INTEGRATING SMART GROWTH INTO TRANSPORTATION CORRIDOR PLANNING TO PROMOTE ECONOMIC DEVELOPMENT AND ACTIVE LIVING

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Introduction

Transportation corridor design and planning are garnering much interest from government agencies and planners largely due to growing concerns over their economic and environmental implications. Historically, the objectives of a transportation corridor focused on issues such as improving traffic flow, reducing travel time, safety, promoting economic development, and more recently environmental concerns (Bhatta 2003; Ben-Elia 2003; Forman 2003). Currently, the U.S. Department of Transportation and the Federal Highway Administration are actively pursuing innovative approaches to strengthen the relationship between environmental stewardship while streamlining the planning process in order to foster Context Sensitive Solutions (CSS) (U.S. DOT, n.d.). As part of a larger study, for the Mississippi Department of Transportation (MDOT), concerned with the application of remote sensing and spatial information technologies in promoting economic development, this paper describes an investigation of an alternative to traditional bypass corridor development along the United States Highway 49 transportation corridor from Florence to Wiggins, Mississippi (see Figure 1). The highway 49 transportation corridor is instrumental in linking the Jackson metropolitan area with the Mississippi Gulf Coast, connecting two of the

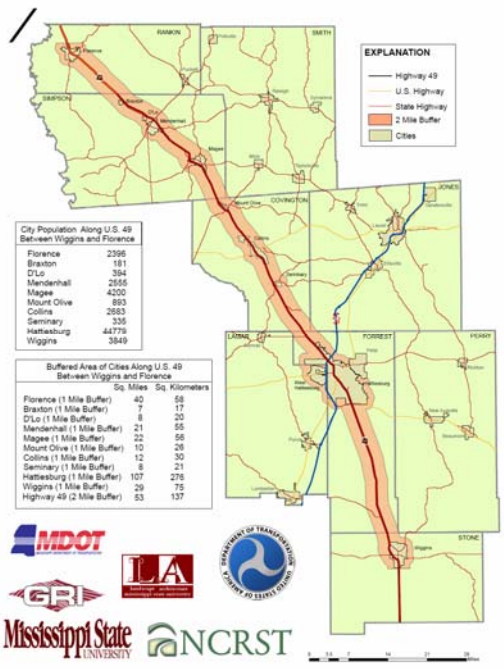

Figure 1 – U.S. Highway 49 from Florence to Wiggins, MS

state's economic engines and serving as a primary hurricane evacuation route. While the transportation corridor links two metropolitan areas, it also transects the largely rural landscape and bypasses the small communities along its route. Unfortunately, in many cases the economic development that results from the bypasses occurs as sprawl, which is typically detrimental to the economic vitality of the small, rural community centers it avoids (Boarnet 1996). Likewise, while an Environmental Impact Statement addresses basic environmental concerns, the implications to the socio-cultural and socio-economic considerations seem much less important. In particular, communities along the highway 49 corridor in Mississippi are experiencing unprecedented population growth and population shifts, a phenomena jumpstarted by Hurricane Katrina. Hurricane Katrina, and the resultant funding pouring into the state, offers the opportunity to wisely plan for this population surge while maintaining the integrity of the Mississippi landscape. While planning for this population surge must consider thoroughly and sensitively the impacts on the land, perhaps of equal or greater importance is thoughtfully addressing the physical environment's role in encouraging a more active citizenry. Mississippi consistently ranks within the top two states in the nation exhibiting the highest rates of obesity (DeNoon 2005). Research has shown that the minority and low income demographic within the state account for the majority of the overweight and obese segments of the population (Hughes and others 2005; Murray and others 2005). There may be numerous explanations for such conditions, yet surely physical activity, or inactivity, plays a significant role in the physical health of this portion of the population. There is much ongoing research examining links between the built environment, physical health, and active living. Therefore, corridor planning that promotes active living is a high priority due to Mississippi's obesity epidemic. This paper investigates innovative planning techniques that offer viable alternatives to traditional corridor by-pass development and design. Specifically, the goal was to identify data types and analysis methods that would best suit development alternatives to transportation corridor planning projects. Furthermore, planning and design principles comprising the "Smart Growth" theories of community development, including active living, present enormous potential for integration into MDOT's transportation corridor planning process.

In order to develop an understanding of transportation corridor issues and dynamics, background research focused on three primary issues pertaining to transportation corridor planning: 1) *application of remote sensing and spatial information technologies to corridor planning,* 2)

sustainable development and environmental impact issues, and 3) *transportation corridor concepts and definitions.* In addition to focusing efforts on the Highway 49 corridor itself, other "corridor types" within the Hwy 49 corridor matrix were defined and considered. Such corridor types include, but are not limited to, wildlife and other environmental corridors, existing and/or potential greenway corridors, historic and cultural corridors for which no visible infrastructure may exist, social corridors at urban nodes, transportation corridors intersecting the Hwy 49 corridor, and small-scale infrastructure such as bike and pedestrian routes. Currently, these important factors influence the economic, social, and environmental success of a corridor's design and development and are not well addressed within MDOT's planning process and therefore warrant the analysis of Hwy 49 as a multi-modal corridor (Albrechts 2003; Conine and others 2004). Principles of "Smart Growth" provide the theoretical underpinning for this research. Specifically, principles defined by the smart growth advocacy coalition Smart Growth America, which offers nine overall elements comprising the smart growth philosophy: 1) *Housing* 2) *Economy* 3) *Children and Schools* 4) *Environment* 5)*Preservation and Revitalization* 6) *Social Equity 7) Transportation 8) Open Space and Farmland 9) Health and Aging* (Smart Growth America, n.d.). From these general elements, specific principles concerning community development, growth patterns, and land use were developed. This project focused on eight smart growth principles that served as the basis for the development of a selection matrix. The matrix served as the tool to select the model towns along the Highway 49 transportation corridor by which to examine the applicability of smart growth techniques to rural communities. The principles forming the theoretical basis for the matrix selection criteria are as follows:

1) Provide a variety of transportation choices
2) Direct development towards existing communities
3) Mix land uses
4) Take advantage of compact building design
5) Preserve open space, farmland, natural beauty, and critical environmental areas
6) Create a range of housing opportunities
7) Create walkable neighborhoods
8) Create distinctive, attractive communities with a strong sense of place

In order to recommend where to integrate Smart Growth approaches into MDOTs planning process required a thorough understanding of the current planning process employed by MDOT. On their website MDOT provides a flowchart (see Fig. 2), with links to explanations of its components, detailing their process of project development for local public agencies

(http://www.gomdot.com/localgov/planning/pdm/manual.htm).

One goal of the project was to situate smart growth planning, as it pertains to transportation planning, within one of the elements outlined in the flowchart, thereby integrating it into MDOT's planning process. MDOT's explanation of the chapters in their flowchart indicate that design decisions and issues pertaining to the projects' location, occur in *Chapter 3- Environmental Documentation*. Based on information gathered, it seems that the *Environmental Documentation* stage of MDOT's project development process was an appropriate inroad for the analysis of smart growth planning in Mississippi communities. Such an analysis contained a twofold target. First, it is possible to assess the quality of the remotely sensed data in aiding the identification of transportation-related issues within rural communities, in the context of Smart Growth planning. Second, the feasibility of adding an innovative planning approach to MDOT's current transportation corridor planning process can be tested.

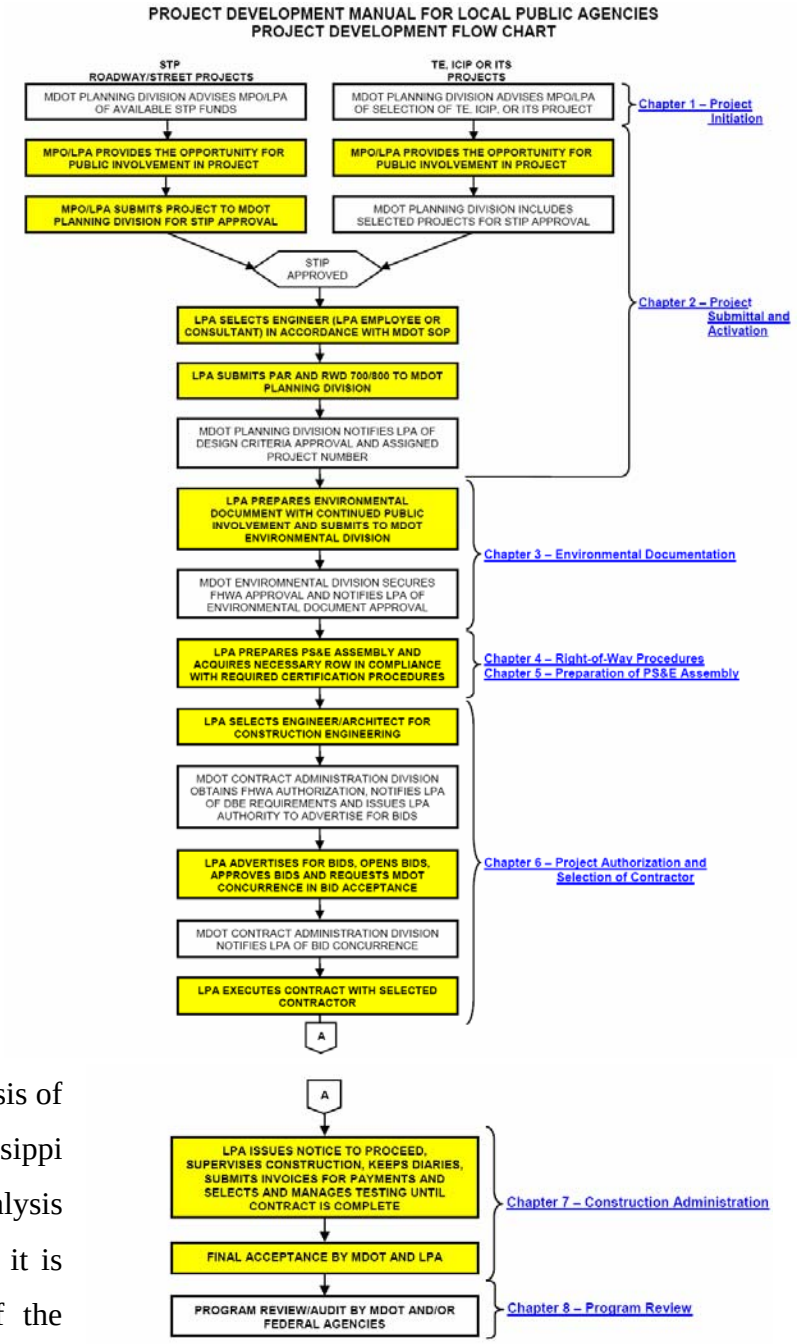

Figure 2 - MDOT Project Planning Process Flowchart

Method

Methods used in this study consisted of a combination of background research and on-site reconnaissance paired with remotely sensed data. After data collection and assimilation, a selection matrix based on Smart Growth principles was developed in order to identify candidate communities along the Hwy 49 corridor by which to test the application of Smart Growth techniques related to transportation planning. No formal hypothesis was developed but rather the analysis goal was to identify the data types and analysis methods that would best suit a study of the application of Smart Growth development alternatives to transportation corridor planning projects. These alternatives were supported by their hypothetical application to "model communities" chosen through the selection matrix. The basis of selecting these communities was on characteristics relating to scale and existing infrastructure with the intention that development alternatives proposed therein may be extrapolated to other rural communities along the Hwy 49 corridor (or similar transportation corridors) which exhibit characteristics similar to the model communities.

Data Collection

On-Site Reconnaissance: On-site reconnaissance consisted primarily of a field trip in June 2005 along the Hwy 49 corridor. The objectives of the reconnaissance trip were to observe and document land use types and other contextual character of the corridor. These observations provided a first-hand understanding of the land-use along the corridor, spatial relationships between the communities and the highway itself, aesthetic and cultural characteristics of the communities, and the extent of economic development along the bypasses of the towns. Field observations were recorded with photographs and notes taken in the field.

Remotely Sensed Data: Aerial imagery of the Hwy 49 corridor, acquired from the GeoResources Institute, served as the base layer for this project. The imagery encompasses the corridor from Florence to Wiggins, MS with a one-mile buffer extending from the highway centerline. Data acquired in 2005 made it possible to make accurate observations of existing infrastructure along the Hwy 49 corridor to supplement previous data collection, as well as facilitate analysis of Smart Growth applicability for the chosen communities. Aerial imagery from the GeoResources Institute along with Vector data sets from the Mississippi Automated Resource Information System (MARIS) provided additional infrastructure and land-use data not otherwise apparent.

Data Analysis

Development of Selection Matrix: Using Smart Growth as the theoretical basis for this project served as a framework upon which the selection matrix developed. While not all of the general principles and their associated issues are directly applicable to this transportation corridor study, there initial inclusion provided a breadth of theoretical information that led to a tailored, specific set of circumstances for the Hwy 49 study area. These issues, or "criteria", provided the basis for the development of a selection matrix that allowed for the selection of a sample of communities along the Hwy 49 corridor that served as models for testing the applicability of Smart Growth techniques in transportation planning and development. In doing so, it was possible to evaluate the usefulness of the 2005 aerial imagery to inform the analysis of the chosen communities and their relationship to Hwy 49. The criteria developed for the eight smart growth principles are as follows: (these criteria are site-scale issues relating to each principle).

Smart Growth Principles and Related Sub-criteria
I. Provide a Variety of Transportation Choices
a) community bisected by Hwy 49 corridor
b) community by-passed by Hwy 49 corridor
c) public transportation available within Hwy 49 town/corridor interface*
d) bicycle paths present within Hwy 49 corridor town/corridor interface
e) pedestrian paths present within Hwy 49 town/corridor interface
f) separated circulation infrastructure present within Hwy 49 town/corridor interface
g) railroad present within Hwy 49 town/corridor interface
h) at-grade railroad crossings present within Hwy 49 town/corridor interface
*For the purposes of this study the Hwy 49 town/corridor interface consists of Hwy 49 itself and the one-mile buffers extending from each side of its centerline in accordance with the 2005 aerial imagery
II. Direct Development Towards Existing Communities
a) low density development (<7 units/acre)
b) high density development (>7units/acre)
c) sprawl development*
d) no development
*Within the context of this study "sprawl" is defined as single-use zoned, low density, automobile oriented development
III. Mix Land Uses
a) mixed use zoning exists within Hwy 49 town/corridor interface
b) single use zoning exists within Hwy 49 town/corridor interface
IV. Preserve Open Space, Farmland, and Environmentally Critical Areas
a) presence of public open space*
b) presence of private open space**
c) waterbodies >25 acres
d) waterbodies <25 acres

e) major rivers/perennial streams
f) intermittent streams
g) wetlands
h) open space bisected by transportation infrastructure
*Refers to publicly accessible open space such as parks, plazas, courtyards, greenspace, cemeteries, Etc...owned by public or private entities **Refers to privately owned land not open to the public
V. Take Advantage of Compact Building Design
Existing High Density Development
a) commercial
b) residential
c) industrial
d) mixed
Existing Low Density Development
a) commercial
b) residential
c) industrial
d) mixed
VI. Create Walkable Neighborhoods
a) presence of sidewalks
b) presence of bicycle paths
c) pedestrian access between commercial and residential areas
VII. Create a Range of Housing Opportunities
Existing Residential Areas
a) high density (>7 units/acre)
b) low density (<7 units/acre)
Housing Variety
a) apartments
b) condominiums
c) townhomes
d) single-family homes
e) multi-family homes
VIII. Create Distinctive, Attractive Communities with a Strong Sense of Place
a) architectural variety
b) historical features/attractions
c) street trees
d) green space/parks
e) water bodies
f) unique neighborhoods/districts
g) distinctive town center

Table 1 - Smart Growth Principles with their related sub-criteria from which selection matrix was derived

With the spectrum of smart growth principles and their related issues established, paring down the criteria to those most directly influenced by transportation corridor planning and development along Highway 49 reduced both the amount of upfront data inventory that was necessary, as well as the number of analysis variables present in the final selection matrix. Likewise, narrowing down the smart growth principles to the five most relevant reduced the number of communities to be examined. The strongest emphasis was on principles **I-III,** as these issues most immediately relate to transportation corridor planning. Removing smart growth principles **IV-VIII** reduced the variables and resulted in a matrix that consisted of the most relevant smart growth principles with their sub-criteria. In turn, this focus led to selecting sample communities along the Highway 49 corridor between Florence and Wiggins, which served as models for the study. The model communities represented a different scale function associated with transportation corridor planning.

Findings/Discussion

Results from this study present the development of an objective system to assess the potential for rural communities located along a major transportation corridor to integrate Smart Growth development alternatives into the economic development patterns occurring along their town-corridor interfaces. In the case of the Hwy 49 corridor, these town-corridor interfaces primarily take the form of highway bypasses. Noteworthy, is that the analysis techniques presented in this study are directed toward the application of Smart Growth techniques within the context of existing transportation infrastructure and do not address policy-based planning interventions. Overall, this study is concerned with Smart Growth development opportunities that exist for the communities along the Hwy 49 corridor, and the type of data and analysis tools necessary to carry out a comprehensive evaluation and offer implementation suggestions for the Smart Growth principles deemed applicable. The findings consist of two primary components intended to serve as planning tools to identify, categorize, and analyze the development opportunities and constraints of rural communities located along a major transportation corridor. First, a selection matrix based on transportation related criteria derived from Smart Growth principles. Second, a proposed GIS model for acquisition and analysis of transportation and land-use related data.

Selection Matrix

In order to determine the opportunities and constraints facing the integration of transportation-related Smart Growth techniques into economic development patterns along the Hwy 49 corridor

required an objective system of site-selection criteria. In response to this need, a matrix composed of Smart Growth principles was developed, each with a subset of issues related to transportation infrastructure and land-use (see **Table 1**). The matrix presents a set of issues that require consideration when planning for Smart Growth in the context of transportation corridor development, with a specific focus on rural communities. If development is to occur along the corridor in accordance with the theories of Smart Growth, each of the principles listed in the final matrix must have some degree of influence over the planning process. The function of the sub-criteria, listed under each Smart Growth principle, identifies the types of data required in order to analyze that principal's potential for integration into the planning process. Likewise, the matrix serves as a checklist to analyze existing infrastructure within the communities along the Hwy 49 corridor. In this way "model communities," which share many of the same infrastructure characteristics but may differ in regards to factors such as scale, can be selected to reduce the analysis to fewer communities and increase efficiency. Selected communities exhibit general, transportation-related characteristics common to the rest of the towns along the corridor. Thus, allowing for extrapolation of the analyses results from the model communities to the entire corridor, with minimal change. Figures **3-5** illustrate an example of an inventory and analysis

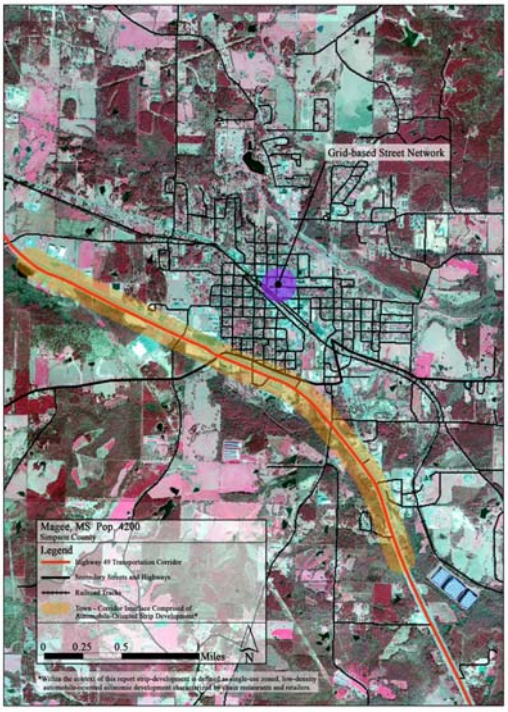

Figure 3 - Map of Magee, MS

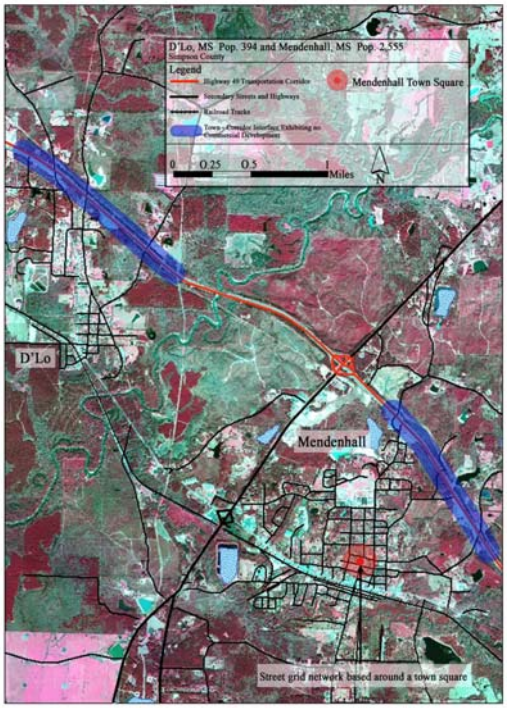

Figure 4 - Map of D'Lo and Mendenhall, MS

process using the matrix.

Figures **3-5** shows images of four communities along the Hwy 49 transportation corridor exhibiting both similarities and differences in regards to transportation related infrastructure. **Table 2** shows a checklist of these characteristics. The most obvious characteristic common to all four communities is their location along the Hwy 49 transportation corridor, and the fact that all are by-passed by the highway itself. Other common features include the presence of a railroad as well as socio-demographic concerns such as population size. It is in the examination of the town-corridor interface where differences begin to arise in terms of transportation related infrastructure and existing development. In order to propose viable Smart Growth alternatives to common economic development patterns, a thorough understanding of the existing infrastructure and its relationship between these towns and their interface with highway 49 is important. The analysis observed certain features in a town such as Magee (**Figure 3**) that were also found in Mendenhall (**Figure 4**), yet have a different relationship to the Hwy 49 corridor in terms of development presence or

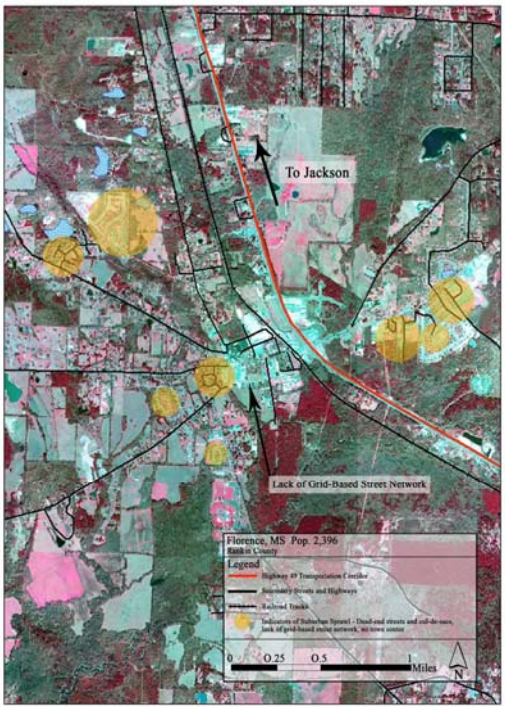

Figure 5 - Map of Florence, MS

Comparison of Communities Portrayed in Images 3-5					
	Florence	D'Lo	Mendenhall	Magee	
Population Less Than 5000	**X**	**X**	**X**	**X**	
By-passed by Hwy 49 Corridor	**X**	**X**	**X**	**X**	
Grid-Based Street Network		**X**	**X**	**X**	
Intersected by Railroad	**X**	**X**	**X**	**X**	
Strip Development Along Town-Corridor Interface*	**X**			**X**	
No Development Along Town Corridor Interface		**X**	**X**		
Part of Sprawl from Larger Metropolitan Area	**X**				

*Within the context of this report "strip development" is defined as single-use zoned, low-density, automobile oriented economic development characterized by chain restaurants and retailers

Table 2 – Characteristics of Model Communities

pattern. Magee exhibits a strong grid-based street network that is also present in Mendenhall, but whereas Magee's character is consistent with automobile-oriented strip development along its interface with Hwy 49, Mendenhall shows none of this type of development. The town of D'Lo, much smaller than the other two, was considered alongside Mendenhall because of their proximity and the similar lack of strip development along its interface with Hwy 49. Even though D'Lo has a less extensive street network than Mendenhall or Magee, it does show the presence of a grid pattern therein. Conversely, the town of Florence (**Figure 5**) is in stark contrast, primarily in terms of street pattern, with the other three communities. Typical characteristics of suburban sprawl include many dead-end streets and cul-de-sacs and the conspicuous absence of a strong grid-patterned street network. When placed next to the maps of Magee and Mendenhall, the contrast of transportation infrastructure patterns on the map of Florence clearly indicate the community's origins in the suburban sprawl type development migrating southward from the Jackson metropolitan area. The examples presented in Figures **3-5** merely scratch the surface on the level of analysis needed to assess the potential for integration of Smart Growth planning principles into economic development planning along the Hwy 49 transportation corridor. Instead, there purpose is to illustrate the basic structure of the process for arriving at proposals for development alternatives. It should be clear that the contrasts evident in these maps point toward a more detailed level of data collection in which infrastructure and land use for these communities could be parsed out into all of their individual components. This level of inventory would include information such as presence of bicycle and pedestrian paths, presence of at-grade railroad crossings and separated circulation infrastructure, density of different types of development, and current land use. These and other criteria are outlined in Tables 3-4.

GIS Model

This section outlines the need for a GIS model to be developed for the collection and analysis of data deemed necessary (through the selection matrix) for the assessment of Smart Growth development opportunities along the Hwy 49 transportation corridor. This "model" would essentially be a decision support system for planners and designers when considering Smart Growth alternatives within the context of transportation corridor planning. Ideally, this tool would serve as an interface between transportation corridor research and the planning/design decisions made by professional practitioners and government officials. It is our intention that

such a decision making tool would provide the breadth necessary to make informed planning decisions that give equal weight to economic, environmental, and socio-cultural concerns. For example, if MDOT's primary concern were with the economic factors influencing transportation corridor development, this type of a tool would consider those factors in conjunction with the social characteristics that Smart Growth principles seek to improve. Thus, an effective interface between research and project planning/implementation would expand the scope of transportation corridor planning processes in a streamlined manner.

In the context of this project, the proposed GIS tool would be the next step forward from the selection matrix. The matrix organizes the Smart Growth principles into those most relevant to transportation corridor planning through subsets of criteria that influence the relationships of those principles to the planning process. These criteria, in effect, determine the type of data to be collected and analyzed in order to propose viable Smart Growth development alternatives. Using the matrix to determine types of inventory data will keep the GIS decision-making tool focused within a Smart Growth context. Appropriate GIS-based analysis should have the capacity to inventory all data derived from the selection matrix and assemble it in a database from which to run queries. In this way, common characteristics between communities along the Hwy 49 transportation corridor are linked together and patterns of land use, transportation infrastructure, and economic development should begin to emerge. A tool such as this would enable planners to critically assess Smart Growth development opportunities and constraints, and prioritize implementation decisions.

Conclusion

The findings of this study document a preliminary stage in the analysis of economic development alternatives for the interfaces between rural Mississippi communities and the Highway 49 transportation corridor. This research establishes and documents a vision for the integration of Smart Growth principles into transportation corridor planning, as well as the dissemination of such research to planning officials, and awaits the next step of the process. As indicated, the next step is the development of the proposed GIS model to perform inventory and analysis functions on the appropriate data. This study provides a framework for incorporating Smart Growth alternatives within the context of MDOT's transportation corridor planning process. In order to implement and fully realize the impact of the Smart Growth principles in MDOT's planning process, the study proposes the need for a GIS model. The GIS model could ultimately

be an effective decision-making tool that would aid transportation planners and officials (specifically MDOT) in making "smart" and efficient development decisions that not only boost local economies, but enhance quality of life and maintain environmental integrity of the Mississippi landscape and its residents.

Table 3 - Finalized Selection Matrix with Model Communities

Smart Growth Principle				
I. Variety of Transportation Choices				
Site Related Issues	Magee	Mendenhall	Florence	D'Lo
Community bisected by Hwy 49 corridor				
Community by-passed by Hwy 49 corridor				
Public transit available within Hwy 49 town/corridor interface*				
Bicycle paths present within Hwy 49 town/corridor interface				
Pedestrian paths present within Hwy 49 town/corridor interface				
Separated circulation infrastructure present within Hwy 49 town/corridor interface				
Railroad present within Hwy 49 town/corridor interface				
At-grade railroad crossings present within Hwy 49 town/corridor interface				

*For the purposes of this study the Hwy 49 town/corridor interface consists of Hwy 49 itself and the half-mile buffers extending from each side of its centerline in accordance with the 2005 aerial imagery

Smart Growth Principle				
II. Direct Development Toward Existing Communities				
Site Related Issues	Magee	Mendenhall	Florence	D'Lo
Low density development (<7 units/acre)				
High density development (>7 units/acre)				
Sprawl development*				
No development				

Smart Growth Principle				
III. Mix Land Uses				
Site Related Issues	Magee	Mendenhall	Florence	D'Lo
Mixed use zoning within Hwy 49 town/corridor interface				
Single use zoning within Hwy 49 town/corridor interface				

Table 4 - Finalized Selection Matrix with Model Communities continued

Smart Growth Principle **IV. Preserve Open Space, Farmland,** **and Environmentally Critical Areas**				
Site Related Issues	Magee	Mendenhall	Florence	D'Lo
Existing open space within Hwy 49 corridor				
Public open space[1]				
Private open space[2]				
Waterbodies >25 acres				
Waterbodies <25 acres				
Major rivers/perennial streams				
Intermittent streams				
Wetlands				
Bisected by transportation infrastructure				

[2]Refers to privately-owned land not open to the public

Smart Growth Principle **VIII. Foster Attractive Communities** **with a Stong Sense of Place**				
Site Related Issues	Magee	Mendenhall	Florence	D'Lo
Existing aesthetic qualities				
Architectural variety				
Historical features / attractions				
Street trees				
Green space / parks				
Water bodies				
Unique neighborhoods / districts				
Distinctive town center				

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