities Department.
txst_sidewalks_nd.html	This network dataset is suitable for routing between building entrances on the San Marcos, TX campus. Importing stops from building entrances will create a route between buildings based on shortest length in feet. This dataset is only partially functional.

	Some locations are not connected to the network. It is suggested that further examination occurs on this network dataset to set full routing capabilities. Created by students for GEO 4427 spring 2026 for the Texas State Facilities department.

9. Appendix III: AI Use Disclosure

Claude was used to format and organize the table of contents, as well as assist in the general editing and revisions of the final report.