Texas State University Campus Basemap Geodatabase Development Project: Phase 1

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Introduction and Background

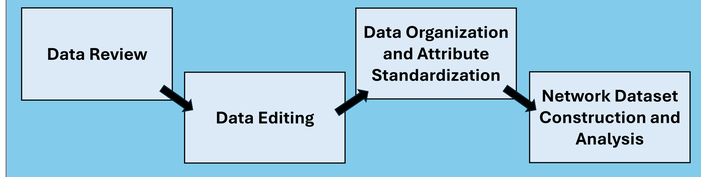
Old Main Geospatial Solutions was tasked by Texas State University Facilities Management to create a foundational geodatabase that would be implemented in future creation of a university-owned and operated interactive map capable of wayfinding. Currently, the university uses a third-party company that 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.

Study Area and Scope

This project covered the entirety of the Texas State University property boundary and roads connecting all university-owned buildings in San Marcos, TX. Our team worked on this project from February 2026 to April 2026, with all deliverables executed and given to the client no April 28th, 2026.

Methodology



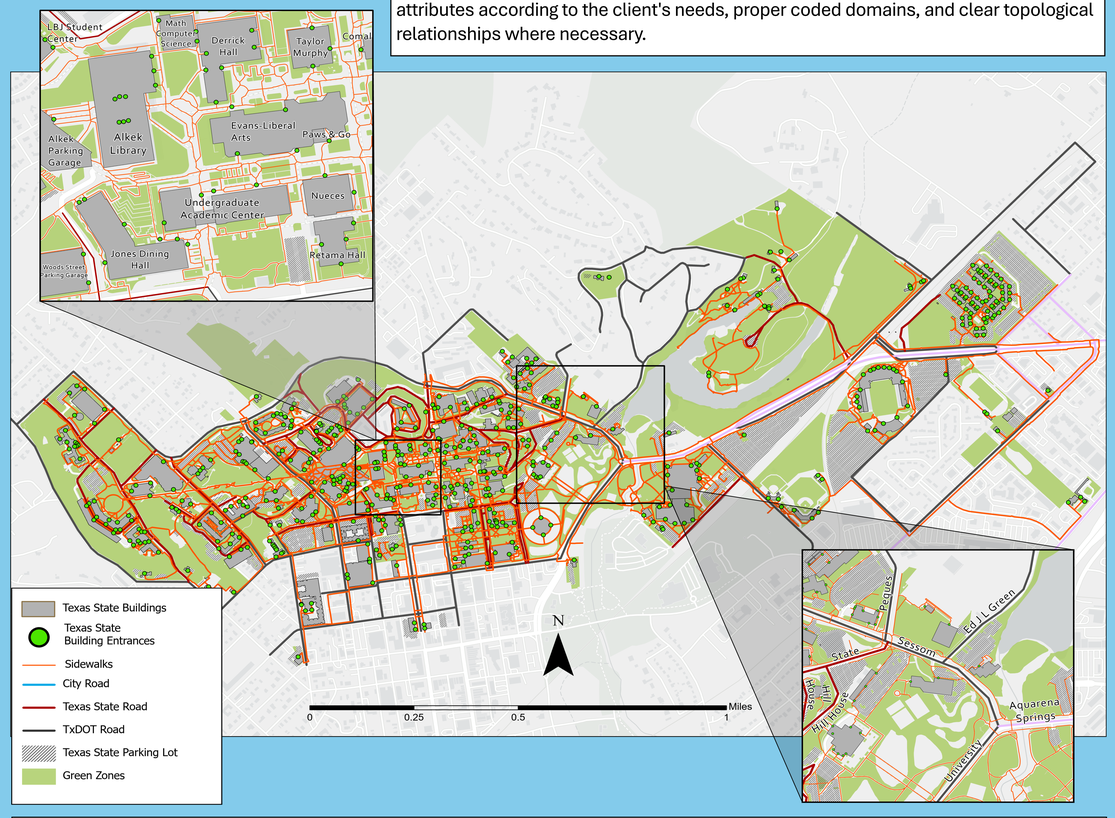
This project's methodology was structured around four phases: data review, data editing, data organization and attribute standardization, and network dataset construction and analysis. Each methodology was designed around refining and building upon the legacy data provided by Texas State University Facilities Management, with the goal of building a foundational geodatabase that can support future interactive map applications and campus wayfinding.

Beginning with data review, each source data layer was reviewed to find missing data points. Next, data editing consisted of creating, editing, or removing necessary data. Edits verified by referencing satellite imagery and Google Earth to maintain location accuracy. Attributes were then standardized with logical naming conventions and logical attribute contents, with coded domains applied as necessary. Following this step, a geodatabase was built in ArcGIS Pro. Inside the geodatabase, topology rules were set and a network dataset was created. The network dataset was then tested to determine connectivity and determine whether the network exhibited routing capability by inputting random combinations of building entrances as stop points, the sidewalks as a network route layer.

Results

Geodatabase

Old Main Geospatial Solutions produced a geodatabase with all features necessary for a campus basemap. The final products include six complete feature classes, one network dataset, and one topology layer. Each feature class holds standardized attributes according to the client's needs, proper coded domains, and clear topological relationships where necessary.

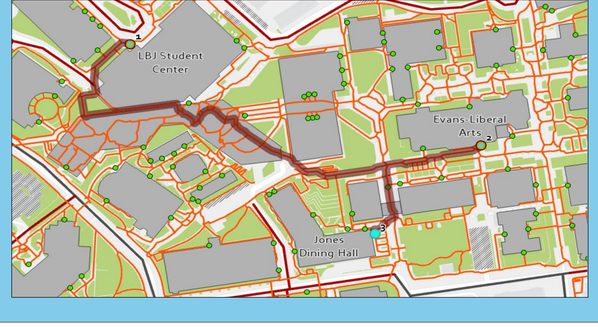


Network Dataset

Using the complete geodatabase, a network dataset was created using sidewalks as routes and building entrances as stop source layers. The goal of the network dataset was to create connectivity between Texas State building entrances for all buildings on campus and sidewalks connecting those building entrances. Topology rules were set to solidify feature relationships, with sidewalks along the network ending in building entrance points and building entrance points placed along sidewalks. Once errors were either fixed or marked as exceptions (for building with no adjoining sidewalks), the network was complete. The completed network can route by walking between selected building entrances along the sidewalk network paths using a route analysis layer between selected stops.

The image on right shows a hypothetical route for a student walking to class from a shuttle stop at the LBJ Student Center. The student may have class at Evans-Liberal Arts then to walk to Jones Dining Hall for lunch. In the route analysis layer, the building entrances are selected, then input as stops along the route.

The route analysis will solve the route based on the shortest walking distance in feet between the input stops. The image shows the output route suggested for this hypothetical student routing scenario.



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 using 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.

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.

Looking Forward

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.

References

Cao, Y., Zhang, H., Yang, Z., & Li, Y. (2024). Database Construction of GIS-Based Hydropower Station Safety Monitoring Platform. *2024 5th International Conference on Clean Energy and Electric Power Engineering (ICCEPE), Clean Energy and Electric Power Engineering (ICCEPE), 2024 5th International Conference On*, 244–248. https://doi.org/10.1109/ICCEPE62686.2024.10931763

Chan, Ho-Yin, et al. "Routes with Roots: Pedestrian Route Choices and Sense of Place of an Urban University Community." *Journal of Transport Geography*, vol. 118, Jun. 2024, p. 103943. *ScienceDirect*, https://doi.org/10.1016/j.jtrangeo.2024.103943.

Chen, Iris, et al. "Accessible Navigation Mapping: Supporting People with Mobility Disabilities for Wayfinding." *2024 Systems and Information Engineering Design Symposium (SIEDS)*, 2024, pp. 331–36. *IEEE Xplore*, https://doi.org/10.1109/SIEDS61124.2024.10534647.

Dahmani, Louisa, et al. "Wayfinding: The Effects of Large Displays and 3-D Perception." *Behavior Research Methods*, vol. 44, no. 2, Jun. 2012, pp. 447–54. *Springer Link*, https://doi.org/10.3758/s13428-011-0158-9.