RESEARCH NEED STATEMENT

Call for Projects 2015

Project Research Title: Enhanced GIS Database for TDOT Legacy Data

TDOT Sponsor Director: Jim Ozment, Director Environmental Division

List TDOT Research Team Lead: Gerald Kline and Tammy Sellers

List TDOT Research Team Members: Holly Barnett, Phil Hodge, Kim McDonough, April Letellier, Alan Jones, and Kwabena Aboagye.

1. Define the problem or research requested. What is the goal/objective of the research?

TDOT has embarked on an initiative to develop enhanced spatial analysis capability using geographic information systems (GIS) technology to serve TDOT's overall needs as well as those of its customers. Critical to the success of this initiative is the ability to deploy an integrated system with representative data capable of supporting a wide range of applications, covering a variety modes operating within the state. The purpose of this project is to research and implement an enhanced GIS database, development of information to support system functionality, and utilization of emerging technologies to expand and enhance the quality of data available to support TDOT's activities.

The proposed GIS database will integrate datasets that were previously managed through different systems into a single system that is compatable with TRIMS, TDOT's existing GIS platform. This will primarily include two datasets - (1) legacy data curated by the Historic Preservation and Archaeology sections within TDOT's Environmental Division and (2) a database of multimodal transportation assets.

Historic Preservation and Archaeology data are currently housed in a Microsoft Excel spreadsheet and Microsoft Access database, respectively, and cannot display spatial data nor link dynamically to project documentation. Georeferencing the legacy data and developing a GIS-enabled system to manage it will facilitate project review and process improvement. Since these data were collected on federally funded projects, and are currently used to document TDOT's compliance with federal historic preservation and archaeological laws on new and existing projects, proposals submitted to address this Research Need Statement must include personnel with an advanced understanding of Section 106 of the National Historic Preservation Act and its implementing regulations at 36 CFR 800, Section 4f of the US Department of Transportation Act, and the Archaeological Resources Protection Act. Furthermore, personnel working on this Research Need Statement must also have advanced experience in not only GIS, but also the environmental review process as it relates to transportation planning, archaeological and architectural/historical resources, as well as historic preservation policies, procedures, and data of the Federal Highway Administration, Tennessee Historical Commission, and Tennessee Division of Archaeology.

2. Is this research a continuation of a past or present project?

☒ No ☐ Yes

If yes, provide current research project title, RES # and reason for the project continuation.

3. Describe anticipated benefits/expected deliverables.

A considerable amount of spatial information characterizing transportation infrastructure and operations in Tennessee is becoming available through the improved capabilities of GIS technologies. However, much of this information resides in disparate locations and/or is being managed by different organizations. By structuring a comprehensive approach to collecting, organizing and delivering this information, TDOT will be able to enhance its capabilities to serve the needs of the agency, as well as those of its government, business and community stakeholders. The end result will be the delivery of a more efficient, safe, secure and environmentally-sensitive transportation system throughout the State.

This research will produce a GIS-enabled database(s) that georeferences various datasets including multimodal transportation networks, transportation facilities and characteristics, and historic preservation and archaeology legacy datasets. This GIS database will be incorporated and compatible with the TRIMS data (including the eTRIMS system) which TDOT already maintains as a GIS application. It will also produce best practices and recommendations for mobile data collection.

The development of a GIS-enabled system for TDOT historical and archaeological data should also faciliate an eventual linkage with TDEC's Division of Archaeology, who are currently developing a statewide GIS for archaeological sites. The Tennessee Historical Commission has already developed a layer for historical and architectural resources that could be imported into this system and overlaid on other geospatial data. The implementation of this system will bring together critical data that TDOT historians and archaeologists use on a daily basis into a single platform and contribute to increased "Coordination, Cooperation, and Consultation," as defined in the Long Range Transportation Plan policy, as well as TDOT's Operational Goal of delivering transportation projects on schedule and within budget.

4. What is your timeline for completion of the research?

2 years

5. List the anticipated tasks for this research.

Consultation with TDOT Research Team.

Literature review and review of current TDOT practices (including existing legacy datasets).

Development and modeling of enhanced spatial analysis system architecture.

Incorporation of datasets into enhanced spatial analysis system.

Date cleaning, migration, and implementation.

Report out and training of TDOT staff.

6. Describe how the project results will be implemented?

Due to the size of the legacy databases, and the volume and variability of associated documentation, it may be advisable to implement this research project in phases. An initial phase, for example, would document existing systesm, develop, and model the geodatabase using a representative sample of legacy data. Then, once developed and tested, the remaining data would be imported into the geodatabase and fully incorporated into staff workflows. For the Historic Preservation and Archaeology Sections, for example, spatial queries of new transportation projects would become a first line response to determine if the area in question has been previously surveyed for archaeological and historical resources. If so, fieldwork would be unnecessary and the project could be cleared immediately under the Minor Projects Memorandum of Understanding between TDOT and the Tennessee StateHistoric Preservation Office (TN-SHPO) or forwarded directly to the TN-SHPO's office for review. Spatial queries will also streamline the identification, location, and sharing of project documentation with internal and external customers.

7. Will this study produce software, web page or other technology that will involve the Information Technology Division?

☐ No ☒ Yes, please describe:

It will result in a GIS-enabled geodatabase compatable with TDOT's current system(TRIMS/eTRIMS).

8. Will training be provided to employees as a result of this research?

☐ No ☒ Yes, please desribe:

Following the final research report, a one-day training session is required to train TDOT personnel on the new system.

9. Will this research involve equipment or materials purchase?

☒ No ☐ Yes, please describe:

10. Research must support the Long Range Transportation Plan Policy Recommendations **and/or** TDOT Operational Goals and/or Strategic Initiative. (*See attachments for additional information)*
Please indicate which categories the research will support:

<u>Transportation Long Range Plan Policy Recommendations</u>

☐ (A) Accessibility

☐ (B) Safety, Security, and Transportation Resilience

☑ (C) Coordination, Cooperation, and Consultation

☐ (D) Demographic and Employment Changes and Trends

☐ (E) Freight Logistics and Planning

☐ (F) Financial

☐ (G) Mobility

☐ (H) Travel Trends and System Performance

TDOT Operational Goals and/or Strategic Initiative

☑ (A) Deliver transportation projects on schedule and within budget

☑ (B) Maintain the state transportation system to protect the long term investment in our infrastructure assets

☐ (C) Operate and manage Tennessee's transportation system to provide a high level of safety and service to our customers and workers

☐ (D) Expanding mobility choices to maximize access

☐ (E) Dramatically change the paradigm for delivery of transportation products and service to improve the efficiency and effectiveness of Tennessee's transportation network

11. Please explain how the research supports the Long Range Transportation Plan Policy Recommendations **and/or** TDOT Operational Goals and/or Strategic Initiative selected above:

This research supports both the Long Range Transportation Plan's policy regarding Coordination, Cooperation, and Consultation and TDOT's Operational Goal to "Deliver transportation projects on schedule and within budget." Regarding "Coordination, Cooperation, and Consultation," the Historic Preservation and Archaeology Sections coordinate and consult with the Tennessee State Historic Preservation Office (TN-SHPO) and federally recognized Native American tribes on every federally funded or permitted TDOT project. The TN-SHPO reviews all reports of historical and archaeological studies conducted by TDOT in-house staff and consultants. The

results of the TN-SHPO are archived in our legacy and Sharepoint systems and constitutes Departmental compliance with applicable state and federal historic preservation and archaeological laws. Furthermore, the Department has recently entered into a Memorandum of Understanding with the TN-SHPO to facilitate project review. This agreement stipulates that the TN-SHPO can audit any individual historical or archaeological project or a sample of all projects. A geodatabase with reporting functionality will facilitate this auditing process and ensure the successful implementation of this streamlining agreement. In addition, converting the legacy databases to a GIS format will result in a streamlined workflow for TDOT historians and archaeologists when determining whether new projects are incorporated within previously studied areas and thereby eliminating duplication of effort and resulting in cost and time savings in the delivery of transportation projects.

For additional information, please contact:
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