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**STRIDE** | Southeastern Transportation Research,  
Innovation, Development and Education Center

# Final Report

## Practitioner Workshop on School Siting & School Transportation Impacts

(Project # 2016-012)



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**ABSTRACT**

This research project presents a conceptual overview of the planning issue of school siting via a series of practitioner-focused workshops and presentations held in North Carolina between November 2016 and March 2017. Through these four public education events, the research team introduced the transportation and land use phenomenon of school siting and transportation to a diverse set of stakeholders – municipal and regional land use and transportation planners; superintendents that manage auxiliary services within school districts; school transportation directors; school facility planners; real estate acquisition specialists; architects; construction managers; public health advocates and programming specialists; and state leaders in active school travel, school bus operations, and school planning. As previous research outlines, school siting is a process that involves each of these stakeholder groups. These workshops were designed to identify the role of each practitioner group within the school siting process, present previously funded STRIDE research, introduce resources and practice-ready tools, and facilitate group discussions to identify models of collaboration between school siting professionals.

## EXECUTIVE SUMMARY

According to the US Department of Education, Americans spend \$20 billion annually to bus 25 million elementary and secondary children to school. Not only is this annual educational expenditure sizable, trends indicate that the cost of busing children to school are increasing. Between 1995 and 2007, constant-dollar school busing costs increased 51%; yet, student enrollments only rose by 11% over the same period (U.S. Department of Education, National Center for Education Statistics 2009; National Center for Education Statistics 2009). Declining state and local revenues make it imperative for school districts to efficiently manage transport costs in order to preserve funding for classroom activities without sacrificing students' ability to get to school.

School districts and municipalities regularly make educational facility and land use decisions without fully understanding the impact of such decisions on overall school transportation costs. For example, school district facility decisions on whether to build, renovate, or close a district's schools directly influence the location of schools within the district and, correspondingly, the district's school transportation network. These land use and transportation issues are particularly relevant for the southeastern United States, where, during the 2000s, the regional cost outlays averaged \$9.4 billion per year for school construction and \$3.1 billion per year for school transportation. These costs represent between 3.5 and 4.8 % of all education expenditures for each state in the southeastern region.

This project builds on two STRIDE-funded projects, *Quantifying the Cost of School Transportation* and *Development of an Education Module and Workshops on Multi-modal Costs*, in which we selected 20 recently-built schools in North Carolina (11 schools in urban, suburban and rural contexts) and Florida (9 schools in urban and rural contexts) and collected data on the

multimodal costs of school transportation. These schools were selected to document the variation in school costs by location type (urban, suburban, and rural) and nearby built environment characteristics. Using these results, we developed a decision support tool, referred to as the School Transportation Cost Calculator, to estimate the public and private transport costs of potential school sites. This tool provides a multi-modal perspective on school transportation costs and school location selection by estimating the public capital costs on developing a transportation system in conjunction with annual public and private school transportation operation costs.

Our study integrates the decision support tool developed in our previous research into a practitioner focused workshop series delivered between November 2016 and March 2017. Stakeholder workshop attendees include: planners in local land use and transportation at the municipal, county and MPO levels; architects and urban designers of school facility sites; school planners; real estate acquisition specialists; school district superintendents in charge of auxiliary services; public health advocates of programming specialists. By introducing educational facility, transportation and land use planning practitioners to school travel issues and transferring decision support technology, this project will promote the policy issue of school siting and enable local decision makers to make more efficient use of scarce infrastructure resources in the future.

## I. INTRODUCTION

This project entails the development and delivery of a practitioner workshop that addresses the STRIDE themes of livability and safety. Schools are a critical part of public infrastructure contributing to economic and community development, and social integration (Vincent 2006). Getting children to school safely and at reasonable cost to the public sector are crucial elements of a livable community. Despite the importance of schools in our communities, educational facility planning has typically been disconnected from transportation and local land use planning (McDonald 2010; Steiner et al. 2011).

This project addresses the practitioner gap between educational facility, transportation and land use by bringing these practitioners together in a workshop setting - sharing essential background concepts highlighting the relationship between school facility siting and pupil transportation and presenting decision support tools to aid school siting professionals. In addition to the practitioner workshop, STRIDE research staff also presented the technology transfer materials at three school practitioner-targeted conferences.

The issue of school siting and transportation is particularly relevant for the southeastern United States. Outlays for *school construction* averaged \$9.4 billion per year in the late 2000s across the states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee (Filardo et al. 2010). In addition, the *school transportation* costs were \$3.1 billion for these eight states in fiscal year 2010. Currently, southeastern states spend between 3.5 and 4.8% of all education expenditures on school transportation (U.S. Department of Education, National Center for Education Statistics 2012). Financial pressure on municipal and school budgets makes it critical that investments in school facilities and transportation be efficient and minimize lifecycle transportation costs. Our project benefits the region by providing



time and space for relevant practitioners to understand the interconnection between school location decisions and school transportation expenses. Our workshop includes schools located in North Carolina to ensure the concepts are directly applicable to practitioners in the state.

This project builds on the findings of two previous STRIDE projects, number 2012-022S, *Quantifying the Costs of School Transportation*, and number 2013-032S, *Development of an Education Module and Workshops on Multi-modal Costs*. The *QSTC* project documented the multimodal costs associated with school transportation and the variation in school transportation costs by location type and nearby development patterns. Results were used to develop a decision support tool for estimating the transport costs of potential school sites. This project introduces that tool, referred to as the School Transportation Cost Calculator, which enables the comparison of estimated school travel costs by school site characteristics.

This project accomplishes three distinct objectives. First, we have developed a workshop that can be delivered across a variety of practitioner audiences. This workshop uses the results from our earlier STRIDE studies to introduce the physical location of a school, referred to as school siting, as an important policy and planning issue to relevant practitioners. The research team presented the issue of school siting broadly so as to be accessible to a range of attendees – from seasoned professionals to those that are just learning about the relationship between school siting and transportation. Second, we paired this information with practice-ready resources; not only do we provide background planning and policy information for practitioners, but we also share tools, such as the recently developed School Transportation Cost Calculator, that empower decision makers, planners and the public to evaluate school siting decision with as much information as possible. Third, we provided time and space for practitioner dialogue, identifying models of collaboration and best practices across the practical disciplines.

## II. BACKGROUND

Americans spent \$21.8 billion to bus students to school and invested \$50 billion in school construction in 2010 (Filardo et al. 2010; U.S. Department of Education, National Center for Education Statistics 2012). These investments in public infrastructure and services are massive and on-going. Despite the size of these investments, little attention has been paid to school transportation and planning outside of experts in educational facilities and pupil transportation.

Yet, research indicates that decisions about where to locate schools and how to provide transportation have important impacts on the larger transport system and community development and deserve wider attention from planners and engineers (Vincent 2006; McKoy, Vincent, and Makarewicz 2008; Vovsha and Petersen 2005). At the same time, municipal governments, state transportation departments, and school districts are entering an era of reduced fiscal capacity where they are required to provide better results with less funding. Given these responsibility, planners and engineers from local government agencies and school districts must understand the short- and long-term cost considerations of student transportation and the connections with school location decisions.

The 2012 STRIDE-funded project, *Quantifying the Costs of School Transportation*, evaluated the full costs of getting children to school and developing a pilot decision support tool to help planners and decision-makers minimize transport costs when selecting a school site or improving an existing school. The goal of this proposal is to develop and deliver a workshop that provides a foundation in school transportation planning and policy professionals and provides resources to encourage the use of the school transportation costs decision support tool. The benefit of this project will be making transportation and planning professionals aware of the

critical issues involved in school transportation and school location, thus enabling decision makers to make more efficient use of scarce infrastructure resources in the future.

### *School Transportation & School Siting*

In the United States, the federal government has delegated responsibility for school transport policies to the state and local school districts. The result is a patchwork of policies (McDonald and Howlett 2007; Safe Routes to School National Partnership 2014). Some states, such as Texas and California, do not require districts to provide school transport. Many other states do require their school districts to transport children to school but differ in defining exactly who must be transported. For example, Idaho requires that all children who live more than 1.5 miles from school receive transport, while New York mandates a distance of two miles. Most states provide options to bus children living closer to school if hazardous walking conditions exist. The one exception to this varied playing field is the transport of students with disabilities. Under the Individuals with Disabilities Education Act, all states must transport special needs students at public expense.

States also set policies about the school parcel's physical design as it relates to transportation. For example, the *North Carolina Public Schools Facilities Guidelines* (Department of Public Instruction 2010) suggests providing on-site parking for “all staff, itinerant specialists, and [more] for visitors” and providing student parking for “a third or more of the student population” at high schools. These requirements carry clear cost implications and make assumptions about students' travel behavior in accessing school. Furthermore, the guidelines do not reflect the variation in parking needs between denser cities and more rural areas. Because the guidelines may require a larger site for the school to accommodate more

parking, and the inherent challenges in assembling large land parcels, the number of children who can live close enough to the school to walk may decrease.

Much of the research on school transportation has focused on optimization algorithms for school bus routes (see Jozefowicz (2008) for summary). However, missing from the optimization algorithms literature is consideration of other transport modes and how school location affects the population that requires busing. Studies of economic production functions generally account for school bus costs to assess the merits of school consolidation and optimum school size. For example, Andrews, et al (2002) found that “moderately sized” elementary (300-500) and high (600-900) schools balance savings on administrative and infrastructure costs without the negative impacts of large schools, such as increased violence and the costs of longer trips to school for students and parents (Ferris and West 2004).

The lack of comprehensive analysis of multi-modal school transport costs is problematic because these costs appear to be increasing. Between 1995 and 2007, constant-dollar school busing costs increased 51%; yet student enrollments only rose by 11% during the same period (U.S. Department of Education, National Center for Education Statistics 2009; National Center for Education Statistics 2009). At a time when transport busing costs are rising more quickly than student enrollments, significant limits have been placed on school budgets due to the economic recessions of the late 2000s.

Declining school budgets have caused districts to make cuts, and, understandably, many districts have opted to cut school transport rather than teachers. Still, there are clear concerns about equity of school access due to busing cuts. To manage these situations, local governments and school districts need better information about the up-front and on-going costs associated with school transportation. Selecting school locations to minimize overall transport costs, as

opposed to just school bus costs, could save districts money and provide a system that is more resilient to exogenous shocks, such as gas price increases or school budget decreases.

During the initial STRIDE *QSTC* project we worked closely with school district staff and officials at each of the twenty study school sites and districts. A common theme in discussions with transportation and facility planners was that, while each understood that the other impacted the transportation system and associated costs, neither facility construction nor transportation operations staff have a *comprehensive* understanding of the costs associated with the development and operation of a school transportation system. This perspective informed our intent and approach to this project.

The results of the initial STRIDE-funded study on the multi-modal costs of school transportation shed light on the issue of institutional siloing around site selection and provided core material for the development of an education module supporting the school siting decision making process. Congruent with previous research, education leadership consultation of local government officials in school facility decisions doesn't always happen; when it does, local government officials' comments have little influence (Norton, 2006). As a result, education on this topic must be integrated into training and curricula of the many different professions involved in decisions related to education facilities and community development.

City and regional planners assess demographic trends, using population estimates to develop land use and transportation plans that influence the location of educational facilities and residential developments. Transportation engineers design the roadways and network that connect homes to schools; in so doing they influence the modes accommodated in a transportation network. Educational leaders shape district and school policies and educational facility plans that have the potential to enable or discourage various transportation modes. School

planners and architects are responsible for the physical development of the education facility and involved with the project from inception to completion; their understanding of the interrelated concepts of school site selection and travel costs are essential.

In addition to professionals of the built environment, elected and appointed officials, administrators and educators play a crucial role in the selection and design of a school site. City and county elected officials often help negotiate and secure school sites and funding for the project. School district superintendents and board members are tasked with balancing built environment considerations with political, budgetary, and operational realities; they are thus a natural audience in consideration of the full cost outlays associated with site selection and school travel planning (Norton, 2006). In addition, school principals and teachers are key stakeholders and leaders in the facility design process; thus their understanding of the long-term school travel costs associated with the design of a site is critical.

### III. RESEARCH APPROACH

Emerging from the larger project objective and background regarding the intersection of school siting and transportation, the goals of STRIDE project number 2016-012 were threefold:

1. Develop materials for an advanced workshop and webinar on school transportation and school siting issues for an audience of practicing school planners.
2. Deliver an in-person workshop co-hosted by the NC Department of Public Instruction.
3. Deliver and archive a webinar for Florida school facility and transportation which will be advertised through the Florida Educational Facilities Planners Association, the Florida Department of Office Education Facilities Planning and the Florida Planning Association.

Below, we highlight the process and approach to accomplishing each of these three goals.

#### *1. Develop Materials for Workshop and Webinar*

The research team developed a comprehensive workshop and presentation slidedeck that was delivered at the North Carolina practitioner workshop on School Siting and Transportation Impacts. The NC practitioner workshop materials highlighted an introduction and review of the relationship the built environment surrounding a school site and derivative school transportation implications. After the conceptual background, a selection of NC school site case studies were shared that demonstrated the application of the concepts. Resources and relevant tools were then shared to ensure that participants left the event with tangible technical assistance; of note, the School Travel Cost Calculator was introduced as a resource and demonstrated. Lastly, focus groups were formed that worked through a collection of six facilitated group questions. Responses to the school site-related questions were then shared with the larger workshop audience.

#### *2. Deliver In-Person Workshop*

The workshop, held on November 17, 2017 at the NC State University Institute for Transportation Research and Education, was attended by 45 practitioners involved in school site selection and development in North Carolina. The list of attendees is available in Appendix A. The workshop opening remarks came from Derek Graham, Pupil Transportation Section Chief for the NC Department of Public Instruction, Noreen McDonald, and Ruth Steiner. Mathew Palmer delivered the technical agenda.

### *3. Deliver Webinar*

Logistical challenges in the coordination and production of the Florida webinar necessitated a re-consideration of the projects objectives. It was determined that, in addition to a centralized workshop drawing from the collective disciplines associated with school site selection, it would be a strategic next step to deliver the workshop materials in a presentation format to a broader array of practitioner disciplines. Between December 2016 and March 2017, the STRIDE research team presented the school siting and transportation impacts materials at three separate events, each targeting a different practitioner audience.

In December, 2016, Noreen McDonald and Mathew Palmer presented the workshop materials at the Capitol Area Metropolitan Organization's (CAMPO) quarterly Safe Routes to School Taskforce meeting. There were 18 attendees at the presentation, and attendees included active school travel public health programming specialists, active school travel advocates, municipal planners and regional planners.

In January, 2017, Mathew Palmer presented the workshop materials at the Piedmont Triad Educational Consortium's Auxiliary Services annual meeting, held in Pittsboro at the Chatham County Schools Transportation Offices. Attendees were exclusively upper-level school



administrators tasked with supervising both educational facility development and maintenance, as well as school transportation services. In total, 28 school professionals in the Piedmont area were able to attend and learn from the presentation.

In March, 2017, Mathew Palmer presented the workshop materials as a conference presenter at the 2017 North Carolina Chapter of the Association for Learning Environments (A4LE) annual conference held in Wilmington, North Carolina. In total, 24 school planning professionals from architecture, construction management, real estate acquisition, and school leadership attended and learned from the presentation.

#### IV. FINDINGS AND APPLICATION

This project introduced three critical elements into the compendium of STRIDE research activities related to school site selection and transportation:

First, the research team developed a comprehensive presentation and workshop structure that efficiently and accessibly introduces a complex topic central to city and regional planning – school siting and transportation implications.

Second, the research team delivered a well-attended practitioner workshop held in Raleigh, North Carolina for 45 practitioners. The workshop not only covered the conceptual underpinnings of school siting, it clearly laid out the roles of practice in developing a school site, introduced practice-ready tools and resources, including the previously developed STRIDE resource known as the School Travel Cost Calculator, and provided time and space for practitioners to learn from one another.

Third, the workshop was then taken “on the road” and delivered where many of the practitioners related to school site selection gather – the Piedmont Triad Education Consortium, where school administrators tasked with developing schools congregate annually to learn about recent trends; the Capitol Area Metropolitan Planning Organization, where safe routes to school practitioners and advocates plan out local steps to enhance active school travel; and the Association for Learning Environments, where architects and construction management engineering firms come together to share new technology and best practices. In short, while previous STRIDE efforts have focused on research through data collection and analysis that are shared electronically, in this research project we took the concepts and research into the communities that are most relevant to the topic and most likely to utilize the previous research findings in their daily school planning and transportation practice.

## **V. Conclusions, Recommendations and Suggested Research**

This research finds that the topic of school siting involves numerous fields of practice that have variable familiarity with the topic of school site selection and the derivative implications that this land use decision has on school transportation mode choice, network operation, and cost. What is novel regarding the approach used in this technology transfer project is the level of embeddness that the research team was able to achieve – going to where each of these practitioner groups already come together via the conference presentations. In addition, the practitioner workshop was the first of its kind in North Carolina, highlighting the long term importance of these efforts to build understanding and relationships across institutional and practitioner realms.

It is recommended that STRIDE researchers continue efforts to produce both digital and in-person technology transfer resources. In comparison with a previously produced STRIDE School Siting Webinar from November 2015, the in-person efforts utilized in this project resulted in a total of 115 practitioners in North Carolina – many of which serve in high level roles either within their school community or at the state level. This includes, state leaders in school bus transportation, active school travel, and school planning (architectural and design).

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## VII. Appendix A – NC Practitioner Workshop Attendees

First Name	Last Name	Institution
Sandi	Bailey	Town of Cary
Jennifer	Baldwin	Alta Planning
Shawan	Barr	East Carolina University
Nicole	Bennett	Parsons Brinkerhoff
Chris	Blice	Chatham County Public Schools
Kevin	Brittain	Caldwell County Schools
Kristen	Brookshire	UNC Highway Safety Research Center
Joel	Caviness	Chatham County Public Schools
Joel	Cranford	NCDOT
Brandie	Crawford	City of Raleigh
Bob	Deaton	NCDOT
Jennifer	Delcourt	Wake County
Scott	Denton	Durham County Public Schools
Randy	Drumheller	Chatham County Public Schools
Thomas	Dudley	NCSU ITRE
Lynn	Edmonds	Wake Up Wake County
Todd	Edwards	City of Raleigh
Beth	Fornadley Johnson	AppHealthCare
Tim	Gardiner	Wake County
Derek	Graham	NC Department of Public Instruction
Shahnee	Haire	Robeson County
Kevin	Hart	NCSU ITRE
Trisha	Hasch	City of Raleigh
Andy	Henry	City of Durham
Ed	Johnson	NCDOT
Justin	Jorgensen	Granville County
Timothy	Maloney	Wake County
Leah	Mayo Acheson	Albemarle Regional Health Services
Joe	Michael	City of Raleigh
Michael	Miller	Numerix
Jackie	Moore	Jackson County
Jennifer	Park	Chatham County Public Schools
Betty	Parker	Wake County Public Schools
Bob	Peters	NC Department of Public Instruction
Teresa	Piner	Town of Wendell
Karen	Rindge	Wake Up Wake County
Sue	Rutledge	Brunswick County School District
Dhanya	Sandeep	City of Raleigh
Danielle	Sherman	Active Living by Design
Robert	Snidemiller	Wake County Public Schools
Stephen	Sposato	Wake County Public Schools
Margaret	Sutter	Wake County Public Schools
Bobby	Taylor	Brunswick County School District
Jeff	Tsai	Wake County Public Schools
Kenneth	Withrow	CAMPO

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