

Remote Sensing and Spatial Information Technologies for Transportation Decision Making

*Streamlining Environmental Impact Information Collection, Assessment, and the
Planning Process for New Transportation Corridors and Relocations*

By

Charles O'Hara, Ph.D.
GeoResources Institute
Engineering Research Center
Mississippi State University
P.O. Box 9627
Mississippi State, MS 39762-9627
1-662-325-2067
cgohara@erc.msstate.edu

and

Lonnie P. Hearne
SimWright Inc.
Middle Tennessee Office
P.O. Box 682648
Franklin TN 37068-2648
1-615-497-0569
lonnie@simwright.com

Submission Date: February 13,2004

ABSTRACT

Improving the timeliness and cost-effectiveness of delivering transportation projects is a major concern of the US DOT, State DOTs, and MPOs. The National Consortium for Remote Sensing in Transportation (NCRST) is a joint effort of NASA and the US Department of Transportation dedicated to develop innovative ways for using remote sensing and spatial information (RSSI) technologies to improve transportation planning and management. NCRST has five member consortia each headed by a university and consisting of educational, government, and industry representatives. One of these consortia, NCRST-E, focuses on areas designed to improve processes for completing transportation corridor planning and environmental assessment tasks. Over the past 3 years NCRST-E has conducted several technology application projects including the use of remote sensing for wetlands analysis and mapping, land use/land cover assessments, and for developing corridor oriented regional GIS databases for multi-modal transportation planning.

Transportation corridor-planning processes are well understood and a high degree of consensus exists among practitioners about the stages and tasks that should be included as best practices. However, current practices of conducting these planning processes do not typically employ use of RSSI technologies to streamline and improve the processes. DOTs, practitioners, and consultants are willing to use RSSI Technologies. However, research, development, integration, piloting, and deployment demonstrations are needed to understand, document, and refine the costs, requirements, definitions, and specifications for how these services may be made a part of standard business practices for transportation corridor planning.

NCRST-E is currently exploring ways that RSSI technologies might be used to assist corridor planning in the Southeast U.S. Corridors selected for on-the-ground partnering projects might include the US 98 Coastal Corridor in NW Florida, segments of I-69 in Mississippi, the Birmingham Northern Beltway Corridor in Alabama, and corridor issues that may arise relative to the reconfiguration of SR 840 plans in Middle Tennessee.

The NCRST-E research project seeks to develop and deploy improved methods of data collection and exchange, information technologies, analysis tools and methods, and collaborative architectures. These efforts would improve the data-driven planning and evaluation processes that have been identified as major needs to improve the delivery of environmentally sound transportation projects to the public. An adjunct to the effort is the development of improved methods for public participation and early involvement of resource agencies as a key to improving the delivery of sound transportation projects. The overall goal of the project is to increase the speed and efficiency with which statutory environmental assessments are conducted.

Background

The National Consortium for Remote Sensing in Transportation (NCRST) is a joint effort of NASA and the U.S. Department of Transportation (USDOT). Funding for the effort is provided by the Department of Transportation and administered by the USDOT Research and Special Projects Agency (RSPA). The Transportation Research Board (TRB) provides research guidance. NCRST has five member groups each headed by a university and consisting of educational, government, and industry representatives. These five groups are:

- NCRST-I for transportation infrastructure studies
- NCRST-E for the study of environmental assessment issues related to transportation
- NCRST-DASH for disaster, safety, and hazards assessment issues
- NCRST-F for issues related to transportation flows
- NCRST-P for issues related to pavement research

These groups are responsible for conducting research and executing technology application projects that demonstrate the use of new technologies for innovation in transportation operations. Representative NCRST projects in recent years have included:

- Use of remote sensing for air quality evaluation
- Use of remote sensing for land use/land cover assessments for transportation planning
- Development of automated tools for optimum corridor planning
- Use of remote sensing and corridor oriented regional GIS databases for multi-modal transportation planning
- Use of remote sensing for emergency preparedness planning and transportation hazard analysis
- Use of remote sensing for GASB-34 data acquisition and archiving

NCRST-E is managed by the Mississippi State University GeoResources Institute. Recent efforts by NCRST-E as well as aggressive efforts by state DOT's and local geographic information system (GIS) offices have developed a number of analysis technologies to enable transportation planners to do their jobs more effectively. The NCRST environmental consortium (NCRST-E) has explored the use of remote sensing for a number of transportation corridor applications. Examples include a regional database for environmental planning in the I-10 Mississippi Gulf Coast corridor and environmental assessment for a new Mississippi river crossing for the I-59 corridor.

Prior projects have demonstrated that the most cost/time consuming parts of the projects have been assimilating relevant geospatial data for the areas of concern. The problem is that the required data is often available but obtaining access can be very time consuming due to the fact that the data is owned by multiple agencies in multiple formats with multiple policies regarding data distribution. One solution to this problem is to create "regional" databases that focus on a "collect once- use many times" approach to data collection. This approach is now being explored for use in the I-10/CSX railroad relocation effort in coastal Mississippi and is being actively

pursued by the Florida DOT. In an era of shrinking resources this approach has the potential to provide great cost savings.

A logical next step in exploring remote sensing applications for environmental assessment in transportation planning would be to investigate the geospatial data needs of a regional Metropolitan Planning Organization and to explore application of the technologies developed for corridor planning to network oriented planning issues. A technology application project is proposed that would be conducted in two phases. The first phase would be a requirements definition to specify the data types/content required to support regional network planning. This would require comparing lessons learned in corridor planning and assessing their applicability to regional network planning. Another facet of this phase would be an assessment of the technical and political hurdles that would need to be solved in order to implement the system. The output of this phase would be a proposed demonstration pilot plan for implementing a regional database structure for specific regional projects. The second phase of the effort would be to implement a regional geospatial database structure for the target regions.

NCRST-E Proposal for SAFE-T Transportation Bill

Previous NCRST-E consortia research and technology application projects (TAPs) focused environmental studies on such topics as wetlands mapping and impacts, air quality impacts, transportation and land use development impacts on the environment at regional, watershed and landscape scales. This included evaluation of the impact of transportation and land development on sensitive coastal environments. Successes in early projects demonstrated that these technologies can be integrated into early planning and design processes and add significant efficiencies to the processes of transportation corridor planning and related environmental assessment activities.

The Federal Highway Administration's *National Environmental Streamlining Initiatives* have resulted in increased awareness of critical success factors and areas of greatest need for improved transportation decision-making. Other research has clearly demonstrated that streamlining the environmental assessment process has potential for decreasing the cost and time associated with transportation projects.

The next phase of NCRST-E research will focus on practical implementation of new RSSI technologies at regional levels. The NCRST-E research project will provide for an approach that would streamline the process while providing improved decision and analysis tools. The NCRST-E proposal has been approved by the NCRST oversight committee and is currently slated for full funding under the SAFE-T transportation bill.

“The single biggest challenge to environmentally sound Federal-aid transportation project development is related to the amount of time it takes to advance a project through the project development process (i.e., from the planning phase through the environmental review and approval process through final design and then through construction). It is common for major projects to take 10 years or more to advance from the planning phase to completion of construction and 20 years is a common time frame for complex, controversial projects.”
(NCHRP 25-24, Draft Interim Report)

The core of the NCRST-E research effort would be creation of a geospatial database that can integrate imagery and geospatial data on a regional basis and readily provide this data to the agencies that need it. The research will also provide these agencies with tools that were developed under prior research efforts. This will enable these agencies to exploit this geospatial data for decision-making.

The next phase of NCRST-E research will build on the successes of the past and will involve selected on-the-ground transportation corridor projects and strategic partnerships with industry partners and state DOT practitioners. In these new projects, the NCRST-E team of researchers and partners will work closely with data providers, consultants, commercial off-the-shelf software companies, industry planners and practitioners, and DOT project managers to deploy RSSI technology solutions to help streamline NEPA processes and related transportation corridor planning tasks.

Transportation Corridor Planning Processes

A transportation corridor is a broad geographic area served by various modal transportation systems that provide important connections within and between areas of a state or region for people, goods, and services. Transportation corridor planning is a long-range program for developing and managing transportation systems that move people, goods, and services within a specific transportation corridor. DOTs have diligently sought to identify and refine planning processes that will result in the delivery of environmentally sound transportation projects that meet the long-term needs of the public.

Transportation corridor planning comprises many stages and tasks that vary between specific corridors. However, corridor planning generally includes the stages and tasks included in Table 1.

TABLE 1. TRANSPORTATION CORRIDOR PLANNING STAGES AND TASKS THAT MAY BENEFIT FROM RSSI TECHNOLOGIES	
Transportation Corridor Planning Stage	Tasks That May Benefit
Scope the project and develop a work plan for the transportation corridor planning process	Develop interactive methods for mapping potential corridor boundaries, drilling down to and highlighting critical needs, and extracting key decision points for the project.
Develop a public participation plan	Develop tools that create maps and data results with adequate image, demographic, and environmental information content. Develop and provide web-based map content, information delivery, and improved notification methods.
Develop early resource agency involvement	Improve maps that identify specific resource agency concerns, providing appropriate image and environmental information content. Provide web-based map content and information delivery.
Develop a data and information sharing and exchange plan	Develop and deploy an enterprise RSSI technology architecture that provides all spatial data needed in the planning process and allows interoperability with tools needed to analyze data, extract information, and support decision-making.
Analyze current and future projected multimodal demand and performance	Improve linkage between demand forecasting models and spatial tools to estimate long-term (20-year) multimodal demand. Develop improved mapping tools to identify deficiencies in existing transportation systems where the system will be inadequate to serve future projected needs.
Document existing conditions of the transportation system	Improve use of RSSI technologies to research, attribute, and map a complete picture of the existing transportation system including highways and streets, railroads, airports, transit services, bicycle and pedestrian facilities, intermodal connection facilities, and utilities.
Document existing and projected environmental and land use conditions	Improve use of RSSI technologies to research, attribute, and map current and planned land use and the cultural, historical, and socio-economic characteristics and critical components of the corridor. Develop improved method for screening and identifying critical environmental factors and identifying issues that must be addressed and mitigated in decision-making processes.
Establish purpose and prioritize needs to meet goals	Develop tools to explore issues within the corridor boundary including deficiencies, inadequacies, and long-term planning factors so that spatial information may be best used to document needs and establish long-term goals for the corridor.
Generate alternatives that meet goals	Develop improved RSSI and information technology tools in cooperation with industry and practitioners that will assist in the generation of alternative routes and provide participatory methods to gather the list of alternatives that are generated as map-based products to be used in decision support processes. Develop tools that generate conceptual maps to show potential alignments and tabulate local human, property, and environmental impacts for initial screening.

TABLE 1. TRANSPORTATION CORRIDOR PLANNING STAGES AND TASKS THAT MAY BENEFIT FROM RSSI TECHNOLOGIES	
Transportation Corridor Planning Stage	Tasks That May Benefit
Identify feasible alternatives by evaluating all alternatives that achieve goals	Develop RSSI tools that employ spatially variable significant constraints and screening criteria to identify feasible alternatives. Tools will generate cumulative “cost-path” comparisons for alignments and support comparative analysis for decision support that compiles results for all alternatives. Make the tools available to public participation and planning processes to help compile feasible alternatives list.
Compare alternatives to generate a list of preferred alternatives	Develop RSSI tools that consider more detailed information to evaluate, rank, and prioritize the feasible alternatives. Develop decision support tools that allow selection of preferred alternative(s) from the prioritized feasible alternatives.
Compile all results and components into a corridor plan document	Develop RSSI tools to gather needed information and decision support products for inclusion in a corridor plan document that includes all key findings, map-based and tabular data and information summaries, and implementation recommendations that include detailed map-based and tabular information.

An integrated approach is proposed in which an enterprise-wide data-enabled framework will be established to support research, development, piloting, and deployment of results in a regional selection of transportation corridor projects. Specific on-the-ground projects have been selected based on geographic location, identification of projects providing opportunity to partner, and identification of agency champions who desire to participate in the NCRST-E follow-on research program. The selected projects are of various scopes and at different stages in their project life cycle, thereby illustrating the important point that RSSI technologies offer methods of improving tasks in most or all of the stages of the transportation corridor planning process. However, since the typical project may be 10 to 20 years in duration, it is necessary to select multiple projects at different stages to develop RSSI technologies that can be developed, piloted, and deployed in phases throughout transportation project life cycles.

Research, development, piloting, and deployment activities will be directed to address factors that include, but are not limited to the following:

- Identifying and selecting appropriate data for specific tasks
- Developing specifications for desired data
- Acquiring and verifying data and ancillary products
- Developing architectures for the broad use and efficient access and exchange of data
- Developing tools to extract information products from data for the corridor planning process
- Developing decision support environments for comparative analysis of alternate solutions
- Preparing methods and materials that best present data and results in public processes
- Verifying and validating results with stakeholders and natural resources agencies
- Conducting outreach to gain acceptance of results and benefits of RSSI technologies
- Developing tools and methods for documenting, aggregating, and encapsulating results

Proposed Project Areas

NCRST-E has selected regions and transportation projects to demonstrate methods that effectively integrate RSSI technologies to maximize their usefulness and application for supporting transportation corridor planning processes. This has been done through consultation with DOT, MPOs, and other agencies. These projects have been selected to focus resources on the southeastern part of the nation. NCRST-E involvement will benefit existing projects by providing participation and added resources to advance planning processes that in some cases have slowed or stalled due to actual or perceived planning or environmental problems. By developing and sharing vital RSSI data, technologies, and information products among several projects and practitioners for the southeastern region, this effort will demonstrate the importance of regional databases for transportation corridor planning and environmental impact assessment processes. The proposed on-the-ground corridor projects have been identified in the southeastern United States geographic area and are presented in Table 2.

The overall goal of the NCRST-E research effort is *to demonstrate through cooperative development, piloting, and deployment the utility of an enterprise data framework that is interoperable with an extensible set of validated analysis tools that streamline specific tasks within a highly integrated, data-driven, RSSI technology-enhanced transportation corridor planning process*. As a core component of this project, data sharing technologies and architectures will play a prominent role. Cooperation with standards bodies and software developers, outreach with practitioners, and validation with resource agencies will facilitate the acceptance of results and enable full industry and commercial deployment. The proposed project is vital to the successful deployment of RSSI technologies in streamlining transportation corridor planning and relocation projects.

TABLE 2. PROPOSED ON-THE-GROUND CORRIDORS AND PRINCIPLE ISSUES REQUIRING IMPROVED RSSI TECHNOLOGIES	
Corridor Project	Principle Issues
<i>I-69 Corridor</i>	Planning and designing segments of the I-69 project in Mississippi and Tennessee will entail consideration of numerous access plan issues and connector strategies. Specific segments offer the opportunity to deploy improved spatial data to facilitate these studies.
<i>Birmingham Northern Beltline Corridor</i>	This high-visibility project has been approved, but improved technologies for land use planning and access management solutions are required to streamline the delivery of the project.
<i>US Highway 98 Coastal Corridor</i>	Coastal topographic constraints, sensitive environmental elements, and vulnerability to natural disasters add complexity to the transportation corridor planning process.
<i>Middle Tennessee SR 840</i>	Dramatic growth and prosperity have driven the need for transportation improvements, but sensitive cultural and agricultural resources, as well as human and natural environmental conditions, have led to conflicts in project progress, contention in planning processes, and stalled projects.

Project Tasks and Approach

The overall project is divided into two phases. The first phase will be a requirements definition phase during which the data acquisition/integration needs will be defined. Although the overall transportation planning process is somewhat generic, individual regions have specific needs and problems. During the first phase, stakeholder “pain elements” will be catalogued to ensure that the pilot implementations address stakeholder problems and issues. Project Tasks are defined in Table 3.

TABLE 3. TASK CATEGORIES IDENTIFIED FOR THE PROJECT	
Task Categories	Descriptions
<i>Enterprise Architecture (EA)</i>	Interoperable hardware, software, interfaces, and methods are developed that enable the common use of all needed data and analysis tools throughout the enterprise. Data requirements will be developed, exchange and sharing methods developed, piloted, and deployed for each project providing access to all partners for data needed for respective project components.
<i>Tools Development (TD)</i>	The EA exposes data to tools developed by using software development kits (SDKs) based on open application programming interfaces (APIs). Tools will be developed for individual project components, but will be developed to be applicable for use in any geographic local for that particular task in the corridor planning process. Tools will be developed or integrated from existing sources that accomplish tasks that include, but are not limited to corridor boundary definition and mapping, land use determination, environmental analysis, corridor least cost analysis, wetlands mapping, mitigation and right-of-way acquisition planning, and decision support analysis tools.
<i>Data Acquisition (DA)</i>	Common remote sensing foundation data will be compiled from existing sources or acquired as needed. Common data will include retrospective satellite multispectral and panchromatic image data, high-resolution satellite multispectral and panchromatic image data, high-resolution aerial multispectral and panchromatic image data, high-resolution aerial hyperspectral image data, and high-resolution elevation data from LIDAR, SAR, or stereo image data.
<i>Outreach and Technology Transfer (OTT)</i>	Extensive communication, collaboration, and user community involvement will be undertaken to gather input, develop requirements, communicate activities, conduct workshops, publish results, and document the overall efforts to deploy RSSI technologies that improve operating procedures and business practices in transportation corridor planning processes. Training materials will be developed, tested, and optimized to provide effective training experiences for users, managers, and practitioners.
<i>Verification and Validation (VnV)</i>	Data, tools, and results will be verified through coordinated investigations and analysis. Results and products will be validated with users, DOT practitioners, and resource agencies to enhance the acceptance of the data, tools, and results in planning processes.
<i>Information Technology and Documentation (ITD)</i>	To optimize distribution of data, provide extensible use of tools and methods, and to provide an enhanced capability to involve the public and decision makers in the planning process extensive information technology methods will be used to deploy results of the project via web mapping, analysis, interactive planning, and decision support tools. Methods will be developed and deployed to enhance sharing of data and tools among project partners, stakeholders, and public participants.

Technologies and Technology Partners

The current RSSI technology base, tools, and products that can be used in an enhanced transportation corridor planning process have been developed and used in piece-meal planning processes in various streamlining pilot projects across the nation. However, these activities have tended to develop stand-alone tools, analysis environment, and data management approaches which have typically resulted in stovepipe solutions rather than highly integrated data-driven planning processes needed to improve transportation decision making and the timeliness of project delivery.

To overcome the limitations of stovepipe solutions, a “best-of-breed” or industry standard set of data sources, technology solutions, industry partners, and fundamental tools have been selected to be extended and integrated into the proposed enterprise decision-support framework. Table 4 provides an overview of the selected tools and data that have been used in the transportation industry and have been selected because of the capabilities they provide, the commitment of the vendors to partner in the project, and the enhanced services that the solutions provide due to their near readiness for full deployment. Each solution selected is at a technology readiness level that will enable the full deployment of proposed services through the successful completion of project objectives.

TABLE 4. BEST OF BREED TECHNOLOGIES AND DATA SOURCES SELECTED FOR PARTICIPATION	
ARCHITECTURE AND SOFTWARE TECHNOLOGIES	
Intergraph Corporation	GIS, remote sensing, corridor analysis, and spatial decision support tools
ESRI	GIS, remote sensing, SDE and GeoDatabase enterprise architecture, IMS web mapping services, and decision support tools
Z/I Imaging	Terra/Share enterprise architecture for RSSI data, web mapping and information services, and photogrammetric software tools
Microsoft and Oracle	Operating system, network capabilities, application environment, and database tools
LINUX Clustering	Computationally expensive tasks can benefit from distribute high-performance computing
HSA Consulting	Feature extraction, attribution, and management tools
SimWright	Engineering analysis and visualization tools
Smart Data Strategies	Land ownership and business process analysis tools

REMOTE SENSING AND SPATIAL INFORMATION DATA SOURCES	
USGS	Landsat 7 ETM, Historical satellite image data
EarthData Technologies LLC	ADS40 digital aerial multispectral image and elevation data, GeoSAR, and LIDAR
Digital Globe	Quickbird satellite image data
Itres Corporation	CASI II hyperspectral image data
Z/I Imaging	Digital Mapping Camera (DMC) aerial image data and elevation data
SDS Corporation	Demographic and parcel data
RESOURCE21	Satellite image data

Architecture and software technologies will be deployed to provide integrated and interoperable mapping services, feature extraction, and analysis environments. Advanced data sources will be deployed along with technologies to extract data products and information that are needed for mapping analysis and decision support processes. Tables 5 and 6 provide an overview of data layers, maps, tools, and services the combination of architecture, tools, software, and data technologies will provide to enhance abilities to conduct standard land use and environmental mapping and analysis, generate and screen alternatives to arrive at a set feasible alternatives, and conduct analysis with increased detail and information extraction within a decision support environment to arrive at a preferred alternative(s) all of which can be included in a transportation corridor plan document .

TABLE 5. TYPICAL THEMATIC LAYERS AND MAPS FOR ENVIRONMENTAL SCREENING IN THE CORRIDOR PLANNING PROCESS	
Representative Maps and Thematic Layers Needed for Environmental Analysis	
Floodways and 100-year flood plain boundaries	Wildlife reserves
Wetland boundaries	Critical wildlife habitat
Archaeological sites	Public parks
Mines	Prime agricultural land
Hazardous waste sites	Barrier effect
Community or public wells	Pedestrian and bicycle access
Rivers and lakes (identifying any designated wild and scenic rivers)	Threatened and endangered species (locations or likely presence)
State and national forests	Noise
Historical buildings, sites, and districts	Neighborhood/business displacement

TABLE 6. INTEGRATED ANALYSIS TOOLS AND DECISION APPLICATIONS PROPOSED TO ENHANCE CORRIDOR PLANNING PROCESSES	
Tool Description	Technology Readiness
Corridor Boundary Mapping	The tool may readily be developed, piloted, and deployed.
Public Participation Portal	The tool may readily be developed, piloted, and deployed.
Resource Agency Portal	The tool may readily be developed, piloted, and deployed.
Regional Database Enterprise Architecture	Existing applications will be adapted and integrated to enable needed data management, access, sharing, and distribution.
Integrated Travel Demand Modeling Toolkit	The tool may readily be developed, piloted, and deployed.
Performance and Deficiencies Analysis and Mapping Toolkit	The tool may readily be developed, piloted, and deployed.
Transportation System Conditions Mapping and Analysis Toolkit	The tool may readily be developed, piloted, and deployed.
Existing and Projected Environmental Conditions Mapping and Analysis Toolkit	The tool may readily be developed, piloted, and deployed.

Existing and Projected Land Use Conditions Mapping and Analysis Toolkit	The tool may readily be developed, piloted, and deployed.
Alternates Generator Interface	The tool may readily be developed, piloted, and deployed.
Feasible Alternatives Analysis and Decision Support Interface	The tool may readily be developed, piloted, and deployed.
Preferred Alternatives Analysis and Decision Support Interface	The tool may readily be developed, piloted, and deployed.
Corridor Plan Document Compilation Kit	The tool may readily be developed, piloted, and deployed.

In addition to developing tools that directly impact and enhance transportation corridor planning processes, specific tools are needed to provide smart services. The need for smart services tools has been identified for RSSI data management, land ownership information management, application streamlining analysis, and core smart services. Core smart services are those that should be incorporated in all tools and applications for measuring and benchmarking process performance.

Smart Services Tools for Data Acquisition and Management include tools for 1) Inventorying RSSI data resources, 2) Determining what RSSI data gaps exist for the project area, 3) Planning appropriate RSSI data acquisition, 4) Developing specification and requirements for data acquisitions, 5) Tracking data acquisition tasks, data licensing restrictions, and data access privileges and 6) Managing the process of RSSI data acquisition, data compilation, and efficient integration of acquired data in the enterprise data framework.

Smart Services Tools for Land Ownership Information Management include tools for 1) Exploring right-of-way acquisition and financial planning, 2) Exploring land acquisition strategies for mitigating impacts, and 3) Integrating RSSI and land acquisition management tools.

Smart Services Tools for Streamlining Analysis of Planning Processes include tools for 1) Identifying planning process bottlenecks, 2) Identifying data, information, and process duplication, and 3) Conducting comparative analysis of processes to determine where “speedup” is being or may be achieved by adding additional technology resources.

Core Smart Services include tools for 1) Measuring duration of processing steps, 2) Logging and documenting process steps, 3) Logging and documenting process analysis data input, outputs, and operation settings, and 4) Managing information about processing tasks completed within an object-based enterprise framework so that activities may be analyzed monitored and measured for performance monitoring and benchmarking the benefits of the streamlining activity.

The project will be led by Mississippi State University and will involve full participation of an extensive set of industry, data provider, agency, and software provider partners. A series of

scoping meeting have been conducted to plan and outline the participation of all partners. Current technology partners are shown in Table 7.

TABLE 7. NCRST-E PARTNERS FOR TRANSPORTATION CORRIDOR PLANNING FOLLOW-ON RESEARCH		
Category	Partner	Specific Role
<i>Data Providers</i>	EarthData Technologies LLC	Aerial image data and elevation data
	Digital Globe	Satellite image data
	Itres Corporation	Hyperspectral image data
	Z/I Imaging	Aerial image data and elevation data
	SDS Corporation	Demographic and parcel data
	RESOURCE21	Satellite image data
<i>Software Providers</i>	Intergraph Corporation	Corridor analysis and spatial decision support tools
	Z/I Imaging	Enterprise architecture for RSSI data
	HSA Consulting	Feature extraction, attribution, and management tools
	SimWright	Engineering analysis and visualization tools
	Smart Data Strategies	Land ownership and business process analysis tools
<i>Agency Partners</i>	Mississippi DOT	I-69 Studies
	Federal Highway Administration	I-69 Studies
	Alabama DOT	Birmingham Northern Beltway Corridor Project
	Birmingham RPC and MPO	Birmingham Northern Beltway Corridor Project
	Nashville MPO	Nashville MPO
	Tennessee DOT	Environmental Planning/Assessment Issues in Nashville MPO area
	Alabama Department of Revenue	Birmingham Northern Beltway Corridor Project
	Florida DOT	Florida Highway 98

Current Project Status

The Joint Program Oversight Committee (JPOC) approved the NCRST-E research project in October of 2003. The project has been included as a part of the research title for the SAFE-TEA transportation bill. Work is currently in progress at MSU to implement the database structure of

the enterprise architecture. Team members are in the process of identifying and contacting stakeholders to apprise them of the project and also to begin identifying what data may be available and what political and engineering issues may arise when the attempt is made to integrate the datasets.

For further information contact:

Dr. Charles O'Hara at 1-662-325-2067; email cgohara@erc.msstate.edu

Dr. Roger King at 1-662-325-2168; email rking@erc.msstate.edu