

2010 NSDI Cooperative Agreement Program Proposal

Category 7: Demonstration of Geospatial Data Partnerships across
Local, State, Tribal, and Federal Government

Taking it to the Next Level: NCStreetMap 2.0

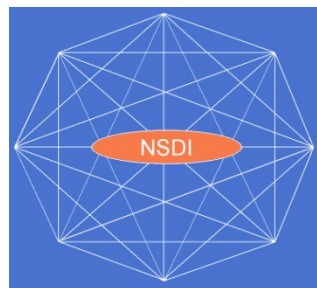
Local to State Transformational Data Exchange

Prepared By:



Eastern Carolina Council

Presented To:



In Response To:

**Program Announcement No. 10HQPA0011
For Fiscal Year 2010**

January 7, 2010

Project Narrative

Proposal Summary

(a) Project Title	<i>Taking It To The Next Level: NCStreetMap 2.0 Local to State Transformational Data Exchange</i>
(b) Applicant Organization	Eastern Carolina Council of Governments 233 Middle Street New Bern, NC 28560 www.eccog.org
(c) Relevant National Digital Geospatial Clearinghouse node	NOneMap www.nconemap.com
(d) Principal Investigator	Alex W. Rickard, Planning Director Eastern Carolina Council of Governments Co-Chair, WGRT 252-638-3185 ext. 3021 arickard@eccog.org
(e) Collaborating organizations	NC Department of Transportation GIS Unit 4101 Capital Blvd Raleigh, NC 27604 Eastern Band of Cherokee Indians 45 Council House Loop Cherokee, NC 28719 The NC State Mapping Advisory Committee's (SMAC) Working Group for Roads and Transportation (WGRT) http://www.ncgicc.org/
(f) Other key contact personnel	Janet Lowe, Spatial Data Manager NC DOT GIS Unit & Co-Chair, WGRT 919-707-2153 jolowe@ncdot.gov David Wyatt, GIS Manager Eastern Band of Cherokee Indians 828-497-8123 DAVIWYAT@nc-chokeee.com
(g) Geographic scope	The State of North Carolina Eastern Band of the Cherokee Tribal Lands
(h) Previous CAP participation	Eastern Carolina Council of Governments 2003 Category 1 – Metadata Creation & Implementation

(i) Project Description

The Eastern Carolina Council of Governments, the NC Department of Transportation, the Eastern Band of Cherokee Indians, and the NC Working Group for Roads and Transportation seek \$75,000 as a FY2010 CAP award in Category 7: Demonstration of Geospatial Data Partnerships across Local, State, and Federal Government. The objectives of this proposed project include:

- Develop a “NC Community Street Centerline” data exchange standard and schema (both in ESRI Shapefile and GML Simple Features formats).
- Collaboratively with the NC parcel data community, develop an open source desktop data transformation tool to assist local data stewards with converting their data into common formats - in this case, the “NC Community Street Centerline” exchange standard.
- Develop documentation and training materials in the use of the new street centerline standard, the data transformation tool, and offer a series of training workshops for local street centerline providers.
- Enhance the existing “NCStreetMap” data repository to incorporate the use of the new data transformation tool in the data sharing workflow.
- Provide the NCDOT with transformed street centerline data from the Tribe and all of the participating NC local government data stewards to facilitate the compilation with the NCDOT System roads into an integrated statewide street network for North Carolina.

Project Background

North Carolina has a long and successful history of geospatial collaboration between many different levels of government. This proposal is a continuation of that ongoing commitment to partnership and data sharing. The success is due in no small part to the organized governance structure established within the state. The NC Geographic Information Coordination Council (GICC) is the primary governance body for geospatial matters, and is established by legislation. The State Mapping Advisory Committee (SMAC) is the arm of the GICC that sets data and mapping standards and coordinates statewide data collection and funding efforts. The SMAC commissioned the Working Group for Roads and Transportation (WGRT) in 2006. The WGRT is composed of domain experts and interested members from all levels of government who create or depend on transportation data. The WGRT is the GICC’s official spatial data coordination mechanism for framework transportation data in North Carolina. As the project applicant, the Eastern Carolina Council of Governments (ECC) respectfully submits this proposal for funding to enhance and extend the WGRT’s existing transportation data sharing infrastructure, *NCStreetMap1.0* (www.ncstreetmap.net), on behalf of a larger project team composed of the Eastern Band of Cherokee Indians (EBCI), the NC Department of Transportation (NCDOT), the WGRT members, and the participating local data stewards.

Project Scope

Although *NCStreetMap* 1.0 already provides a secure, “one stop shopping” repository for local, and regional street centerline data, it does not yet resolve the problem of each dataset existing in its own format. Since the release of *NCStreetMap 1.0* in 2008, the WGRT has focused its efforts on updating the state’s existing street data exchange standard to prepare for the next level of improvements – the creation of a new NC community street centerline data model and GML schema. This next phase is the subject of this funding proposal and aims to develop a freely available mechanism for local governments to transform their data to the community schema before submitting it to an enhanced *NCStreetMap 2.0* data repository. The fundamental problem to be solved is how can local government spatial data stewards maintain their framework transportation data in their own native formats (designed to meet their own business needs); while also sharing the data with State and Federal Agencies who need data in a common format to aggregate contributions from many producers into seamless statewide and national products.

The WGRT considered and investigated several options using either server or desktop based commercial spatial Extract, Transform, and Load (ETL) software to accomplish the task of data integration. However, the prospect of unfunded yearly software licensing costs resulted in eliminating these possibilities as viable solutions. This left one solution – consider an open source desktop data transformation tool approach. Providing local governments with a free tool would resolve the software licensing and maintenance cost problem.

The WGRT’s companion entity, the Working Group for Seamless Parcels (WGSP), has recently begun a similar project to create a parcel data transformation tool which contains most of the same features that local transportation data stewards need to share their data. However, certain features the WGRT considers necessary for transportation data are not included in the WGSP project scope. The WGRT faces the same constraints the WGSP did with local data, and has come to the same conclusion: the best approach will be to develop an open source data transformation tool that may be freely distributed to all local government data producers. The WGRT proposes, as a part of this project’s activities, to collaborate with the WGSP in developing a single tool that will meet the needs of both groups, with the WGRT project concentrating on functionality specific to the integration of transportation data. As a result of the collaborative effort, rather than being dedicated solely to parcel data, the proposed tool would then be useful for the transformation of multiple framework datasets.

The most efficient method to build the proposed tool will be to leverage one or more of the existing open source libraries that already provide a high percentage of the desired functionality. The working groups have identified the following candidate projects: GDAL/OGR, FDO, FDO Toolbox, Proj4, SharpMap, and GEOS. By releasing the tool as open source and sharing it with the community, it will be easier for future enhancements to be collectively developed by like-minded contributors. The WGRT submits that a “community owned and operated” open source solution will provide the best opportunity for a sustainable system in NC.

The objectives for the proposed *NCStreetMap 2.0* project are:

- Develop an “NC Community Street Centerline” data exchange standard (both Shapefile and GML Simple Features formats) as the WGRT’s primary data transformation target. As a secondary transformation target, develop an “FGDC-aspirant” schema that aligns, as closely as is

feasible, with the FGDC Framework Transportation Standards. Refer to the illustrations in Appendix A for a comparison of the different data standards.

- Collaboratively with the WGSP, develop an open source desktop data transformation tool to enable local data stewards to visually map the existing structure of their datasets to a target community schema, control the transformation process of their data and perform basic schema validation functions. The additional capabilities WGRT proposes to develop with CAP funding to facilitate the sharing of transportation data include:
 - Ability to generate a report after transformation identifying logical errors such as incorrect domain values or inconsistencies in street names or address ranges on individual routes.
 - Ability for users to identify keys and split input spatial dataset attributes into core centerline dataset properties and others belonging in a reference table, such as number of lanes and lane width.
 - A “mini metadata” capture interface so local data providers can input critical temporal information for each iteration of data transformation for the tool to include at the feature level.
- Promote the project and increase future participation by developing end-user tool documentation for local providers; developer-level documentation for the code modules; host regional training workshops for participating data stewards; present the project at one national conference and two state level meetings; and identify and document the following items in a project report:
 - Best practices for vertical sharing of transportation data that include: geometric alignment of roads at jurisdictional boundaries, establishing policies for data sharing, maintenance of database attributes, data update cycles, and topological requirements.
 - The organizational relationships and data sharing agreements between the different project participants.
 - Mutual benefits to project partners this effort provides.
 - Technical issues encountered and overcome during the project
- The WGRT will enhance the existing *NCStreetMap 1.0* application and integrate automated output from the data transformation tool into the *NCStreetMap 2.0* data sharing work flow.
- Provide the NCDOT with street centerline data in the “NC Community Street Centerline” standard to facilitate its aggregation with the NCDOT System roads into an integrated statewide street network. Although the entire statewide data integration effort is beyond the scope of funding available for this proposal, it represents the planned next phase of work in the process of developing and publishing a seamless NC street centerline dataset for USGS to incorporate into The National Map. All transformed data and metadata produced by this project will be available from the *NCStreetMap* repository, and freely shared with Federal programs.

The role of ECC's representative is that of Principal Investigator (PI) and WGRT co-chair. The PI will manage the contractors, track funding utilization, reporting requirements, and assign the in-kind services components to WGRT members. The key contact from the EBCI will create project documentation describing the unique conditions placed on the sharing of Tribal data and how the restrictions will be handled. The role of the NCDOT key contact is WGRT co-chair and will provide project support concerning methods the agency uses to manage transportation data associated with other federal reporting requirements that may affect the project. The role of other WGRT members will be to define the transformation tool's functional requirements and user interface design specifications in collaboration with the existing WGSP project team; perform iterative testing of the tool; and complete in-kind services project components assigned by the project manager.

The geographic extent of the project will include the EBCI Tribal land. The jurisdiction of the largest data partner (NCDOT) is the entire state of North Carolina, which covers 48,850 square miles of land surface. The Tribal lands of the EBCI cover approximately 63 square miles of land surface. This project will include street centerline data from the national priority urban areas of Charlotte and Raleigh-Durham.

Organizational Capacity and Project Management Strategy

The Eastern Carolina Council of Governments (ECC) is a multi-county planning and economic development entity in nine east-central NC counties: Carteret, Craven, Duplin, Greene, Jones, Lenoir, Onslow, Pamlico, and Wayne. ECC provides the organizational mechanism for local officials to address region-wide planning issues and goals in a structured manner. By joining together, local governments create a valuable instrument for crossing political jurisdictions and a system for cooperation and coordination.

The *NCStreetMap 2.0* Integrated Project Team (IPT) is composed of WGRT members and participating data providers. It will solicit proposals for the programming tasks and select a contractor who is able to working collaboratively with the WGSP developers to create the transportation-specific functionality and integrate new functions into the larger project as extensions. The IPT will define technical and functional requirements, research applicable standards, develop a communications plan, participate in iterative testing, and provide ongoing feedback to developers through bug reports, regular web-based meetings and conference calls. The development contractor will be responsible for creating and documenting the application code and developer-level instructional materials. The IPT will take the lead role of developing end-user manuals, promotional materials, training workshops and presentations as the project's in-kind services match. Most of the members of the IPT are responsible for creating and maintaining geospatial data in their primary positions, and are practiced in responding to the needs of their organization's constituents. The IPT and WGRT leadership possess demonstrated experience in managing transportation and geospatial projects, contractors, budget, and staff.

A subset of the IPT member organizations will perform beta testing of the data transformation tool. Upon acceptance of the final product, the IPT will conduct a pilot project to train and transform the street centerline data for all participating local data providers. Each participating Council of Governments (COG) will be responsible for overseeing the installation, training, and implementation of the translator in their constituent counties. Local data providers will attend training in the use the

data transformation tool and complete the process of mapping their data to a common schema. Each will provide quarterly updates of their street centerline data, with metadata to the *NCStreetMap 2.0* repository. Upon completion of this pilot project, the IPT will produce a comprehensive final project report.

The requested funding represents 0.013% of the applicant organization's yearly budget. The WGRT has no budget of its own. However, as an arm of the GICC, it will continue to exist and perform its mission beyond the scope of this project. The WGRT member organizations will continue to support the project with in-kind services and other funding opportunities as they become available. The WGRT submits that this project is an ideal candidate for NSDI funding, as it aims to provide the following benefits to participants or other entities that use or depend on local transportation data:

- A vendor-neutral approach to data sharing that others may use as a model
- A freely available, open source data transformation tool with documentation
- A community street centerline schema that others may use as an example
- Training materials for local governments, including best practices identified throughout this project for use in developing vertical organizational data sharing partnerships

Related Experience of Project Team

Prior to the commission of the WGRT, NCDOT was the primary organization driving transportation standards in the state. A large number of resources were dedicated annually to aggregate state and local datasets. NC DOT partnered with USGS for many years to digitize and attribute all of the transportation features in NC from the 7.5 minute USGS topographic maps in DLG format. This base data served as an integral part of early Federal/State partnership effort to produce a national transportation layer.

In 2006 local and state stakeholders agreed to change the mechanism for coordinating these efforts to benefit as many stakeholders as possible. By 2008 the WGRT was co-chaired by NCDOT and a local government representative. These changes have resulted in significant productive collaboration across the state, as well as serving as a model for the WGSP and other organizing bodies within the state. The WGRT and the *NCStreetMap* effort have been an active component of the larger *NCOneMap* project since their creation and continue the partnership tradition.

Today the WGRT is the official spatial data coordination entity for framework transportation data in NC. The GICC and its working groups exist to develop policies regarding the use of geographic information related spatial technologies. They conduct strategic planning, resolve policy and technology issues, and provide coordination of GIS efforts. The fundamental goals of the proposed project are in complete alignment with the GICC mission, *NCOneMap's* guiding principles, and the larger NSDI concept. The WGRT has taken a phased approach to achieve these goals.

The first phase of WGRT's work was to create a secure data sharing repository known as *NCStreetMap*, piloted in 2007 and released statewide in 2008. Its purpose is to be a "one-stop shop" where centerline data from many data stewards is available to authorized users in a "self-serve"

format. In the first project, the WGRT conducted stakeholder requirement meetings, application design sessions, testing iterations, documentation review, promotional talks, and data provider training sessions.

The WGRT has spent the past twelve months completing the second phase which was to update the state's street centerline exchange standard. To accomplish this task the WGRT created a subcommittee of fifteen state and local data stewards (see Appendix B). This subcommittee surveyed industry efforts such as TransXML, NCHRP 20-64, GDM-O-Matic and the FGDC transportation schema to recommend an updated transportation standard to the GICC that would significantly enhance vertical integration of transportation data across local, state, and federal agencies. In addition to improving compliance with the FGDC Framework Transportation Standards, the revisions enhanced the standard by placing a greater emphasis on geospatial data integrity, allowing for greater functionality such as routing, and providing greater documentation and guidance for local government data stewards.

As the third phase, this project will result in the creation of a NC Community Street Centerline data exchange schema based on the new exchange standard and a translator to facilitate implementation. Upon completion of this project the WGRT will be equipped to pursue the fourth phase which is to coordinate with NCDOT in the creation of a seamless statewide centerline dataset that can be incorporated in the National Map.

Data Gathering, Documenting and Promotion Capacity

The recently updated centerline standard and the initial NCStreetMap 1.0 effort clearly demonstrate the WGRT's capacity to work with many partners and their understanding of the issues associated with implementing a nested approach to Local/Regional/State/Tribal/National data sharing. Over the course of these two projects the WGRT has led the collaborative effort of over a dozen state agencies and twenty local governments along with the USGS, the US Census Bureau, and the Eastern Band of Cherokee Indians.

In addition to developing standards and policies, the WGRT membership is responsible for coordinating with the other groups under the GICC and providing outreach to the larger NC GIS community. The WGRT co-chairs provide regular updates on activities and progress to all GICC committees and working groups. For the last two years WGRT members have given presentations on *NCStreetMap 1.0* and the revisions to the street centerline exchange standard at annual conferences for URISA, the NC Arc Users Group, the NC Property Mappers Association, the NC GIS Conference, as well as other regional technical groups.

Beyond engaging the NC GIS community, the WGRT has sought to include many of the street centerline end-user groups in the state. The WGRT membership includes representatives from transportation planning and engineering groups such as the NC Association of Metropolitan Planning Organizations (NCAMPO), the NC Association of Rural Planning Organizations (NCARPO), NC Section Institute of Traffic Engineers (NCSITE), and the Institute for Transportation Research and Education at North Carolina State University (ITRE). The WGRT co-chairs have also given presentations at the NC Public Transportation Association Conference and provided updates to the NC E911 Board.

Enhancing and Expanding the Current Best Practice Capacity

Vertical integration of street centerline data has been the goal of all past and current WGRT activities. While this project and the proposed translator primarily focus on the local to state portion of the overall data integration effort, the work and effort going into this project as well as the tools developed will aid NCDOT in the final state to national portion of the overall centerline data integration effort. In the proposed NC Community Centerline Data Exchange Standard, the WGRT has taken great effort to include the necessary element properties to comply with the FGDC Framework Transportation Schema definition of a “Road Segment” feature (see Appendix A).

During the pilot project, the Integrated Project Team (IPT) will create training materials and end-user manuals in the use of the data transformation tool. Regional training workshops will be held across the state and participating Councils of Governments (COGs) will provide additional support to local data providers. Upon completion of the pilot project, all training materials (including end-user manuals, presentations, centerline standard and schema documentation, and sample datasets) as well as application code and developer-level instructional materials will be posted on the WGRT website to ensure that others may benefit from this project.

No hardware or commercial software will be purchased with CAP monies, but they will be used to fund the primary development of open source software to accomplish the project goals. After the pilot concludes, the WGRT will continue a phased approach to training and bringing the remaining local data providers into the data sharing collective. Later project phases are anticipated to take an additional three to five years beyond the pilot’s performance period to accomplish complete statewide participation. Future WGRT standards development activities will include creating community schemas and implementation best practices for other transportation features: sidewalks, bike trails and transit routes. By partnering with the WGSP in its work to create a similar data sharing infrastructure for parcels, the resulting tools and techniques will be flexible enough to use with other data layer aggregation efforts.