RESEARCH & DEVELOPMENT

Quantifying Incidental Bicycle & Pedestrian Costs in Highway Projects

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16. Abstract

Bicycle and pedestrian infrastructure is growing in importance to the public and increasingly being incorporated into highway and bridge improvements and new construction. However, systems have not typically been in place to track "incidental" expenses in highway projects. These expenses may include bicycle lanes and pedestrian sidewalks that were constructed as smaller parts of highway and bridge projects. This has made it difficult to understand the scope of the bicycle and pedestrian elements included in highway projects and the cost of those improvements.

This report quantifies the costs for incidental bicycle and pedestrian elements in a sample set of North Carolina highway and bridge projects. NCDOT highway and bridge projects that contain bicycle and pedestrian elements and have sufficient data for analysis have been identified from July 1, 2011 to June 30, 2014. For those identified projects, detailed cost data have been summarized to analyze the bicycle and pedestrian incidental costs.

Data are presented for 84 projects in FY 2011 to FY 2014 with incidental bicycle and/or pedestrian elements. Fourteen of these projects were let at NCDOT Division Offices. The remaining projects were let at the NCDOT Central Office. For the 70 centrally-let projects, contract total budgets were $847,698,452. Of that total amount, an estimated $19,931,546 (2.35%) was used for incidental bicycle and pedestrian elements. Bridges were the largest element by cost at $11 million, followed by sidewalks ($7 million). Detailed bridge data provide information on the average additional cost to widen bridges to accommodate pedestrians (22%). The cost-share agreements with local municipalities are analyzed to obtain more accurate net costs to NCDOT. In the dataset, 27 projects had municipal cost-share agreements that were estimated to cover $3.1 million of the bicycle and pedestrian elements in those projects, 26% of the incidental elements in those projects – although of items identified in individual agreements cost-share averaged 55%.

In addition to the report, the data is also available to help create better tools for future budgeting, justify future funding requests, produce reports and for integration with other databases.

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Executive Summary

Bicycle and pedestrian infrastructure is growing in importance to the public, and increasingly being incorporated into highway and bridge projects. However, systems have not been in place to track "incidental" expenses for bicycle and pedestrian accommodations within highway, bridge and interchange projects. This has made it difficult to understand the scope of the bicycle and pedestrian elements such as bicycle lanes, pedestrian sidewalks and bridge widening that has been included in highway projects and the cost of those improvements.

Incidental bicycle and pedestrian costs are those costs included in the budgets of larger, scheduled highway improvement projects. These may include, but are not limited to, bicycle lanes, sidewalks, intersection improvements, and widened shoulders. Adding pedestrian accommodations to bridges requires additional bridge width, increasing their structural costs. Projects funded exclusively for bicycle and pedestrian improvements (considered "independent" bicycle and pedestrian projects) are not included in this research. Neither a detailed analysis of incidental bicycle and pedestrian expenses nor guidance on quantifying incidental costs for bridge accommodations was not available to researchers or other interested groups. This report attempts to fill in these gaps and provide guidance and greater understanding of incidental expenses for bicycle and pedestrian elements.

An accurate cost calculation for incidental bicycle and pedestrian expenditures requires both a detailed accounting of all identifiable bicycle and pedestrian costs by category and an estimate of the additional costs associated with bridge elements. Whether a bridge was widened to accommodate pedestrians is not routinely tracked as part of project cost data, so those data were gathered and calculated in a separate process, with the results incorporated into the final total cost calculations.

Summary of Findings

A set of NCDOT highway and bridge projects which contained bicycle and pedestrian elements were identified from the projects that were let between July 1, 2011 and June 30, 2014. For those identified projects, detailed cost data have been summarized to analyze the bicycle and pedestrian incidental costs.

Eighty-four projects were analyzed from FY 2011 to FY 2014, with detailed cost calculations of incidental bicycle and/or pedestrian elements. Fourteen of these projects were let at NCDOT Division Offices (division-let), and the remaining ones were let at the NCDOT Central Office (centrally-let). Based on contract and bid tabulations documents, the total cost for the 70 centrally-let projects was $847,698,452. Of that total amount, $19,931,546 (2.35%) was used for incidental bicycle and pedestrian elements.

Bridges were the largest element by cost at $11.4 million, followed by sidewalks ($7 million). Detailed bridge data provide summary information on the average cost to widen bridges to accommodate pedestrians. The $11.4 million of bridge costs represent 11.6 percent of the $98 million spent on bridges in the projects covered. In the cases that bridges required widening to accommodate pedestrian access, the costs for those changes represented 22.6 percent of bridge costs.

Through municipal cost-share agreements with NCDOT, local jurisdictions contributed to many of these bicycle and pedestrian elements. The cost-share agreements with local municipalities were analyzed to obtain more accurate net costs to NCDOT. In the dataset, 27 projects had municipal cost-share agreements that were estimated to cover $3.1 million of the bicycle and pedestrian elements in those projects (26 percent) of the incidental elements in those projects.

This report will be useful to administrators in the Department, the State Board of Transportation, the State Legislature, and the general public. The resulting data will be used to help create better tools for future budgeting, justify future funding requests, produce reports and for integration with other databases.

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Introduction

Bicycle and Pedestrian Construction: A Changing Environment

This report is being completed at a challenging time for funding and prioritizing bicycle and pedestrian infrastructure. Critical decisions must be made to balance tightening budgets with the growing interest in bicycle and pedestrian accommodations. The direction in highway construction and improvements is increasingly aimed at more routinely including multimodal accommodations.

This report will help to draw a picture of the type of work that has been done in the last three years in bicycle and pedestrian projects within the state, and give detailed cost information that should prove useful in estimating future budgets.

Defining Incidental

Bicycle and pedestrian infrastructure is growing in importance to the public, and increasingly being incorporated into highway and bridge projects. However, systems have not typically been in place to track these "incidental" expenses for bicycle and pedestrian elements within larger projects. This has made it difficult to understand the scope of the bicycle and pedestrian elements included in highway projects and the cost of those improvements. This report attempts to remedy this by providing detailed data on projects that included these elements. It creates a dataset that can be referenced for better future budgeting, justifying future funding requests, as well as producing data for reports and for integration with other databases. This information will be useful to administrators in the Department, the State Board of Transportation, the State Legislature, and the general public.

Incidental bicycle and pedestrian costs are those costs that are included in scheduled highway improvement project budgets, as smaller parts of the overall project. These incidental costs are not the same as costs in projects that were specifically funded for bicycle and pedestrian improvements. They may include bicycle lanes, sidewalks, intersection improvements, bridge improvements, railings, signage and widened shoulders. Adding pedestrian accommodations to bridges requires additional bridge width, increasing their structural costs.

Most categories of incidental costs are identifiable in detailed accounting records maintained for each project. However, added expenditures for bridge accommodations cannot be easily separated in detailed budget records. These incidental expenditures must be estimated by creating alternative bridge cost calculations that show the expenditures without these accommodations so that the total cost addition can be determined.

This report quantifies the costs for incidental bicycle and pedestrian elements in a set of North Carolina highway and bridge projects from July 1, 2011 to June 30, 2014. For those identified projects, detailed cost data have been summarized to analyze the bicycle and pedestrian incidental costs.

Literature Review

In the 1970s, there was an increasing interest in bicycling as a mode of transportation. As a response to this, North Carolina instituted the Bicycle and Bikeway Act of 1974[1], establishing a statewide highway bicycle infrastructure program. This was the first state bicycle infrastructure program in the nation, and it would serve as a model for other states in the coming years. The first route in the program, the Mountains to Sea Route, was completed two years later and extended 700 miles across the state.[2]

Numerous other statewide highway routes were established between 1976 and 1985, totaling 2,500 miles of bikeways throughout the state. Eight years after the introduction of the Bicycle and Bikeway Act of 1974, the United States would begin developing nationwide highway bicycle routes. Among the first two of these routes was U.S. Bike Route 1, extending 200 miles from North Carolina's northern border, with Virginia, to its southern border, with South Carolina. This route was the first to be signed by the American Association of State Highway Transportation Officials (AASHTO), as USBR 1.[3]

Since the 1970s, the popularity of bicycling and walking has grown even more – in 2003, 29 state DOTs were reported to have some form of bicycle and pedestrian plan[4]. One of the reasons for the growing interest in bicycling and walking has been the number of benefits associated with active transportation, which refers to modes of transportation that require users to increase physical activity, such as biking, walking and using public transit systems. Several of the benefits reaped from active transportation include health benefits, such as low rates of heart disease, stroke, diabetes and obesity; transportation benefits, including lowered traffic congestion; environmental benefits, such as a reduced carbon footprint; and quality of life benefits, which can encompass all of the other benefits, and also tie in accessibility and the ability to live independently.[5] Regarding economic benefits, and specific to North Carolina, there has been an increase in bicycle tourism throughout the Outer Banks. This region has experienced economic benefits resulting from bicycle tourism that were estimated to total around $60 million. That amount is almost nine times the amount spent on construction of bicycle and pedestrian facilities. Additionally, 1,400 jobs were supported from bicycle tourism in the region.[6]

In recent years, and with the growing interest in bicycling and walking as modes of transportation, states have begun to adopt Complete Streets policies that promote active transportation. This is one of the more recent bicycle and pedestrian-related policies that the North Carolina Department of Transportation (DOT) has adopted, and is aligned with the U.S. DOT's Complete Streets policy. The state adopted the policy in 2009, aiming to develop travel networks that promote the use of non-vehicular travel, including bicycling, walking and utilizing public transportation. The goal of this policy is that users of all ages, mobility levels, and transportation preferences will be considered in transportation planning.[7]

Although the Complete Streets policy was seen as an improvement for multi-modal transportation, other policies have since taken effect that have been seen by some as a step backward by proponents of active transportation. The most recent policy was MAP-21: Moving Ahead for Progress in the 21st Century. This policy has been in effect since October

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[1] Bicycle and Bikeway Act of 1974
[2] History of Bicycle Mapping Program
[3] History of Bicycle Mapping Program
[4] Are We There Yet?
[5] The National Bicycling and Walking Study- 15-year Status Report, PBIC
[6] Pathways to Prosperity: The Economic Impact of Investments in Bicycle Facilities
[7] Complete Streets Planning and Design Guidelines.

of 2012, and has received a range of differing opinions. While the Federal Highway Administration (FHWA) claims that it was a "milestone for the US economy and the Nation's surface transportation program," other groups have not been as receptive.[8] MAP-21 has combined the three distinct Transportation Enhancements, Safe Routes to School, and Recreational Trails programs into the stand-alone Transportation Alternatives Program. MAP-21 also cut funding to bicycle and pedestrian programs by 33 percent, and now allows states to "opt out" of funds for bicycle and pedestrian projects and, instead, allocate portions of those funds to other transportation projects that don't contain bicycle or pedestrian elements. If all states choose to distribute those funds to other projects, funding to these programs may be cut by up to 66 percent.[9]

However, according to the NCDOT, Complete Streets in North Carolina will still have a major impact on bicycle and pedestrian projects despite the introduction of MAP-21.[10] Some of the things that will happen as a result of the implementation of the North Carolina Complete Streets Policy include:

- NCDOT will fund 4' wide bicycle lanes adjacent to through vehicle traffic lanes
- NCDOT will fund a portion of 5' sidewalks
- In curb and gutter sections, NCDOT will construct 10' berms behind the curb and gutter, to provide adequate space to place a sidewalk and still leave a utility strip /buffer
- In curb and gutter sections where guardrail is required, NCDOT will construct a 15' wide berm with 12' to the face of guardrail. If sidewalks are constructed, they will be located in front of guardrail
- NCDOT will accommodate sidewalks on a bridge by constructing a 5' wide sidewalk on both sides of bridges less than 200' in length and on one side of bridges greater than 200' in length

NCDOT also initiated a transportation reform program, "From Policy to Projects," in January of 2009.[11] This program was intended to convert the state's 30-year transportation plan into a work program. The system is broken into four sections beginning with the 30-year N.C. Statewide Long-Range Transportation Plan, moving into a 10-year Program and Resource Plan, then to the State Transportation Improvement Program (STIP),[12] and finally to a 5- year work program.

The Statewide Long Range Plan (later updated by the NCDOT 2040 Plan) was intended to outline important transportation planning and investment actions. The Program and Resource Plan addressed revenue and funding projections between 2013 and 2023. NCDOT estimated that roughly $48 billion would be available across all modes of transportation; annually, prior to this plan, $6 million was set aside for independent bicycle projects, and $1.4 million was set aside for independent pedestrian projects, while funding for incidental projects could come from a combination of federal, state, and local roadway construction funds. These policies have changed effective 2014. Future funding will be based on new scoring system.

The STIP Process helps determine the priority of projects, based on several factors including whether or not the project is included in a bicycle or pedestrian plan. Bicycle and pedestrian projects are generally divided into two categories, which determine the types of funds that may be available. "Independent projects" are those that are carried out separately from a scheduled highway project. The main purpose of these projects is to build bicycle and pedestrian facilities. "Incidental

[8] MAP-21: Moving Ahead for Progress in the 21st Century.
[9] America Bikes Comparison
[10] NCDOT Complete Streets Policy, July 2009.
[11] Transportation Reform: From Policy to Projects.
[12] State Transportation Improvement Program (STIP) Process, NCDOT.

projects" refers to bicycle and pedestrian elements that are incorporated into a scheduled highway project. The main purpose of these projects may be to build or improve upon current roadways, and bicycle and pedestrian elements are included as additions to the main project. Since the incidental projects are included as parts of these larger projects, a true figure of the total expenditures on bicycle and pedestrian construction has been difficult to determine. The costs can depend on a number of factors including current cost of materials, rights-of-way needs and topographical site features.[13]

Regarding the quantification of costs, there is only a small amount of research that has been done into quantifying costs for bicycle and pedestrian projects that are incorporated into highway projects. The majority of research has been done in urban areas; however, urban projects are very different in nature than highway projects, and therefore may not necessarily be a good basis for analyzing those costs[14]. This is largely due to the fact that characteristics of urban roads are very different from those of highways; for example, the number of intersections increases drastically in urban areas, resulting in a need for bicycle-friendly intersections which require more extensive planning.

Examples of generic cost-per-mile model estimates can be found for several states, including Florida[15] and Virginia[16]. These cost allocation models are designed to be used as a reference for projects, with a few examples of costs per mile for several types of bicycle and pedestrian projects. However, bicycle and pedestrian infrastructure is rarely separated out from other items in the project budgets. This makes it challenging to determine how much is actually spent on bicycle and pedestrian infrastructure.

An example of this is Florida's Generic Cost-per-Mile Models, which offers a variety of cost-per-mile estimates for different highway projects, several of which include bicycle and pedestrian features[17]. However, the cost of the pavement for a highway and a bike lane is combined, so one is unable to easily determine the difference in cost between highways with and without bike lanes. Furthermore, there are no cost-per-mile estimates for the same types of roadways without bicycle and pedestrian features so simply comparing costs with and without these features is not possible. These estimates are only intended to serve as generic models and are not based on actual costs of construction which could also be misleading, especially if actual costs exceed or do not meet the estimates provided.

As a way to improve the Virginia's own cost estimation methods, Virginia DOT examined cost estimation methods used by various other state transportation departments. The paper offers a hypothetical application of the state's then-current practice of cost estimation, and discusses two commonly-used cost-estimation procedures utilized in other states, including the parametric cost estimation model (linear regression functions) and the neural network model, " a computer/ mathematical function-based tool, rooted in artificial intelligence."[18] Some of the factors that the Virginia DOT considered were how states handled inflation, how they account for contingencies, and how right-of-way and preliminary engineering costs were calculated. They identified three common categories for highway project cost estimation:

Rough estimates of item quantities and costs, based on recent unit prices
Cost-per-mile and cost-per-item tables, based on generalized prices
Non-uniform estimation methods (combination of the two previous methods, and professional engineering judgment and experience)

[13] Costs for Pedestrian and Bicyclist Infrastructure Improvements
[14] NCDOT Complete Streets Planning and Design Guidelines, 2012.
[15] Florida Department of Transportation, 2012. Generic Cost per Mile Models,
[16] Highway Project Cost Estimating Methods Used in the Planning Stage of Project Development, 2001.
[17] Generic Cost per Mile Models, FDOT.
[18] Highway Project Cost Estimating Methods Used in the Planning Stage of Project Development, 2001.

In addition to the state-level research, the Pedestrian and Bicyclist Information Center (PBIC) has developed a calculator that is intended to help with general cost estimates, and provide information on demand and benefits associated with the development of bicycle facilities in specific metropolitan areas.[19] This tool was originally based on the research found in the National Cooperative Highway Research Program (NCHRP) Report 552, as a way to estimate costs, demands, and benefits associated with specific bicycle facilities. Costs were gathered from various sources around the country, divided into four categories based on roadway features, and were then normalized to a national level based on the Construction Cost Index of 2003, found in the Engineering News Record (ENR). The Consumer Pricing Index was used for real estate cost adjustments, and the Producer Price Index was used to adjust highway and street construction costs to the base year. The final cost tables mainly accounted for the following:

- Roadway Construction Costs
- Structures
- Equipment
- Real Estate and Operation
- Maintenance

Other costs included design and engineering, which was generally estimated at 10% of overall construction costs; inspection costs, which were estimated to be around 2% of construction costs; and administration, which was estimated as 6% of construction costs. Additionally, they accounted for contingencies in the projects, such as project scope, time lag, and market conditions, which are prone to fluctuation due to various factors.

However, since the beginning of our study, the tool has been updated with information from a study done by the UNC Highway Safety Research Center (HSRC). This 2013 HSRC report breaks out a large variety of bicycle and pedestrian costs from projects across the United States.[20] This report was based on 1,747 cost observations from 40 states. The report contains averages, medians and ranges of costs for key types of bicycle and pedestrian elements, adjusted to 2013 prices. [21]

An important element of this report is the detailing of the challenges of these data due to the variations in costs each year and across geographic areas. That variation is clear in the range presented. This range is large for some elements, in spite of a careful method for excluding outliers in the dataset. There are also notes for each element describing typical reasons for cost variation such as whether the element was installed in conjunction with other road treatments.

That issue is not in place for this report, since all elements here are examined within the context of a larger project. It would indicate, however, that the data in this report would be less-representative of costs for the separate addition of bicycle and pedestrian elements.

[19] Cost-Benefit Analysis of Bicycle Facilities Tool, 2012.
[20] HSRC, 2013
[21] Cost-Benefit Analysis of Bicycle Facilities Tool, 2012.

Data sources and Methods

Sources

In August 2013, UNC Charlotte Urban Institute staff began developing a dataset detailing incidental expenditures for bicycle and pedestrian work included in larger highway, bridge and interchange projects. The project's purpose was to help the North Carolina Department of Transportation (NCDOT) better identify, understand and report on bicycle and pedestrian elements within highway projects.

The first research step was to identify a sample set of projects containing bicycle and/or pedestrian elements. Lists of projects with identified bicycle and/or pedestrian elements were obtained from the NCDOT Division of Bicycle and Pedestrian Transportation. Additional lists of centrally-let projects were also obtained from NCDOT's Roadway Design group and from several local division offices across the state.

North Carolina highway project data became available electronically in 2011. This coincided with increased numbers of incidental bicycle and pedestrian elements in projects. The difficulty of obtaining data prior to 2011, coupled with the small number of projects with pedestrian and/or bicycle elements prior to that year, made obtaining data from earlier projects unfeasible. The research period was changed from the original, longer period, to the years for which electronic data were available. The data set includes sample projects with let dates between July 1, 2011 and June 30, 2014.

Other issues related to the availability of data altered the methodology as research staff became familiar with the data. The goal of a complete accounting of all projects during the time of the study was hampered by the level of project review required to identify projects that would be relevant to this study. More importantly, to estimate the additional costs associated with bridge elements required an unforeseen set of research and analysis. Whether or not a bridge was widened to accommodate pedestrians is not currently tracked in agency budget and cost data, but must be researched in planning documents for each project that contains a bridge.

As a result of these issues, it was determined that a much larger sample set of projects containing bicycle and pedestrian elements identified by agency staff would be analyzed for the project period, instead of the original plan to select a smaller sample set of projects. It was also determined that part of this research would include special calculations on bridges that would provide the first estimates of these costs. The inclusion of bridge data can form the basis for both estimating future costs and streamlining cost calculations on historic projects. The result is a larger, more robust set of sample data and new information for future research. Historical reports were limited to the identified sample set of projects.

To make the dataset as large (and as representative of multiple types and locations) as possible, institute staff gathered data on the identified sample projects throughout most of the research project period as bid data became available. This allowed for the inclusion of sample projects for three complete fiscal years.

Centrally-Let Projects

The majority of the study dataset consists of projects let from the central NCDOT offices in Raleigh. This set of projects was identified by NCDOT staff to be included in the sample.[22] Institute staff gathered plans, contracts and bid information[23] for each of these projects and organized it for analysis.

Division-Let Projects

Not all NCDOT projects are administered by the central office. The fourteen division offices of NCDOT administer some projects. Those offices were surveyed in order to identify projects with bicycle and/or pedestrian elements, where possible. Projects let at the division level often do not have the same level of detail available as centrally-let projects, so some types of summaries and analysis do not include these projects. Data tables and summaries make note when they include these division-let data.

Design-Build Projects

Institute staff also investigated design-build projects. These projects combine design and construction services into a single instrument (compared to the design – bid – build process in the centrally and division-let projects). This process does not include the detailed cost breakdown required for our analysis of bicycle and/or pedestrian elements. However, it should be noted that, though there are relatively few of these projects, they can be high-profile, and they often contain bicycle and/or pedestrian elements.

Cost-share Agreements

Municipal agreements associated with NCDOT projects detail any cost sharing between NCDOT and local jurisdictions for highway projects. Often, bicycle and pedestrian infrastructure elements are key components of these local agreements. The NCDOT Division of Bicycle and Pedestrian Transportation gathered these agreements so that institute staff could review and add these data to the dataset. Data from these cost-share agreements allow for analysis of the local share of any incidental costs for bicycle and/or pedestrian elements.[24] These data also help provide a more accurate picture of the net cost to NCDOT of including these elements. The costs listed in these agreements reflect estimates given prior to beginning the project. The amount of money to be contributed by a municipality is based on an agreed-upon percentage of specific elements (a sliding scale is used between 20 and 50 percent, based on town population). Depending on the difference between the estimate and the actual amount spent, the dollar amount contributed by a municipality may change, but the percentage will not. The whole amounts are adjusted after the project is over and the actual costs are determined.

[22] Lists of projects from the Pedestrian and Bicycle Division, Roadway Design.
[23] Contract information was used when available; otherwise bid information (lowest bid) cost data were used.
[24] Although the majority of cost-share agreements are done with municipalities, there was one project where an entity that was not a municipality entered into a cost-share agreement. This project was U-2507A and the cost-sharing entity in this project was the Serbian Orthodox Church.

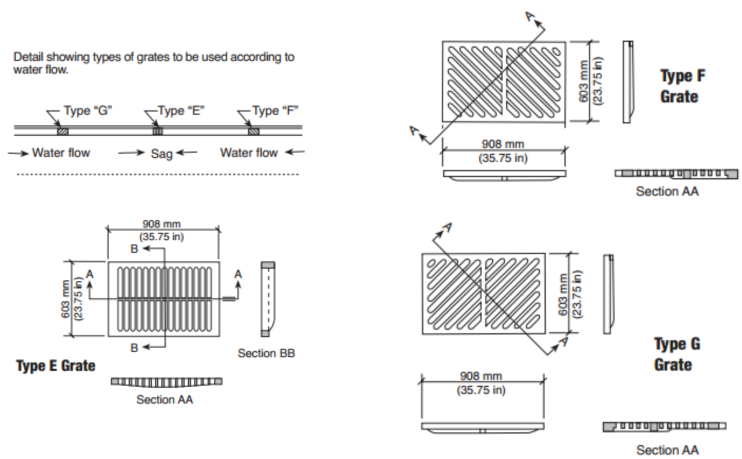
Methods

Using the detailed budget information from the bids and contract, all pedestrian and bicycle elements were identified and organized by project, date, division, and type. To enhance the final analysis, all centrally-let projects in the sample were geo-located. This allows for summaries by a number of geographies in geographic information systems (GIS) as well as better integration with other NCDOT datasets.

Engineering consultants on the research team verified that these budget breakdowns constitute the full costs per item, including labor and other overhead as well as profits allocated in the bid. They also verified that additional right-of-way costs were not of concern, as the bicycle and pedestrian accommodations fit within the existing right-of-way for the project. Some incremental additional supplies such as drainage pipe and culverts may be needed to satisfy additional width needs associated with bicycle and pedestrian accommodations, but that difference would vary with each project. It was determined that the small difference in the cost calculation did not justify the extensive research required to obtain these data.

Unit costs for bicycle and pedestrian elements in projects could be calculated in most cases with available budget data. There were a few exceptions that required special calculations:

Bicycle-safe grate and frame was used in two projects (U-3812 and U-2809B). The calculation for bicycle-safe grate and frame accounted for the cost for the standard grate and frame that would typically be used; this type of grate and frame is not as safe for bikes, because bicycle tires can get trapped in the grate. In order to generate a cost difference for the upgrade to bicycle-safe grate and frame, the average cost of the standard grate and frame was used from the two projects listed above, that had the bicycle-safe alternative. The image to the right shows several examples of bicycle-safe grates that have been approved by NCDOT.



Source: NCDOT Bicycle Projects Planning and Design Guidelines

To calculate the cost of the bike lane symbols, the pavement marking plans were consulted for each project to identify the number of pavement marking symbols that were used to mark bike lanes. The costs for bike lane markings were then separated from the total cost of pavement marking symbols to generate the cost for this element.

For high-visibility crosswalks, a similar method to the one used for bike lane symbols was applied. Pavement marking plans were consulted, and items that were used for other purposes were separated out. The remaining amount was used for crosswalks.

For some projects, the cost for standard crosswalks was determined to be too complex to extract from the total set of pavement markings costs. These projects were I-4733, U-0209B, U-2412B/U-2524AE, U-2507A, and U-2809B. Based on other projects in the dataset for which these costs could be calculated, an average cost-per-crosswalk was applied to the projects listed above.

For the multi-use path and the bike lanes, distances were calculated from the project plans, and then cost-per-mile estimates were applied from *Costs for Pedestrian and Bicyclist Infrastructure Improvements*.[25] For the multi-use path, this applied to project B-4660. For the bike lanes, this applied to four projects, including U-0209B, U-0624, U-2507A, and U-2803.

Bridges

Bridge replacement projects and highway projects that included bridges or overpasses with identified pedestrian and bicycle accommodations required a different approach than other items. Bridges accommodating pedestrians require additional expenses that should be included in this report if the bridges are wider or longer than they would have been without bicycle or pedestrian accommodations. Likewise, bridge rails that enhance pedestrian and bicyclist safety typically cost more, so this accommodation should be included as well. However, only the additional cost for these accommodations should be included as an incidental bicycle or pedestrian cost estimate.

To determine how much of the cost should be included in this research, an estimate is needed for costs without these accommodations. For instance, how would the bridge cost have been reduced if it hadn't required the additional length or width for pedestrian or bicycle accommodation? What is the difference in cost between the pedestrian-safe rail and the standard treatment for the bridge?

According to NCDOT Structural Engineering staff, striping of bicycle lanes on bridges is typically possible within the standard width called for by the road classification other "special designations" (such as bicycle route, scenic highway, etc.), so no additional width would be necessary for this accommodation. However, bridges with added pedestrian accommodations (sidewalks) usually require additional width, and the length of a bridge can also be affected in cases where additional span is required to cross a greenway or trails below. On bridges where there is no pedestrian or bicycle accommodation, the standard concrete barrier is typically used in place of rails.

Structural engineering staff at NCDOT determined which of the bridges identified for this study required increased length, width or additional cost for rails. Planning documents associated with the projects were reviewed to determine whether bridge length or width was increased specifically to accommodate pedestrians. The calculations for additional bridge length and width used the project-specific costs from contract and bid documents to estimate the additional amount spent, in comparison to the same bridge without pedestrian accommodations. Rail cost differences were calculated compared to average costs from the let year for standard concrete barriers[26].

These estimates allowed for the calculation of the incidental cost of pedestrian accommodations in bridge projects. Since the replacement of bridges has been an area of focus during the study period, the bridge data will have some of the largest samples for cost calculations. Only the bridges' structural additions and rail costs were done in this way.

The need to understand the actual expenditures on these items combined with the relatively compact range of years in the dataset means that the data are shown in unadjusted dollars (actual expenditures). Adjustments to current dollar value were not considered helpful in this situation.

Classification of projects/ project type

[25] Costs for Pedestrian and Bicyclist Infrastructure Improvements (Bushell, et al. 2013) from the UNC Highway Safety Research Center became available during the period of this research. Available at http://katana.hsrc.unc.edu/cms/downloads/Countermeasure%20Costs_Report_Nov2013.pdf.

[26] In one project, B-4122, Alaska Rail was determined to be the alternative that would have been used.

In this study, projects were classified into four categories: Bridge Replacement, Roadway Improvement, Interchange and New Roadway. Bridge Replacement projects involve the construction of a new bridge that replaces an older bridge that may be approaching its life expectancy. In this study, the majority of Bridge Replacement projects are marked with a "B" at the beginning of the TIP Number [27] . However, one of these projects is not a Bridge Replacement project. The scope of this project (TIP Number B-4656) covered the removal of a bridge and, instead of replacing it, an intersection was reconfigured and a signal was added. This project was classified as a Roadway Improvement project for this analysis.

Projects that were classified as New Roadway projects entail the construction of new roadways where a roadway did not already exist. For this study, these projects cover the construction of parts of the Greensboro Urban Loop.

Interchange projects involve the construction or improvement of interchanges, where such improvements weren't part of a larger project and the interchange was the main focus of the project. In this study, this included the construction of new interchanges and the conversion of existing interchanges to diverging diamond interchanges.

The scope of work for Roadway Improvement projects in this study includes widening of roadways, and reconfiguration of roadways, intersections and interchanges. Roadway Improvement projects in this study entail making changes to roadways that already exist. Generally, these projects are much larger in scale than other types of projects listed here and there is a wide variation in the types of construction done on these projects. Since they are larger and multifaceted, they may include some bridge replacements or interchanges as smaller parts of the whole project. The TIP Numbers for these project most commonly begin with the letter "U" but can include other special cases, such as B-4656 and R-2237C.

Findings

Identified Projects

The following section describes the set of projects identified. The core set of projects were centrally-let between July 1, 2011 and June 30, 2014 (See appendix for list of projects. Data download available for full set of calculated costs.)[28]. The resulting list is well distributed across the state and includes examples of many pedestrian and bicycle elements. It reflects an effort to show as comprehensive a list as possible within the data constraints. However, due to limits in the availability of data, Design-Build projects could not be included and some division-let projects that were identified had to be omitted. Figure 1, on the next page, shows the distribution of projects by type of project, and by fiscal year. During the time period, the projects were relatively evenly distributed by fiscal year.

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[27] Since bridge replacements and new bridges may exist in roadway projects, the number of bridges exceeds the number of designated Bridge Replacement projects in detailed lists.

[28] In gathering data for this study, several projects were identified that were outside the final determined study period. Available data on those projects are included in the dataset that accompanies this report, even though those projects aren't included in the analysis.

Figure 1. Identified Projects by Fiscal Year and Classification

Project Summary – Centrally-Let Projects					
Time Period	Bridge Replacement	Interchange	New Roadway	Roadway Improvement	(n)
FY 2012	13	1		7	21
FY 2013	19			8	27
FY 2014	15	2	2	3	22
Total	47	3	2	18	70

Figure 2. Identified Projects by Classification

Project Summary – Centrally-Let Projects		
Category	(n)	Percent
Bridge Replacement	47	67.0
Interchange	3	4.3
New Roadway	2	2.9
Roadway Improvement	18	25.7
Total	70	100%

Nearly 70 percent of the centrally-let projects in this study were Bridge Replacements (Figure 2). The next largest category was Roadway Improvement projects, while Interchanges and New Roadways represented a much smaller part of the dataset. The map below (Figure 3) shows the geographic distribution of the dataset's identified centrally-let projects by category. The map reinforces the predominance of bridge projects in the data and shows the wide distribution of the projects across the state.

Figure 3. Distribution of Identified Projects by Category

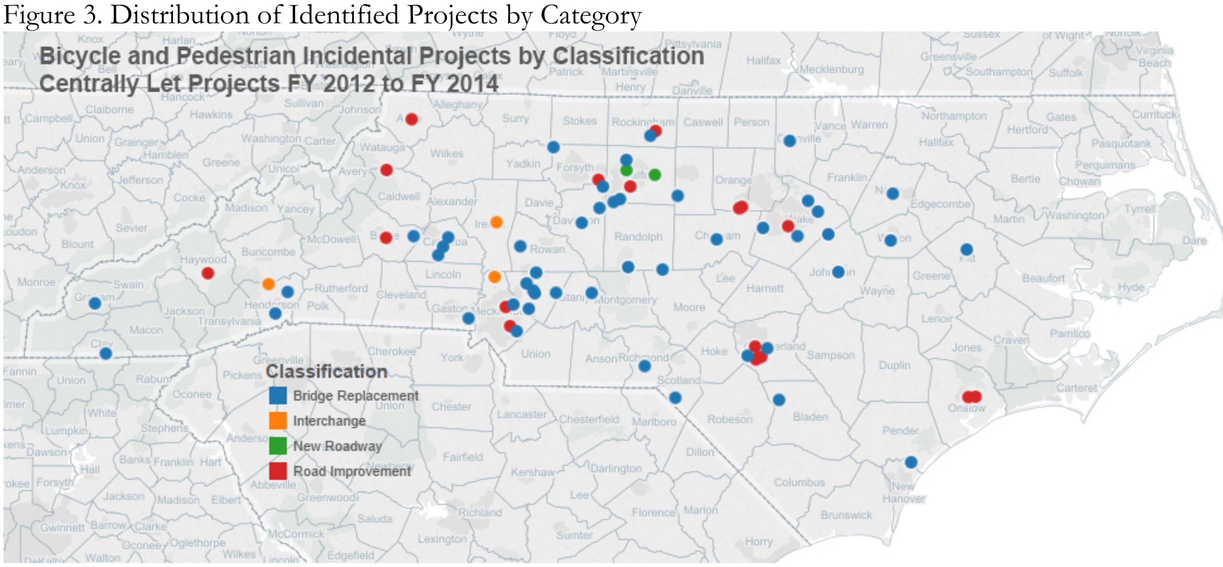
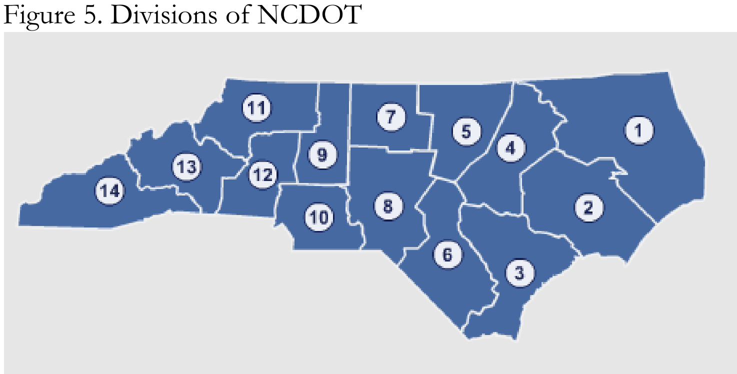


Figure 4. Identified Centrally-Let Projects by Division

Project Summary – Centrally-Let Projects					
Division	Bridge Replacement	Interchange	New Roadway	Roadway Improvement	(n)
2	1				1
3	1			2	3
4	3				3
5	6			1	7
6	3			4	7
7	5		2	4	11
8	5				5
9	6			1	7
10	8	1		2	11
11				2	2
12	4	1			5
13	1	1		1	3
14	4			1	5
Total	47	3	2	18	70

NCDOT is organized into fourteen separate divisions, illustrated in the map below (Figure 5). Division 7 and Division 10 had the highest number of centrally-let projects in this report. The only division that does not have a centrally-let project with incidental bicycle and pedestrian elements represented in this report is Division 1, located in the northeastern part of the state.

Figure 5. Divisions of NCDOT



Source: NCDOT

In addition to identification by division, this study also looked at where projects were located in terms of urban areas and rural areas. Projects were categorized as being located in an urban area or a rural area, based on the NCDOT Smoothed Urban Boundaries from 2000. The majority of projects, 73 percent, were in areas that were designated as “urban”. The only types of projects done in rural areas were Bridge Replacements and Roadway Improvements; there were no projects designated as an Interchange or New Roadway located in areas that were designated “rural.”

Figure 6. Identified Projects by Urban or Rural Designation and Classification

Project Summary – Centrally-Let Projects						
Urban/Rural	Bridge Replacement	Interchange	New Roadway	Roadway Improvement	(n)	Percent
Rural	17			2	19	27.0%
Urban	30	3	2	16	51	73.0%
Total	47	3	2	18	70	100.0%

Division-Let Projects

For this report, 14 division-let projects fall within the time of the study and have sufficient data to be included in some parts of the analysis. Data for division-let projects are tracked differently, and some projects were not included if sufficient data were not available. For the remainder of the report, all figures will note where division-let projects are included. The data that has been included is from Divisions 7, 10 and 11, and covers projects in seven counties, identified in the table below. This report does not contain data for other divisions.

Figure 7. Identified Projects by Division and County

Division – Let Projects		
County	Division	(n)
Alamance	7	1
Cabarrus	10	1
Caldwell	11	1
Guilford	7	1
Mecklenburg	10	7
Union	10	2
Yadkin	11	1
Total	*	14

Detail by Type of Infrastructure

Within these identified projects there were a range of pedestrian and bicycle elements included. Detailed contract and bid documents provided the data to identify these elements. For this analysis, we organized bicycle and pedestrian elements as follows:

- Pedestrian – Curb ramps, steps, barriers, signalized crossings, transit waiting elements and walkways (including sidewalks and other paths)
- Bicycle – Bicycle lanes and bicycle safety elements
- Bridge – Changes to bridge length, width or railing to accommodate bicycles or pedestrians
- Signage and Pavement Markings - Signs, crosswalks and pavement symbols that relate to pedestrians or bicycles

Appendix 1 lists the elements in those categories with a brief description and the cost unit used.

Project Agreements (Cost-share)

In many cases, NCDOT enters into project agreements with entities being affected by transportation projects (typically a local government agency, such as a municipality). These agreements are project-specific and set out the roles and responsibilities for the project. Project agreements may include financial responsibility for bicycle and pedestrian elements. To better understand the actual financial cost to NCDOT of incidental bicycle and pedestrian elements, information on this cost-share part of the agreement is included in this analysis.

Figure 8. Identified Projects with Cost-Share on Pedestrian and/or Bicycle Elements

Projects with Cost-Share Agreements			
	Covers some funding for project? (n)	Covers funding for BikePed elements? (n)	Percent Projects with Agreement covering BikePed Elements
Yes	29	27	39%
No or N/A	41	43	61%
Total	70	70	100%

Of the centrally-let projects in the study, 39 percent had a cost-share agreement in place that reimbursed NCDOT some portion of the costs for bicycle and pedestrian elements. Of the two types of projects that represented the largest portion of the dataset (Roadway Improvements and Bridge Replacements), Roadway Improvement projects had the highest number of cost-share agreements, with 14 cost-share agreements. This represented 78 percent of the total number of Roadway Improvement projects, while only 19 percent of Bridge Replacement projects had an associated cost-share agreement that covered bicycle and/or pedestrian elements. Although there were only two New Roadway projects, both of these projects received funding from their respective municipality that covered some portion of bicycle and pedestrian elements.

Figure 9. Identified Projects with Cost-Share on Pedestrian and/or Bicycle Elements by Classification

Cost-Share Agreements by Classification				
	Agreement Covered BikePed Elements	Agreement Did Not Cover BikePed Elements[29]	Total	Percent with Cost-Share Agreements
Bridge Replacement	9	38	47	19%
Interchange	2	1	3	67%
New Roadway	2		2	100%
Roadway Improvement	14	4	18	78%
Total	27	43	70	

[29] This includes projects for which a cost-share agreement did not exist.

Summary of Costs

A main goal of this study was to provide detailed cost information on incidental bicycle and pedestrian elements within highway, bridge, interchange and roadway projects. These cost data would be used as an aid in estimating future costs. As noted previously, some project types (design-build and some division-let projects) did not have sufficient data to be included in the analysis. This section shows the cost information for the identified projects summarized by the project classifications as well as by the bicycle and pedestrian elements within those projects.

Costs by Project

Overall, the 70 centrally-let projects in the study total just under $848 million in contracted costs. Of that total, $19.9 million (2.35%) are incidental bicycle or pedestrian costs. This section provides details of those costs by year, type of project, division and type of infrastructure. The table below (Figure 10) shows the distribution of costs for incidental bicycle and pedestrian expenses for the sample set of centrally-let projects from July 1, 2011 to June 30, 2014.

Figure 80. Incidental Bicycle and Pedestrian Costs by Year

Costs by Year and Quarter					
Year of Let Date	Quarter of Let Date	Total-Contract Amount($)	Total-Bike/Ped Amount ($)	Bike/Ped Portion (%)	(n)
FY 2012	Q1	$ 1,294,907	$ 28,220	2.18%	1
	Q2	71,167,023	1,294,522	1.82%	3
	Q3	105,228,537	3,934,497	3.74%	11
	Q4	127,800,393	1,794,332	1.40%	6
FY 2012	Total	305,490,860	7,051,571	2.31%	21
FY 2013	Q1	114,723,623	1,958,153	1.71%	5
	Q2	26,422,710	1,607,359	6.08%	8
	Q3	73,901,775	3,358,859	4.55%	10
	Q4	8,455,834	198,929	2.35%	4
FY 2013	Total	223,503,943	7,123,300	3.19%	27
FY 2014	Q1	130,647,441	1,316,811	1.01%	4
	Q2	43,071,835	2,133,556	4.95%	6
	Q3	28,680,269	1,299,290	4.53%	8
	Q4	116,304,103	1,007,019	0.87%	4
FY 2014	Total	318,703,649	5,756,675	1.81%	22
Grand Total	Total	847,698,452	19,931,546	2.35%	70

Figure 91. Incidental Bicycle and Pedestrian Costs by Project Classification

Costs by Classification				
Category	Total Contract Amount ($)	Bike/Ped Amount ($)	Bike/Ped Portion (%)	(n)
Bridge Replacement	$ 93,349,508	$ 7,204,607	7.72%	47
Interchange	103,787,902	1,156,023	1.11%	3
New Roadway	234,487,810	1,599,443	0.68%	2
Roadway Improvement*	416,073,232	9,971,473	2.40%	18
Total	$ 847,698,452	$ 19,931,546	2.35%	70

**Also contain bridge replacements.*

Of the categories in Figure 11 (above), bicycle and pedestrian incidental costs account for over $7 million (almost 8 percent) of projects classified as bridge replacements. In Roadway Improvement projects, which may also contain some bridges, bicycle and pedestrian costs represent a larger total amount spent (approximately $10 million), but that number still reflects a smaller percentage (2.4%) of the total project costs for projects classified as Roadway Improvements.

Figure 102. Incidental Bicycle and Pedestrian Costs by Division

Costs by Division				
Division	Total Contract Amount ($)	Bike/Ped Amount ($)	Bike/Ped Portion (%)	(n)
2	1,055,300	38,059	3.61%	1
3	63,894,199	939,944	1.47%	3
4	8,342,009	1,212,493	14.53%	3
5	14,653,056	1,752455	11.9%	7
6	64,933,713	2,327,799	3.58%	7
7	341,747,077	3,535,424	1.03%	11
8	4,424,465	147,985	3.34%	5
9	39,405,838	861,311	2.19%	7
10	98,208,714	6,018,775	6.13%	11
11	70,037,733	434,299	0.62%	2
12	97,716,551	816,138	0.84%	5
13	24,445,383	1,267,141	5.18%	3
14	18,834,413	579,723	3.08%	5
Total	847,698,452	19,931,546	2.35%	70

The two divisions that had the highest percentages of their contract amounts allocated to bicycle and pedestrian facilities were Division 4 (14.53%) and Division 5 (11.9%). However, in terms of the total dollar amount spent on incidental bicycle and pedestrian elements, Division 10 and Division 7 rank highest, with approximately $6 million spent within Division 10 and $3.5 million spent within Division 7. (For map of Divisions, see page 12.)

Costs by Type of Infrastructure

Cost statistics are shown by type of infrastructure in the table on the next page (Figure 13). Of the items classified as pedestrian elements, there are 18 separate items summarized for this report. Other categories may also apply to pedestrian accommodations (noted below). A total of over $7 million was spent on pedestrian accommodations alone. Of these elements, the items with the highest total costs across all projects are sidewalks and curb ramps. These two items, along with pedestrian signal heads, have the highest number of cost observations in this group, indicating that they are the more common features of the 18 elements.

There were only two types of bicycle-specific facilities in the identified projects. A total of over $1 million was spent on bicycle-friendly infrastructure. The majority of that money was put towards bicycle lanes, but a small amount ($2,676) was spent on bicycle-safe grate. When compared to the total spent, this represents less than 0.01% of the total cost of bicycle facilities. Other aspects of bicycle accommodations are included in bridge elements and pavement markings in the next paragraphs (see below).

The next category is Bridge elements. For this table, the categories of bridge rails are detailed. Other bridge elements are tracked by structural additions (additional length; width; girders and cored slabs; approach slabs). A total of $11 million was spent to accommodate pedestrians and bicyclists on bridges. The highest amount of money ($8.5 million) went towards structural additions, such as additional length or width. Two-bar metal rail was second in terms of the amount of money spent, with over $2 million allocated to these specific bridge rails. More details on these costs are found in the section on estimating future costs. Full sets of detailed bridge cost calculations are also available in data tables for these structural cost categories.

Pavement Marking and Signage is the last category. These are also related to both bicycle and pedestrian accommodations. This category comprised the smallest amount of money, at only $286,676 for bike lane symbols, crosswalks, and signage. The signage and bike lane symbols were the least expensive items in this category, at $21,000 and $31,000, respectively.

Figure 113. Incidental Bicycle and Pedestrian Costs by Type of Infrastructure

Total Cost by Bicycle or Pedestrian Feature		
Pedestrian	Total Costs	(n)
Curb Ramp	$1,116,229	29
Curb Ramp- Retrofit	13,200	4
Curb Ramp -Temporary	9,000	1
Path - Boardwalk*	174,160	2
Path -Multi-Use Path*	48,114	1
Pedestrian refuge island-barrier	637,097	3
Pedestrian refuge island-perimeter *	15,000	1
Pedestrian refuge island-sidewalk	125,000	1
Railing- Handrail on Steps	5,790	2
Railing -Pedestrian Safety Rail	58,370	5
Sidewalk	4,464,025	26
Sidewalk -Remove/Reset Brick Sidewalk	18,000	1
Sidewalk -Temporary	18,900	1
Signal -Pedestrian Signal Head	265,944	21
Signal -Pushbutton Post	56,645	7
Steps- Concrete	12,750	1
Transit -Shelter Pad	3,750	1
Transit -Waiting Pad	1,755	1
Subtotal	7,043,729	
Bicycle		
Bicycle Lane*	1,179,354	4
Bicycle Safe Steel Grate & Frame*	2,676	2
Subtotal	1,182,030	
Bridge		
Bridge- BikePed Structural Additions Cost*	8,460,395	26
Railing- Bridge- Three-Bar Metal Rail*	505,423	10
Railing- Bridge- Two Bar Metal Rail*	2,395,728	40
Railing- Bridge- Double-Faced Two-bar Metal*	57,565	1
Subtotal	11,419,111	
Pavement Markings and Signage		
Pavement Markings- Bike Lane Symbols	31,636	4
Pavement Markings- Hi-Vis Crosswalk	130,807	14
Pavement Markings-Standard Crosswalk*	103,161	14
Signage *	21,072	20
Subtotal	286,676	
Total	$19,931,546	*

Cost-Share: Project Agreements

Of the $ 19.9 million in identified bicycle and pedestrian costs in the dataset of centrally-let projects, an estimated $ 3.1 million or 16 percent of those costs were covered by local governments. Figure 8 (in the previous section) showed that 39 percent of the projects (27 projects) with identified bicycle and pedestrian accommodations contained project agreements with local governments that covered some portion of those costs. The table below (Figure 14) shows details of those 27 centrally-let projects by project classification.

Figure 124. Cost-Share Agreements for Incidental Bicycle and Pedestrian Costs by Type of Infrastructure

Cost-Share-Agreements for Centrally-Let Projects					
Category	Total Contract Amount ($)	BikePed Amount ($)	Cost contributed for BikePed by local government ($)	Percent of BikePed Costs covered by local government (%)	(n)
Bridge Replacement	22,007,759	3,322,523	1,412,988	42.53%	9
Interchange	95,012,365	649,169	501,092	77.19%	2
New Roadway	234,487,810	1,599,443	48,699	3.04%	2
Roadway Improvement*	254,271,255	6,320978	1,691,579	18.71%	14
Total	605,779,188	11,892,112	3,145,354	26.45%	27

**May contain Bridge Replacements and Interchanges as smaller parts of a larger projects.*

For the projects that had cost-share agreements for bicycle and pedestrian elements, municipalities contributed an estimated $3 million out of almost $12 million that was spent on incidental bicycle and pedestrian elements, meaning an average of a quarter of the cost of those elements were funded by local governments. Bridge Replacement and Roadway Improvement projects are the largest samples by classification, so those percentages may be more useful for understanding the likely participation pattern.

Estimating Future Costs

Unlike a typical cost calculator for engineering project development, the goal for this report is to create tools for understanding the likely cost impact for a class of project elements (bicycle and pedestrian accommodations) for budget planning and funding decisions. No information existed that gave budget planners the ability to broadly understand the cost effect of adding bicycle and pedestrian features to projects.

In a dynamic policy and funding environment, and with the advent of new initiatives like Complete Streets, the standards for bicycle and pedestrian accommodations may be in flux. Furthermore, the way that federal, state and local governments split the costs for these elements may also face some changes.

This section shows the past experience of costs and cost-sharing for these elements with the acknowledgement that future changes in approach on funding may render these data more useful as an historic record than an estimator of future possible funding strategies.

The tools presented for estimating future costs consist of two kinds of aids:

Data and Interactive Tool

Data tools are included with this project that allow the user to see summary data for estimating costs based on the information gathered over the three years of projects (see Technology Transfer section). The full reported set of costs by project and element is available with this report[30]. Interactive data tools were also made available to NCDOT staff that allow for easy filtering of this large data file to query individual project incidental costs or quantities by category, division or year.

Summary Reports of Costs

In addition to the data files and interactive data tool, summaries are presented in this section that show ranges of costs from the data that can also be used as a budget aid for understanding the effect of adding bicycle or pedestrian elements to projects.

Costs by Type of Infrastructure

Bid-year averages are available for elements in creating cost calculations, but the ranges of data in the table below (Figure 15) are specific to incidental costs of these elements within larger highway projects. Further, the dataset is available to refine searches to similar projects by location and scope.

[30] A link to this data will be made available through NCDOT.

Figure 135. Incidental Bicycle and Pedestrian Range of Costs by Type of Infrastructure

Unit Cost by Type of Bicycle or Pedestrian Feature						
Pedestrian	Median Cost	Avg. Cost	Min Cost	Max Cost	(n)	Unit
Curb Ramp [31]	$ 890	$ 915	$ 34	$ 1,700	32	EA
Curb Ramp- Retrofit	1,025	1,063	700	1,500	4	EA
Curb Ramp -Temporary	1,500	1,500	1,500	1,500	1	EA
Path - Boardwalk*	87,080	87,080	81,160	93,000	2	LS
Path -Multi-Use Path*	See text below for details.				1	Mile
Pedestrian refuge island-barrier	325	292	152	400	3	LF
Pedestrian refuge island-perimeter *	15,000	15,000	15,000	15,000	1	LS
Pedestrian refuge island-sidewalk	125,000	125,000	125,000	125,000	1	LS
Railing- Handrail on Steps	95	95	90	100	2	LF
Railing -Pedestrian Safety Rail	40	38	19	60	5	LF
Sidewalk	16	16	11	27	36	LF
Sidewalk -Remove/Reset Brick Sidewalk	720	720	720	720	1	SY
Sidewalk -Temporary	30	30	30	30	1	SY
Signal -Pedestrian Signal Head	813	836	650	1,453	21	EA
Signal -Pushbutton Post	1,146	1,135	850	1,400	7	EA
Steps- Concrete	850	850	850	850	1	CY
Transit -Shelter Pad	38	38	38	38	1	SY
Transit -Waiting Pad	29	29	29	29	1	SY
Bicycle						
Bicycle Lane*	See table below for details.				4	Mile
Bicycle Safe Steel Grate & Frame*	1,318	1,318	1,135	1,500	2	EA
Bridge						
Railing- Bridge- Three-Bar Metal Rail*	163	177	62	375	11	LF
Railing- Bridge- Two Bar Metal Rail*	207	204	100	350	48	LF
Railing- Bridge- Double-Faced Two-bar Metal*	230	230	230	230	1	LF
Pavement Markings and Signage						
Pavement Markings-Standard Crosswalk*	509	496	223	812	14	EA
Pavement Markings- Hi-Vis Crosswalk	649	1,049	132	3,598	14	EA
Pavement Markings- Bike Lane Symbols	119	122	100	150	4	EA
Signage *	110	115	90	161	21	EA

[31] The minimum cost for curb ramps ($34.00) is considerably different from the amount quoted in other projects and appears to be an outlier, but has been verified with contract and bid documents as being correct. If one were to exclude this individual cost observation, the cost would range from $400 to $1700 per curb ramp.

Costs for bicycle lanes and multi-use paths were not available in the data in a format that allowed for the same calculations as the other elements above. The next table show the individual projects which contained bicycle lane elements and the cost information that was available. The total cost column is an estimate based on the cost-per-mile estimate for a bicycle lane in the 2013 study done by the UNC Highway Safety Research Center. This study estimated that, on average, a bicycle lane costs $133,170 per mile, and this was the amount used as a basis for our calculations.

Figure 146. Bicycle Lane Costs

Results of Bicycle Lane Cost Calculations			
TIP	Bicycle Lane- Qty	Bicycle Lane- Unit	Bicycle Lane- Total Cost
U-0209B	1.6	mile	$213,072
U-0624	1.496	mile	199,222
U-2507A	5.16	mile	687,157
U-2803	0.6	mile	79,902

Only one project in the sample, B-4660, contained a 0.1 mile length of multi-use path. Using the UNC Highway Safety report above, the cost per mile basis was $481,140/mile (the average value for the report), making the estimated cost of this item $48,114.

Estimating Costs for Budgeting

As seen above, some refinement of unit costs is helpful to compare to costs in independent bicycle and pedestrian projects. A goal of the study is to determine how much can be said about the cost impact of adding incidental bicycle and pedestrian elements to projects more broadly. By separating out the bicycle and pedestrian elements, some overall guidance in budgeting may be obtained.

This section provides summary information of the most common bicycle and pedestrian elements to aid in understanding the overall impact of adding these elements to highway projects. Those elements included had a minimum of 20 occurrences within projects: Curb Ramp (32) Sidewalks (29), Signal – Pedestrian Signal Head (20) and Signage (20).

Due to the differences in the way bridge costs are available, a more detailed section follows on bridges.

The last part of this section details the cost-share data among projects with cost-share agreements that cover some part of bicycle and pedestrian elements.

Curb Ramps:

There are 32 projects with incidental curb ramp elements. This was approximately 0.25 % of overall project costs where it occurred. The average cost of curb ramps was $900 each, with an average of 40 curb ramps per project.

Figure 157. Curb Ramp Costs

Curb Ramp Costs				
Curb Ramps (32 projects)	Quantity (EA)	Actual costs	Cost/ EA	% of overall project cost
Average	39.6	$ 34,882	$ 899.9	0.26 %
Median	24.5	24,470	870	0.25 %
Minimum	1	800	33.5	0.00 %
Maximum	130	141,700	1,700	0.79 %

Sidewalks:

There are 36 projects with incidental sidewalk elements. The minimum length of sidewalk for any given project was 0.0068 miles (36 ft.), the maximum length was 9.6 miles, and the average length for all sidewalks in the dataset was 1.6 miles (8,831 ft.). The average cost to add a sidewalk to a project was $124,000; however, in terms of the overall project cost, sidewalks cost less than one percent of the overall project cost on average.

Figure 168. Sidewalk Costs

Sidewalk Costs				
Sidewalks (36 projects)	Length (LF)	Actual costs	Cost/LF	% of overall project cost
Average	8,831	$124,000	16.47	0.86 %
Median	4563	76140	16	0.72 %
Minimum	36	623	11	0.01 %
Maximum	50,634	625,892	27	2.86 %

Signal – Pedestrian Signal Heads

Pedestrian signal heads were found in 21 of the projects in the dataset. The maximum number of signal heads in a project was 50, whereas the minimum was two and the average across all projects was approximately 16. These signal heads range in cost from $640 to $1,453, with an average cost of $834 per signal head. As a percentage of the overall project cost, signal heads represented less than half a percent of the total project cost and averaged about 0.10% of the overall project cost.

Figure 19. Pedestrian Signal Heads

Pedestrian Signal Heads				
Pedestrian Signal Heads (21 projects)	Quantity (EA)	Actual costs	Cost/ EA	% of overall project cost
Average	15.7	$ 12,644	$ 834	0.10 %
Median	14	10,024	810	0.07 %
Minimum	2	1,600	640	0.01 %
Maximum	50	43,000	1,453	0.43 %

Signage

The signage cost (Figure 20) took into account the cost of the sign post and the cost to erect the sign, but did not include the signs themselves due to a lack of available information. Total signage costs ranged from $94 in one project to a maximum of $3,418, with an average cost per unit of $115 per sign. This represented a very small percentage of the overall cost, with an average of 0.01% of the overall project cost.

Figure 170. Bicycle and Pedestrian Signage Costs

Bicycle and Pedestrian Signage Costs				
Signage (21 projects)	Quantity (EA)	Actual costs	Cost/EA	% of overall project cost
Average	9	$ 1,004	$ 115	0.01 %
Median	6	660	110	0.01 %
Minimum	1	94	90	0.00 %
Maximum	32	3,418	161	0.04 %

Costs for Bridges

With few exceptions, data needed to calculate specific costs for elements other than bridges could be derived from bid tabulations. The additional costs to accommodate bicycle and pedestrian on bridges were handled differently. To understand what additional bridge costs were added to accommodate bicycles and pedestrians, the bridge costs had to be estimated without those accommodations.

For the sample set of projects in this report, all bridge cost estimates are based on the actual costs for bridge elements minus the estimated cost of the bridge without those elements. For example, if the only additional cost was determined to be for special railings, then the railing costs were calculated for the special rails from the bid tabulations, then estimated with the standard treatment that would have been used (typically a concrete barrier). The difference between the actual bridge rail cost and the estimated cost for the concrete barrier is the incidental cost.

Structural changes for bridges (increased width and/or length) were calculated in a similar way. The actual structural costs, broken down in to several categories, were compared to estimated costs without the extra structural elements that were added to accommodate pedestrians.

The total number of projects that contained bridges with costs associated with bicycle and pedestrian accommodations was 57. Of those, the majority (54) included additional costs for bridge rails to accommodate bicycle or pedestrian use. In 35 projects, bridge rails were the only additional cost related to pedestrian- or bicycle-related bridge improvements.

Additional structural bridge costs occurred in 22 projects. Of those 22 projects, several included more than one bridge, bringing the total number of bridges with additional structural costs in the study to 27. Bridges were widened in all 22 projects with structural additions, and lengthened in 5 of the 22 projects (total of 7 bridges were lengthened). Additional bridge width was necessary to accommodate pedestrian sidewalks. Bicycle accommodations are handled with lane striping, and standard bridge widths provide adequate space for bicycle lane striping so no additional width is typically needed to accommodate bicycles.

Bridge Summary

In the three years of the dataset, all additional bridge-related costs for bicycle and pedestrian accommodations are estimated to be $ 11.4 million dollars out of a total of $ 98.2 million dollars in contracted bridge costs (11.6 percent). Among the individual projects, the average of these percentages is 12.03 percent (reflected in Figure 21).

The costs for accommodations were a lower overall percentage if there were no structural costs to lengthen or widen the bridge. For projects with bridges that only needed special rails, the average additional cost was 5.47 percent. For the bridges that did require additional width or length to accommodate bicycle or pedestrian uses, the increased cost averaged 22.45 percent.

The following sections show the additional costs needed to accommodate bicycles and pedestrians on bridges, calculated in the manner explained above.

Figure 21 (below) summarizes the costs for the set of bridges in the sample set. Bridges that only required special railings (35 projects), added an average of just over $50,000 or 5.47 percent of the total bridge costs. Bridges that required structural additions (22 projects) averaged $439,917 in additional costs or 22.45 percent of all bridge costs.

Figure 181. Additional Costs by Categories of Bridge Accommodations

Additional Cost for All Bridge Bicycle and Pedestrian Accommodations						
Bridge Costs for Bike/Ped	Costs for Bridges Requiring Rails Only (35) projects	% of Total Additional cost for bridges with rail costs	Costs for bridges Requiring Structural Changes (22) projects	% of Total Additional cost for bridges with Structural Changes	Total additional costs for bridges (57 projects)	% of Total Additional cost for bridges
Average	$ 50,369	5.47 %	$ 439,917	22.45 %	$ 200,335	12.03 %
Median	36,547	5.52 %	365,503	20.74 %	63,991	7.09 %
Minimum	3,663	0.02 %	69,788	11.97 %	3,663	0.02 %
Maximum	233,404	8.43 %	1,760,616	35.01 %	1,760,616	35.01 %

Bridge Rails

Bridge rails are summarized for all the sample projects in Figure 22. The cost is calculated as the additional costs for pedestrian or bicycle-safe rails compared to concrete barriers (the standard treatment when pedestrian or bicycle accommodations are not being made). Concrete barrier costs are based on at the let-year average cost.

Since several projects have multiple bridges with multiple rail options, the table does not summarize cost per unit for bridge rails. All costs are shown by project, rather than by bridge. The detailed cost-per-bridge for all items is available in the separate data table for bridge calculations. The percent of overall project cost for these items in the table above (Figure 21) are more informative for understanding the cost for bridges that only required special rails. Figure 22 shows all projects that required special rails, including projects that had structural changes and special bridge rails.

More projects contained bridge rail costs than structural bridge cost additions. There were also bridge rails in projects that were classified as other types of projects such as roadway improvement or interchanges, bringing the total number of projects to 57 and total bridges to 61. For one individual bridge project, the difference in bridge rail requirements lowered the project cost (B-4122). This project required other additional costs, and is not reflected in the projects above that only had rail expenses.

Figure 192. Bridge Rail Costs

Additional Cost for Bridge Rail	
Bridge – All Additional Rail Costs – (57 projects, 61 bridges)	Actual costs
Average	$ 54,791
Median	39,776
Minimum	-2,010
Maximum	233,404

Bridges: Cost to Widen

This dataset contained 22 projects that required widening for pedestrian elements. Within those 22 projects, there were 26 bridges that were widened from as little as 3 linear feet to as many as 17.83 linear feet. On average, they were widened 9.05 linear feet at an average cost of $21,997 per linear foot. Total costs to widen individual bridges ranged from just under $ 40,000 to $ 875,000. Figure 23, below, summarizes these costs, including the cost per linear foot.

Figure 203. Bridge Widening Costs

Additional Cost for Extra Bridge Width				
Bridge – Cost / LF to Widen – (22 projects, 26 bridges)	Width Increase (LF)	Actual costs	Cost/LF	% of overall project cost
Average	9.05	$ 220,300	$ 21,997	6.0 %
Median	10.25	180,815	19,802	5.8 %
Minimum	3	39,145	8,524	0.3 %
Maximum	17.83	875,022	49,067	16.6 %

Note: Costs are per bridge except for % overall project cost, which may include a variety of other expenses or multiple bridges.

Bridges: Cost to Lengthen

Seven bridges in this study were lengthened to accommodate pedestrian and bicyclist facilities. An example of the need to lengthen a bridge would be to accommodate a greenway beneath. They were lengthened between 5 and 25 feet. Overall costs to lengthen bridges ranged from $44,000 to $146,000, at an average of approximately $7,555 per linear foot for the additional length. These data are summarized below in Figure 24.

Figure 214. Bridge Lengthening Costs

Additional Cost for Extra Bridge Length				
Bridge – Cost / LF to Lengthen – (5 projects, 7 bridges)	Length Increase (LF)	Actual costs	Cost/LF	% of overall project cost
Average	13.71	$ 92,357	$ 7,555	2.1 %
Median	12	93,468	7,789	1.74 %
Minimum	5	43,960	2,931	0.52 %
Maximum	25	145,822	12,163	3.63 %

Note: Costs are per bridge except for % overall project cost, which may include a variety of other expenses or multiple bridges.

Bridges: Cost for Girder(s), Cored Slabs and Approach Slabs

When bridges required additional length or width, structural components required for the bridge construction may also increase. The table below (Figure 25) shows the additional girder or cored slab costs required for these increases in length or width. Costs per unit are not shown for this category since those items were grouped together in the data.

Figure 225. Additional Girder and Cored Slab Costs

Additional Cost for Extra Girder and Cored Slab			
Bridge – Cost for Additional Girders or Cored Slabs – (18 projects, 22 bridges)	Quantity of Girders or Cored Slabs (LF)	Actual costs	% of overall project cost
Average	1.31	$ 86,300	4.32 %
Median	1	65,928	3.90 %
Minimum	1	19,825	1.29 %
Maximum	3	202,812	11 %

Bridges: Costs for Approach Slabs

Additional costs to the approach slabs for bridges to accommodate bicycle and pedestrian uses are summarized below. Total costs are the only available data for this element.

Figure 236. Additional Approach Slab Costs

Additional Cost for Extra Approach Slabs		
Bridge – Cost for Additional Approach Slab – (21 projects, 25 bridges)	Actual costs	% of overall project cost
Average	$ 9,177	0.68 %
Median	9,078	0.45 %
Minimum	2,002	0.52 %
Maximum	18,077	3.63 %

Shared Costs

Like bridge costs, calculating the amount of a project's bicycle and pedestrian incidental costs covered by another entity also required special calculations and research. Shared costs are not listed in bid tabulations, since any project agreement to share costs is billed to the other agency (typically a municipality) by NCDOT after the project is completed, based on the negotiated terms of the project agreement. This section shows the result of the research into the terms of each project agreement for the sample set of projects and an estimate of what the final settlement would be, based on those terms.

Overall, of the 27 projects that included cost-sharing with local governments, an average of 55 percent of bicycle and pedestrian costs were covered. In the projects classified as Bridge Replacements, it was a similar average share (Figure 28, below).

The tables below show the range of local government participation in bicycle and pedestrian incidental costs for the full set of sample projects with a cost-share (Figure 27), then by each classification of project in Figures 28 through 31.

Figure 247. Municipal Cost-Share for All Projects

Additional Cost		
Project Agreements – All that contribute to BikePed (27 projects)	Local Government Estimated Contribution to BikePed Work (%)	Local Government Estimated Contribution to BikePed Work ($)
Average	55.2 %	$ 116,495
Median	50 %	51,376
Minimum	20 %	1,265
Maximum	100 %	628,110

In the sample set, 9 Bridge Replacement Projects contained cost share agreements. Figure 28 below shows the breakdown of those costs, with an average 55 percent of the bicycle and pedestrian incidental costs being covered.

Figure 258. Municipal Cost-Share for Bridge Replacement Projects

Bridge Replacement Project Cost-Share		
Project Agreements – Bridge Replacements (9 projects)	Local Government Estimated Contribution to BikePed Work (%)	Local Government Estimated Contribution to BikePed Work ($)
Average	55.0 %	$ 156,999
Median	40.0 %	48,363
Minimum	20.0 %	1,265
Maximum	99.2 %	628,110

Nine projects classified as interchanges or new roadways had a cost-share agreement for bicycle and pedestrian elements in the sample, and there was some consistency in the portion of these costs that were paid for by local governments (63 percent for interchange projects and 50 percent for new roadways). Figure 29 shows the results of cost share for bicycle and pedestrian elements in Interchange Projects. Figure 30 shows New Roadway projects. Interchange Improvement projects averaged the dollar contribution for bicycle and pedestrian work at $250,546.

Figure 29. Municipal Cost-Share for Interchange Projects

Interchange Project Cost-Share		
Project Agreements – Interchange (2 projects)	Local Government Estimated Contribution to BikePed Work (%)	Local Government Estimated Contribution to BikePed Work ($)
Average	63.2 %	$ 250,546
Median	63.2 %	250,546
Minimum	30.0 %	18,880
Maximum	96.4 %	482,212

Figure 260. Municipal Cost-Share for New Roadway Projects

New Roadway Project Cost-Share		
Project Agreements – New Roadway – (2 projects)	Local Government Estimated Contribution to BikePed Work (%)	Local Government Estimated Contribution to BikePed Work ($)
Average	50.0 %	$24,350
Median	50.0 %	24,350
Minimum	50.0 %	6,436
Maximum	50.0 %	42,263

Roadway improvement projects were a larger group in the sample of projects, numbering 14, and had a local contribution average of 55 percent, giving cost-shares a relatively consistent range of averages where it occurs. Figure 31 summarizes those costs below.

Figure 271. Municipal Cost-Share for Roadway Improvement Projects

Roadway Improvement Project Cost-Share		
Project Agreements – Roadway Improvement – (14 projects)	Local Government Estimated Contribution to BikePed Work (%)	Local Government Estimated Contribution to BikePed Work ($)
Average	55 %	$ 84,420
Median	47 %	60,568
Minimum	30 %	3,876
Maximum	100 %	200,000

Significance of This Research

This research creates a better understanding of the types of investments in bicycle and pedestrian accommodations made by the state of North Carolina and local governments during the 2012-2014 fiscal years. It also provides new information for those who need to understand how to plan for making such accommodations in future projects. As public expectations evolve in regard to multi-modal transportation options, it is useful to understand the underlying additional costs that will come with making these accommodations.

The data associated with this report provide a new resource for detailed analysis and comparison. Incidental bicycle and pedestrian project elements can be reviewed based on actual costs and real projects. In the case of bridge accommodations, this report provides a new set of information that improves the understanding of the costs of these accommodations for planning.

This work also adds to the understanding of how a true accounting of all incidental bicycle and pedestrian expenditures may be tracked in the future. Bridge expenditures for incidental costs are the largest single category in this sample. The complex calculations needed to include bridge incidental expenditures, along with the individual research needed to identify which bridges were widened to accommodate pedestrians, enhances the body of information available for future research.

The discreet nature of bridge incidental costs does make them a reasonable candidate to use an estimate for incidental cost calculation. So, if ways can be developed to identify and track which bridges incorporate structural and bridge rail changes for bicycle and pedestrian accommodations, a formula to estimate the additional cost in that project may be a reasonable approach. This research provides a set of data to use in that work.

The variability in incidental expenditures between projects is also highlighted in this research. When analyzing how much incidental cost is added to a bridge, it is clear that those costs apply to the entire cost of that bridge. Bridge costs can be analyzed as discrete items in highway projects. The added cost for bicycle and pedestrian accommodation is directly relatable to the bridge overall cost. That is not the case in other incidental elements. While some relatively minor costs like bicycle and pedestrian signage were fairly consistent in the overall project budgets in this sample, other items like sidewalks are unique to individual projects and would have to be calculated for each project as they were in this sample to be accurate.

These areas of improved understanding point to a potential approach for tracking bicycle and pedestrian incidental costs: Adding codes in bid and contract systems that automate tracking of non-bridge bicycle and pedestrian incidental costs paired with a periodically updated set of bridge cost estimate formulae, can be applied to the identified bridges where structural costs for widening and/or lengthening of bridges, as well as changes in rails, is required.

Conclusions

The sample set of projects included in this report totaled $848 million in total contact costs. Of this amount an estimated $19.9 million (2.35 percent) was spent on incidental bicycle and pedestrian elements. Bridges accounted for the largest share of these costs at $11.4 million. The combined pedestrian items of curb ramps, paths, sidewalks and signage totaled $7 million. Detailed bridge data provide summary information on the average cost to widen bridges to accommodate pedestrians. The $11.4 million of bridge costs represents 11.65 percent of the $98 million spent on bridges in the projects covered.

In the projects where bridges required widening to accommodate pedestrian access, the costs for those changes represented 22.6 percent of bridge costs. The calculation of bicycle and pedestrian incidental costs for bridges is substantially different in nature than other cost elements and required a different approach. Information necessary for this calculation is not currently available in a single source, but required a multi-step process for each bridge.

In the breakdown of expenditures by type of infrastructure, the structural costs to bridges were the largest at $8.5 million; sidewalks were next at $4.6 million. Expenditures for pavement markings and signs related to bicycle and pedestrian accommodations were the smallest category of expense, at $287,000. However, those signage expenditures were most consistent compared to other elements across projects with an average and median percent of overall project costs of 0.01 percent of the overall project budget across 21 projects containing those costs.

Curb ramp costs associated with bicycle and pedestrian accommodations were also a relatively consistent as a percent of the overall cost of the sample projects. Those costs averaged 0.26 percent across 32 projects. The percent of total project cost varied more by other types of infrastructure. Sidewalk costs across 36 projects averaged 0.86 percent of overall costs, but ranged from 0.01 percent to 2.86 percent of the sample projects.

Through municipal cost-share agreements with NCDOT, local jurisdictions contributed to many of these bicycle and pedestrian elements. The cost-share agreements with local municipalities were analyzed to obtain more accurate net costs to NCDOT. In the dataset, 27 projects had municipal cost-share agreements that covered over $3.1 million of the bicycle and pedestrian elements in those projects – an estimated 26 percent of the incidental elements in those projects. Among the 27 projects with cost-share agreements the average of local government contributions to the identified accommodations was 55 percent. Project agreements required extensive individual review to calculate estimates.

Recommendations

The historical systems in place in state departments of transportation often leave gaps in the tracking of incidental bicycle and pedestrian elements in highway projects. Identifying which projects contain these elements, then separating out those costs for analysis involved asking new questions and bringing information together that is not typically combined. This report attempts to fill in these gaps and make accurate estimates of incidental expenses for bicycle and pedestrian incidental expenses more manageable and accurate.

While bid and contract information does allow for separation of elements into bicycle and pedestrian accommodations, the task is more challenging for calculating incidental bicycle and pedestrian bridge costs. There is not an easily accessible answer to the question of whether an individual bridge was widened or lengthened to accommodate bicycles or pedestrians in these project budget data. Since bids for bridge costs are based on the final project requirements (after decisions are made about the need for multi-modal accommodations) there is no straightforward way to separate out additional costs related to those accommodations from the cost data available. Instead, estimates must be made of the costs for the bridge without these elements for comparison to the actual costs.

Bridge data, while the most complex to calculate, provides some of the best information for estimating future costs, since when bicycle or pedestrian elements are added, they are added for the complete bridge, while other types of elements, like sidewalks, may be added to a large or small percentage of the new or improved roadway.

The growing interest in understanding total expenditures for bicycle and pedestrian infrastructure that led to this research indicates the need to track this category of cost within NCDOT. The experience of gathering these data suggested several strategies to assist the tracking of this information.

To assist future tracking of these data, an easier way to determine whether centrally-let and division-let projects contain bicycle or pedestrian accommodations would be very useful. The current procedure in place to request comments from the Bicycle and Pedestrian Division was a useful tool in the process of identifying sample projects. Introducing an additional question (reported to this division) for projects that have multi-modal elements for both centrally and division-let projects would greatly enhance future efforts to continue tracking these costs.

This approach would also enable future tracking with a more complete accounting of projects with bicycle and pedestrian elements. Adding a flagging system of this type creates a mechanism that reduces this challenge of tracking projects.

Information on bridge pedestrian and bicycle elements will be required to obtain an accurate accounting of this category of costs. The first step is to develop a way to track which bridge projects include bicycle and pedestrian accommodations, specifically, whether individual bridges were widened and/or have alternate rails to accommodate bicycles or pedestrians. The option of using data in this report as the basis for a cost estimation method that will allow for a streamlined way to calculate the additional cost for bridge accommodations should be investigated.

Several groups within NCDOT were interested in data on the agreements with local governments to cover part or all of the incidental costs. Data gathering for this information required that all agreements be identified and reviewed. Since all projects are unique, the specific terms of the agreements had to be translated into an estimated set of budget numbers based on the contract bid data. An initial step to aid in this process would be to report whether any terms cover bicycle or pedestrian elements when these agreements are finalized. As there may be other elements that are of interest throughout the agency, a summary of these agreements in a very simple format may be useful for multiple constituencies within NCDOT.

For cost tracking systems already in place, further research should be conducted on the addition of a category for bicycle and pedestrian costs so that those costs can be easily summarized in bid tabs or contract documents.

Tracking of cost information for division-let projects may not have the detail available in centrally-let projects, which often meant the level of information needed for analysis was incomplete. A procedure should be created for tracking division-let projects that contain bicycle and pedestrian elements. More detailed budget information for these projects would also be required for complete tracking of these elements.

With design-build projects, the current procedures do not require the detailed level of cost information that is standard in centrally-let projects. Ways that the scope of these projects can flag bicycle and pedestrian elements should be considered, even if detailed cost information may be deemed difficult to include. Tracking categories of cost like bicycle and pedestrian elements in these projects would require more detailed reporting to NCDOT by the contractor. Summarizing the general scope of the project in a way that highlights bicycle and pedestrian elements may be an approach worth pursuing to track, at minimum, which design-build projects contain these elements. Asking for further detail to analyze costs may not be possible, due to the nature and goals of the design-build process.

The elements that constitute bicycle and pedestrian accommodations in bridge projects highlight a different kind of challenge. In projects that include bridges, the decision on the need to accommodate pedestrians is made in the planning process, and all consequent cost tracking shows the wider and/or longer bridge with all the needed special railing and additional structural elements for that pre-determined set of bridge dimensions. This practice is understandable, but makes determining the cost for adding pedestrian or bicycle accommodations require that the bridge costs be re-calculated without those structural or rail additions.

This report gives substantial information about the overall expected increase, on average, for those accommodations. Some further work and analysis may make a simplified estimating percentage possible. This approach should be much more straightforward than the lengthy calculations needed to estimate the costs without accommodations.

Summary of Recommendations

Track which projects contain bicycle and pedestrian elements. Review the processes in place for commenting on projects for opportunities to introduce tracking of all projects that contain bicycle and pedestrian elements with the least additional cost and effort.
Track which bridge projects include bicycle and pedestrian accommodations, specifically, whether individual bridges were widened and/or have alternate rails to accommodate bicycles or pedestrians.
Track project agreements that contain bicycle and pedestrian cost-sharing elements, and consider a simplified summary of the cost-sharing elements of these agreements.
Create a procedure for tracking division-let projects that contain bicycle and pedestrian elements. More detailed budget information for these projects would also be required for complete tracking of these elements.
Review the cost/benefit of asking for more information on categories of cost within design-build projects. Consider ways that the scope of these projects can flag projects with bicycle and pedestrian elements, even if detailed cost information may be deemed difficult to include.
For cost tracking systems already in place, consider adding a category for bicycle and pedestrian costs so that those costs will be easily summarized in bid tabs or contract documents.
For bridge elements, consider further research to determine if there is an acceptable increased average cost to use for estimating bridge structural and rail costs that compare to bridges without multi-modal accommodations.

Implementation and Technology Transfer Plan

In addition to this report, the full dataset of cost calculations is available. That includes all projects in the sample, as well as all bridge cost calculations provided by NCDOT staff. To enhance the usefulness of these data to agency staff, a data dashboard will also be provided that allows for interactive crosstabs of the data as well as mapping by project or category of projects. This set of interactive crosstabs of the research data allows for details by individual project and a variety of summary cost data views.

The dataset with all cost calculations are in Excel and with the formulae shown should be self-explanatory. Key data field columns are highlighted.

The interactive dashboards would be mostly likely to be used by Bicycle and Pedestrian Division staff, and training in the download of the needed software (Tableau Reader) and familiarization with its use would be suggested training.

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Appendices

Appendix 1. Summary by Type of Bicycle and Pedestrian Feature, Special Calculations

Appendix 2. Project Descriptions

Appendix 3. Project Cost Summary

Appendix 1

Summary by Type of Bicycle or Pedestrian Feature. ***Abbreviations are as follows: EA – each, LS – lump sum, LF – linear foot, Mile – cost per mile, SY – square yard, CY – cubic yard.***

Type of Bicycle or Pedestrian Feature		
Pedestrian	Description	Cost Unit
Curb Ramp	Install New Curb Ramp	EA
Curb Ramp- Retrofit	Remove and Replace Curb with Curb Ramp	EA
Curb Ramp -Temporary	Temporary Curb Ramp	EA
Path - Boardwalk*	Timber pedestrian boardwalk	LS
Path -Multi-Use Path*	Multi-Use Path	Mile
Pedestrian refuge island-barrier	Diverging Diamond Interchange Barrier	LF
Pedestrian refuge island-perimeter *	Diverging Diamond Interchange Perimeter	LS
Pedestrian refuge island-sidewalk	Diverging Diamond Interchange Sidewalk	LS
Railing- Handrail on Steps	Handrails on steps	LF
Railing -Pedestrian Safety Rail	Pedestrian Rails	LF
Signal -Pedestrian Signal Head	Pedestrian Signal Head at intersection	EA
Signal -Pushbutton Post	Pedestrian Pushbutton Post at intersection	EA
Sidewalk	Five Foot Concrete Sidewalk	LF
Sidewalk -Remove/Reset Brick Sidewalk	Remove and Reset Brick Sidewalk	SY
Sidewalk -Temporary	Temporary Sidewalk	SY
Steps- Concrete	Concrete Steps	CY
Transit -Shelter Pad	Bus Stop Shelter Pad	SY
Transit -Waiting Pad	Bus Stop Waiting Pad	SY
Bicycle		
Bicycle Safe Steel Grate & Frame*	Steel grate and frame compatible with bicycle tires	EA
Bicycle Lane*	Construction of bicycle lane.	Mile
Bridge		
Bridge- Structural Additions Cost*	Combined cost of additional structural components to accommodate bicycle and pedestrian elements	LS
Railing- Bridge- Three-Bar Metal Rail*	Three-Bar Metal Rail, used for structures with sidewalks[32]	LF
Railing- Bridge- Two Bar Metal Rail*	Two-Bar Metal Rail with Parapet, used for structures with bicycle routes[33]	LF
Railing- Bridge- Double-Faced Two-bar Metal*	Double-Faced Two-Bar Metal Rail with Parapet	LF
Signage and Pavement Markings		
Signage *	Signage cost for bicycle and pedestrian signs	EA (per sign)
Pavement Markings-Standard Crosswalk*	Standard Crosswalk	EA
Pavement Markings- Hi-Vis Crosswalk*	High Visibility Crosswalk	EA
Pavement Markings- Bike Lane Symbols*	Bike Lane Symbols	EA

*All variables that required special calculations.

[32] NCDOT Structures Management Unit Manual, https://connect.ncdot.gov/resources/Structures/StructureResources/LRFDManual(Feb2014).pdf

[33] See previous footnote

Special Calculations and Notes (for table above).

Type of Bicycle or Pedestrian Feature	Notes
Pedestrian	
Path - Boardwalk*	For B-4660, the separated boardwalk costs were combined into a lump sum.
Path -Multi-Use Path*	Total costs for multi-use path was calculated using data from the UNC HSRC study
Bicycle	
Bicycle Safe Steel Grate & Frame*	Special calculation that accounted for the additional cost to upgrade to bicycle safe steel grate and frame from the standard alternative
Bicycle Lane*	Total costs for bicycle lanes were calculated using data from the UNC HSRC study
Bridge	
Railing- Bridge- Three-Bar Metal Rail*	Special calculation that accounted for the additional cost to accommodate bicycle and pedestrian facilities on a bridge compared to standard treatment.
Railing- Bridge- Two Bar Metal Rail*	Special calculation that accounted for the additional cost to accommodate bicycle and pedestrian facilities on a bridge compared to standard treatment.
Railing- Bridge- Double-Faced Two-bar Metal*	Special calculation that accounted for the additional cost to accommodate bicycle and pedestrian facilities on a bridge compared to standard treatment.
Signage and Pavement Markings	
Signage *	This cost does not include the cost of the actual signs. It only reflects the cost of posts for signage and the cost of sign erection.
Pavement Markings- Standard Crosswalk*	This Thermoplastic Pavement Marking material may be used for other markings on roadways in addition to crosswalks, such as lane striping. Plans were consulted to identify the number of crosswalks in each of the projects. An average cost-per-crosswalk from other identified projects, where this was easier to calculate, was applied in these instances.
Pavement Markings- Hi-Vis Crosswalk*	This Thermoplastic Pavement Marking material may also use to mark other features on roadways in addition to crosswalks, such as stopbar at intersections. The pavement marking plans were observed and the amount that was used for other markings was subtracted from the total, to get the amount used for crosswalks.
Pavement Markings- Bike Lane Symbols*	The pavement marking plans were consulted and the number of bike lane symbols was identified, and separated from the total number of pavement markings, which may include turn arrows among other things.

Appendix 2: Project Descriptions

Let Date	TIP	Div	City	County	U/R	Class	Agency	Project Description
12/18/2012	B-2948	6	Fayetteville	Cumberland	U	BR	Central	Replace bridge on Strickland Bridge Rd. (2 lanes, SR 1104) in Fayetteville NC
2/21/2012	B-3421	10	Concord	Cabarrus	U	BR	Central	Replace bridge on Cabarrus Ave (2 lanes, SR 1002) in Concord.
2/21/2012	B-3864	4	Smithfield	Johnston	U	BR	Central	Replace bridge on US 70 Bus (W Market Street) in Smithfield.
2/21/2012	B-4050	10	Kannapolis	Cabarrus	U	BR	Central	Replace bridge on Orphanage Rd (2 lanes) in Concord.
1/17/2012	B-4090	6	Fayetteville	Cumberland	U	BR	Central	Replace bridge on Grove St (NC 24) over Cross Creek in Fayetteville.
2/19/2013	B-4122	14	Robbinsville	Graham	R	BR	Central	Replace bridge on Moose Branch Rd (2 lanes) in Robbinsville.
1/15/2013	B-4147	14	Flat Rock	Henderson	U	BR	Central	Replace bridge on Little River Rd (2 lanes) near Flat Rock.
2/21/2012	B-4201	10	Matthews	Mecklenburg	U	BR	Central	Replace bridge on Sam Newell Rd (2 lanes) in Matthews with sidewalks and center turn lane.
1/17/2012	B-4456	12	Conover	Catawba	U	BR	Central	Replace bridge on NC 16 BUS (2 lanes) over I-40 in Conover.
3/19/2013	B-4458	12	Newton	Catawba	R	BR	Central	Replace bridge on Rocky Ford Rd (2 lanes) southwest of Newton.
4/17/2012	B-4498	9	Lexington	Davidson	U	BR	Central	Replace bridge on Center St (2 lanes) in Lexington.
8/16/2011	B-4499	9	Thomasville	Davidson	U	BR	Central	Replace bridge on Martin Luther King Jr. Drive (2 lanes, SR 1792) in Thomasville.
10/18/2011	B-4522	5	Oxford	Granville	R	BR	Central	Replace bridge on Goochs Mill Rd (2 lanes, SR 1150) west of Oxford.

Let Date	TIP	Div	City	County	U/R	Class	Agency	Project Description
1/17/2012	B-4588	4	Nashville	Nash	U	BR	Central	Replace bridge on N 1st St (2 lanes, SR 1670) in Nashville.
5/20/2014	B-4591	3	Topsail	New Hanover	R	BR	Central	Replace bridge on Holly Shelter Rd (2 lanes) north of Wilmington.
6/17/2014	B-4608	8	Seagrove	Randolph	R	BR	Central	Replace bridge on Erect Rd (2 lanes) southeast of Asheboro
2/19/2013	B-4615	8	Rockingham	Richmond	U	BR	Central	Replace bridge on Steele St (2 lanes) in Rockingham.
10/16/2012	B-4656	5	Raleigh	Wake	U	RI	Central	Remove bridge on Hillsborough St over WB Western Blvd in Raleigh. Reconfigure intersection and add signal.
10/18/2011	B-4660	5	Raleigh	Wake	U	BR	Central	Bridge over Neuse River on Falls of Neuse Rd. Greenway under bridge and bridge pre-widened to accommodate 6 lanes in the future.
1/17/2012	B-4661	5	Raleigh	Wake	U	BR	Central	Replace bridge on Watkins Rd (2 lanes) south of Rolesville.
8/20/2013	B-4663	5	Wendell	Wake	U	BR	Central	Replace bridge on Turnipseed Rd (2 lanes) south of Wendell.
4/17/2012	B-4697	5	Apex	Wake	U	BR	Central	Replace bridge on Green Level Church Rd (2 lanes) in Cary. Includes Boardwalk to Greenway
3/19/2013	B-4712	6	White Oak	Bladen	R	BR	Central	Replace bridge over Cape Fear River on Tar Heel Ferry Rd (2 lanes) near Tar Heel, NC.
12/18/2012	B-4719	10	Harrisburg	Cabarrus	U	BR	Central	Replace bridge on Hickory Ridge Rd (2 lanes) south of Harrisburg.
1/21/2014	B-4720	10	Mt. Pleasant	Cabarrus	R	BR	Central	Replace bridge on Bowman-Barrier Rd (2 lanes) in Mt. Pleasant.
1/21/2014	B-4731	8	Pittsboro	Chatham	R	BR	Central	Replace bridge on Alston Chapel Rd (2 lanes) west of Pittsboro.

Let Date	TIP	Div	City	County	U/R	Class	Agency	Project Description
6/18/2013	B-4733	14	Hayesville	Clay	R	BR	Central	Replace bridge on NC 175 (2 lanes) over Chatuge Lake.
2/19/2013	B-4744	9	Tobaccoville	Forsyth	U	BR	Central	Replace bridge on Spainhour Mill Rd (2 lanes) west of King, NC.
8/21/2012	B-4752	12	Cramerton	Gaston	U	BR	Central	Replace bridge on Lakewood Rd (2 lanes) in Cramerton
11/19/2013	B-4756	7	Summerfield	Guilford	U	BR	Central	Replace bridge on Bunch Rd (2 lanes) northwest of Greensboro, north of the airport.
7/17/2012	B-4760	7	High Point	Guilford	U	BR	Central	Replace bridge on Surrett Dr. (2 lanes) over BUS 85 in Archdale.
10/15/2013	B-4765 /B-5149	14	Hendersonville	Henderson	R	BR	Central	Replace bridges on Fruitland Rd (2 lanes) near Hendersonville.
3/18/2014	B-4779	10	Charlotte	Mecklenburg	U	BR	Central	Replace bridges on N Tryon Street (US 29) over Mallard Creek in Charlotte.
11/20/2012	B-4787	2	Greenville	Pitt	U	BR	Central	Replace bridge on Old River Rd (2 lanes) in Greenville.
1/15/2013	B-4796	8	Asheboro	Randolph	R	BR	Central	Replace bridge on Pisgah Covered Bridge Rd (2 lanes) south of Asheboro.
4/16/2013	B-4806	7	Reidsville	Rockingham	R	BR	Central	Replace bridge on Boyd Rd (2 lanes) west of Reidsville.
1/15/2013	B-4809	9	Kannapolis	Rowan	U	BR	Central	Replace bridge on Moose Rd (2 lanes) over Lake Fisher in Kannapolis.
3/19/2013	B-4810	9	Mt. Ulla	Rowan	R	BR	Central	Replace bridge on Graham Rd (2 lanes) east of Mooresville.
4/16/2013	B-4946	5	Raleigh	Wake	U	BR	Central	Replace Wilmington St bridge (US 70) over Fayetteville Rd (US 401) at 70/401 split in Raleigh.
11/20/2012	B-4955	7	Liberty	Alamance	R	BR	Central	Replace bridge on Kimesville Rd (2 lanes) south of Burlington.

Let Date	TIP	Div	City	County	U/R	Class	Agency	Project Description
7/16/2013	B-4957	7	High Point	Guilford	U	BR	Central	Replace bridge on Baker Rd (2 lanes) in High Point.
11/19/2013	B-4973	10	Concord	Cabarrus	U	BR	Central	Replace bridge on Wilshire Ave SW north of US 601. In Concord.
6/17/2014	B-4983	13	Icard	Burke	U	BR	Central	Replace bridge over Southern Railroad on Icard School Rd in Icard.
1/21/2014	B-5101	12	Newton	Catawba	U	BR	Central	Replace bridge on Old Conover-Startown Rd west of Newton.
11/19/2013	B-5107	9	Kernersville	Forsyth	U	BR	Central	Replace bridge on High Point Rd (2 lanes, SR 1003) between High Point and Winston Salem.
6/18/2013	B-5126/ B-4679	4	Wilson	Wilson	R	BR	Central	Replace two bridges on Downing Rd (2 lanes) in Wilson.
3/18/2014	B-5131	8	Gibson	Scotland	R	BR	Central	Replace bridge on Old Stage Rd (2 lanes) west of Laurinburg.
2/18/2014	B-5137	10	Albemarle	Stanly	R	BR	Central	Replace bridge on Ridge Rd (2 lanes) north of Albemarle.
6/19/2012	I-3819A	12	Statesville	Iredell	U	I	Central	I-77 & I-40 interchange in Statesville.
9/17/2013	I-4733	10	Cornelius	Mecklenburg	U	I	Central	Diverging diamond interchange at West Catawba Ave and I-77 (Exit 28) in Cornelius.
3/18/2014	I-5501	13	Asheville	Buncombe	U	I	Central	Diverging diamond interchange at Airport Rd and I-26 (Exit 40) in Asheville.
11/15/2011	R-2237C	11	Blowing Rock	Watauga	R	RI	Central	Widen US 321, between NC 221 & SR 1500 in Blowing Rock.
2/19/2013	U-0209B	10	Charlotte	Mecklenburg	U	RI	Central	Convert Independence Blvd to a freeway between Albemarle Rd and Conference Dr. in Charlotte.
10/16/2012	U-0624	7	Chapel Hill	Orange	U	RI	Central	Widen S Columbia St (NC 86) in Chapel Hill to 3 lanes with bike lanes, sidewalks, etc.
8/21/2012	U-2412B/ U2524AE	7	Greensboro	Guilford	U	RI	Central	Widen High Point Rd. and build interchange at Greensboro Loop.

Let Date	TIP	Div	City	County	U/R	Class	Agency	Project Description
11/19/2013	U-2507A	10	Charlotte	Mecklenburg	U	RI	Central	Mallard Creek Rd. widening and realignment from WT Harris to Sugar Creek Rd in Charlotte.
9/24/2013	U-2524C	7	Greensboro	Guilford	U	NR	Central	Greensboro Urban Loop from Bryan Blvd to US 220 (Battleground Ave) in Greensboro.
6/17/2014	U-2525B	7	Greensboro	Guilford	U	NR	Central	Greensboro Urban Loop from US 70 to US 29 (eastern portion).
4/17/2012	U-2551	13	Morganton	Burke	U	RI	Central	Enola widening and interchange rebuild in Morganton.
12/18/2012	U-2803	7	Carrboro	Orange	U	RI	Central	Convert Smith Level Rd to a 3 lane road with bike lanes, sidewalks, etc., and add a roundabout in Carrboro.
9/18/2012	U-2809B	6	Fayetteville	Cumberland	U	RI	Central	Widen Legion Rd in Fayetteville.
12/18/2012	U-2810B	6	Hope Mills	Cumberland	U	RI	Central	Widen Camden Rd in Hope Mills to 4 lanes, includes bridge over railroad tracks.
1/21/2014	U-2810C	6	Hope Mills	Cumberland	U	RI	Central	Widen Camden Rd from Oakland Ave to Owen Dr.
1/17/2012	U-3326A&B	7	Reidsville	Rockingham	U	RI	Central	Widen US BUS 29/158/Freeway Drive in Reidsville.
9/18/2012	U-3810	3	Jacksonville	Onslow	U	RI	Central	Widen Piney Green Rd in Jacksonville.
1/17/2012	U-3812	11	Jefferson	Ashe	R	RI	Central	Widen and realign NC 88 in Jefferson.
10/15/2013	U-4412	14	Waynesville	Haywood	U	RI	Central	Widen Howell Mill Rd to 3 lanes with a center turn lane and a roundabout. In Waynesville.
6/19/2012	U-4422	6	Fayetteville	Cumberland	U	RI	Central	Widen Glensford Dr. in Fayetteville to 6 lanes.
1/17/2012	U-4909	9	Kernersville	Forsyth	U	RI	Central	Widen Union Cross Rd in Kernersville to 4 lanes between US 311 and I 40.
4/17/2012	U-5132	3	Jacksonville	Onslow	U	RI	Central	Add interchange on NC 24 in Jacksonville west of interchange with US 17 Bypass.
3/17/2014	C-4956A	10	Cornelius	Mecklenburg	U		Division	West Catawba Ave. at Westmoreland Rd.

Let Date	TIP	Div	City	County	U/R	Class	Agency	Project Description
8/15/2013	DG00162	7	Burlington	Alamance	U	RI	Division	Improve intersection of University Dr. and Boone Station Dr. in Burlington
7/1/2011	DJ00036	10	Charlotte	Mecklenburg	U		Division	NC-27 at Pierson Drive (WBS 43268)
9/10/2012	DJ00086	10	Monroe	Union	R		Division	Sun Valley Intersection Improvement (Int. of Old Charlotte Highway & Wesley Chapel-Stouts Road)
11/4/2013	DJ00115	10	Matthews	Mecklenburg	U		Division	NC-51 at Paces Ave.
4/1/2014	DJ00122	10	Charlotte	Mecklenburg	U		Division	Independence Blvd. Culvert (3700 Independence Boulevard) culvert Replacement/Rehabilitation
4/3/2014	DK00113	11	Salisbury	Yadkin	R	RI	Division	Milling, Resurfacing, Curb and Gutter Sidewalk, US 601 from NC 67 to SR 1367 (Sunset Drive)
5/6/2013	P-3814C	10	Kannapolis	Cabarrus	R		Division	Universal Rd. and NS Railroad
5/17/2012	SS-4907P	7	Greensboro	Guilford	R	RI	Division	Improve intersection of Alamance Church Rd and SE School Rd near Greensboro.
7/1/2013	SS-4910AL	10	Charlotte	Mecklenburg	U		Division	Harrisburg Rd. Roundabout (Int of Harrisburg Road and Cambridge Commons Dr.)
9/9/2013	SS-4910AO	10	Charlotte	Mecklenburg	U		Division	I-85 NB Ramps at Mallard Creek Rd.
9/3/2012	SS-4910Y	10	Charlotte	Mecklenburg	U		Division	NC-160 and Sam Neely Rd.
10/25/2012	U-3437	11	Hudson	Caldwell	R	RI	Division	Improve Intersection SR 1160 and Roy E. Coffey Drive
7/1/2013	U-5325B	10	Weddington	Union	R		Division	Weddington Roundabout (NC-84 at Weddington-Matthews Road)

Appendix 3: Project Cost Summary

Let Date	TIP	Total: Contract Amount	Total: Bikeped Cost	Total: Bikeped % of overall cost	Bridge: Cost without BikePed Accommodations	Bridge: Cost of BikePed Accommodations	Bridge: Cost Increase for BikePed
12/18/2012	B-2948	$1,240,929.34	$166,471.06	13.42%	$336,426.14	$166,471.06	49.48%
2/21/2012	B-3421	$4,481,631.04	$587,928.16	13.12%	$1,558,238.13	$515,198.16	33.06%
2/21/2012	B-3864	$5,287,697.89	$1,051,978.98	19.89%	$3,107,803.19	$1,044,296.48	33.60%
2/21/2012	B-4050	$1,185,124.56	$106,392.64	8.98%	$479,592.93	$106,392.64	22.18%
1/17/2012	B-4090	$4,021,563.79	$480,589.21	11.95%	$1,930,867.81	$470,734.04	24.38%
2/19/2013	B-4122	$963,705.86	$75,303.26	7.81%	$513,329.24	$69,787.26	13.60%
1/15/2013	B-4147	$1,288,398.31	$42,334.20	3.29%	$517,164.55	$42,334.20	8.19%
2/21/2012	B-4201	$1,548,197.92	$148,258.84	9.58%	$487,263.73	$139,388.59	28.61%
1/17/2012	B-4456	$2,016,122.49	$384,094.63	19.05%	$828,712.42	$361,684.63	43.64%
3/19/2013	B-4458	$1,744,888.88	$51,856.74	2.97%	$744,006.75	$51,856.74	6.97%
4/17/2012	B-4498	$1,850,053.49	$74,173.91	4.01%	$1,269,069.00	$74,173.91	5.84%
8/16/2011	B-4499	$1,294,907.25	$28,220.08	2.18%	$652,615.42	$28,220.08	4.32%
10/18/2011	B-4522	$1,433,695.26	$59,687.75	4.16%	$879,186.16	$59,687.75	6.79%
1/17/2012	B-4588	$1,206,702.20	$124,293.37	10.30%	$642,870.64	$118,093.37	18.37%
5/20/2014	B-4591	$2,029,711.18	$47,398.79	2.34%	$770,640.91	$47,398.79	6.15%
6/17/2014	B-4608	$1,066,534.95	$33,151.96	3.11%	$625,401.74	$33,151.96	5.30%
2/19/2013	B-4615	$994,503.63	$33,950.49	3.41%	$642,152.61	$33,950.49	5.29%
10/16/2012	B-4656	$2,705,158.35	$134,520.00	4.97%			
10/18/2011	B-4660	$3,295,180.21	$855,045.87	25.95%	$1,608,936.00	$722,171.87	44.89%
1/17/2012	B-4661	$802,370.45	$36,472.61	4.55%	$396,319.40	$36,472.61	9.20%
8/20/2013	B-4663	$883,337.95	$40,338.37	4.57%	$539,810.08	$40,338.37	7.47%
4/17/2012	B-4697	$2,529,587.12	$578,607.09	22.87%	$941,965.78	$457,797.09	48.60%
3/19/2013	B-4712	$11,790,386.25	$233,404.24	1.98%	$8,302,089.01	$233,404.24	2.81%
12/18/2012	B-4719	$817,757.34	$31,237.45	3.82%	$581,602.69	$31,237.45	5.37%

Let Date	TIP	Total: Contract Amount	Total: Bikeped Cost	Total: Bikeped % of overall cost	Bridge: Cost without BikePed Accommodations	Bridge: Cost of BikePed Accommodations	Bridge: Cost Increase for BikePed
1/21/2014	B-4720	$533,390.25	$18,052.20	3.38%	$334,826.00	$18,052.20	5.39%
1/21/2014	B-4731	$823,329.48	$29,784.32	3.62%	$455,737.05	$29,784.32	6.54%
6/18/2013	B-4733	$3,039,823.61	$87,285.91	2.87%	$1,776,803.76	$87,139.91	4.90%
2/19/2013	B-4744	$1,649,977.05	$39,213.94	2.38%	$915,295.57	$39,213.94	4.28%
8/21/2012	B-4752	$3,988,285.05	$92,936.07	2.33%	$2,812,965.93	$85,336.07	3.03%
11/19/2013	B-4756	$1,066,122.65	$242,229.79	22.72%	$449,625.91	$242,229.79	53.87%
7/17/2012	B-4760	$3,559,402.32	$159,618.45	4.48%	$960,072.54	$150,268.45	15.65%
10/15/2013	B-4765/B-5149	$1,854,251.26	$63,990.80	3.45%	$854,224.96	$63,990.80	7.49%
3/18/2014	B-4779	$4,393,837.25	$451,674.19	10.28%	$1,690,801.86	$413,314.19	24.44%
11/20/2012	B-4787	$1,055,300.00	$38,058.90	3.61%	$469,878.45	$38,058.90	8.10%
1/15/2013	B-4796	$992,876.73	$29,784.77	3.00%	$384,630.96	$29,784.77	7.74%
4/16/2013	B-4806	$564,675.74	$27,638.40	4.89%	$307,301.34	$27,638.40	8.99%
1/15/2013	B-4809	$1,737,865.17	$43,270.82	2.49%	$781,173.20	$43,270.82	5.54%
3/19/2013	B-4810	$1,069,888.88	$31,856.40	2.98%	$369,881.45	$31,856.40	8.61%
4/16/2013	B-4946	$3,003,726.33	$47,783.84	1.59%	$734,214.80	$47,783.84	6.51%
11/20/2012	B-4955	$694,047.17	$32,797.89	4.73%	$429,893.76	$32,797.89	7.63%
7/16/2013	B-4957	$1,019,710.50	$32,813.19	3.22%	$624,716.81	$32,703.19	5.23%
11/19/2013	B-4973	$1,594,372.15	$135,218.74	8.48%	$677,125.31	$131,309.14	19.39%
6/17/2014	B-4983	$1,524,435.95	$172,219.44	11.30%	$655,290.76	$157,400.04	24.02%
1/21/2014	B-5101	$894,893.81	$36,546.95	4.08%	$551,608.30	$36,546.95	6.63%
11/19/2013	B-5107	$1,472,610.30	$40,376.59	2.74%	$776,014.41	$40,376.59	5.20%
6/18/2013	B-5126/B-4679	$1,847,608.75	$36,220.40	1.96%	$903,483.60	$36,220.40	4.01%
3/18/2014	B-5131	$547,220.28	$21,312.96	3.89%	$300,904.96	$21,312.96	7.08%
2/18/2014	B-5137	$648,870.05	$22,732.80	3.50%	$381,934.50	$22,732.80	5.95%
6/19/2012	I-3819A	$89,072,360.65	$250,703.79	0.28%	$15,608,468.25	$3,663.21	0.02%

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9/17/2013	I-4733	$5,940,004.11	$398,464.76	6.71%			
3/18/2014	I-5501	$8,775,537.02	$506,854.20	5.78%			
11/15/2011	R-2237C	$66,438,147.43	$379,788.16	0.57%			
2/19/2013	U-0209B	$51,669,284.58	$2,777,884.50	5.38%	$6,515,252.81	$1,760,616.34	27.02%
10/16/2012	U-0624	$4,565,146.64	$380,715.32	8.34%			
8/21/2012	U-2412B /U2524AE	$40,094,959.99	$438,312.25	1.09%			
11/19/2013	U-2507A	$25,396,245.00	$1,340,931.07	5.28%			
9/24/2013	U-2524C	$122,804,388.50	$845,194.28	0.69%	$2,513,906.37	$739,210.89	29.40%
6/17/2014	U-2525B	$111,683,421.13	$754,248.48	0.68%	$1,892,913.87	$655,504.28	34.63%
4/17/2012	U-2551	$14,145,410.18	$588,067.40	4.16%	$1,442,682.85	$309,509.35	21.45%
12/18/2012	U-2803	$4,946,197.82	$266,077.00	5.38%			
9/18/2012	U-2809B	$16,537,284.09	$411,963.68	2.49%			
12/18/2012	U-2810B	$10,398,173.34	$557,481.02	5.36%	$2,194,029.45	$555,891.86	25.34%
1/21/2014	U-2810C	$12,063,191.15	$212,332.50	1.76%			
1/17/2012	U-3326A&B	$50,749,004.96	$355,778.92	0.70%	$4,341,873.19	$152,678.48	3.52%
9/18/2012	U-3810	$50,543,691.89	$855,322.98	1.69%	$1,680,259.85	$368,920.81	21.96%
1/17/2012	U-3812	$3,599,585.33	$54,510.86	1.51%			
10/15/2013	U-4412	$11,688,234.11	$310,809.02	2.66%	$2,917,607.44	$98,768.42	3.39%
6/19/2012	U-4422	$8,882,184.74	$265,557.60	2.99%			
1/17/2012	U-4909	$30,330,536.26	$604,199.00	1.99%	$726,875.95	$30,983.50	4.26%
4/17/2012	U-5132	$11,320,796.34	$37,222.14	0.33%			
3/17/2014	C-4956A		$20,130.00				
8/15/2013	DG00162	$180,059.46	$11,722.61	6.51%			
7/1/2011	DJ00036		$17,419.50				

Let Date	TIP	Total: Contract Amount	Total: Bikeped Cost	Total: Bikeped % of overall cost	Bridge: Cost without BikePed Accommodations	Bridge: Cost of BikePed Accommodations	Bridge: Cost Increase for BikePed
9/10/2012	DJ00086		$21,439.64				
11/4/2013	DJ00115		$2,750.00				
4/1/2014	DJ00122		$8,760.00				
4/3/2014	DK00113	$504,778.00	$54,560.00	10.81%			
5/6/2013	P-3814C		$20,855.00				
5/17/2012	SS-4907P	$375,001.20	$3,685.70	0.98%			
7/1/2013	SS-4910AL		$4,986.74				
9/9/2013	SS-4910AO		$1,600.00				
9/3/2012	SS-4910Y		$8,800.00				
10/25/2012	U-3437	$791,264.01	$16,880.00	2.13%			
7/1/2013	U-5325B		$6,300.00				