Cost-Effectiveness of North Carolina's Major Road Projects

By

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Disclaimer

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Contents

Abstract

Major road projects are freeway and arterial widenings, new freeways and arterials, new exits, climbing lanes and other major actions that are large enough to likely affect growth. Between 1990 and early 2004, North Carolina constructed 349 major road projects costing about $7.34 billion, about 50 percent of the total expenditures for the TIP and Loop roads and about 1/3 of the total NC State highway program over the same period. This study reviews recent trends in North Carolina's highway funding practices and the cost-effectiveness of these major capital actions. Using the geographic information system TransCAD, each project is located exactly and its characteristics (present and future traffic, capacity, and type and cost of improvement) are correlated with data on the population living within 1 mile of the project, county road expenditures, Board of Transportation representation, and other fiscal and traffic factors. The resulting 750 individual road sections are then evaluated according to their cost-effectiveness, defined as the cost to construct the section, in 2002 dollars, divided by the 20-year estimated vehicle-miles served, accounting for growth and congestion-related diversion. The Study finds that the State's deteriorating road conditions are directly attributable to its continued focus on system expansion and diversion of funds from the highway budget while decreasing attention to maintenance. On average, the 349 major projects cost about 2.67 cents per vehicle-mile served, or about 5 percent of the cost of driving. However, their cost-effectiveness varied widely, from as little as about 0.3 cents per vehicle-mile to over $1.00 per vehicle-mile. The key factor affecting cost-effectiveness was found to be the traffic volume shortly after completion: projects with a traffic volume of less than 6200 average daily traffic (ADT) were found to be very cost-ineffective, compared with projects with higher volumes. A second key factor was found to be the volume-to-capacity (V/C) ratio. Typical of cost-ineffective projects were new exits on freeways in rural areas serving low-volume cross-street traffic, new 2-lane and 4-lane arterials, and new freeways serving less than 35,000 ADT. Typical cost-effective projects were those with high post-construction traffic, climbing lanes, and freeway widenings from 4 to 6 lanes. Projects constructed with a prudent design, yielding a V/C ratio of greater than about 0.35-0.75, were found to be more cost-effective than projects that were over-designed. If the projects costing more than 5.3 cents per vehicle-mile (two times the state average) had been delayed or deleted, about $2.5 billion would have been saved, about the same as the maintenance shortfall. The study concludes that the State's deteriorating road conditions could be reversed if just 9 percent of its highway capital budget could be diverted to maintenance. The study calls for a re-focusing of the State's highway program on maintenance needs, funded by savings from better selection of major projects according to cost-effectiveness rather than the geographic criteria presently used. Recommendations for changes in the State's funding formulas and highway allocations are also suggested.

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I. Introduction

A. Issues

Between 1990 and early 2004, North Carolina constructed **349** major road projects[1] costing about **$7.34 billion** (in nominal dollars), about 50 percent of the total expenditures for the Transportation Improvement Program (TIP[2]) and Loop roads and about 1/3 of the total NC highway program over the same period. An earlier analysis of 312 of these projects in 2003[3] concluded that in spite of their magnitude these major projects had only a minor impact on sprawl and growth of the state's population. This is because population generally increased throughout North Carolina during the 1990s and was more closely related to local growth factors rather than to major road improvements.

In the course of this earlier review the 312 projects were also assessed for cost-effectiveness, defined as each project's nominal cost per vehicle-mile served. The assessment concluded that the 312 projects varied widely in cost-effectiveness, averaging as little as 0.9 cents per vehicle-mile served for 4-to-6 lane freeway widenings to over 7.7 cents per vehicle-mile served for new exits. Overall, the projects averaged about 2.6 cents per vehicle-mile served. (For comparison, vehicle ownership and operating costs typically average about 54 cents per vehicle-mile nationwide[4]). However, the study also found a very wide range of cost-effectiveness of individual projects within each group, and no obvious geographic pattern of cost-effectiveness. Projects varied widely from as little as 0.3 cents per vehicle-mile served to over $1.00 per vehicle-mile served. But more study was needed to determine why these projects vary so much in cost-effectiveness, and how the State can improve the delivery of more cost-effective projects.

In North Carolina transportation projects are selected by the Board of Transportation based on recommendations of the 19 (recently 26) members of the Board of Transportation, along with Metropolitan Planning Organizations and NCDOT staff, following guidelines set down by the Legislature for geographic distribution. Within major program areas, projects are generally not compared one versus another. Even within regions of the state, projects are generally not compared one against each other. As a result, projects can range widely in traffic served, cost, user benefits, and other criteria. This leads to wide variations in the effective use of taxpayer dollars, because projects are not selected on the basis of how much they benefit the people of the state. Some observers also see the hand of political favoritism in project selection, since projects in some areas of the state are funded while other similar projects in other areas of the state are not. This leads to cynicism and distrust of the process and fosters a belief that the entire road project selection process is politically driven. One Chamber of Commerce President recently commented that the county could not get a project because it had "no [home county] Board Member", even though it was represented on the Board by a member from a nearby county, suggesting that neither the present system of representation nor the worthiness of projects was viewed as relevant in project selection.

B. Goals

Because of the obvious implications of such perceptions on the effectiveness of government and the complexity of project selection, the John Locke Foundation has funded this study to identify the range of cost-effectiveness of major road projects across the state, the factors leading to low- and high-cost-effectiveness, and actions that might be taken to reduce this range and fund the worthiest projects. Specifically, the goals of the study are to:

- **Identify major road projects** recently completed by the State from 1990 to early 2004.
- **Determine the range of cost-effectiveness of these projects** and the major **factors** influencing cost effectiveness.
- **Suggest policies** for funding the most worthy projects while ensuring fair treatment of the state's regions.

C. Literature Review

The literature on highway project evaluation methods and cost-effectiveness in transportation investment is extensive and a complete review is not possible here. We provide here a short overview of the major approaches in use in highway cost-effectiveness assessment today.

"Cost-effectiveness" is defined as "achieving an objective for the least cost, or getting the best return for the money"[5], but the methods can be very simple or complex depending on the range of objectives assessed and the nature of costs considered. A comprehensive review of cost-effective methods in highway project selection has not been undertaken recently. However, in 1988 the National Cooperative Highway Research Program prepared a synthesis of practice on this topic and issued a summary[6] of the state-of-the-practice as of the mid 1980's. The synthesis surveyed the 50 states and other agencies, and found that every state transportation agency regularly performs at least some informal analysis of cost-effectiveness, but not always on a formal basis. Three basic methods are in use: 1. traditional benefit/cost methods; 2. systems analysis packages, that is largely mainframe software for analyzing specific problems; 3. 'sufficiency' and 'severity' methods that compare projects on the basis of improvement in road conditions, congestion and accident severity reduction versus cost. The report described several innovative applications in each of these areas and recommended that one or two "as simple as possible" procedures be developed that allow for integration of (at the least) new construction or rehabilitation, maintenance, safety and traffic flow projects. The systems analysis and sufficiency methods are not comparable to the problem faced here, and therefore will not be reviewed.

Traditional benefit-cost methods are based on the classical transportation economics approach to project evaluation, which is derived from the benefit-cost methodology in comparative economics. This method is based on a comparison of the project's benefits with its amortized annual cost. This methodology is the basis of AASHTO's benefit-cost method[7], recently updated[8]. In this methodology, "benefits" are traditionally limited to those received by users as a result of the project, but only three of these (travel time savings, reduced accident costs, and reduced operating costs) are typically quantified. Other user benefits (for instance, greater choice of goods and services, increased access, and smoother or more reliable travel time) are traditionally ignored. Non-user benefits such as increased economic activity and jobs or other environmental or social impacts are also not considered, although in recent applications several traffic-related impacts (typically air quality and noise) are sometimes quantified. Benefits are determined by the changes in user costs that the project causes, compared with the baseline ('no project') situation. Project costs over the anticipated lifetime are amortized to present value and may include periodic repair costs.

The traditional benefit-cost method has been extended to a wide range of specialized applications in the literature for a variety of purposes. Only a few of the many examples are covered here. As early as 1960, the Oregon Department of Highways[9] developed a means of evaluating proposed projects for worthiness based on their 'solvency quotient', a measure of the expected annual revenue versus the cost of the project, and the 'benefit quotient', a measure of user benefits from the project. Extending the classical method into store location theory, Winfrey and Zellner (1971[10]) developed an integrated method of evaluating highway improvements using both the classical transportation benefits approach and market-based store access concepts. Karan and Haas[11] extended the traditional method to the evaluation of user delays during construction rehabilitation. The National Cooperative Highway Research Program (1980[12]) developed procedures for updating assumed values of user travel time, operating and accident costs. Texas DOT (1982[13]) developed a means of extending the state's highway evaluation model (HEEM) to HOV lane evaluation. Schofer (1988[14]) developed a road project decision support package for use on early microcomputers. In research for the National Cooperative Highway Research program, Lewis[15] found that 'net present value' (present-day value of benefits minus present-day value of costs) was the most appropriate measure of project cost-effectiveness, and that sufficiency and other similar measures do a poor job of identifying the most productive policies and projects. In a case study using data from Texas, Lewis found that the overall rate of return could be almost doubled if projects were selected according to their net present value rather than their sufficiency criteria. A further finding was that projects should be 'optimally timed' so that their benefits in the first year after construction divided by the total cost incurred till then just equal the minimum-required rate of return, the so-called 'hurdle rate' (See Lewis, p. xi). Texas DOT (1998[16]) also developed the MicroBENcost software to assist in evaluating projects. Daniels and Stockton[17] report MicroBENcost to evaluate the cost-effectiveness of HOV lanes by comparing user savings in travel time versus the cost of the facilities.

The traditional benefit-cost methodology has also recently been modified for use by states and for a variety of special situations, as well as being adapted for use in modern PC-based environments. Among the most commonly used methods are:

- **STEAM/SPASM/SMITE**[18], an FHWA spreadsheet system that uses trip tables from traffic assignments and traffic volumes to estimate user benefits, air quality and noise impacts, in a multi-mode environment;
- **StratBencost**[19], a vendor sketch planning product that evaluates highway projects on a traditional user-benefit basis but also includes air quality and neighborhood impacts;
- **GradeDec**[20], an FRA product that evaluates alternative highway-railroad grade crossing upgrades and closures;
- **CAL/B-C**[21], a specialized spreadsheet version developed by the California Department of Transportation that uses the traditional user-benefit approach but includes air quality impacts and alternative modes;
- **HERS-ST**, the Federal Highway Administration's Highway Economic Requirements System-State Version[22]. It identifies an 'optimum' repair action

based on amortized costs and user savings, with elasticity adjustments for increased traffic caused by the improvement.

- AASHTO's **User Benefit Analysis**[23, 24] software that evaluates highway impacts, including congestion-related community impacts, using the traditional user-benefit methodology.

A recent edition of the Urban Transportation Monitor[25] provides a very useful comparative summary of these PC-based methods.

While generally straightforward in its approach, the traditional benefit-cost method seems to be less frequently used now than in the past, having been supplanted by 'comparative data' methods that focus on a mixture of information. Part of the reason for this shift is the difficulty of quantifying numerous factors in dollars or even numerical counts. Many seemingly important factors in project evaluation cannot be easily counted or dollar-ized. In his 1984 review, for instance, Winfrey[26] listed over 40 separate 'measures' of impact, most of which could not be stated in easy-to-understand dollar terms. Nonetheless, the economic analysis approach still is the preferred method. The Federal Highway Administration has recently issued a primer on economic analysis of transportation projects[27], perhaps in the hope that the method will re-gain popularity in the future.

Understandably therefore, analysts have sometimes developed indices to describe other impacts, for instance safety[28]. Multi-dimensional 'evaluation matrices' are also very common; for instance, this author (Hartgen, 2004[29]) has conducted a series of evaluations over the past 13 years comparing general trends in the condition of state highway systems with the costs of maintaining and improving them. And the Federal Transit Administration, for instance, publishes a multi-dimensional table[30] comparing 'new start' transit systems on 7 basic dimensions. Marshment[31] devised a method of comparing MIS alternatives across modes using the Federal Transit Administration's cost-effectiveness index along with the traditional AASHTO benefit-cost index, and a broader comparative index incorporating air quality, congestion, noise and commercial traffic. DeCorla-Souza calls for the use of more generalized measures such as the cost per trip in evaluating projects across different modes. And Pravin[32] suggests the use of travel time and flow speed as joint measures of effectiveness for freeway flow, and recommends the wider use of ramp metering to prevent freeway flow from breaking down when capacity is reached.

In summary, the literature on transportation project evaluation provides a wide range of procedures for comparative assessment. Most are based on the traditional benefit-cost method in which savings in user costs are compared with the incremental costs of providing the project. However, these methods require detailed information about alternatives, particularly what the traffic levels would have been without the project, and are thus unsuitable to situations in which projects do not have alternative forecasts.

D. Method

The method used here to assess cost-effectiveness is a straightforward consolidation of data on recent major NC projects, combined with information on local demographics. The specific steps in the methodology are described briefly below. More detail is provided in the Appendix.

1. **Determine measures of cost effectiveness**. The lack of data precludes use of a more traditional measure such as net project benefits. The measure chosen for use in this study is:

   $$\textbf{Cost effectiveness} = \frac{\textbf{(Project cost, in Year 2002 dollars)}}{\textbf{(Vehicle-miles served over 20 years)}}$$

   This measure applies equally well to various road projects, brings all projects to a 'current year' base, allows for both present and future traffic to be considered, accounts for road section length in both costs and traffic, and uses readily available data.

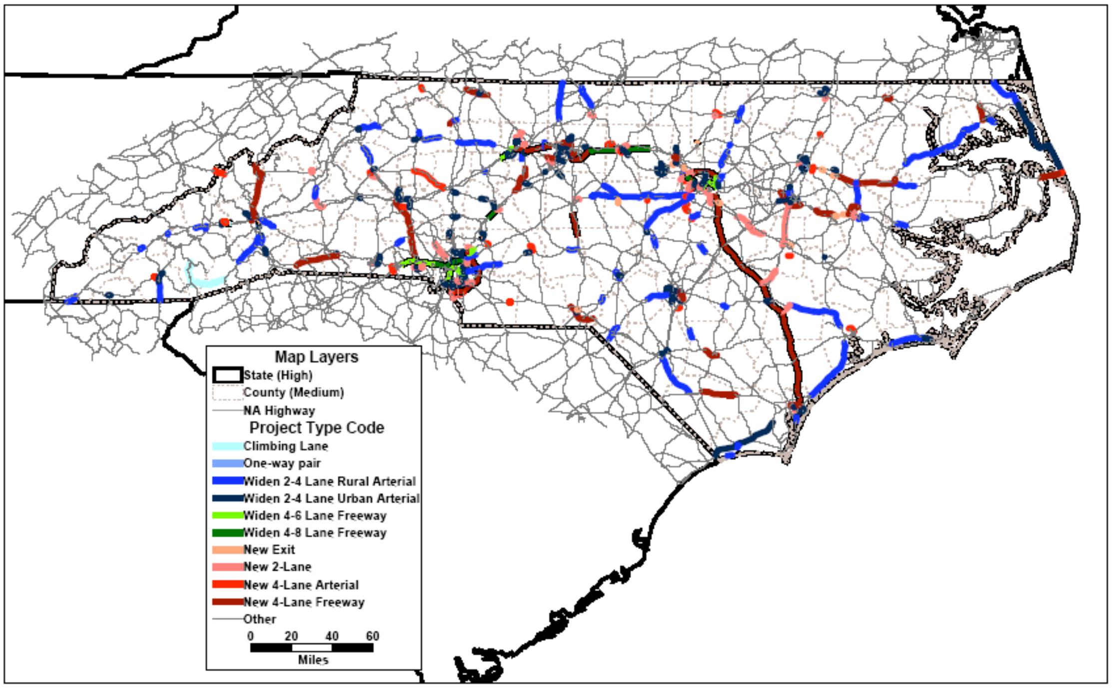
2. **Identify major projects.** Using NCDOT records and contacts with MPOs in major regions, an extensive list of 349 major projects constructed over the past 13 years was developed. Major projects are defined as those large enough to affect congestion or growth, and include most freeway and arterial widenings, new 4+ lane facilities, new exits, and some new 2-lane arterials.

3. **Locate projects.** Each of the 349 projects was located exactly within the NC road system and census tracts using the TransCAD© geographic information system[33]. Each project was broken into several sections according to major roads crossed and changes in traffic volumes or other characteristics. This yielded 750 separate road sections. **Figure 1.1** shows the locations of these projects, which were found to be distributed all over the state.

4. **Gather traffic, cost and administrative data for each project.** For each project, administrative information and descriptive data were obtained from project records or from additional research of NCDOT websites or traffic volume maps. In a few cases where 'after' traffic counts were not available (as in very recent projects), volumes were estimated based on traffic on nearby or similar facilities.

5. **Estimate future traffic.** Future traffic was estimated by forecasting the 'after' traffic (the traffic shortly after project completion) forward to 20 years from the time of completion, using growth trends or comparable growth for similar roads in urban areas. To account for the effects of congestion on traffic growth, the traffic forecast is adjusted downward to be no greater than rated capacity of each road segment.

Figure 1.1
Major Highway Projects by Project Type (1990 - 2003)



Cartography by John Simpson, 5-19-04

6. **Estimate 20-year vehicle-miles-of-travel served.** Using the 'after' traffic and the forecast traffic, along with project length, the 20-year vehicle-miles-of-travel is estimated.

7. **Adjust project costs to 2002.** All project costs are brought to 2002 as a common year, using NC highway construction inflators.

8. **Calculate cost-effectiveness for each project segment.** Using the above formula, the 20-year cost-effectiveness, in cents per vehicle-mile served, is computed.

9. **Gather information on Board of Transportation membership and County expenditures.** Data on expenditures for the TIP and Loop projects, by county and year, and data on Board of Transportation membership by 'home' county, was obtained from NCDOT.

10. **Estimate nearby demographics.** The characteristics of the population living within 1 mile of each project section are estimated using the 'band' features in TransCAD.

11. **Merge project, expenditure Board and demographic data.** Using the 'join' features of TransCAD, a consolidated database of information for each of the 750 project sections was developed containing information on the project itself, nearby demographics, Board of Transportation representation, and county expenditures.

12. **Explore relationships** between cost-effectiveness and project, county, and nearby population, using summary tabulations, regressions and classification models.

13. **Displays**. The results of the analysis were then described in tabular, map and chart forms.

II. Findings

A. The State Highway Program

1. The State Highway System

At 101,743 miles, North Carolina's highway system is the 15th largest in the Nation[34]. But since North Carolina does not have a county-owned road system, the State is generally responsible for roads outside of municipalities; the State-owned road system, at 79,265 miles, is the 2nd largest in the Nation, behind Texas.

Transportation experts classify roads according to *function*, the primary purposes of each road class[35]. North Carolina's roads are summarized in **Table 2.1**. At the top of the functional classes the Interstate System serves as the backbone of the State's commerce and provides inter-city and inter-regional connection for long-distance high-speed travel. North Carolina's Interstate System consists of 1020 miles, just over 1 percent of the total mileage, but carries almost 20 percent of all the travel in the State. The urban Interstates average over 72,000 vehicles per day, while the rural Interstate System averages about 37,000 vehicles per day. Other (non-Interstate) urban freeways also carry a significant amount of traffic, over 35,000 vehicles per day. The urban and rural principal arterials serve to support the higher systems and provide for major corridor movements within urban areas and between cities; they average 12000-20000 vehicles per day. Minor arterials provide similar services for major land uses and feed the major arterials; they average 6500 vehicles per day. Collectors and local roads provide access to land parcels and serve to feed the arterial system. They constitute over 90 percent of the system mileage but average less than 4000 vehicles per day down to only 260 vehicles per day in rural areas.

Table 2.1: North Carolina Highway Miles and Traffic, 2002

Functional Class	Miles	Percent of Miles	Travel, Billion Annual VMT*	Percent of Travel	Average Daily Traffic
Interstate-Urban	370	0.4	9.75	10.5	72200
Interstate-Rural	650	0.6	8.45	9.1	37100
Other Frwys/Expys-Urb	291	0.3	3.76	4.0	35400
Other Princ Art-Urban	1362	1.3	9.87	10.6	19900
Other Princ Art-Rural	2214	2.2	9.85	10.6	12200
Minor Arterial-Urban	2351	2.3	8.23	8.9	9600
Minor Arterial-Rural	2982	2.9	7.03	7.6	6500
Collector-Urban	1631	1.6	2.40	2.6	4000
Collectors-Rural	16102	15.8	15.34	16.5	2600
Local-Urban	18110	17.8	12.72	13.7	1920
Local- Rural	56650	55.6	5.47	5.9	260
Total	**101743**	**100.0**	**92.88**	**100.0**	**2501**

Source: Tables VM-2, HM20, and HM-10, Highway Statistics, 2002 *VMT: Vehicle-mile-of-travel, a measure of travel, is defined as one vehicle traveling one mile.

This table suggests that major road improvements are likely to be concentrated in the higher functional classes (that is, minor arterials and above), particularly those roads that carry more than about 6000 vehicles per day. We will return to these criteria later in the analysis

Overall, travel in North Carolina has risen substantially during the past decade. North Carolina's VMT (that is, all the vehicle-miles traveled on all the state's roads) increased 42.7 percent during the 1990's, twice as fast as its population growth and considerably faster than US travel (28.1 percent). Urban Interstate traffic grew most rapidly, 154 percent, but substantial gains were also made in rural arterial and urban local traffic. Many of the major traffic routes in the state (I85, I40, I95) saw traffic increases of 30-70 percent. The traffic growth was caused by several factors: increasing population, increasing auto use and increasing national connectivity and travel on the Interstate system by tourists and commercial vehicles.

It is commonly believed that urban travel has been increasing most rapidly, and on balance this data confirms that. However, rural travel has grown considerably more rapidly than rural population. During the 1990's the population growth of North Carolina's 17 urbanized areas (50.7 percent) was roughly in line with the urbanized area VMT growth (56.8 percent). However, the rural population grew just 3.5 percent, while the rural VMT grew 30.7 percent. In rural areas, travel is increasing not because of rural population growth but because of increasing national connectivity and wealth, reflected in increasing truck traffic, tourism, and long-distance commuting. So, relative to population growth, rural areas of North Carolina have experienced greater relative increases in traffic and congestion than many of its urban areas.

The condition of North Carolina's highway system has exhibited different trends, depending on the criterion, over the past 20 years **(See Figure 2.1).** Initially, the highway system generally improved in condition, but more recently this improvement has slowed or reversed. Although some trends are clouded by changes in measurement procedures, the following figure shows the overall statistics. The State has performed best on bridge condition: the long-term downward trend in the percentage of deficient bridges has roughly paralleled US improvement, but North Carolina remains worse than the US averages. Urban Interstate congestion improved during most of the 1990s but recently has worsened substantially, to the point where the State now ranks 47th nationwide in percentage of congested Urban Interstates. Interstate pavement condition worsened in the mid 1990s, then slowly improved but has recently worsened again; the State remains worse than the US averages, and in the last year has reported a disturbing up-tick in the percentage of poor pavement on these key systems. The rural primary system has also improved over time but has also reported a recent up-tick in poor mileage.

Although the state's road system has reported progress on a number of indicators, the US has reported even more improvement, so North Carolina has actually lost ground against other states. **Table 2.2,** based on the author's annual review of the 50 states' road systems[36], indicates that the North Carolina is ranked in the 30s and 40s on key condition indicators and has one of the lowest per-mile capital and maintenance lowest budgets in the Nation.

Figure 2.1

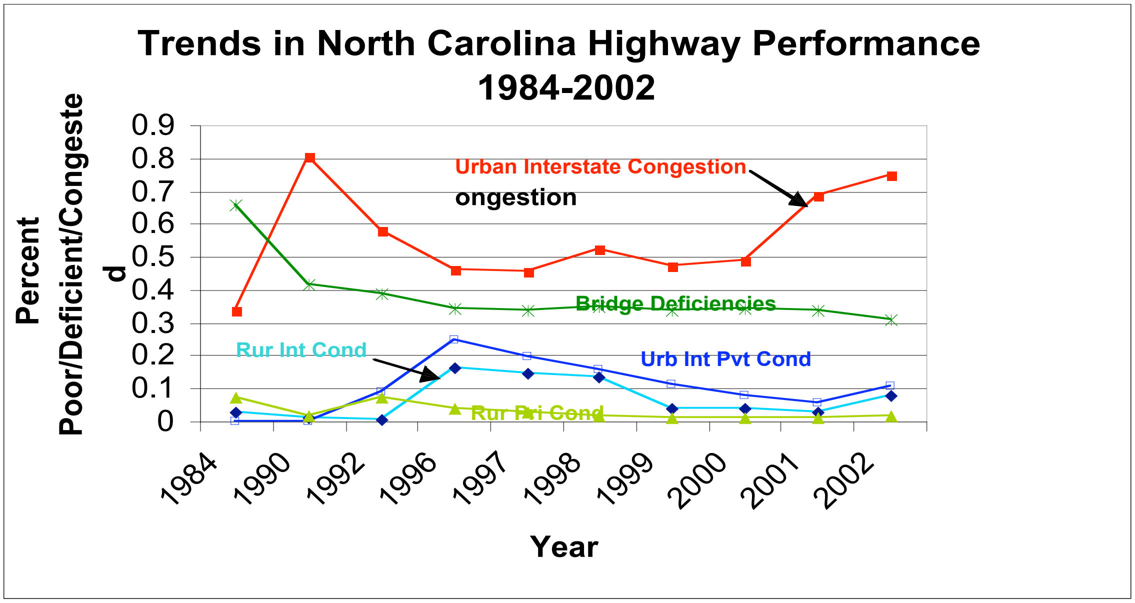


Table: 2.2 North Carolina Highway Performance, 2002

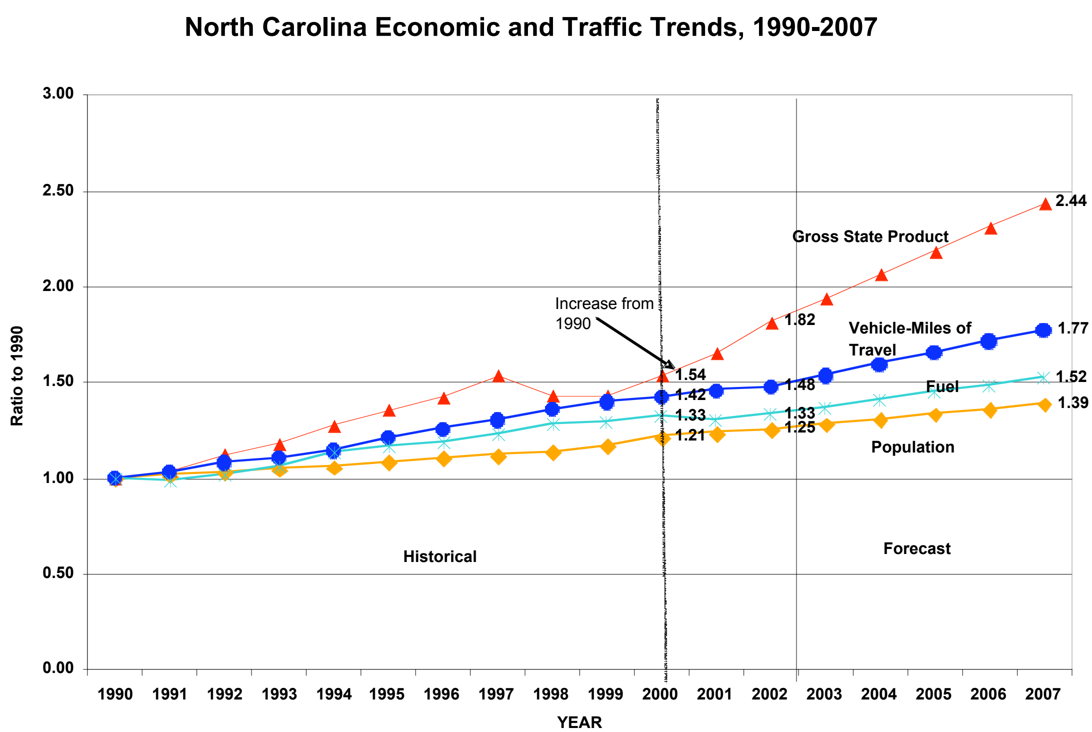
Statistic	2002	Rank
State-Owned Miles	79,265	2nd largest
Total Budget, $B	$2.865	10th largest
Capital and Bridge Expenditures, per Mile	$22,841	3rd lowest
Maintenance Expenditures, per Mile	$7,228	4th lowest
Administrative Expenditures, per Mile	$2,870	10th lowest
Rural Interstate, Percent in Poor Condition (IRI>170)	7.69	44th
Urban Interstate, Percent in Poor Condition (IRI>170)	10.57	42nd
Rural Other Principal Arterial, Percent Poor (IRI>220)	1.67	45th
Urban Interstate, Percent Congested (V/C>0.7)	74.86	47th
Bridges, Percent Deficient	31.2	37th
Fatal Accident Rate, per 100 MVMT	1.70	30th
Rural Other Principal Arterial, Pct Narrow Lanes (<12 ft)	12.73	33rd
Overall Rating		**36th**

This assessment acknowledges the State's progress in some key indicators over the 20 years. But North Carolina can clearly no longer be referred to as 'the Good Roads State'. The recent up-ticks in poor mileage for the higher systems portend even greater problems on the lower-level systems. The conclusion to be drawn from these observations is that ***North Carolina's highway system is losing ground against other states. Deterioration and congestion are in danger of getting out of hand.***

2. Funding the System

Over the past 13 years North Carolina's highway system has become more difficult to fund and to maintain in good condition. The fundamental reasons behind this circumstance are reflected in the State's growth and in the highway funding method. **Figure 2.2** shows how several key indicators of growth have changed over the past 13 years. While North Carolina has experienced quite rapid growth in population growth during the 1990's (21 percent compared to the US average of 13 percent) the State's economic growth was even more robust (54 percent) and travel increased about 43 percent.

Fig. 2.2

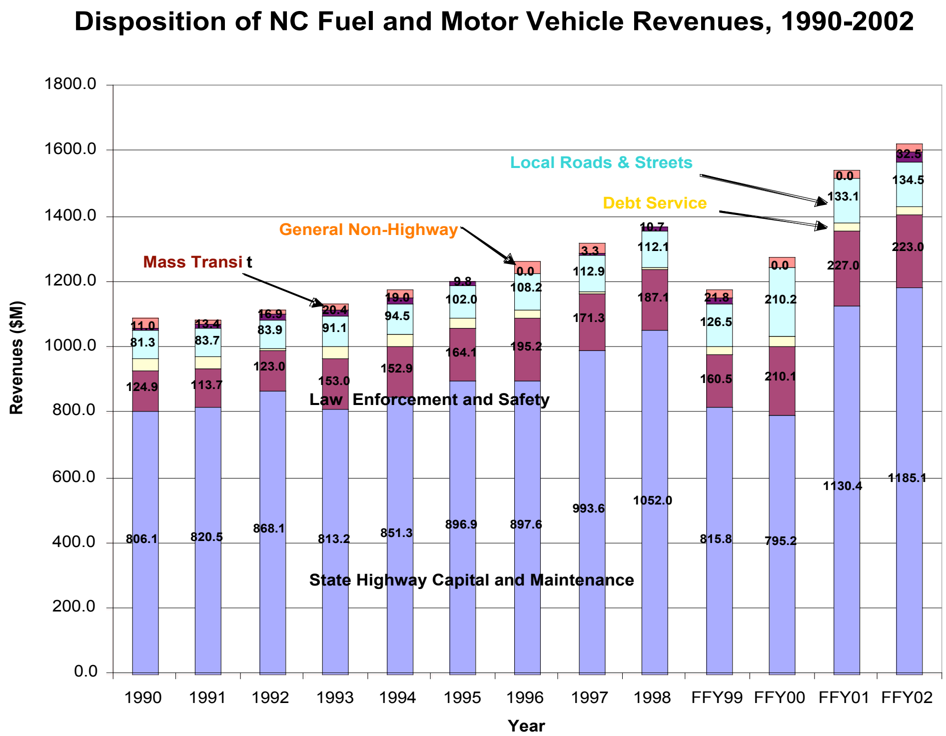


The increase in travel more than outpaced the increase in fuel sales (33 percent), which is the primary source of state revenues for highway repairs and construction. The state's basic tax rate for fuel (about 22-24 cents/gallon) has changed little in the last decade. As the fuel efficiency of vehicles increased during the 1990s, fuel sales slowed relative to travel, and the state found its revenue stream for the highway system slowing relative to need. These disparities are expected to widen over the next several years: by 2007, traffic growth will be 50% greater than fuel growth and about twice as great as population growth. Thus the 'gap' between resources and need is likely to widen, and put further pressure on the highway maintenance program.

In spite of slowing growth in fuel sales, North Carolina's revenues from its fuel and motor vehicle taxes rose substantially during the 1990s. **Figure 2.3** shows trends in the State's basic fuel and motor vehicle revenue sources, and their dispositions over the past 13 years. Revenues from state-based sources rose about 49.4 percent, from $ 1087.9 M to $ 1626.2 M, from 1990 to 2002.

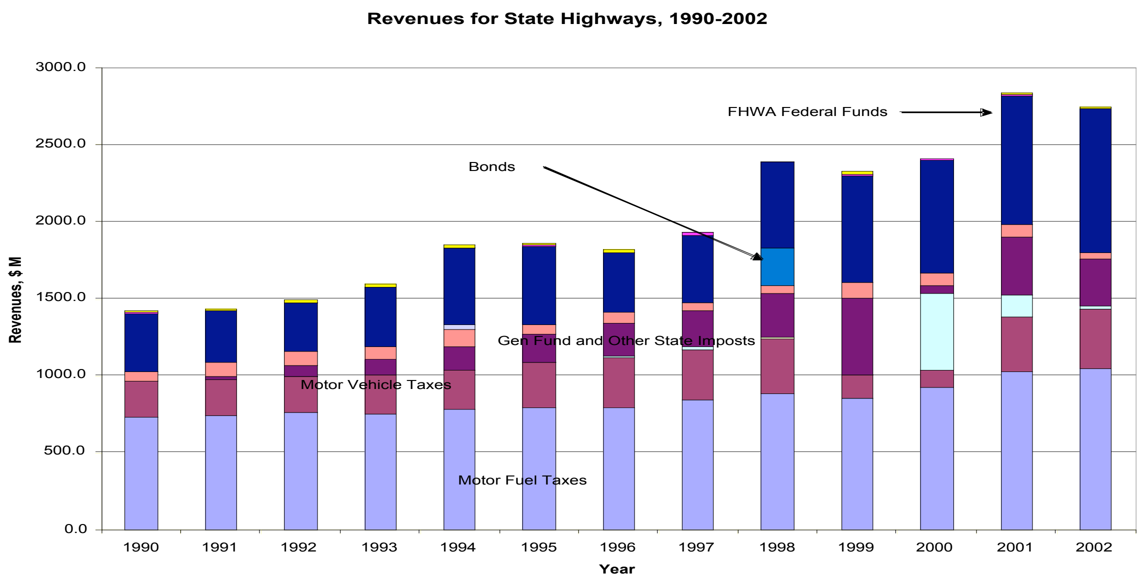
But not all revenues from State fuel and motor vehicle taxes went to highways: in 1990 only about $ 806.1 M, or 74.1 percent, went for highway capital and maintenance. The remainder, $281.8 M went for other purposes, particularly law enforcement and safety, assistance to municipalities for local roads and streets, mass transit, and even some general non-highway purposes. By 2002, however, the percent going to state highway capital and maintenance had fallen to 72.8 percent, with about $441.1 M going to other needs. So, not only have some of the dollars intended for highways been used for other purposes, but the portion of highway dollars actually going to the 'pavement' in the form of capital and maintenance expenditures has declined as well. The dip in revenues during 1999 and 2000 resulting from the 'burst' of the dot-com bubble and subsequent slow-down in the state's economy was largely been recouped in 2001 and 2002.

Figure 2.3



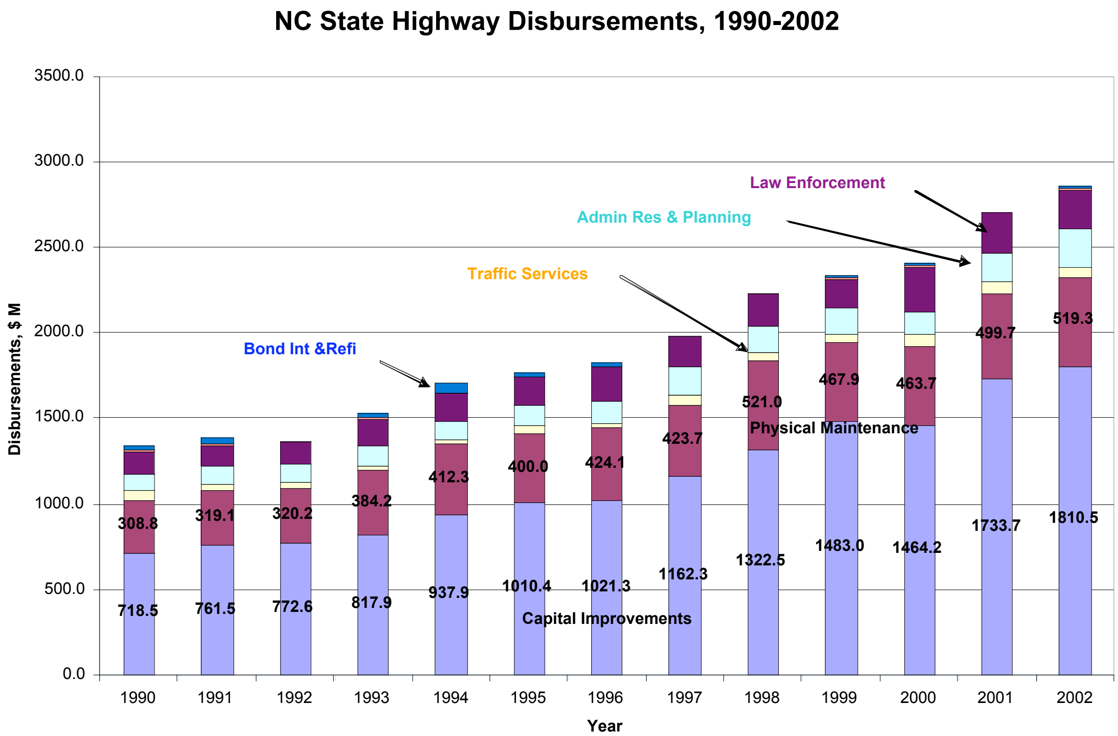
While State funds for capital and maintenance declined as a share of the budget, funds from other sources increased. **Figure 2.4A** shows that the percentage of revenues coming from other sources, particularly federal funds, increased even more than State funds. In 1990, federal funds constituted $379.2 M of a $1424.2 M budget, or about 26.6 percent; by 2002, federal funds constituted $929.6 M of a $2747.7 M budget, or about 33.8 percent. So, while the State's total budget for state-owned highways increased 92.9 percent in 13 years, the federal share increased 145.1 percent. Thus, North Carolina became substantially more dependent on federal funds – precisely those funds that cannot generally be used for maintenance.

Figure 2.4A



But while funds were increasing, 'maintenance needs' have taken a back seat to 'capital' needs. In 1990, 'physical maintenance' constituted $308.8 M of a $1346.1 M disbursement total, or about 22.9 percent; by 2002, 'physical maintenance' constituted $519.3 M of a $2865.9 M disbursement, or about 18.1 percent. **(See Figure 2.4B**). So, the percentage of available funds that went into maintenance as opposed to other actions has declined by about 1/4th. Figure 2.4B also shows that an increasing percentage of the budget has been going to planning and law enforcement. As important as these functions are, the bottom line is that dollars spent on them have not been available for pavement maintenance or capital actions.

Figure 2.4B

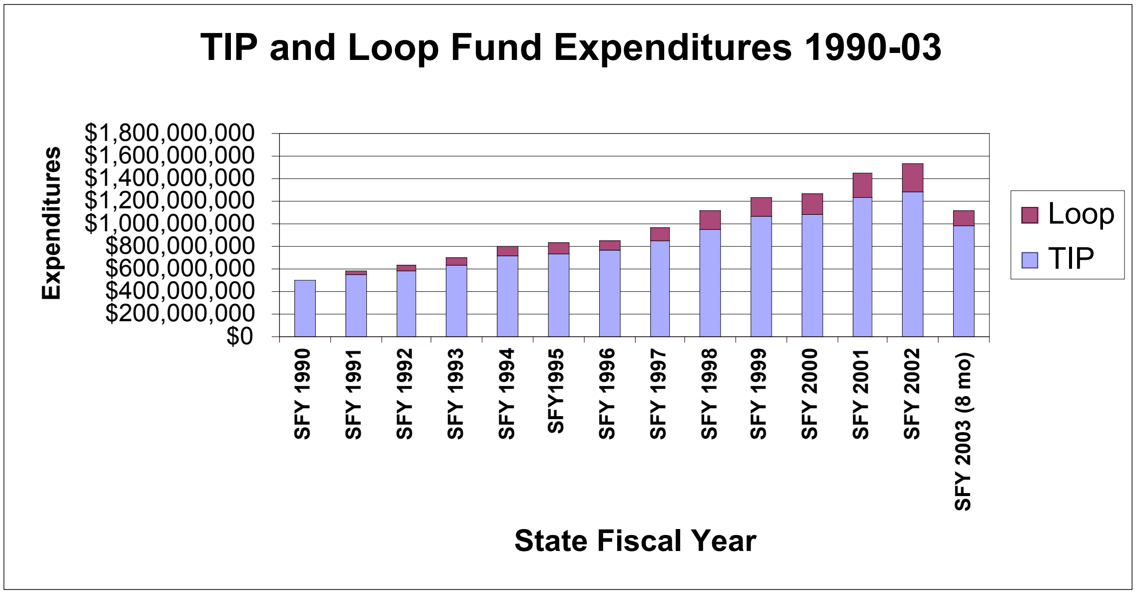


3. TIP and Loop Projects

Federal law stipulates that, in order for highway (and other) projects to receive federal funding, they must be on the State's approved Transportation Improvement Program. This is a biennial list of projects that the State intends to implement over the next 5-7 years. The TIP is approved biennially by the Board of Transportation; within metropolitan regions (17 urbanized areas over 50,000 population) Metropolitan Planning Organizations play a key role in recommending projects for the TIP.

In 1989 the State established an Infrastructure Program with the goal of bringing 4-lane roads to within 10 miles of 90 percent of the State's population, and paving 20,000 miles of (then) unpaved rural roads. Originally funded at about \$13 B, the program was expanded in the mid-1990's to fund "Loop" roads around 7 (now 9) urban areas. Since 1990 North Carolina has spent about \$13.5 B for the TIP and Loop improvements to the state highway system, about 2/3 of the \$20.5 B the State has spent on highways during that time**. Figure 2.5** shows how the expenditures have increased during the period: annual expenditures have risen about 206.5 percent from \$500.5 M in 1990 to \$ 1533.8 M in 2002.

Fig. 2.5



4. Distribution Formulas and Expenditures

Funds for highway expenditures are distributed across the State according to a variety of formulas, depending on the specific program. **Table 2.3** summarizes the major highway funding program distribution formulas.

Table 2.3: NC Highway Funding Distribution Formulas

Program	Distributed To	Basis of Distribution	Formula Proportion	Variables used for Distribution
TIP, Intrastate (and "Moving Ahead", but excl Loops)	7 Distribution Regions	1st 90 Pct of Intrastate System Completion	25 % 50 % 25 %	Miles to complete Intrastate Population 1/7th each
		Last 10 Pct	66 % 34 %	Population 1/7th each
Urban Loops	Named Routes	Discretional	100 %	Project Status
Primary: Maintenance	14 DOT Divisions		100 %	Lane-miles
Secondary: Construction	100 Counties	First $68.67 M annually	100%	Unpaved secondary miles
		Remainder	100%	Unpaved sec miles > 50 ADT
Highway Bonds, 1996	100 Counties	All	100%	Unpaved sec miles > 50 ADT

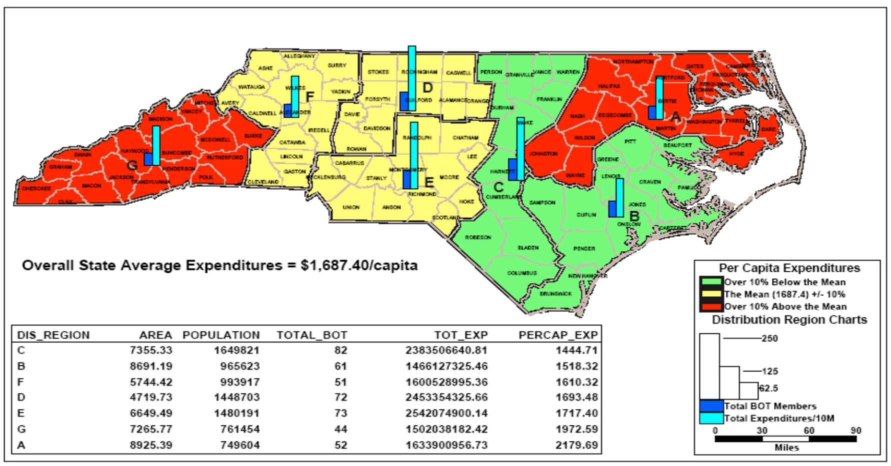
Secondary: Maintenance	100 Counties	All	90% 10 %	Paved miles Population
Urban Maintenance	14 DOT Divisions	All	50 % 50 %	Urban Lane-miles Population
Contract Resurfacing	14 DOT Divisions	All	50 % 37.5 % 12.5 %	Pavement needs Lane-miles Population
	100 Counties	All	50 % 37.5 % 12.5 %	Co pavement needs Secondary paved miles Co population

For the major program (TIP and Intrastate), funds are distributed geographically using population, miles to complete the Intrastate System, and equally by Distribution Region. (About 73 percent of the 3000-Intrastate System is complete or fully funded, but progress has slowed[37]). Needs-based data such as congestion, condition, accident rates, traffic or other measures of need are not used. For the Loop fund, the distribution is discretionary based on status of each loop. Therefore for almost 2/3 of the highway expenditures fund allocations are not likely to be equal per-capita by Distribution Region, DOT Division, or county. This is demonstrated in the following figures.

Figure 2.6 shows the cumulative expenditures, from 1990 to late 2003, by Distribution Region. Although 3 of the 7 Distribution Regions (C: Granville-Wake-Columbus; D: Rowan-Guilford-Caswell; and E: Mecklenburg-Scotland-Chatham) each have received the most funds - about $2.3-2.5 B - over the 13 years, their per-capita distributions have been lower than the overall State average of $1687. Region C has received the lowest per-capita distribution, about $1445, while Regions A (Northeast NC) and G (Western NC) have received the highest per-capita distributions, $1973 and $2180. The highest per-capita distribution is about 51 percent more than the lowest.

Figure 2.6
NORTH CAROLINA HIGHWAY (TIP + LOOP) EXPENDITURES (1990 - 2003)

DOT Distribution Region Per Capita Expenditures vs.
Board Membership by Year (1985 - 2004) and Total Expenditures (1990-2003)

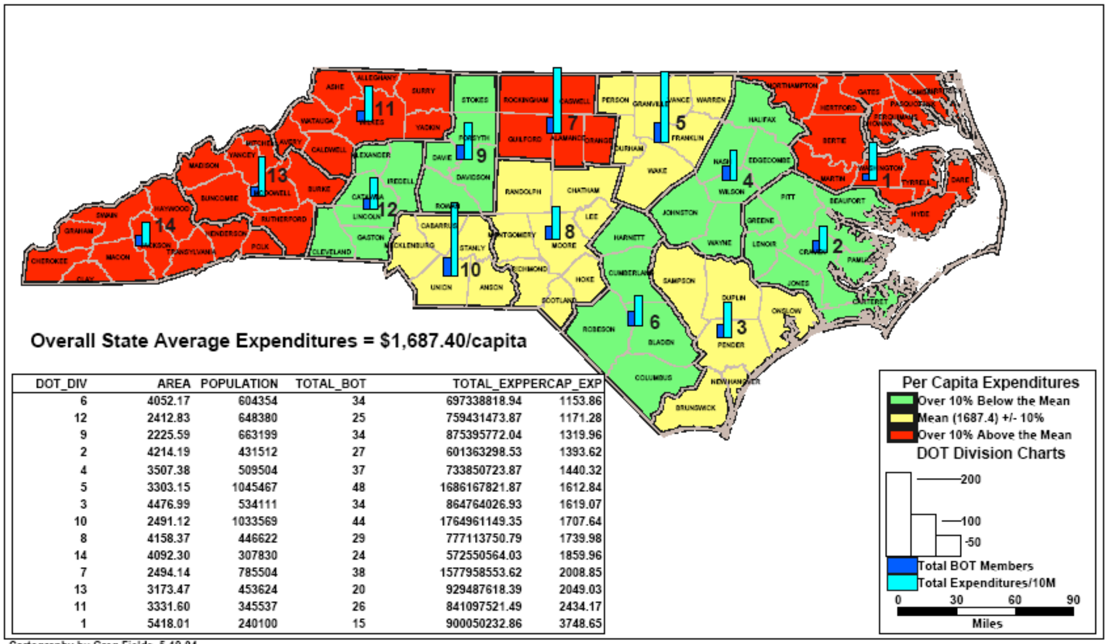


DIS_REGION	AREA	POPULATION	TOTAL_BOT	TOT_EXP	PERCAP_EXP
C	7355.33	1649821	82	2383506640.81	1444.71
B	8691.19	965623	61	1466127325.46	1518.32
F	5744.42	993917	51	1600528995.36	1610.32
D	4719.73	1448703	72	2453354325.66	1693.48
E	6649.49	1480191	73	2542074900.14	1717.40
G	7265.77	761454	44	1502038182.42	1972.59
A	8925.39	749604	52	1633900956.73	2179.69

Cartography by Greg Fields, 5-19-04

Funding distributions by DOT Division show an even wider disparity. **Figure 2.7** shows that Divisions 5 (Wake-Warren), 7 (Guilford-Caswell) and 10 (Mecklenburg-Anson) have received the highest amount of funds, $1.58-1.75 B each over 13 years, but are in the middle in per-capita distributions. The highest per-capita Divisions (1, Northeast NC, and 14, Western NC) are both largely rural Divisions, while the lowest (Division 6, Fayetteville) is in south-central NC. On a per-capita basis, the highest Division allocation is 2 _ times larger than the lowest Division.

Figure 2.7
NORTH CAROLINA HIGHWAY (TIP + LOOP) EXPENDITURES (1990 - 2003)
Division Per Capita Expenditures vs.
Board Membership by Year (1985 - 2004) and Total Expenditures (1990-2003)



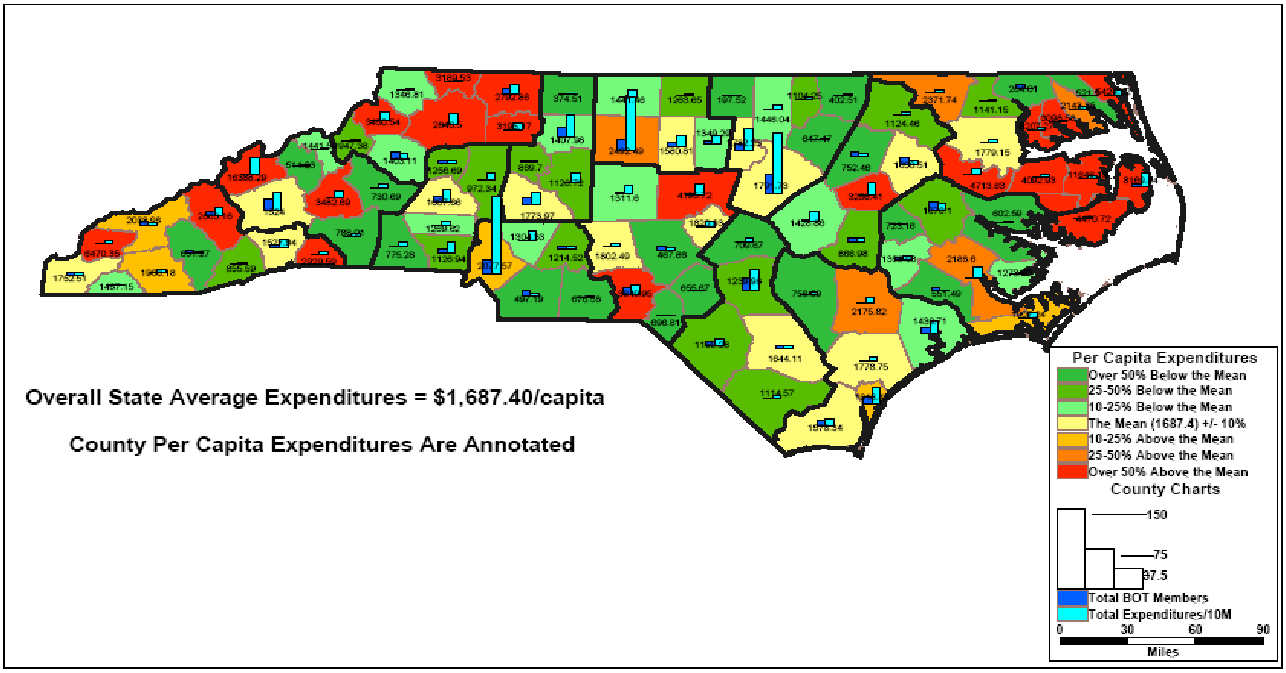
DOT_DIV	AREA	POPULATION	TOTAL_BOT	TOTAL_EXPPERCAP_EXP	
6	4052.17	604354	34	697338818.94	1153.86
12	2412.83	648380	25	759431473.87	1171.28
9	2225.59	663199	34	875395772.04	1319.96
2	4214.19	431512	27	601363298.53	1393.62
4	3507.38	509504	37	733850723.87	1440.32
5	3303.15	1045467	48	1686167821.87	1612.84
3	4476.99	534111	34	864764026.93	1619.07
10	2491.12	1033569	44	1764961149.35	1707.64
8	4158.37	446622	29	777113750.79	1739.98
14	4092.30	307830	24	572550564.03	1859.96
7	2494.14	785504	38	1577958553.62	2008.85
13	3173.47	453624	20	929487618.39	2049.03
11	3331.60	345537	26	841097521.49	2434.17
1	5418.01	240100	15	900050232.86	3748.65

Cartography by Greg Fields, 5-19-04

On a county basis, the disparities are even more striking. **Figure 2.8** shows that the 100 counties vary widely in per-capita highway fund allocations. The highest per-capita allocation is for Madison County ($16388), the lowest for Person County ($197). Although the counties with the highest per-capita allocations tend to be in the eastern and far western areas, there are also a number of low per-capita allocation counties in those areas as well. Conversely, the counties with the lowest per-capita allocations tend to be in the Piedmont, but many are also scattered though the east and west areas. Of course, these are not the only highway funds allocated to counties, but they are the largest allocation for most counties.

Figure 2.8
NORTH CAROLINA HIGHWAY (TIP + LOOP) EXPENDITURES (1990 - 2003)

County Per Capita Expenditures vs.
Board Membership by Year (1985 - 2004) and Total Expenditures (1990-2003)



Cartography by Greg Fields, 5-19-04

The current distribution formula has created not only wide disparities in per-capita distributions, but it has also probably led to variations in system condition. Recent reports show that the condition of the system, as of 1998 when the latest analysis was completed, has begun to 'drift', with the eastern region of the State having substantially better condition than the other regions[38]. The disparity is likely to be higher now.

Some (but not all) of these problems have been recently addressed. In 2003, the North Carolina Legislature addressed the short term problem of declining funds for repairs and maintenance by authorizing diversion of funds from the State's highway capital program. The program, called Moving Ahead[39], authorized the diversion of $630 million ($270 m in FY 2003-04 and $ 360 m in FY 2004-05) from the "cash balance of the Highway Trust Fund" for maintenance and repairs, to be allocated using the current TIP equity distribution formula. (An additional $ 70 million was allocated for transit). While the program addressed short-term highway repair needs, it did not address the structural or geographic imbalances in the program, nor did it provide for longer term solutions to funding resources. An additional problem is that the recent action expanded the diversion of highway funds to transit and other non-highway needs. The legislation also established a Commission to review highway urban needs.

As of this writing the issue appears to be off-the-table for FY 2004-05. The State's proposed FY 2004-05 Budget does not highlight highway repair needs, even thought there is general agreement that the system is deteriorating. Other problems such as the emerging disparity in condition and wide variations in per-capita expenditures have not been addressed.

B. Cost-Effectiveness of Major Projects

This section summarizes the primary findings of the study with regard to cost-effectiveness.

1. Costs, Traffic Served and Cost-Effectiveness

The first step in the assessment of cost-effectiveness is to review the major-project program itself. **Table 2.4** shows the summary for all 349 projects.

Table 2.4: Overall Cost-Effectiveness of NC Major Projects, 1990-2003

Number of Projects	Number of Sections	Length, Miles	Nominal Cost, M	2002$ Cost, M	20-Year VMT Served, M	Cost-Effectiveness, Cents/VMT
349	**750**	**1707.32**	**7336.34**	**8661.66**	**324,827**	**2.67 cents**

This Table indicates that:

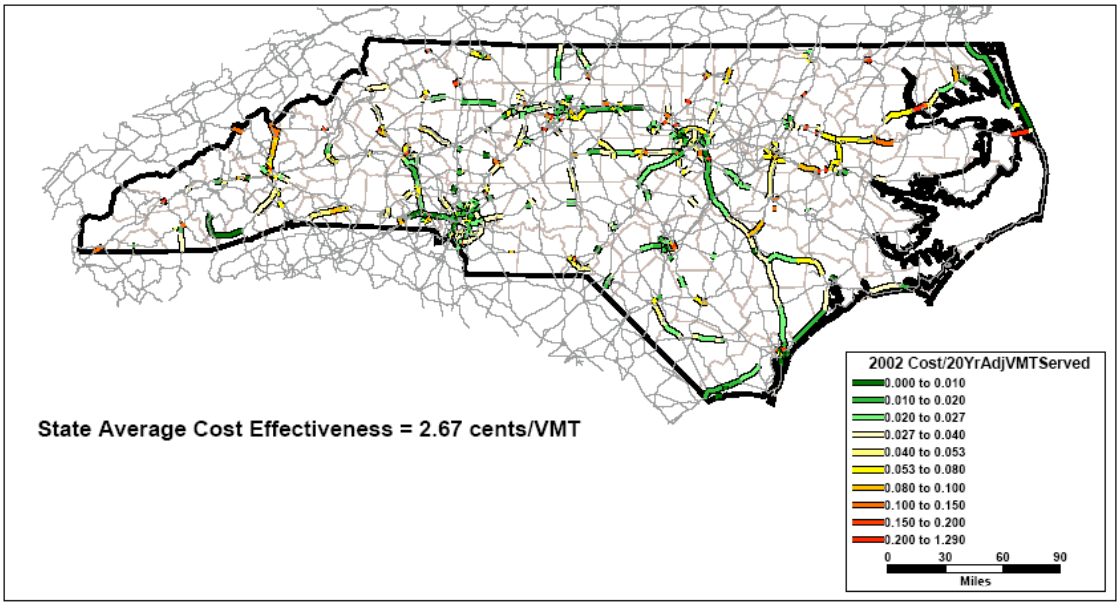
- Over the period 1990-2003, **North Carolina constructed about 349 major projects (750 road sections) costing about $7.34 B**, or slightly more than _ the total TIP and Loop expenditures ($13.5 B) during the period. On a current-dollar ($ 2002) basis, these projects would cost about $8.67 B.
- In total, **these projects accounted for about 1707.3 miles** of improved roadway, or about 2.1 % of the 79,000-mile state-owned highway system.
- Accounting for traffic growth and increasing congestion, these 349 projects are predicted to serve about **324.8 billion vehicle-miles** over their 20-year lifetimes. This is about 13 percent of the state's total VMT expected over this timeframe.
- **On average, these projects are estimated to cost about 2.67 cents per lifetime (20-year) vehicle-mile served**, or about 5 percent of the average cost of US vehicle ownership (about 54 cents per vehicle-mile[40]).

Figure 2.9 shows the distribution of projects according to cost-effectiveness. Statewide, there are cost-effective and cost-ineffective projects in all locations of the State.

Figure 2.9

NORTH CAROLINA MAJOR HIGHWAY PROJECTS (1990 - 2003)
(349 Projects - 750 Sections)

Cost Effectiveness in 2002 Dollars



Cartography by Greg Fields, 5-20-04

2. Distribution of Projects by Cost-Effectiveness

Table 2.5 indicates the distribution of projects by number, length and cost-effectiveness. Of the 750 sections analyzed, 347 have a cost-effectiveness of better than 2.7 cents/VMT, the statewide average. The cost of these projects was about $ 2.55 B. Another 289 sections have an average cost-effectiveness of between 2.7-8.0 cents/VMT, from 1-to-3 times the state average. The cost of undertaking these projects was about $ 3.51 B.

And about 114 sections have cost-effectiveness ratings higher than 3 times the state average, or 8.0 cents/VMT. The cost of undertaking these projects was about $1.27 B.

Table 2.5: Cumulative Cost of Projects by Cost-Effectiveness

Cost-Effectiveness Range	Upper Level	Number of Segments	Length	Nominal Cost $M	Incremental Cost, $M
0 - 1.0 cents	Better	89	190.63	503.53	
1.0 - 2.0 cents	Than	152	365.93	1126.56	
2.0 – 2.7 cents	Average	106	314.15	929.66	
(Subtotal)		**347**	**870.71**	**2559.75**	
2.7 - 4.0 cents	1.5 x ave	120	308.75	1524.33	
4.0 – 5.3 cents	2.0 x ave	91	164.07	764.57	

5.3 – 8.0 cents	3.0 x ave	78	186.36	1219.11	
(subtotal)		**289**	**659.18**	**3508.01**	
8.0– 10.0 cents		41	77.05	409.94	409.94
10.0-15.0 cents	Worse	30	53.65	388.78	798.72
15.0-20.0 cents	Than	12	15.51	159.69	958.41
20.0 c to $1.29	Average	31	31.12	310.26	1268.57
(subtotal)		**114**	**177.33**	**1268.57**	
Total		**750**	**1707.32**	**7336.34**	

This information can be interpreted as follows: ***If North Carolina had limited its major highway projects to those with better than 3 times the state's average cost effectiveness, then almost $1.3 B would have been saved. If the State limited construction to just those projects with cost-effectiveness no worse than 2 times the overall state average, then about $ 2.5 B would have been saved***. These funds would have been available for other more worthy projects or could have been spent on maintenance.

3. Cost-Effective and Cost-Ineffective Projects

As examples of typical of cost-effective or cost-ineffective projects, the following are briefly described. These are not necessarily the best or worst projects in the State, but are merely examples of the kinds of projects that typically rank in the top and bottom. Examples of the most **cost-effective projects** reviewed are:

- **U-2571**: **Oleander Drive (US 76) in Wilmington, New Hanover County**, between Hinton St. and Bagley Ave and between Pine Grove Road and 52nd St. The 1998 project widened a 1.6 mile section of 2-lane urban arterial to 4 lanes at a cost of $600,000, and now carries 25000-28000 vehicles per day. Its overall cost-effectiveness is about 0.2 cents per vehicle-mile.
- **I-302: Interstate 85 in Gaston County**, from NC 29/US 74 east of Kings Mountain to NC 273 in Belmont. Completed in 2000, this Interstate widening project from 4 to 6 lanes cost $ 49.10 million for 17.5 miles now serves 75000-100000 vehicles per day. Its overall cost-effectiveness is of 0.4 cents per vehicle-mile.
- **R-2409: NC 107 in Jackson and Transylvania Counties.** This project added climbing lanes to portions of a 20-mile rural route carrying about 6600 vehicles per day, at a cost of $ 4.00 million. Its overall cost-effectiveness is 0.4 cents per vehicle-mile.

Examples of **cost-ineffective projects** reviewed are:

- **I-2103: New exit on I40 at Milepost 33**, Newfound Road in Haywood County. This 1995 project constructed a new exit and added a frontage road to an nearby exit, at a cost of $4.9 M, to serve just 500 vehicles per day. Its overall cost-effectiveness is $1.29 per vehicle-mile.
- **R-509: New exit on US 64 in Edgecombe County at SR 1207**. This exit was constructed in 1998 at a cost of about $7.7 million to serve just 800 vehicles per day. Its overall cost-effectiveness is $1.12 per vehicle-mile.

- **A-6: US 19/74 in Swain County** from NC 28 to the Little Tennessee River. This 2.12 mile rural widening project was completed in 1992 at a cost of $21.7 million, but serves just 3500-5400 vehicles per day. Its overall cost-effectiveness is 30 cents per vehicle-mile.

4. Savings from Deferred Projects

What types of projects would have been deleted or deferred if cost-ineffective projects were deleted? **Table 2.6** shows the types of projects that would have been deferred or not implemented if a cost-effectiveness criterion of 8.0 cents per vehicle-mile had been in place during the last decade.

Table 2.6: Savings from Cost-Ineffective Projects

Project Type and Description	Number of Sections	Sections with C/E > 8.0 C/VMT	Total Cost, $M (nominal)	Cost of Sections with C/E > 8.0	Percent of Program Deleted
10. Climbing Lanes	4	0	9.9	0	**0**
6. Widen Frwy 4 to 6 lanes	39	0	340.02	0	**0**
4. Widen Frwy 4 to 8 lanes	26	0	533.42	0	**0**
9. One-Way Pairs	2	0	4.20	0	**0**
2. Widen Urban Arterial	209	17	948.77	84.76	**8.9**
5. Widen Rural Arterial	165	12	1566.62	218.74	**13.9**
3. New 4+Lane Freeway	161	42	3052.85	679.74	**22.2**
11. New 4-Lane Arterial	91	18	600.47	155.1	**25.8**
1. New 2-Lane Arterial	33	11	180.21	60.83	**33.8**
7. New Exits	20	14	99.87	69.40	**69.4**
Total/Average	**750**	**114**	**$7336.34**	**$ 1268.6**	**18.1**

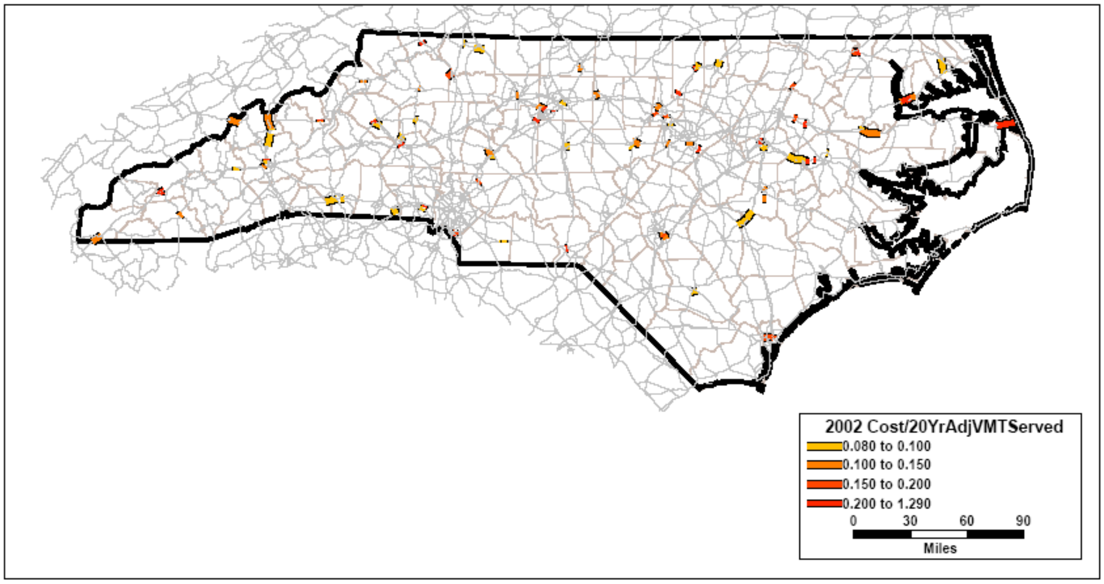
So, the imposition of a cost-effectiveness criterion of about 3 times the state average would have resulted in less than 18 percent of the 'major projects' being deleted, if such a policy had been in place. On the other hand, the stricter cost-effectiveness criteria would have resulted in larger reductions in expenditures for new exits and new roads.

These savings would occur throughout the State. **Figure 2.10** indicates that if these savings were made, no region of the State would be unfairly singled out for deletion of projects. This analysis suggests that a policy of cost-effectiveness for project selection would not unduly burden any region.

Figure 2.10

NORTH CAROLINA MAJOR HIGHWAY PROJECTS (1990 - 2003)
(349 Projects - 750 Sections)

Cost Effectiveness (in 2002 Dollars) > 8 cents/VMT



Cartography by Greg Fields, 5-20-04

C. Factors affecting Cost-Effectiveness

This portion of the Report covers the various factors affecting project-cost effectiveness, and evaluates their importance in identifying cost-effective or cost-ineffective projects.

1. Project Type

The 10 major project types vary substantially by cost-effectiveness. **Table 2.7** summarizes the average cost-effectiveness of projects according to the type of project. The most cost-effective projects, on average, are those that involve higher-traffic widenings, such as widenings of freeways from 4 to 6 and 4 to 8 lanes and widenings of urban arterials. Although only a few climbing-lane projects are included in our database, they are also quite cost-effective since they are generally lower cost actions and their benefits extend over longer highway sections. On the other hand, projects tend to be cost-ineffective when they involve providing new low-volume facilities rather than widenings. New freeways, new exits, and new 2-lane arterials were found to be less cost-effective, on average, than the overall state average. Particularly, new exits on existing freeways were found to average low in cost-effectiveness, probably because they generally do not serve much cross-street traffic. Overall, the range of average cost-effectiveness by project type is about 23.4, a very large spread. Even setting aside the climbing-lane projects (which tend to spread relatively low costs over a larger VMT served), the range of cost-effectiveness by project type is about 10-to-1.

Table 2.7: Cost-Effectiveness by Project Type

Project Type and Description	Number of Sections	Total Length, miles	Nominal Cost, $M	Total Cost, $2002 M	Lifetime VMT, M	2002 Average Cost/VMT
7. New Exits	20	17.63	99.87	129.15	1576	**8.19 cents**
3. New 4+Lane Freeway	161	458.08	3052.85	3515.04	85121	**4.13 cents**
11. New 4-Lane Arterial	91	138.11	600.47	716.10	18608	**3.85 cents**
1. New 2-Lane Arterial	33	77.01	180.21	211.47	5536	**3.82 cents**
5. Widen Rural Arterial	165	520.19	1566.62	1833.61	59909	**3.06 cents**
9. One-Way Pairs	2	2.39	4.20	5.10	189	**2.69 cents**
2. Widen Urban Arterial	209	339.50	948.77	1180.95	49910	**2.37 cents**
4. Widen Frwy 4 to 8 lanes	26	59.93	533.42	676.95	54313	**1.25 cents**
6. Widen Frwy 4 to 6 lanes	39	57.47	340.02	382.52	46597	**0.82 cents**
10. Climbing Lanes	4	37.01	9.90	10.76	3064	**0.35 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

2. Location

Project location across the state can be described in several ways. One of the most common descriptions is the NCDOT Division within which the project is located. NCDOT has 14 Divisions, each of which manages the road system for a group of counties. (Since Divisions are numbered in order from east to west, "Division Number" is a rough surrogate for 'western-ness' within the state). (See Figure 2.7 for a map of Dot Divisions). However, because these Divisions are managed quite autonomously and are sometimes responsible for major project construction, Division Number can describe both location and administrative control.

The following table **(Table 2.8)** shows the average cost-effectiveness ratings for each NCDOT Division, in order of increasing cost-effectiveness. The table indicates that major projects in the more 'urban' Divisions tend to average better in cost-effectiveness, while major projects in the more 'rural' Divisions, both east and west, tend to average worse in cost-effectiveness. Differences in average cost-effectiveness by Division vary by about a factor of 3. This does not mean that rural Divisions are wasteful, but rather suggests that the traffic levels in the rural areas of the State are lower, and therefore the projects built there serve generally less traffic or are less costly, or a combination of both.

Table 2.8: Cost-Effectiveness by NCDOT Division

Division/ Major Cities	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Average Cost/VMT
13. Asheville	45	96.03	505.20	575.78	10370	**5.50 cents**
14. Western NC	34	105.77	347.34	401.96	9411	**4.27 cents**
11. North Wilksboro	25	73.99	398.60	426.98	10157	**4.20 cents**
1. Eastern NC	31	141.57	519.66	584.25	15074	**3.87 cents**
2. Greenville New Bern	22	60.38	196.31	228.71	5949	**3.84 cents**
4. Wilson Rocky Mt	55	136.72	508.90	586.93	16887	**3.47 cents**
8. Pinehurst Rockingham	52	132.13	398.57	445.74	14054	**3.17 cents**
6. Fayetteville	50	100.19	301.71	364.31	12518	**2.91 cents**
9. Winston-Salem High Pt	46	76.83	450.89	589.81	22201	**2.65 cents**
3. Wilmington	52	221.49	554.95	724.93	27978	**2.59 cents**
5. Raleigh Durham	76	139.47	833.42	956.15	39834	**2.40 cents**
7. Greensboro Burlington	69	130.52	789.09	898.99	42693	**2.10 cents**
10. Charlotte	127	179.20	1156.30	1400.58	70362	**1.99 cents**
12. Gastonia Hickory	66	113.04	384.38	476.64	27336	**1.74 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827.9**	**2.67 cents**

The findings therefore imply that traffic levels are likely to be a key indicator of project effectiveness, overshadowing construction cost differences between Divisions.

Another measure of location is the Highway Fund Distribution Region. These are 7 combinations of the 14 DOT Divisions cited in state law as the basis for allocation of funds from the TIP and Loop portions of the Highway Fund. The 7 Distribution Regions also correspond roughly to location within the state, with increasing letter designations running form east to west. See Figure 2.6 for a map of Distribution Regions.

The following table **(Table 2.9)** shows the variation in average cost-effectiveness for the 7 Distribution Regions. Average cost-effectiveness of major projects does not vary as much by Distribution Region (about 2.3) as by region or by project type. However, the same finding as above – that the far west and east regions seem to have less cost-effective projects – is also apparent. The finding seems to strengthen the above note, that traffic volumes, which are lower in these regions and higher in the Piedmont, are the likely cause of much of the variation in cost-effectiveness.

Table 2.9: Cost-Effectiveness by Highway Fund Distribution Region

Highway Fund Distribution Region	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Average Cost/VMT
G: Western NC	79	201.80	852.54	977.74	18981	**4.94 cents**
A: Eastern NC	86	278.28	1028.56	1171.18	31962	**3.66 cents**
B: SE Coastal	74	281.87	751..27	953.64	33927	**2.81 cents**
C: Mid State	126	239.66	1135.13	1320.46	52352	**2.52 cents**
F: W Piedmont	91	187.03	773.98	903.52	37494	**2.41 cents**
D: C Piedmont	115	207.35	1239.98	1488.79	64895	**2.23 cents**
E: S Piedmont	179	311.32	1554.87	1846.33	84416	**2.18 cents**
Total	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

3. Project Size

Several measures of project 'size' are available. One obvious measure is **project cost**, the cost of each road section as estimated from the TIP as the project neared completion. One might expect that high-cost projects might be less cost-effective since traffic served might increase less rapidly than costs. The following table **(Table 2.10)** shows the relationships between project cost ('nominal cost') and cost-effectiveness.

Table 2.10: Cost-Effectiveness by Project Cost

Project Nominal Cost, $ Millions	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Average Cost/VMT
> $ 13.80 m	150	820.16	4512.89	5221.72	170856	**3.06 cents**
$ 3.77 – $ 7.11	151	245.81	792.33	968.39	36119	**2.68 cents**
$ 7.11 – $ 13.80	149	360.68	1461.23	1772.35	74809	**2.37 cents**
$ 1.84 - $ 3.77	149	192.28	414.06	506.45	30978	**1.63 cents**
0- $ 1.84	151	88.41	155.83	192.86	12064	**1.60 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

Generally, higher-cost projects (those with section costs greater than about $ 13.8 million, reported average cost-effectiveness that was considerably worse than the state average, and about 1.9 times worse than low-cost projects. But the relationship is not linear: the next worse cost-effectiveness is for projects of relatively small overall cost, $3.77- $7.11 M. However, the best average cost-effectiveness is for low-cost projects that cost less than $1.8 M.

Alternatively, one can assess projects according to **cost per lane-mile**, which is a measure of the intensity of the work and relative cost. The following table indicated the overall cost-effectiveness of projects using this criterion.

Table 2.11: Cost-Effectiveness by Project Cost per Lane-Mile

Nominal Project Cost per Lane-Mile, $ M.	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Average Cost/VMT
> $ 1.65 M	150	252.81	2850.29	3192.62	61949	**5.15 cents**
$1.006- $ 1.65	150	288.11	1459.77	1781.61	58313	**3.06 cents**
$ 0.72 - $ 1.006	150	393.19	1465.54	1701.71	75659	**2.25 cents**
$ 0.55 - $0.72	150	360.57	953.89	1215.61	78663	**1.55 cents**
0-$ 0.55	150	412.64	606.84	770.10	50243	**1.53 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

This table shows that, as expected, projects with relatively high cost per lane-mile also tend to have average cost-effectiveness worse than the state average. Conversely, projects that have costs per lane mile averaging less than about $ 1 M per lane-mile are likely to report average cost-effectiveness that is better than the state average.

An alternative measure of size is a project's **capacity**, that is its estimated peak hour carrying capacity in vehicles per hour. This measure is essentially a size measure because it is measure of the number of lanes in the completed project. The following table shows a mild, but not perfect, correspondence between road capacity and cost effectiveness.

Table 2.12: Cost Effectiveness by Road Capacity

Road Capacity After Completion and Description	Number of Segments	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Average Cost/VMT
2800 (2-L rur)	43	86.42	232.08	274.22	5941	**4.62 cents**
2400 (2-L urb)	3	34.06	7.00	7.92	1943	**4.08 cents**
9600 (4-L Frw)	158	446.27	2822.94	3289.72	82109	**4.00 cents**
7200 (6-L art)	4	3.01	21.72	31.69	830	**3.81 cents**
4800 (4-L art)	396	858.27	2805.35	3364.72	111211	**3.02 cents**
3200 (3-L urb)	2	2.39	4.20	5.10	189	**2.69 cents**
12000 (4-L Fry)	1	2.95	2.90	2.84	1121	**2.53 cents**
5600 (5-L art)	64	124.69	310.40	367.42	15049	**2.44 cents**
19200 (8-L Fw)	28	65.53	642.63	783.97	55744	**1.40 cents**
3600 (3-L art)	11	20.06	26.39	33.24	2508	**1.33 cents**
14400 (6-L FW)	40	63.87	460.72	500.81	48179	**1.04 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827.9**	**2.67 cents**

Six-lane freeways (generally widened from 4 lanes) and 3-lane arterials (generally widened from 2 lanes) show the best average cost-effectiveness ratings, followed by 8-lane freeways (which are generally widened from 6 lanes). On the other hand, projects with the worst cost-effectiveness tend to be new 2-lane roads and new 4-lane freeways, often where traffic volumes do not fill the facility. Overall, the least cost-effective projects have average cost-effectiveness about 4.24 worse than the best projects.

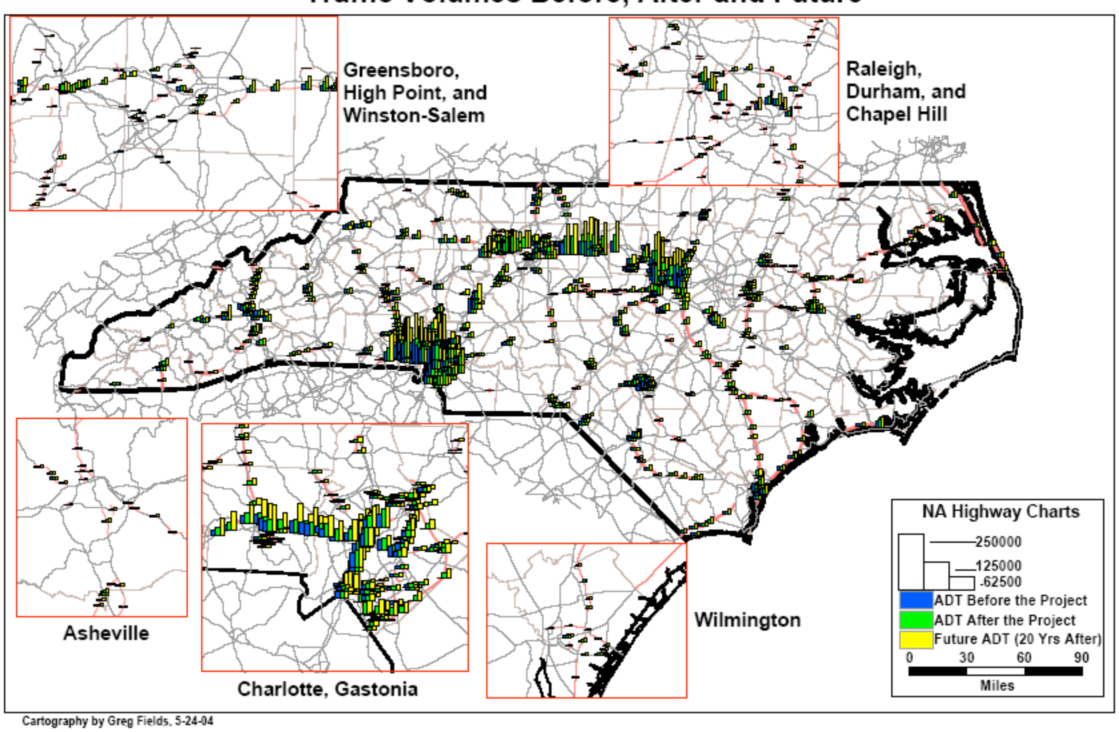
4. Traffic and Congestion

Obviously, project traffic should contribute significantly to its cost-effectiveness: projects with higher traffic volumes are likely to benefit more drivers and if completed efficiently are likely to be cost-effective. The following table shows average cost-effectiveness of projects according to their **average daily traffic after project completion** ("ADT2"). **Figure 2.11** shows 'before', 'after' and 'forecast' traffic volumes.

Table 2.13: Cost-Effectiveness by Traffic After Completion

Average Daily Traffic After Completion (ADT2)	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Ave Cost/VMT
500-6200	79	153.3	612.91	706.27	61695	**11.44 cents**
6200-13200	246	661.36	2207.20	2543.23	59566	**4.27 cents**
13200-16100	83	209.09	736.63	900.29	27699	**3.25 cents**
16100-35000	323	471.05	1981.63	2345.07	88485	**2.65 cents**
35000-94000	75	156.23	1396.19	1666.91	84969	**1.96 cents**
94000-152000	35	56.27	401.78	499.89	58037	**0.86 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

Figure 2.11
NORTH CAROLINA MAJOR HIGHWAY PROJECTS (1990 - 2003)
Traffic Volumes Before, After and Future



Projects with higher traffic volumes generally showed better cost-effectiveness ratings. High-volume roads, those with traffic volumes over 94,000 ADT, showed an average cost-effectiveness rating about 13.3 times better than roads with very low traffic volumes after project completion.

As an alternative to recent (after-completion) traffic, one might also use a forecast of traffic ("**Forecast ADT**") as a measure of cost-effectiveness. The following table shows how project cost-effectiveness is related the forecast traffic.

Table 2.14: Cost-Effectiveness by Forecast Traffic

Forecast Average Daily Traffic	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Ave Cost/VMT
0-11945	150	323.66	1024.51	1189.90	16949	**7.02 cents**
11945-18966	150	400.99	1324.13	1543.07	38240	**4.03 cents**
18966-25040	150	399.58	1393.37	1692.81	53304	**3.18 cents**
25040-39000	150	308.77	1308.32	1543.16	57733	**2.67 cents**
>39000	150	275.32	2286.01	2692.72	158603	**1.69 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

Higher-traffic projects are generally more cost-effective, since they carry more traffic relative to their cost. In North Carolina, roads with a forecast traffic volume greater than 39,000 vehicles per day have an average cost-effectiveness more than 4.15 times the low-volume road projects.

An alternative measure of traffic is **forecast traffic per lane**, which is a rough measure of congestion. One would expect that projects with relatively high traffic per lane would be more efficient, since they would be 'sized' to carry the forecast traffic but not over-built. **Table 2.15** shows the distribution of project cost-effectiveness according to this criterion. The table shows that, as expected, road projects with high predicted traffic per lane are considerably more cost effective than those with lower forecast traffic levels.

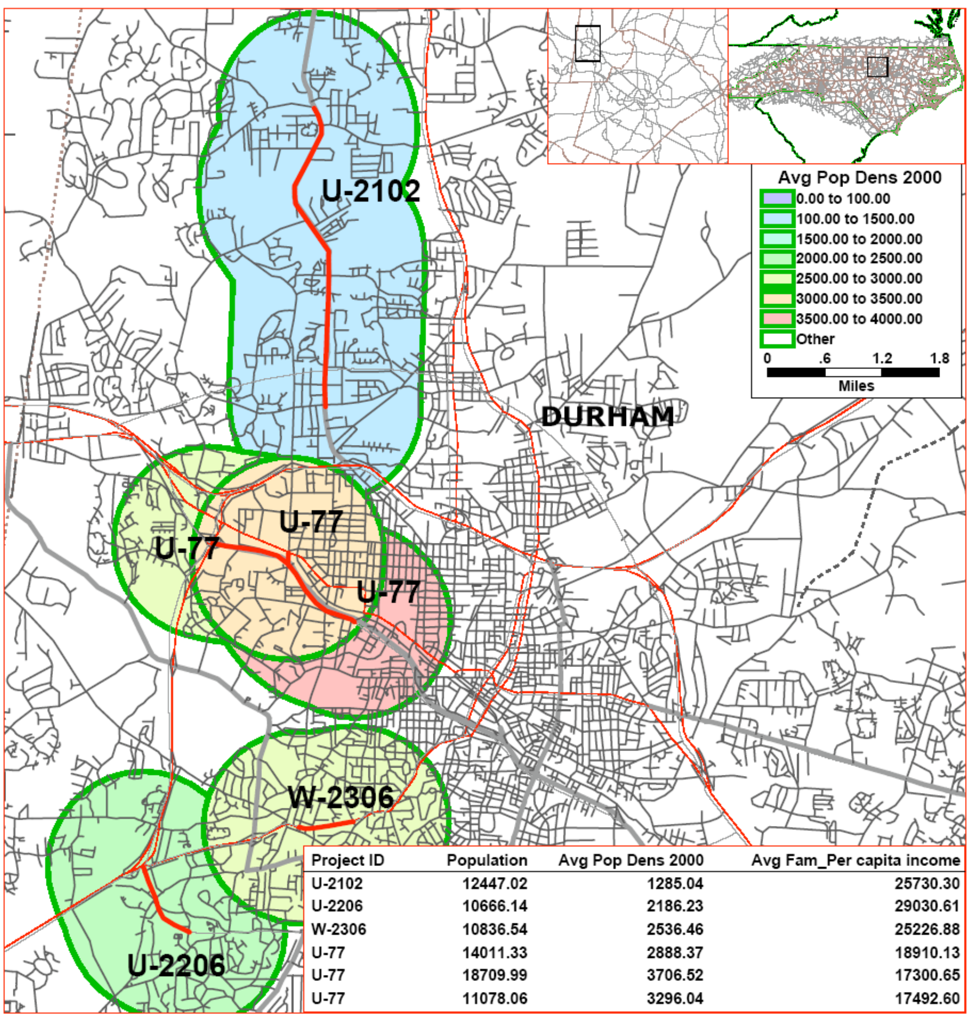
Table 2.15: Cost-Effectiveness by Forecast Traffic per Lane

Forecast Average Daily Traffic per lane	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Cost/VMT Served, Cents
0-3140	150	335.3	1029.75	1198.76	19082	**6.30 cents**
3140-4720	150	376.56	1256.66	1463.13	36949	**3.96 cents**
4720-6200	150	392.19	1535.15	1820.60	50689	**3.59 cents**
6200-9530	150	330.48	1438.75	1696.10	61642	**2.75 cents**
>9530	150	272.79	2076.04	2483.07	156465	**1.59 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

5. Nearby Population

An additional set of factors that may be related to project cost-effectiveness are those describing the nearby population. To measure these factors, characteristics of the population living within 1 mile of each project were determined. This was done by using the 'band' feature of TransCAD, which estimates the number of people and their characteristics within a given 'distance band' of each project. **Figure 2.12** shows an example of the 'bands' procedure for several projects in the Durham area. The specific population characteristics reviewed are population, average population density, and average per-capita income.

Figure 2.12
Example of One-Mile Bands Around Projects



Project ID	Population	Avg Pop Dens 2000	Avg Fam_Per capita income
U-2102	12447.02	1285.04	25730.30
U-2206	10666.14	2186.23	29030.61
W-2306	10836.54	2536.46	25226.88
U-77	14011.33	2888.37	18910.13
U-77	18709.99	3706.52	17300.65
U-77	11078.06	3296.04	17492.60

The following table shows the range of cost-effectiveness for projects with various levels of **population within 1 mile**:

Table 2.16: Cost-Effectiveness by Population Within 1 Mile

Population within 1 Mile of the Section	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Ave Cost/VMT
0-1440	150	334.28	1211.84	1381.32	31139	**4.43 cents**
1440-2380	150	432.77	1402.21	1671.20	57262	**2.92 cents**
2380-4810	150	390.53	1492.14	1777.49	67158	**2.64 cents**
4810-9037	150	250.36	1375.80	1646.40	61823	**2.66 cents**
>9037	150	299.37	1854.35	2185.26	107446	**2.03 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

This table indicates a factor of about 2.2 between the highest and lowest cost-effectiveness averages. This suggests that, while a project's nearby population can have an effect on the project's cost-effectiveness, the effect is not as strong as that of traffic volume.

Another important measure of nearby demographics is the **population density** of the nearby area. All things being equal, one would expect that as the density of the area near a road project increases the cost-effectiveness of the project should also increase since the increasing density should create more traffic. **Table 2.17** shows the findings for this analysis. The table indicates that, as expected, the average cost-effectiveness of projects with higher nearby densities is better, by a factor of 1.8, than that of projects with low-density population nearby.

Table 2.17: Cost-Effectiveness by Nearby Population Density

Population Density (pop/sq mi) of Nearby Geography	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Ave Cost/VMT
1-127	149	652.27	2036.64	2395.06	68073	**3.52 cents**
127-389	150	389.36	1591.11	1841.75	64913	**2.84 cents**
389-810	149	234.58	1266.17	1475.68	56566	**2.61 cents**
810-1580	150	223.83	1308.89	1536.37	62127	**2.47 cents**
1580-10000	150	203.60	1116.34	1394.12	72807	**1.91 cents**
Other*	2	3.67	17.18	18.68	342	**5.45 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

*2 sections over water (to the Outer Banks) had no population within 1 mile.

To put these ranges in perspective, a previous analysis indicated that the population density of North Carolina cities ranges from a high of about 2000 persons per square mile for the innermost rings to a low of about 100 persons per square mile for populated rural areas. Typical suburban densities are in the range of 500-1000 persons per square mile. Thus, the table indicates that projects built within urban areas, where densities are already higher, are likely to be more cost-effective than those built in rural areas where densities are lower[41].

Another common measure of nearby population characteristics is relative wealth, measured by **family per-capita income**. The following table shows how project cost-effectiveness is related to this statistic. The table suggests no strong relationship: the most cost-effective projects, on average, are those with upper-middle per-capita income averages. On the other hand, the table also indicates projects with the worst cost-effectiveness seem to be in areas of relatively low per-capita incomes. This finding may reflect the 'rural' character of these projects, that is they have both relatively low traffic volumes (and hence lower cost-effectiveness) as well as are surrounded by relatively low-income tracts.

Table 2.18: Cost-Effectiveness by Nearby Family Per-Capita Income

2000 Per-Capita Income Range	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Ave Cost/VMT
0-$ 15825	149	385.40	1523.13	1864.02	47972	**3.88 cents**
$ 15825-$17660	150	349.72	1401.09	1659.04	60254	**2.75 cents**
$ 20370-$25100	150	317.98	1520.52	1755.81	67386	**2.61 cents**
> $25100	150	268.59	1339.90	1561.28	67629	**2.31 cents**
$ 17660-$20370	149	381.94	1534.50	1802.82	81243	**2.21 cents**
Other*	2	3.67	17.18	18.68	342	**5.45 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

*2 sections over water (to the Outer Banks) had no population within 1 mile.

6. Board of Transportation Representation

One of the most controversial issues in transportation funding is the relationship between NCDOTs Board Member representation and funding distributions. In this section of the report we review the extent to which project cost-effectiveness is related to Board of Transportation representation.

As noted above, the NCDOT Board members are appointed by the Governor and the Legislature and nominally represent groups of counties. In theory, therefore, the entire state is 'represented' each year. However, there is also a perception that the 'home county' of each Board member somehow gets favorable treatment in project selection and funding, so counties that have more 'home county' representation over the years are suspected of getting both more projects and more funding.

Whether the projects in these counties are more or less efficient is also an important issue. If Board members tend to favor their 'home counties' then one might hypothesize that the projects in those counties would be less cost-effective than projects in other counties that might require more justification to get on the TIP. To test this hypothesis we identified the 'home county' of all 114 board members appointed over the period 1985-2004, then added up the 'member-years' for each county in the state. These 'member-years' ranged from a low of 0 (no home county representation over the 20 year period) for 52 counties to a high of 36 'member-years' for Wake County (Mecklenburg is second with 24 'member-years'). We then grouped the projects into ranges of 'member-year' categories for their respective counties and computed average cost-effectiveness for each range[42].

The following table **(Table 2.19)** shows the average cost-effectiveness of our 750 sections, arranged by 'BOT member-year' representation of the county within each project falls. The table indicates a complex relationship between Board membership and cost-effectiveness. Projects in the State's two most populous counties (Mecklenburg and Wake) have both the largest Board membership and the best average cost-effectiveness, but counties with 12-18 Board member-years averaged the least cost-effective projects, at 5.74 cents/VMT. Projects from counties with 0 or 1-2 members also averaged worse in cost-effectiveness. This suggests that low-member counties, which tend to be small rural counties, tend to have less cost-effective projects, possibly because there are fewer high-traffic projects in those counties. Another possible explanation is that projects selected from these counties are selected by members who are not thoroughly familiar with the projects, or possibly that the Board members from Wake and Mecklenburg selected more cost-effective projects than other members. Either way, the data suggest that increasing Board member representation tends to increase the cost-effectiveness of projects selected, not decrease it.

Table 2.19: Project Cost-Effectiveness by NCDOT Board Member Representation

BOT Home County Member-years 1985-2004	Number of Sections	Total Length, miles	Total Cost, $M (nominal)	Total Cost, 2002 $M	Lifetime VMT, M	2002 Ave Cost/VMT
12-17	28	64.74	262.54	307.38	5352	**5.74 cents**
1-2	23	80.45	314.88	378.58	9416	**4.02 cents**
0	193	576.37	1880.43	2240.66	64445	**3.47 cents**
18-23	110	176.48	1107.37	1307.25	42416	**3.08 cents**
3-5	72	226.51	733.13	838.02	30593	**2.74 cents**
6-11	159	317.61	1282.68	1517.14	71828	**2.11 cents**
24-36 (Wake, Mecklenburg)	165	265.17	1755.30	2072.61	100779	**2.06 cents**
Total/Average	**750**	**1707.32**	**$7336.34**	**$8661.66**	**324,827**	**2.67 cents**

This information contradicts the belief that NCDOT Board Members 'push' weak major projects to their home counties.

7. Summary

The following table summarizes the independent effects of some of the factors investigated, and their direct influence on cost-effectiveness. The table shows that the key factors correlated with cost-effectiveness are project type and traffic shortly after completion. The first factor reveals that the weakest projects, new exits, have average cost-effectiveness over 23 times worse than the most cost-effective projects, climbing lanes. The second factor shows that cost-effectiveness is largely determined by traffic shortly after completion: when that traffic is high, greater than 94,000 vehicles per day, cost-effectiveness is likely to be superior; conversely when the after-completion traffic is less than 6200 vehicles per day, cost-effectiveness is likely to be weaker. Other factors show a considerably smaller spread, indicating that their influence on cost-effectiveness is less than these two key factors. Perhaps surprisingly, location variables like DOT

Division, Distribution Region, or Board member representation have less overall effect on project cost-effectiveness. This finding suggests that concerns about inequitable 'balance' between regions of the State might be explained by differences in traffic loads rather than regional representation.

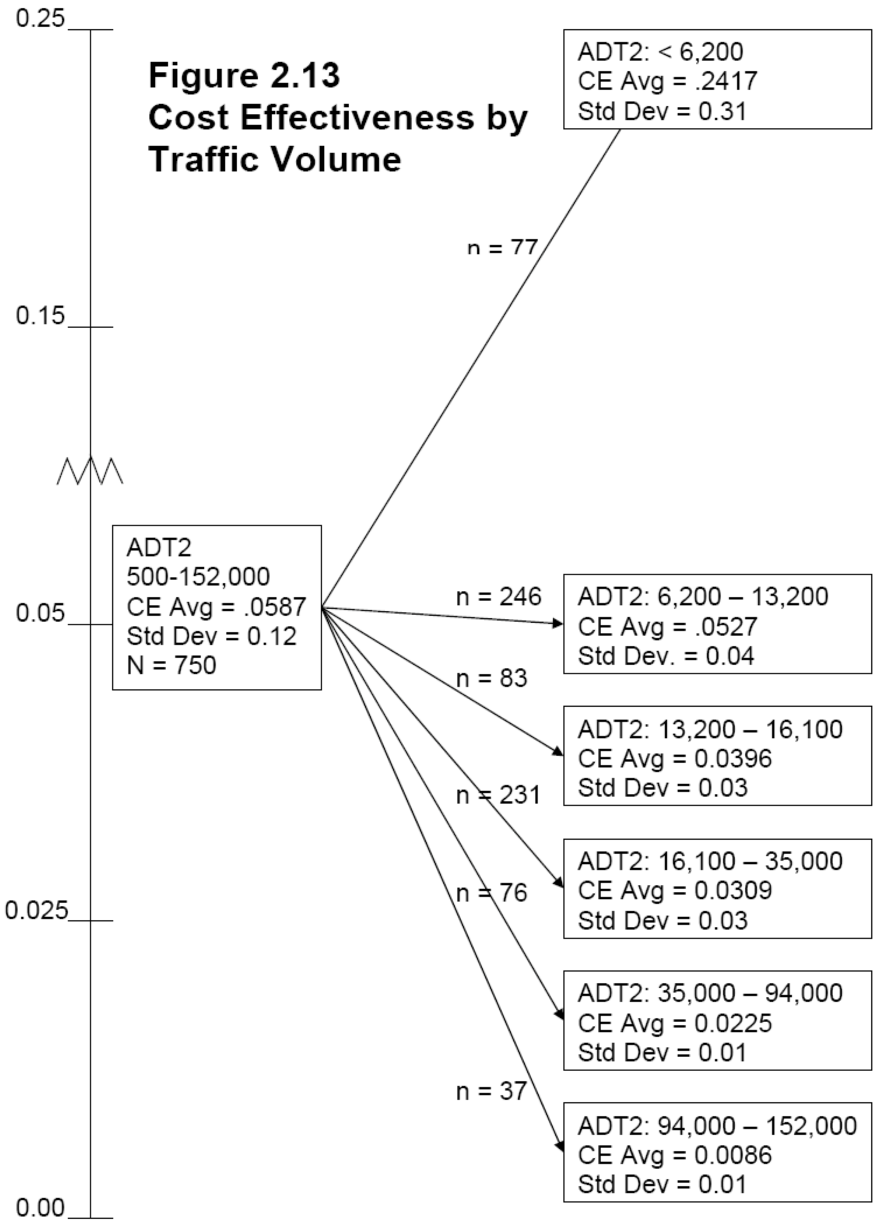
Table 2.20: Summary of Factors Affecting Cost-Effectiveness

Variables (in order)	**Best C/E Category**	**Ave C/E Value**	**Worst C/E Category**	**Ave C/E Value**	**Worst-to-Best Ratio**
Project Type	Climbing Lanes	0.35	New Exits	8.19	**23.40**
"After" Traffic	94000-152000	0.86	Less than 6200	11.44	**13.30**
"After" Capacity	14400 (6-ln frwy)	1.04	2800 (rural 2-lane)	4.62	**4.44**
Future Traffic	> 39,000 per day	1.69	< 11945 per day	7.02	**4.15**
Future Traffic/Lane	> 9530 per day	1.59	< 3140 per day	6.30	**3.96**
Nominal Cost per Lane-mile	< $ 0.55 M	1.53	> $ 1.65 M	5.15	**3.36**
DOT Division	Albemarle	1.74	Asheville	5.50	**3.16**
BOT Membership	24-36 Wake-Meck	2.06	12-18	5.74	**2.79**
Distribution Region	Region E (Meck and east)	2.18	Region G (Western NC)	4.94	**2.26**
Pop in 1 mile	> 9037	2.03	Less than 1140	4.43	**2.18**
Nominal Cost, $M	< $1.84 M	1.60	> $ 13.8 M	3.06	**1.91**
Pop Density 1-mi	> 1580	1.91	Less than 127	3.52	**1.84**

D. Interaction among Factors and Cost-Effective Designs

The above analysis does not allow for the possibility that interacting variables may influence cost-effectiveness more than individual variables. To investigate that possibility, the data system was subjected to a 'classification analysis' using KnowledgeSEEKER©[43]. This is a special software system that identifies interacting variables that most efficiently explain the variation in a dependent variable, in this case cost-effectiveness. KnowledgeSEEKER systematically searches through the database and accounts for both variable interactions and 'oddly-shaped' relationships that would otherwise be overlooked.

The result of the analysis is a 'classification tree' that shows the interacting variables and their most efficient partitions. The tree can be carried to great detail, but for our purposes one level is sufficient. Results of the classification analysis are shown in **Figure 2.13.**



This figure confirms that **the key factor influencing cost-effectiveness is the traffic shortly after completion,** ADT2. Projects with an ‘after’ traffic of less than 6200 ADT have an average cost-effectiveness ratio of 24 cents per vehicle-mile, almost 5 times the (unweighted) statewide average. On the other hand, projects with high-volume traffic after completion have a much better ratio, 0.8 cents per vehicle-mile. Several other factors also emerge in secondary importance for each sub-category of ADT2. These are discussed below, and are summarized in **Table 2.21**.

Table 2.21: Models of Cost-Effectiveness

Category/ Variable	ADT2 < 6200	ADT2 6200-13200	ADT2 13200-16100	ADT2 16100-35000	ADT2 35000-94000	ADT2 94000-152000
	Coefficient (t)	**Coeff (t)**	**Coeff (t)**	**Coeff(t)**	**Coeff (t)**	**Coeff (t)**
Constant	0.560	0.146	0.0412	0.0378	0.0513	0.0267
ADT2	-9.67^{-5} (-5.0)	3.38^{-6} (2.5)		-5.69^{-7} (-1.3)	-2.51^{-7} (-3.4)	-1.53^{-7} (-4.3)
Forecast V/C Ratio		-0.278 (-7.6)			-0.018 (3.9)	
Lanes After		-0.015 (-3.1)				
Cost 2000M				0.0056 (4.3)		
HUblt 99-00	-.00323 (-3.9)					
Pop Dens 00	.000384 (4.6)					
Pop > 25			-1.68^{-6} (-1.2)			
Ave C/E	**0.237**	**0.053**	**0.0396**	**0.0308**	**0.0225**	**0.0087**
Sample Size	**76**	**246**	**83**	**231**	**76**	**37**
Adjusted RSQ	**0.387**	**0.191**	**0.01**	**0.073**	**0.251**	**0.322**
F-Ratio	**16.80**	**20.31**	**0.78**	**10.00**	**13.54**	**18.07**

1. **"After" ADT less than 6200**

For lower volume roads, the key second-order factors affecting cost-effectiveness were found to be (again) ADT2, recent housing construction near the project, and average population density near the project. The model for this relationship is as follows:

Model		**Elasticity**
$\mathbf{CE_{ADT<6200}}$ **=**	**0.560**	
	- 9.67^{-5} (ADT2)	**-1.58**
	- 0.00322 (Housing Units built 1999-2000)	**- 0.49**
	+ 0.000383 (Pop density 2000)	**+0.72**

RSQ = 0.387
N = 76
F-ratio = 16.80

This model can be interpreted as indicating that cost-effectiveness will decline (improve) as traffic and recent housing activity increases, but increase (worsen) as nearby population density increases. As an example of how the model can be used in forecasting, consider an 'average' low-volume project with an 'average' ADT2 of 3880, recent housing starts of 36, and overall population density of 441.7. The estimated cost-effectiveness for this project would be:

$$CE = 0.56 - (9.67^{-5} * 3880) - (0.00323 * 36) + (0.000384 * (441.7)$$
$$= 0.237$$

If the 'after' traffic increases to 6000 ADT, then:

$CE' = 0.032$

which is considerably better but still worst than the overall state average of 0.0267.

Average values and standard deviations for the terms in this model are shown in **Table 2.22.** The average traffic for lower-volume projects is about 3880 ADT, about the average traffic volume for minor arterials. Traffic volumes this low would not generally cause congestion problems in rural areas, but local residents might notice the higher traffic since it would probably be greater than average traffic in the area. Average nearby population densities for projects with this low a volume is about 441 persons per square mile. Comparatively, this would be about 3-4 times the average rural density of North Carolina tracts (50-100 persons per square mile), but considerably lower densities than most suburban tracts, which are typically in the 500-800 density range[44].

Another common method of describing model applications is 'elasticity'. Economists define 'elasticity' as the percent change in a variable caused by a 1 percent change in another variable[45]. Elasticities greater than +/- 1.0 mean that the variable is 'elastic', while elasticities less than +/- 1.0 mean that the variable is 'inelastic'. **Table 2.23** shows the elasticities for this model and indicates the following:

$e_{ADT2} = -1.58$
$e_{(hhs\ 99\text{-}00)} = -0.49$
$e_{(popdensity)} = +0.72.$

So, a 10 percent change in traffic would improve (reduce) project cost-effectiveness by 15.8 percent; a 10 percent change in new housing starts would improve it 4.9 percent, but a 10 percent change in population density along the project would worsen its cost-effectiveness by 7.2 percent. These statistics, along with the means and standard deviations of the variables reported in **Table 2.22,** are useful in evaluating the impact of changes in a variety of variables on the likely cost-effectiveness of the project. They can therefore be used to assist planners in designing projects and in determining which improvements are cost-effective.

2. "After" ADT Between 6200 and 13200

The analysis found that for mid-volume facilities, roads with a likely 'after' traffic volume of 6200-13200, the key factor influencing cost-effectiveness is the forecast-year peak hour volume-to-capacity ratio. The equation is:

Model	**Elasticity**
CE = 0.147	
+ 3.38^{-6} (ADT2)	**+0.63**
- 0.278 (Forecast year V/C ratio)	**- 1.28**
- 0.0145 (Lanes After Work)	**- 1.13**

RSQ = 0.191
N = 246
F-ratio = 20.31

This equation can be used to 'design' the facility as follows. For instance, an 'average' project in this group with an average Forecast ADT2 of 9796, average forecast V/C ratio of 0.24, and an average lanes after work of 3.95, would have an average cost-effectiveness of 0.0527. If the traffic is increased 30 percent to 12,734, the forecast V/C ratio would also increase 30 percent, so the revised C/E ratio would be:

$$
\begin{aligned}
CE' &= 0.147 + (3.36^{-6} * 12734) - (0.278 * 0.312) - (0.0145 * 3.95) \\
&= 0.046
\end{aligned}
$$

In this case, the cost-effectiveness of the project is determined by compensating factors of V/C ratio and number of lanes after, (which improve cost-effectiveness as it increases) and ADT2, which worsens cost-effectiveness as it increases. For mid-volume projects, therefore, projects should not be 'over-designed', that is they should be designed to have a forecast (20 years out) V/C ratio of, preferably, greater than about 0.50.

4. "After"ADT Between 13200 and 16100

Roads with traffic volumes in this range tend to be recently widened rural arterials, and a few low-volume 4-lane urban arterials. In this case, the analysis failed to identify any significant engineering variables, beyond the initial variable ADT2. One demographic variable, population >25 yrs old within 1 mile of the project, was found to be weakly correlated with project cost-effectiveness. The model is:

Model		Elasticity
$CE_{13200 < ADT2 < 16100} =$	**0.0412**	
	$- 1.68^{-6}$ (Pop > 25 Within 1 Mile)	**-0.13**

RSQ = 0.01
N = 83
F = 0.78

This model is extremely weak, exhibiting essentially no relationship between CE ratio and even the selected variable, population > 25 within 1 mile. Nevertheless we show it for consistency purposes, but do not recommend its use in estimating. Instead, the cost-effectiveness of projects in this range can be best estimated by simply using the mean value, 0.0396, as an initial estimate.

4. "After" ADT Between 16100 and 35000

This mid-volume group consists primarily of urban and rural arterial widenings, new 4-lane freeways, and new arterials. The cost-effectiveness model for the group is:

Model		Elasticity
$CE_{16100 < ADT2 < 35000}$	**= 0.0378**	

+ 0.00056 (Cost in \$2000 M) +0.18
- 5.67^{-7} (ADT2) - 0.41

RSQ = 0.073
N = 231
F-ratio = 10.00

This model is not very strong, having an RSQ of just 0.07, but it does show a modest relationship between cost-effectiveness and both project cost and 'after' traffic.

The model can be used in estimation as follows. For an 'average' mid-volume project with ADT2 of 22068 and estimated cost of \$10.01 million, the estimated cost-effectiveness is:

$$CE = 0.0378 + (0.00056 * 10.01) - (5.67^{-7} * 22068) = 0.0308.$$

If the project cost were to increase to \$15 M, the cost-effectiveness would worsen slightly (increase) to:

$$CE' = 0.0378 + (0.00056 * 15.00) - (5.67^{-7} * 22068) = 0.0337.$$

5. "After" ADT Between 35000 and 94000

Projects with this 'after' traffic volume are typically a mixture of urban arterials (4-5 lanes) with fairly high volume-to-capacity ratios and some new 4-lane and widened 6-lane freeways. The cost-effectiveness model for this group is:

Model		Elasticity
$CE_{35000 < ADT2 < 94000}$ =	**0.0513**	
	- 2.51^{-7} (ADT2)	**-0.65**
	- 0.0179 (Forecast V/C ratio)	**-0.63**

RSQ = 0.251
N = 76
F-ratio = 13.54

This model also shows the importance of the 'after' traffic in the estimation of cost-effectiveness; within the volume range, as 'after' traffic increases, the cost-effectiveness improves (declines), with an elasticity of -0.65.

This model can be used in forecasting as follows. For an 'average' project in this volume group, with an 'average' ADT2 of 58043 and an 'average' forecast V/C ratio of 0.79, the 'average' cost effectiveness would be:

$$CE = 0.0513 - (2.51^{-7} * 58043) - (0.0178 * 0.79) = 0.022$$

or 2.2 cents per vehicle-mile, considerably better than the state average. If the ‘after’ traffic increases 20 percent to 69651, the estimated V/C ratio will also increase 20 percent to 0.99, so the estimated cost-effectiveness would be:

$$
\begin{aligned}
CE' &= 0.0513 - (2.51^{-7} * 69651) - (0.0178*0.99) \\
&= 0.0161.
\end{aligned}
$$

or 1.6 cents per vehicle-mile.

6. “After ADT” Between 94000 and 152000

This high-volume group consists primarily of freeways projects with 6 or 8 lanes, and a few high-volume 4-lane projects. The cost-effectiveness model for this group is:

Model		Elasticity
$CE_{94000 < ADT2 < 152000}$	**= 0.0267**	
	- 0.153^{-7} (ADT2)	**-2.08**

RSQ = 0.322
N = 37
F-ratio = 18.07

The cost-effectiveness model for this group correlates cost-effectiveness with ‘after’ ADT, and even within this volume range the effect of ‘after’ ADT is substantial, showing a high elasticity.

The model can be used in estimating cost-effectiveness as follows. For an ‘average’ high-volume project with an ‘after’ ADT of 117,568 (the average for this group), the estimated cost-effectiveness is:

$$
\begin{aligned}
CE &= 0.0267 – (1.533^{-7} * 117568) \\
&= 0.00865.
\end{aligned}
$$

or about 0.8 cents per vehicle-mile served. If the ‘after’ traffic increases to 130,000, the estimate of cost-effectiveness is:

$$
\begin{aligned}
CE' &=0.0267 – (1.53^{-7} * 130,000) \\
&= 0.0068
\end{aligned}
$$

or 6.8 cents per vehicle-mile.

Table 2.22: Means and Standard Deviations of Key Variables

Category/ Variable	ADT2 < 6200	ADT2 6200-13200	ADT2 13200-16100	ADT2 16100-35000	ADT2 35000-94000	ADT2 94000-152000
ADT2	3879.9 (1480)	9769.1 (2121)		22068 (4138)	58043 (18911)	117568 (22285)
Forecast V/C Ratio		0.243 (0.085)			0.795 (0.30)	
Lanes After		3.95 (0.60)				
Cost 2000M				10.01 (14.13)		
HUblt 99-00	36.3 (47.9)					
Pop Dens 00	441.7 (464.6)					
Pop > 25			3100 (2710)			
C/E Ratio	**0.237 (0.31)**	**0.053(0.043)**	**0.039 (0.03)**	**0.0308**	**0.023 (0.014)**	**0.0087**
Sample Size	**76**	**246**	**83**	**231**	**76**	**37**

Table 2.23: Elasticities of Variables with Respect to Cost-Effectiveness

Category/ Variable	ADT2 < 6200	ADT2 6200-13200	ADT2 13200-16100	ADT2 16100-35000	ADT2 35000-94000	ADT2 94000-152000
ADT2	-1.58	+ 0.63		- 0.41	-0.647	-2.08
Forecast V/C Ratio		- 1.28			-0.630	
Lanes After		-1.13				
Cost 2000M				+ 0.18		
HU built 99-00	-0.49					
Pop Dens 00	+ 0.72					
Pop > 25			-0.13			

7. Summary

This review of the interactions between additional factors affecting cost-effectiveness reinforces the initial findings above. For most of the volume-range groups, **the key interactions are with 'after' traffic and Forecast V/C ratio**. These measures also provide a convenient way of estimating the likely cost-effectiveness of a particular project design, based on probable traffic to be carried and the size of the project as measured by its capacity. Generally, projects that carry more traffic per unit of capacity are likely to be most cost-effective.

In addition, selected secondary effects were found with some characteristics of the nearby population. In particular, for lower volume facilities, cost-effectiveness was found to improve (decline) with increasing recent housing construction, but worsen (increase) with increasing nearby population density. This latter result can be interpreted as indicating that, at least in North Carolina, project costs increase more rapidly than traffic as nearby density increases, so overall cost-effectiveness worsens as density rises. However, this is only the case for low-volume projects; for projects with traffic volumes greater than about 6200 ADT, nearby density does not affect cost-effectiveness.

The elasticities of cost-effectiveness with respect to ‘after’ traffic were found to be generally significant, often greater than 1.0, meaning that increases in ‘after’ traffic result in greater-than-one scale returns in cost-effectiveness. These results mean that, generally, more cost-effective projects will be those with higher traffic volumes after completion. Elasticities of highway-related variables were generally found to be greater than those of demographic variables, and the statistics of the models were also stronger. This means that generally, highway planners need not worry extensively that project cost-effectiveness will be significantly affected by nearby demographics. **Instead, project cost-effectiveness can be largely estimated from the basic data on the project itself, particularly its traffic immediately after completion and its volume/capacity ratio**.

IV. Conclusions and Recommendations

A. Conclusions

This Section briefly summarizes the primary findings of the study, by section.

1. Literature review

- A wide variety of definitions of 'cost-effectiveness' exist in the transportation literature. However, the most common are those that relate project costs to user benefits (savings in travel time, operating cost, and accidents. A few include additional considerations such as air quality and/or noise impacts, and sometimes economic impacts to non-users.
- Most states use some form of 'cost-effectiveness' procedure in assessing and comparing highway projects for possible funding.
- Comparative assessment of projects of different types complicates the choice of a 'cost-assessment' measure since different projects often have different impacts and are directed at different goals.
- Most comparative measures use a measure of project use such as traffic (ADT) or vehicle-miles, and a discounted measure of costs to be incurred over the life of the project. However, few measures are directly related to cost-benefit calculations.

2. State highway system overview

- North Carolina has the 2nd largest State-owned highway system in the Nation, but no county road system.
- About 20 percent of the State's traffic, but just 1 percent of the mileage, is on the Interstate System, which averages 35,000-72,000 ADT. Lower classifications typically average 2000-10000 ADT. The cutoff for the higher functional classes (minor arterials and above) is about 6000 ADT.
- Overall, North Carolina's travel has increased about 43 percent in the last decade. Urban travel grew about as fast as urban population, but rural travel grew almost 10 times faster than rural population because of increased connectivity and longer distance travel.
- Although the condition of the State's road system has improved over the past 20 years, its condition has deteriorated substantially in the last several years and the State has lost ground against other states. North Carolina now ranks in the 30s and 40s on key indicators of road condition.

3. Funding the system

- During the 1990s the State's population increased 21 percent, travel increased 43 percent, and fuel use increased 33 percent. These trends are expected to continue.
- The state's fuel tax rate, 22-24 cents/gallon, has changed little in the past 13 years.
- Between 1990 and 2002, revenues from the State's primary highway taxes (fuel and motor vehicle taxes) increased 49 percent, but the percent going to highway capital and maintenance fell from 74.1 to 72.8 percent. In 2002, $441 M of 1626 M went to other needs.

- Funds from other sources, particularly federal funds, increased sharply during the 1990s. Overall, the State's revenues form all sources increased 93 percent from 1990 to 2002, to about $2.747 B annually. During this same period the portion of funds going to maintenance fell from 22.8 percent to 18.1 percent.
- Over the past 13 years the State has spent about $13.5 B, or about 66 percent of the $20.5 B total, on TIP and Loop projects. TIP and Loop expenditures have increased 206 percent over 13 years.
- The State's major highway distribution formula (Intrastate and TIP) allocates funds to 7 "distribution regions" on the basis of miles to complete the Intrastate system, population, and 1/7 equally. As a result, the distribution of expenditures by Distribution Region, DOT Division, or county varies widely on a per-capita basis.
- Partially as a result, the condition of the State highway system has evolved to be unequal across the State.

4. Cost-effectiveness

- Of the $13.5 B spent on TIP and Loop projects from 1990-2003, $7.34 B was spent on about 349 major projects (750 road sections).
- The overall cost-effectiveness of these projects was 2.67 cents/vehicle-mile, or about 5 % of the cost of driving. These 349 projects vary widely by cost-effectiveness, from as little as 0.3 cents/vehicle mile to over $1.29 per vehicle-mile.
- About 114 sections, out of 750, have a cost-effectiveness of worse than 8 cents/vehicle-mile, 3 times the State average. The cost of these projects is about $1.27 B, or about 18 percent of the total.
- Cost-effective and cost-ineffective projects were constructed all over the State. Neither was concentrated in rural, urban, eastern, western or other locations.
- If cost-ineffective projects were deferred or deleted, reductions would occur in number of new exits, mileage of new 2-lane arterials, new 5-lane arterials, and new 4-lane freeways. Road widenings would be largely unaffected. The savings would amount to about 9 percent of the TIP and loop program. If such a policy were implemented, no region of the state would be unfairly affected.

5. Factors affecting cost effectiveness

- Analysis of the factors affecting project cost-effectiveness determined that the single most important factor is the **project's average daily traffic shortly after completion.** Projects with an 'after' traffic of less than 6200 ADT have an average cost-effectiveness of 24 cents per vehicle-mile, almost 5 times the (unweighted) state average of 5.9 cents. On the other hand, high-volume projects (greater than 94,000 ADT) have an average cost-effectiveness of 0.8 cents.
- A second important factor is the project's **forecast volume-capacity ratio.** Cost-effective projects tend to be those that are designed prudently to carry the forecast traffic adequately and are neither congested nor over-designed.

- Of secondary importance is **project type**: certain project types, particularly new exits, tend to serve low volumes of traffic relative to their cost. New roads, particularly new 2-lane arterials, also tend to serve lower volumes.
- Other factors such as DOT Division, Distribution Region, Board membership, project size, cost or capacity, or nearby population characteristics, tended to be less important than traffic in overall cost-effectiveness.
- Increasing **Board member representation tends to improve project cost-effectiveness** rather than reduce it. However this effect may merely reflect the generally higher traffic volumes on projects in counties with a larger number of Board members.
- The **cost-effectiveness of a proposed project can be estimated in advance of construction**, using a combination of data describing the project, primarily 'after' traffic' and volume/capacity ratio, and other characteristics, depending on traffic volume. Models for estimating project cost-effectiveness are provided for each of 6 volume ranges. This means that project cost-effectiveness can be largely estimated from the basic data on the project itself, particularly its traffic immediately after completion and its volume/capacity ratio.

B. Discussion

1. How should projects be selected?

This analysis suggests that the benefits of highway projects could be substantially improved, relative to their costs, if projects were selected according to their cost effectiveness. In that sense, the study confirms findings from other studies that call for more rigor and benefit-cost assessment in highway fund allocation.

If the benefits are so obvious, why then are projects increasingly NOT selected in this manner? A cynical answer might be that transportation project selection is essentially political, reflecting the power bases of the participants. But other factors must also be considered. For one, transportation project benefits cannot always be quantified in dollar terms, so to select projects solely on this basis would ignore or reduce consideration of other issues. These include improve economic development through improved access, safety, environmental protection, land use compatibility and city form, and social and equity considerations. While many would argue that these factors are even more important than user benefits, perhaps what is needed is a reasonable balance of the two. The purpose of road projects should be to improve mobility by improving network connectivity and access. If they also fulfill other worthy goals, then that also can be a benefit.

Secondly, project selection is not geographically neutral. If projects were selected solely according to user benefits, it is likely that suburban congested geographies would be the major beneficiaries, to the detriment of rural lower-volume regions. Within the political realities of the State, it is not likely that this funding pattern could be sustained for long. Realistically, it may be better to strike a balance between a variety of factors in project selection rather than insist on pure user-benefit criteria that may satisfy only transportation economists.

2. BOT representation.

One of the interesting findings in our study is the lack of a strong correlation between BOT representation and cost-effectiveness. Indeed, we found some evidence that BOT representation actually seems to lead to better projects, not worse, from a cost-effective viewpoint. Although this may be merely a surrogate effect of higher traffic volumes in high-BOT Member counties, it is encouraging to observe that weak projects do not seem to be associated with BOT county representation.

Further analysis is needed to untangle the correlations further. Perhaps we are observing merely a 'fire trucks/fire damage" correlation rather than a causal structure. Another fruitful area of exploration is the effect of time lags: does the presence of a home-county BOT member lead to project selection, and then construction some years later?

3. Optimum timing of projects.

This study has not investigated the question of 'optimum' project timing. The literature (Lewis) provides some theoretical findings in this regard, concluding that optimum timing for project implementation is the point where the year-after benefits just equal the 'hurdle' rate of return for the project. We found tantalizing evidence that this finding might be confirmed here, based on the finding that 'after' traffic shortly after completion was the key element determining cost-effectiveness. More research is needed to determine just when is the best time to build a project. Built too early, and public sector dollars are locked up unnecessarily; too late, and private sector consumers' dollars are wasted in traffic delays.

C. Recommendations

This section of the Report focuses on suggestions for funding the most worthy highway projects while ensuring fair treatment of the State's regions.

1. Program Priorities and Funding Sources

- **Re-focus the Highway Program on Maintenance**. The events of the past several years have sharpened the State's realization that the highway program must be re-focused on stewardship rather than ribbon-cutting. The downward slide in road conditions cannot be reversed by short-term 'fixes'. Improving, and then maintaining, system condition must be the first priority, not the last.

  This will not be easy. Local and state officials understandably focus on major projects such as new facilities and widenings, and many of these needs are real. And the availability of federal funds for major projects but not maintenance increases the tendency to 'over-capitalize' and perhaps 'early-capitalize'. And highway maintenance funds must compete with other needs, both within transportation and in other spheres. Yet it is also clear the State must deal effectively with its highway maintenance needs.

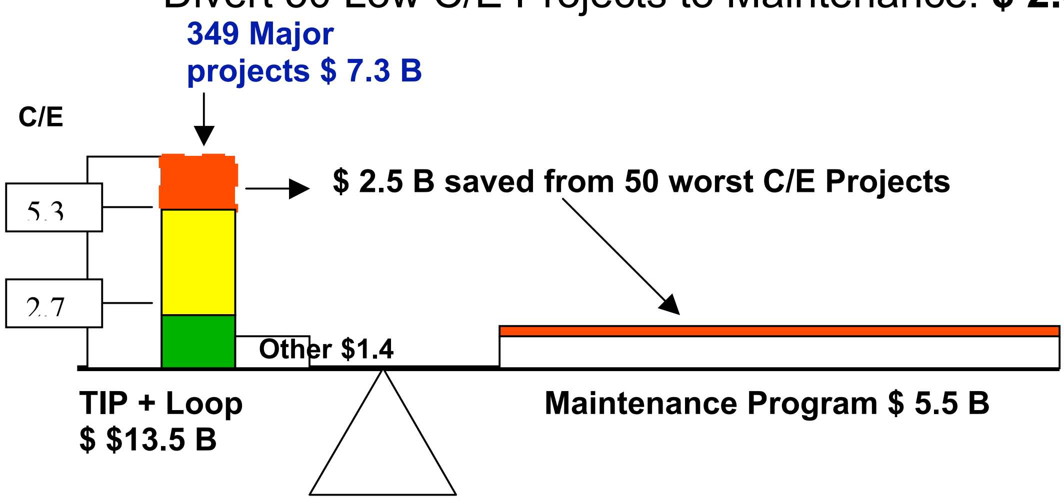
- **No change is needed in the fuel tax rate.** It is tempting to suggest that additional funds for highway maintenance should come from additional user taxes. We do not believe this is wise policy. North Carolina already has one of the highest fuel taxes in the region, and further raises would hurt consumers and businesses and encourage border diversion and skip-over or avoidance by tourists, just at the time that national prices have risen rapidly.

- **Instead, North Carolina should get its additional maintenance funding from shifts in priorities.** We have outlined in this report how better selection of major projects can free up substantial sums for use in maintenance activities. The following figure summarizes the suggested strategy.

Figure 3.1

Strategy for Funding System Maintenance

- Capital and Maintenance Program **$20.5 B** 1990-2002
- Divert 50 Low C/E Projects to Maintenance: **$ 2.5 B**



This Figure suggests that the maintenance program, about $5.5 B over the past 13 years, could have been increased about 40 percent ($2.5 B), by deferring or deleting the funding of about 50 cost-ineffective major highway projects. This shift would have amounted to about 9 percent of the State's funding over the past 13 years.

Looking forward, we suggest that the Legislature, in concert with NCDOT, undertake a similar strategy for the next 10 years, with the intent of increasing long-term maintenance funding by about 40 percent.

- **Constrain the TIP to needed and affordable projects.** Several prior reviews of the highway program in recent years have concluded that the State's TIP is too optimistic, is over-programmed, and understates future costs. This leads to inevitable funding delays and dashed local hopes as construction prices rise and funds tighten. The TIP should be a balanced document that is only slightly over-programmed accounting both for likely increases in project costs and revenue flows but also for project delays.

- **Review all highway fund diversions and non-pavement expenditures.** An additional source of revenue is the considerable diversion of funding from the Highway Fund to other purposes. Over the past 13 years about 25-27 percent, on average, of State highway funds have been used for such purposes. In addition, a declining share of the funds being spent on highways is getting to the pavement as more revenues go into planning and other pre-construction activities.

  We recommend a thorough review of each of these diversions. While we do not doubt the need for these activities, the time has come when we must set priorities between them and highway needs. If these activities are really important, then they should be funded from other revenue sources rather than scarce highway dollars.

- **Innovative financing**. North Carolina should implement innovative ways of financing our transportation systems and in reducing their public costs. The State has recently moved to permit toll roads in selected situations; this is move in the right direction. However, more needs to be done. In the last several years, many states, including South Carolina, have developed State Infrastructure Banks to assist local governments in road financing (thus reducing the pressure on state funds), and used GARVEE and TIFIA bonds to finance major projects. North Carolina needs to review the relevance of these approaches.

2. **Funding Formulas**
   - **Current highway funding formulas should be reviewed and revised.** This analysis shows that the major highway funding formula produces wide variations in per-capita highway fund allocations across the State, with the eastern and western areas receiving more per capita than other regions. We recommend that each of these formulas, but particularly the major Highway Fund formula for Distribution Regions, be reviewed and revised. The portions of the formula that distribute funds on the basis of 'miles to complete the Intrastate System' and '1/7th equally to Distribution Regions", particularly, should be revised. Instead, the formula should

reflect population, system pavement condition, and congestion needs. The other formulas should also be reviewed for current relevance.

- **Separate funding formulas by road classification.** The major funding program, the TIP and Infrastructure program, allocates funds primarily according to geographic criteria rather than road functions. This approach places the needs of the higher road systems, such as the Interstate and other principal arterials, in geographic competition with lower systems and forces localities to choose between one major road job and several smaller ones. The higher road categories that serve longer-distance inter-regional travel and inter-state travel should be put in a separate category from the lower systems.

3. **Project Design and Selection**
   - **Prioritize projects within each road category.** Within each road category, projects should be prioritized and comparatively evaluated for worthiness. The criteria for evaluation should vary slightly by category, but at a minimum should include:
     Cost-effectiveness
     Pavement condition
     Congestion relief (from savings in user travel time costs)
     Increased access (also from savings in user travel time costs)
     Savings in user operating costs
     Savings in accident reduction costs
     Directly attributable economic impacts
     Connectivity and system continuity
     Obviously, this requires the development of accurate comparable traffic statistics and forecasts for all major projects, and the application of a consistent user-benefit-based evaluation methodology for all major projects. Ideally, a user-benefit method such as that now available in the HERS-ST procedure should be applied.

   - **Develop specific rules for project selection.** For instance, this study has found that for traffic volumes less than 6200 per day, road widening or new road construction is rarely cost-effective. The models developed in this Study can serve as the basis for initial guidance on when major construction should occur, and what project design should be selected. These criteria should be based on expected daily traffic volume, peak-hour volume-to-capacity ratios, and other similar measures.

   - **Projects should be selected according to their cost-effectiveness.** It is not enough to evaluate projects comparatively; they must then be selected for the TIP according to their cost-effectiveness. This means applying the evaluation methods uniformly, initially within each distribution region, then later across the entire State.
     Contrary to popular belief, there is nothing in State law that requires the use of the present TIP funding formula BELOW the level

of the 7 Distribution Regions. Until there is, NCDOT has the responsibility, indeed the duty, to select the best projects within each Distribution Region. The present informal practice of using the funding formula at the Division or even the county level simply avoids the difficult task of project selection and rejection.

- **Use cost-effectiveness criteria in determining project selection and design.** The State can set rules that limit its involvement in projects with low cost-effectiveness. For instance, the following criteria might be applied:
    - o Estimated cost-effectiveness < 2.7 cents/vehicle-mile: State funds 100 % of the non-federal share.
    - o Estimated CE between 3 and 5 cents/vehicle-mile: State funds _ of the non-federal share.
    - o CE between 5 and 8 cents/vehicle-mile: State share limited to _ of the non-federal share.
    - o CE > 8 cents/vehicle-mile: No State funds (localities fund non-federal share).

  Such an approach would encourage local governments to support parsimonious road designs that neither under-build nor over-build facilities. Tools such as those developed in this report can be used to estimate project cost-effectiveness in advance of construction.

- **Establish a "New Starts' process for major new roads**. Build roads where demonstrated needs are. Projects should not be built in regions simply for 'geographic' reasons or because 'economic access' encourages them. The State has an additional responsibility to spend taxpayers' money wisely. This approach is similar to that now used by the Federal Transit Administration in evaluating 'new starts' proposals for transit projects. In this approach, local governments would be required to develop road proposals in a consistent manner across the state, and the State would then evaluate those proposals for worthiness and recommend the most cost-effective. As part of the process, local governments would be encouraged by the state-local match rules to use the most parsimonious designs consistent with the approved traffic forecast.

- **Limit major road improvements (widenings, new roads, etc) to the higher functional classes, above collectors and local roads.** There is rarely a compelling need for the State to fund major road improvements on lower functional classes.

- **Apply interim measures before widening.** As traffic increases interim measures are often highly effective in reducing congestion and/or delaying major construction. Examples of such treatments include **coordinated traffic signals, widened intersections and double left turns, channeled intersections, reversible lanes, and**

climbing lanes. Actions such as these should be undertaken before plans for bypasses or expressway-designs roads are moved forward.

- **Implement similar criteria for other modes.** Although this report does not review cost-effectiveness criteria for other systems such as transit, airport, or bikeway-pedestrian actions, they should also be subjected to appropriate cost-effectiveness scrutiny. The goal should be to strengthen cost-effective transit, airport, and train services that serve real needs, and ensure that all services balance the expected use fairly with taxpayer and user costs.

4. Organizational

- **Transportation Board:** Appoint Transportation Board members who are knowledgeable in transportation issues. Specifically prohibit Board Members from engaging in political fund-raising. Charge the Board with setting the state's vision for transportation, not just approving projects.

- **NCDOT**: The NC Department of Transportation has thousands of dedicated professionals whose intent is to manage and improve the State's road system. Hire and reward the best individuals. Provide the analytical tools, data bases, information systems, and management needed to let them do this critical job. Insist on professional, efficient and non-political performance by NCDOT staff.

- **Land use planning:** Encourage local governments to make land use compatible with the functions and capacities of transportation systems, thus protecting the State's investments in improved access. Require commitments from local governments to control access to and development along major facilities, so that the State's investment in better service is not frittered away by increased traffic.

- **Require cooperative planning** for major projects that affect several regions. Make this cooperation mandatory not just for geographically 'nearby' areas, but also distant areas affected by the action.

- **Designate regional MPO allegiances** and boundaries according to economic regions, not jurisdictional lines. Include neighboring states where appropriate.

North Carolina has the nation's second-largest state-owned road system, over 79,000 miles. Our transportation system is the backbone of our economy, providing access to jobs, schools, hospitals, airports and recreation. Without an excellent system our economic progress will be hampered.

Yet we have frittered away the quality of this critical asset by not attending to its maintenance and upkeep. For years North Carolina was known as the Good Roads State, yet now that system is in danger of collapse. Almost 8 percent of the state's rural interstates and almost 11 percent of urban interstates are rated poor-condition. Congestion affects 74.9 percent of our urban interstates. Over 31 percent of our bridges are rated deficient. Rural roads are often too narrow. Our fatal accident rate is significantly above the national average. National ratings show the State's roads rated 44th in condition and 36th overall, down from 8th just a decade ago. Our fuel taxes are the highest in the southeast, but we have the worst road system in our region. The system is collapsing while we fund cost-ineffective improvements.

This situation cannot continue. Good transportation systems are critical to our economy and must provide reasonable and reliable access for all citizens everywhere. The State should act now - not later – to reverse this emerging issue. More money is not the issue. Spending what we have more wisely is the key, by acting to delay or delete funding for the most cost-ineffective actions and moving that money into maintenance needs. By taking the actions suggested in this Study, the State can head off a more serious problem in the future.

Appendices

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Methodology Details

This Appendix provides more detail on the specifics of the methodology used to conduct this assessment.

1. Determine Measures of Cost-Effectiveness:

The brief literature review in Chapter 1 shows that a wide range of measures to compare road projects have been proposed. Although a variety of considerations are available for selecting a measure of cost-effectiveness, the measure chosen for use in this study is:

$$\textbf{Cost effectiveness} = \frac{\textbf{(Project cost, in Year 2002 dollars)}}{\textbf{(vehicle-miles served over 20 years)}}$$

This measure was chosen because it applies equally well to a wide variety or road projects, brings all projects to a 'current year' base, allows for both present and future traffic to be considered, accounts for road section length in both costs and traffic, and uses readily available data.

Although it would be preferable to use a variant of the traditional benefit-cost method, this approach would require forecasts of traffic with and without the facility, a task beyond the range of the study. The method chosen allows future traffic to be adjusted for capacity, but does not, ideally, permit the calculation of benefits to project users or diversion to the project as a result of the improvement.

We recognize that others may take issue with this particular means of determining cost-effectiveness, arguing that it does not account for the myriad factors that should be considered. Particularly, the method does not consider how roads may influence growth or improve safety or increase access, factors which often determine needs in rural areas or in low-volume situations. While ideally these factors could be added to a cost-effectiveness index, others would then argue that still other concerns (for instance, congestion relief) should be also included. Even if included, these many factors would then have to be consolidated, or weighted, in a final cost-effectiveness index, and this is essentially an arbitrary step. We believe that this measure, considering present and future use as the key factor, is overall superior because it brings a wide range of road projects to a common base and avoids the unresolved issue of what importance to place on various factors.

2. Identify Major Projects.

To identify major projects completed in North Carolina over the past 14 years, we reviewed the Transportation Improvement Plans for the past decade, identifying all projects that involved major widenings, new freeways or arterials, new exits, and similar actions. We included in our list a number of major road widenings within cities which, although not on the TIP, would be large enough to affect traffic. The initial effort was completed for the period 1990-2000, and found 312 projects. Searching recent TIPs and supplemental inquiries, we identified an additional 37 projects completed since 2000. Several of these (for instance the Greensboro I-85 loop) were completed as late as March 2004. Ultimately, a **total of 349 projects were identified.**

While there may be additional projects, particularly at the local level, that might be included in a broader search, we are confident that this listing includes the vast majority of major projects constructed in North Carolina over the past 13 years. As a result, we are quite certain that the results of the study, being broad findings from an 'average price' state, may be at least generally if not specifically applicable to other states and perhaps even to the Nation.

To further characterize these projects, we described them according to the nature of the major improvement. Eleven different types of improvements were described, as noted in the following table:

Table A1: Capacity of Project Types

Description	Code	"Before" Lanes	"Before" Capacity	"After" Lanes*	"After" Capacity*
New 2-lane	1	-	-	2	2800
Widen Urban Arterial	2	2	2800	4/5/6	4800/5600/7200
New 4+lane Freeway	3	-	-	4/6/8	9600/14400/19200
Widen Freeway from 4 to 8 Lanes	4	4	9600	8	19200
Widen Rural Arterial	5	2	2800	4/5	4800/5600
Widen Freeway from 4 to 6 Lanes	6	4	9600	6	14400
New Exit	7	2/4 (on X-street	2800/4800	2/4 (on X-street)	2800/4800
New Bridge	8	-	-	2/4	Varies
One-Way Pair (urban CBD)	9	2	1600	4	3200
Climbing Lanes	10	2/3/4	1600 per lane	3/4/5	2400/lane
New 4+ Lane Arterial	11	-	-	4/5	4800/5600

*Several variations (e.g., 4, 5 or 6 lanes) were found in separate projects.

'Before' and 'after' capacities were estimated using rules of thumb from the 2000 Highway Capacity Manual[46], which generally specifies that rural roads have a 2-way capacity of about 2800 vehicles per hour, freeways a capacity of 2400 vehicles per lane per hour, and urban arterials a capacity of about 1200 vehicles per lane per clock hour (effective).

5. Locate Projects Exactly

The source of this information was the maps accompanying each project in the TIP or on the NCDOT website. In a few cases, clarifying calls were made to locate the project exactly, and in a few, field inspections were undertaken to verify the locations. Each of the 349 projects was located exactly within the NC road system and demographics of tracts using the TransCAD© geographic information system. Project locations were determined by comparing TIP maps with background street data available in TransCAD. Each project was broken into several segments according to major roads crossed and changes in traffic volumes or other characteristics. The purpose of this exercise was to be able to identify the exact census tracts for each project, as well as the details of the local traffic picture needed to estimate traffic counts. This yielded **750** separate road segments. Figure 2.9 in the Report shows these project locations.

4. Gather Traffic, Cost and Administrative Data for Each Project

For each project, administrative information and descriptive data (length, lanes, divided or undivided, 'before' and 'after' traffic volume, and estimated capacity) were obtained from project records or from additional research of NCDOT websites or traffic volume maps. The specific source for each of these items is as follows:

- **Section Length**: Data was scaled directly from TransCAD geography, based on exact termini of each project. For sub-sections of projects (sections), lengths were scaled from TransCAD. Where these lengths did not agree closely with the lengths shown in the TIP, checks were made using local maps and a resolution found.
- **Functional class**: Data in TransCAD and TIP. Where unclear, taken from neighboring sections or NCDOT county maps.
- **Administrative class**: same.
- **Route**: Route names from TransCAD and from TIP maps.
- **Infrastructure System**: Coded 0-1, according to whether the project is on the Legislatures' "Infrastructure System" as designated in 1989. This data is reported in the TIP's.
- **PIN Number**: Each project carries a unique 'project identification number' assigned by the NCDOT when it is placed on the TIP. This PIN is used to identify and track the project administratively. Major PIN categories are:

I	Interstate
R	Rural
U	Urban
B	Bridge

  We used the same PINs for NCDOT projects. For a few local projects that were not on the TIP, we assigned 'pseudo-PINs' according to County, e.g., MECK-1.
- **Local Name:** In the TIP, project routes are often identified by their common names. We used these to the extent possible.
- **From**: A brief verbal description of the project's beginning point; used for all sections, of a project, regardless of its actual beginning point within the project length. This information comes from the TIP descriptions.
- **To**: Similar, for end point.

- **Work Description and Project Type Code**: a shorthand description of the work, as described in the TIP; the 1-11 **Project Type Code** was then assigned based on this description.
- **Cost per segment:** The total project cost, as reported in the TIP closest to completion date, allocated proportionally by length to each section of the project. In total, this cost would add up to the reported cost. Also called **"Nominal Cost"** in the project database, since it would be the estimated cost of construction close to the year of completion.
- **Year Completed**: As reported in the TIPs, the most recent 'completion year' for each project. Along with cost, this data provides the 'baseline' information for estimating 2002 project cost. Sometimes, projects were delayed beyond the "Year of Completion"; these were corrected as the information was discovered.
- **'Before' Lanes**: the number of through lanes, before work. Usually available in the TIP, or inferable from local maps.
- **'Before' Capacity (CAP1)**, peak hour. Estimated capacity of the section, before work, based on road geometry and number of lanes. See Table A.1. For new roads, left blank.
- **Year of 'Before' Traffic (Year1)**: Year in which the pre-work traffic count was taken. For new roads, left blank.
- **ADT1 ('Before' Traffic)**: Traffic count, as an average daily traffic, prior to the work. For new roads, left blank.
- **'Before' VMT and 'Before" VMC**. **(VMT1 and VMC1):** Estimates of vehicle-miles-of-travel and vehicle-miles-of-capacity, prior to work. Calculated as ADT*Length and CAP1*Length.
- **"After" lanes**: Same as above, after work completed.
- **'After' Capacity (CAP2)**: Same as above, after work competed. Based on the TIP's description of the number of lanes, or on field verification.
- **Year of 'after' traffic (Year2):** Same as above, shortly after work completed.
- **ADT2 ("After" Traffic):** Same as above, after work completed**.** After-work traffic counts are generally 2-3 years after completion, in time for the project to stabilize its immediate traffic diversion if any, but before longer-term growth can begin.
- **'After' VMT and VMC (VMT2 and VMC2).** Same as above, after work completed.

5. Estimate Future Traffic

In order to estimate the cumulative traffic served over the life of a facility, we must make a forecast of future traffic, 20 years from the point of completion. The procedure for doing this is as follows:

- **Historical traffic growth rate.** Reviewing the traffic count data for each project, about 2/3 of the 349 projects had both prior (ADT1) and post-construction (ADT2) traffic counts, for 2 separate years. The remainder were new sections (and therefore have no prior count) or were so recently completed that a traffic forecast has not yet been reported. These counts were carefully reviewed for reasonableness, and a few (those showing large changes) were checked using other count sources. At conclusion, about ___ of the 750 project sections had 2 traffic counts available.

- **Future traffic growth rate.** To forecast traffic a future growth rate must used; alternatively in urban areas forecasts can be obtained from 20-year transportation plans for urban regions. We elected not to use these forecasts since they often depend on other actions that may or may not come true.

  Future growth rates are calculated from either the current count trends, or from historical data from the region. For those sections with 2 counts, the growth rate, uncompounded per year, is:

  $$\mathbf{G = (ADT2 - ADT1) / ADT1 / 100 / (Year2 - Year1)}$$

  For road sections without 2 counts, the growth rate was estimated by reviewing aggregate traffic growth, per mile of road, for roads of similar functional classes from the region. This data was obtained from the State's 1995 and 2002 Highway Performance Monitoring System, which is submitted to the federal government annually. The Appendix also shows the relevant data for North Carolina.

  Once growth rates were obtained for each section, they were then reviewed for reasonableness against regional trends, too-fast or too-slow growth, and reasonable forecasts. Adjustments were then made to traffic growth rates that appeared to be unreasonable, either too fast or too slow, for the area/functional class.

- **Forecast year.** The forecast year is assumed to be 20 years after the year of completion of the project, as recorded in the TIP. Most highway projects have an assumed lifetime of 20 years, this being the standard forecast timeline.

  Forecast Year = Year of Completion + 20

- **Future Traffic at Forecast Year.** The future traffic in the forecast year is calculated as the 'after' traffic (ADT2), times the growth from the year of completion to the forecast year:

  $$\mathbf{V_f = ADT2 * (1 + G * (Forecast\ Year - Year2))}$$

- **Adjusted Traffic at Forecast Year.** Forecasts of traffic on isolated road sections do not, in and of themselves, account for increased accessibility or congestion effects. Increased accessibility, caused by increases in speed, can cause additional traffic growth (sometimes caused "induced traffic"). But as traffic increases toward the finite carrying capacity of the facility, growth may also slow as traffic diverts to alternative paths. Ideally, these effects would be modeled in each region using the travel demand modeling systems of each area, but this task is beyond the range of this studyAs an approximation, we dealt with these effects as follows:

- **"Induced traffic".** Our prior study of traffic growth in North Carolina[47] indicated that in most rural regions and many urban regions these effects are minor and are overshadowed by the background growth that would have occurred anyhow. In addition, most of the road projects reviewed in this study did not change travel speed substantially and therefore would not have attracted traffic above and beyond the projected background growth. Thirdly, the 'second year' traffic counts for most projects (so-called ADT2 counts) were made within 2-3 years of the project's completion and therefore would have included the short-term 'diversion' effect but not the growth effect. Therefore no adjustment was made for 'induced traffic'.
- **Congestion effect**. This effect, well known in traffic studies, occurs as traffic increases toward the carrying capacity, a finite limit for most facilities. As traffic approaches the capacity, speeds slow and travel times increase exponentially, diverting additional traffic and slowing growth. The effect is a reduction in traffic growth as volumes rise. Since many projects in our study are predicted to have higher traffic volumes in the future, this effect should be considered.

  To account for this effect, several adjustments in traffic forecasts were made. First, the estimated forecast-year traffic (reduced to peak-hour) was compared to the estimated capacity (based on number of lanes and road classification). This comparison was made by estimating the peak hour forecast traffic as 9 % of the forecast-year daily traffic. Then, for those roads for which the forecast peak hour traffic is greater than the capacity, forecast-year traffic was reduced to peak hour capacity, since peak-hour traffic cannot be greater than the capacity. Mathematically:

  $$\textbf{If} \quad V_f * 0.09 > CAP2,$$
  $$\textbf{then} \quad V'_f = CAP2 / 0.09$$

  This adjustment affected only about 15 projects, mostly high-volume Interstates, and had the effect of reducing their forecast traffic volumes by about 5-15 percent.

  For sections with traffic forecasts less than capacity an adjusted forecast traffic is computed using the well-known BPR delay equation:

  $$T'_f / T_f = 1 + 0.15\,(V_f / CAP2)^{4.0}$$

where T is the travel time over the section, V is the traffic volume, and C is the capacity. The BPR equation is widely used in traffic modeling as a means of slowing traffic as congestion increases. Then, the adjusted forecast traffic is:

$$\mathbf{V'_f = V_f * (1- e\,(T'_f - T_f)/T_f))}$$

Where the term '**e**' is the elasticity of demand with respect to travel time. This value was assumed to be -0.5, following the analysis of Lee[48] and others. This adjustment was also generally small, about 5 percent for roads with V/C ratios close to 1.0 and much smaller for roads with lower V/C ratios. Most rural roads were not affected.

6. Calculate the 20-year vehicle-miles served for each project. Twenty-year vehicle-miles-of-travel[49] on each segment is estimated by multiplying the average of the 'after' (ADT2) and '20-year' adjusted forecast traffic by project length, and the 20-year forecast period, annualized:

$$\mathbf{VMT20 = \_\ (ADT2 + V'_f) * Length * 20 * 365}$$

7. Adjust Project Costs to 2002. To compare projects fairly, those built earlier must be adjusted for inflation, since they would have cost more if built later. For example, a project built in 1990 would cost about 49 percent more, in nominal dollars, if built in 2002.This adjustment is applied to each project's cost according to the year in which it was constructed, based on NC highway construction indices. The cost adjustment was made using annual highway construction cost indices for North Carolina. (2002 dollars are the latest available.)

Nominal (year of completion) costs for new road projects were estimated from the Transportation Improvement Programs (TIPs) for various years, which provides estimates of total cost of construction including right-of-way. Costs for recently completed projects were obtained from Project Breakdown Maps, which were obtained from the North Carolina Department of Transportation (DOT) website, at www.ncdot.org. The paper versions of the TIPs were published bi-annually, and cost estimates collected in this study may not necessarily be from the most recent publication. In addition, sometimes projects are delayed or costs increase; we did not research these costs to determine the 'final' audited costs after completion.

When a project was coded as a group of contiguous road sections, the total cost was allocated proportionally to length, by multiplying the ratio of the section lengths to the total length to calculate a cost per section. This is listed in the dataview as "Cost Segment". The "Cost Segment" field represents dollar amounts nominal to the year the project was reported completed according to the TIP. In some cases, only certain phases of a project were of interest because the completion date of some sections was outside our time frame of study.

Data in the “Cost Segment” field for each project segment were then adjusted to 2002 dollars, listed as ‘Cost in 2002$’, by multiplying ‘Cost Segment’ by a Cost Adjustment Factor (CAF) for 2002:

2000 Cost = (Cost Segment) * Cost Adjustment Factor

Cost Adjustment Factors for 2002 were calculated using the Price Index for 1987 from Price Trends for Federal-Aid Highway Construction, published by the Federal Highway Administration[50]. To adjust the Price Index for 1987 to 2002 values, the index listing for each year was divided by the index listing for 2002. “Price Index for 1987” had no data for years between 1987 and 1994. These were estimated using a straight-line projection assuming 0.57 annual growth in the price index. Adjustment factors for 2003 and 2004 were estimated as .985 and .980, representing the modest inflation that has occurred since 2002. Our results were also compared against the GNP Implicit Price Deflator and the CPI Index[51]. The following table shows the resulting indices.

Table A.2 Cost Adjustment Factors

Year Completed	NC Highway Construction Index, 1987 base	Adjustment to 2002 $ (ratio of year’s index to 2002 index)
1990	101.70	**1.488**
1991	102.27	**1.480**
1992	102.84	**1.472**
1993	103.40	**1.464**
1994	103.97	**1.456**
1995	123.13	**1.229**
1996	128.28	**1.180**
1997	143.40	**1.055**
1998	124.58	**1.215**
1999	132.05	**1.146**
2000	133.76	**1.131**
2001	154.65	**0.979**
2002	**151.34**	**1.000**
2003		**0.985 est**
2004		**0.980 est**

8. Calculate 20-year cost-effectiveness for each project.

The cost-effectiveness of each project segment, in 2000 dollars per vehicle-mile served, is computed as the 2002 Project cost divided by the 20-year VMT served:

Cost-Effectiveness = (2002 $ Cost) / (20-Year VMT Served)

This formula produces an index for each project section, in cents per VMT. This index is the basic statistic used for most of the analyses in our report.

9. Political Districts and County TIP and Loop Expenditures

Initially the study work plan called for developing GIS layers of North Carolina's state Assembly and Senate districts. The hope was to identify how these political boundaries affected project selection. However, no readily usable GIS-based maps are available for the 1985-1994 timeframe. Further, more discussion revealed that what was really needed was the representation maps for the members of the NCDOT Board of Transportation (BOT), since these appointees approve the TIPs and hence the major projects. BOT members are appointed to represent groups of counties, so in theory the entire state is 'represented' each year. However, each Member also has a 'home county' of residence. We requested (from NCDOT) and received the names and addresses of all 118 BOT members (including DOT Secretaries) since 1985. This document is also shown in the Appendix.

The BOT membership data were then analyzed to determine, for each county in the State, the exact number of board members serving during each year. Members serving more than 6 months of a given year were assumed to be present for the whole year. NCEOT Secretaries were included in the BOT membership since they chair the Board *ex officio*. A detailed spreadsheet indicating the names and terms of service for each BOT member, identified by 'home county', was then prepared. From this data, a summary table was developed showing, for each county, the number of BOT members for each year, and the total for the entire 18 year period. Results showed that 51 counties, including several very large counties, have had no BOT membership at all in the past 20 years. Wake County has had the highest representation, at 36 "members" over 18 years; Mecklenburg was second with 26. (Several large-population counties have occasionally had more than one member serving simultaneously).

Data on county TIP and Loop expenditures for each year was also obtained from NCDOT's accounting systems. The data was consolidated by county, DOT Division, DOT Distribution Region, and each year. The Appendix also provides this information.

10. Estimate Nearby Demographics

In evaluating the factors affecting project cost-effectiveness, it is also useful to have information on the characteristics of the population residing near the project. This data is obtainable by 'stripping off' population data from the Census blocks or tracts near the project, say 1 mile. Using TransCAD's 'Band' procedure and Census Tract statistics, the characteristics of the population living within 1.0 mile of each project were calculated and 'tagged' to each project. Figure 2.12 in the Report provides and example of the result.

11. Merge Project, Expenditure, Board and Demographic Data.

Using the 'join' procedures in TransCAD, data on projects, county expenditures, Board membership, and population characteristics of nearby areas were merged together and associated with each project section. This procedure created a large 'join' consisting of 750 project records, each with about 300 data items. This 'join' was then used in later summaries and modeling tasks.

12. Explore Relationships Between Cost-Effectiveness.

To undertake this step, we computed cost-effectiveness averages for a variety of variables. The primary classifiers reviewed were:

- Project type
- Project size (length, cost)
- DOT Division
- DOT Distribution Region
- Board membership
- Traffic, congestion and capacity
- Nearby population, population wealth, and density

Initially, tabulations were used to calculate the distributions of projects by number, length, nominal cost, 2000 cost, and VMT served by each of these variables. This process allowed us to isolate several variables as being key discriminators of project cost-effectiveness.

Next several modeling tools were used to further explore the relationships. One of these, KnowledgeSEEKER©[52], is a classification tool that separates a data set into increasingly fine partitions based on ability to explain variation in a dependent variable, in this case cost-effectiveness. The software produces a 'classification tree' showing increasingly smaller partitions of the data set. The method is particularly useful when the original data has a variety of coded, non-linear, verbal descriptor, and other 'messy' variables, as does our data here. To use this tool, data layers in TransCAD were exported to spreadsheets and then converted to KnowledgeSEEKER databases.

Another well-know tool, regression analysis, was also used to sharpen the findings of the KnowledgeSEEKER results. Regression analysis is widely used in modeling and is based on the assumption that a linear (in parameters) relationship exists between a dependent variable, in this case cost-effectiveness, and a group of 'independent' variables. The model takes the form:

$$\mathbf{Y = a + b_1 X_1 + b_2 X_2 + \ldots . + e}$$

Where Y is the 'dependent' variable, X's are the 'independent' variables, and the '**a**' and 'b' terms are the model coefficients. The term 'e' is the error term which includes all effects not measured by the model.

While widely used in modeling, linear regression models also have their limitations, particularly:

1. **Inferences of causality direction.** Regression models assume that the 'independent' variables are known perfectly and direct the changes in the 'dependent' variable, thus inferring causality when generally there is no direct causality present. Analysts are trained to account for this hidden assumption in interpreting regression results.
2. **Dependence on empirical (measurable) relationships:** Regression models of course assume that the data in the equations can be obtained and measured empirically. In fact, variables such as traffic, population, density, and even expenditures are estimates with uncertain measurement error.
3. **Misspecification of variables.** Regression models generally attribute all change in the dependent variable to either the independent variables or to the error term. If the models do not contain enough variables, they may be

mispecified, that is they do not have the underlying data to develop reasonable model relationships.

4. **Independence of the observations**. Regression models assume that the observations in the data are independent of each other. But spatially adjacent or nearby projects are typically spatially correlated, that is adjacent sections of a project tend to have similar values for many common statistics.
5. **Linearity of functional form.** Regression models assume that the relationship between the 'dependent' variable and the 'independent' variables is linear, that is as the independent variables increase or decrease the dependent variable increases or decreases proportionally. The coefficients (b's) express the specific slope of the relationship. However, in spatial models the data are often not linear, but hump-shaped or u-shaped. To account for this possibility, we used the tool KnowledgeSEEKER to explore non-linear relationships.
6. **Autocorrelation between variables**. Regression models assume that the independent variables are not themselves inter-correlated, but in spatial data that is almost always the case. To account for this, we used a 'backwards stepwise' variable selection procedure, eliminating variables with weak coefficients until only the strongest variables remained. Although this procedure does not totally eliminate the problem, it reduces the concern.

In summary, we recognized the limitations of these tools, but since this form is widely used, we used it here because of its popularity in the modeling literature and ease of access, and took steps to account for the primary concerns.

North Carolina Highway Financing Trends, 1990-2002

Table A3:
Revenues and Disbursements for NC State Owned Highways, 1990-2008

North Carolina Federal and State Revenues and Disbursements 1990-2004
Updated 4-12-04

ISTEA | TEA-21 Authorized Apportionments | Assumed 24 Percent Increase Over TEA-21

Federal Revenue (FHWA Appropriation Tables)	1990	1991	1992	1993	1994	1995	1996	1997	1998	FFY99	FFY00	FFY01	FFY02	FFY03	FFY04	2005	2006	2007	2008	sum 2000-08
Interstate	55.7	51.1	111.5	109.3	75.1	71.5	22.4	46.5	64.9	95.3	123.8	100.5	143.1	128.4						
National Hy System	0.0	0.0	14.6	44.9	78.5	92.8	57.9	51.3	86.8	114.4	148.5	119.2	171.1	151.0						
Surface Tr Program	0.0	0.0	1.4	84.3	119.8	121.4	92.9	151.8	248.4	145.3	188.2	182.3	221.3	188.7						
Bridge	38.5	43.8	48.1	52.2	51.0	58.5	45.6	61.8	68.3	86.4	113.7	86.9	122.8	101.7						
CMAQ	0.0	0.0	0.0	2.2	0.6	4.3	4.7	15.7	14.8	13.4	17.8	14.3	20.3	17.8						
High Priority Projects	0.0	0.0	0.2	5.9	21.8	14.1	7.6	17.8	22.6	33.5	40.2	40.2	42.5	42.2						
Minimum Guarantee	74.4	84.5	57.6	87.3	88.8	94.7	39.6	65.4	66.3	222.4	95.6	220.4	99.1	97.8						
Other (Metro plng, App. repr'n, State plng/res, RABA)	217.6	179.8	60.2	75.9	32.4	46.9	41.6	45.7	81.6	32.5	32.8	114.5	46.6	46.8						
Tot Fed $ (millions)	386.2	359.0	321.6	437.0	465.8	504.1	312.5	456.0	695.5	743.2	781.7	848.4	868.9	772.3	957.5	957.5	957.5	957.5	957.5	5038.0
US Gasoline Tax Rate	9.1	14.1	14.1	14.1	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4						
State Tax Rate on Gasoline (MF-205)	21.5	22.6	21.9	22.6	21.3	21.8	21.7	22.6	21.6	21.3	21.3	24.1	22.1	22.1		Based on a 24 % increase from $218 to $270B				
Disposition of State Fuel and Vehicle Receipts (MF-3, MV-3)																				
Motor Fuel: to State Hy Capital, Maint and Admin	622.9	644.8	682.0	618.6	643.8	649.8	651.1	724.2	760.8	695.3	727.9	1007.0	873.1							
: to State Hy Law Enforcement and Safety	78.3	70.5	93.6	104.9	115.6	118.9	128.7	112.1	122.8	136.8	150.7	0.0	156.3							
: to State Hy Debt Service	29.5	30.7	8.3	28.9	27.8	20.0	18.2	3.8	3.8	24.2	25.3	23.9	19.2							
: to Local Roads and Streets	62.8	65.8	64.0	64.3	71.5	93.7	98.8	102.8	104.3	107.8	84.8	118.8	98.9							
: to Mass Transit	8.5	10.5	12.9	15.5	14.4	7.1	0.0	2.4	7.8	18.6	0.0	0.0	23.9							
: to Generan and Non-Hy Purposes	20.4	12.9	8.8	12.4	15.0	2.8	32.8	29.5	0.0	21.5	35.3	25.2	25.0							
Total Motor Fuel	822.4	835.0	848.8	848.6	888.1	892.1	929.6	974.8	999.5	1004.3	1041.7	1174.7	1196.4							
Motor Vehicle: To State Hy Capital, Maint and Admin	183.2	175.7	208.1	194.6	207.5	247.1	246.5	269.4	291.2	120.5	67.3	123.4	312							
To State Hy Law Enforcement and Safety	46.6	43.2	29.2	48.1	37.3	45.2	66.5	59.2	64.3	23.7	41.4	227.0	66.7							
To State Hy Debt Service	8.7	8.4	2.0	9.1	8.9	7.8	6.9	1.4	1.8	4.2	2.3	2.9	6.9							
To Local Roads and Streets	18.5	18.1	19.8	21.8	23.0	8.3	9.4	10.1	7.8	18.7	125.6	14.5	25.8							
To Mass Transit	2.5	2.9	4.0	4.9	4.8	2.7	0.0	0.9	2.9	3.2	0.0	0.0	6.8							
To General and Non-Hy Purposes	6.0	2.1	4.0	4.2	5.1	1.2	4.5	3.1	0.0	0.3	1.1	0.0	0.0							
Total Motor Vehicle	265.5	250.4	265.2	282.7	286.4	312.1	333.8	344.1	367.9	170.6	237.8	367.8	429.8							
State HY Capital and Maint	806.1	820.5	888.1	813.2	851.3	896.9	897.6	993.6	1052.0	815.8	795.2	1130.4	1185.1							
State Hy Law Enforcement	124.9	113.7	123.0	153.0	152.9	164.1	195.2	171.3	187.1	160.5	210.1	227.0	223.0							
State Hy Debt Service	38.2	39.1	8.3	38.0	36.7	27.8	25.1	5.0	5.5	28.4	27.6	26.8	26.1							
Local Roads and Streets	81.3	83.7	83.8	86.1	94.5	102.0	108.2	112.9	112.1	126.5	210.2	133.1	124.5							
Mass Transit	11.0	13.4	16.9	20.4	19.0	9.8	0.0	3.3	10.7	21.8	0.0	0.0	32.5							
General and Non-Highway	26.4	15.0	13.8	16.6	20.1	3.8	37.3	32.8	0.0	21.8	36.4	25.2	25.0							
Total State Fuel and MV Recpts	1087.9	1085.4	1114.0	1132.3	1174.5	1204.2	1263.4	1318.7	1367.4	1174.7	1279.5	1542.5	1626.2							
Total to Transit, Local and General	118.7	112.1	114.6	128.1	133.6	115.6	145.5	148.9	122.8	170.0	246.6	158.3	182.0							
Percent of State Receipts to Transit, Local and General	10.9	10.3	10.3	11.3	11.4	9.6	11.5	11.3	9.0	14.5	19.3	10.3	11.2							

Revenues for State-Administered Highways (SF-3)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	sum
Motor fuel taxes	730.8	748.0	762.2	752.5	787.2	788.7	798.0	839.9	887.6	856.3	821.9	1030.9	1048.6							
Motor vehicle/motor carrier	238.5	227.4	237.3	251.6	253.7	299.9	319.9	330.0	357.0	148.4	111.1	353.3	365.6							
Road and crossing tolls	1.4	1.3	1.4	1.4	1.4	1.5	1.5	1.4	1.7	1.7	1.6	1.6	1.9							
Gen Fund	0.0	0.0	0.0	0.3	0.0	0.0	5.1	14.7	1.4	0.0	500.5	138.0	17.4							
Other state imposts	0.0	24.0	63.6	100.3	150.6	184.2	218.1	237.8	283.4	502.9	54.4	375.2	303.6							
Miscellaneous	57.8	95.6	90.6	93.6	104.5	58.4	70.9	55.8	53.0	101.0	82.2	86.9	44.3							
Bonds for capital outlay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	250.0	0.0	0.0	0.0	0.0							
Bonds for debt service	0.0	0.0	0.0	0.0	35.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Federal funds, FHWA	379.2	335.0	316.5	360.3	469.6	508.4	385.9	430.1	558.0	692.0	729.2	835.0	929.8							
Federal funds, other	3.4	3.3	3.6	3.4	4.3	4.7	6.7	18.0	3.6	4.7	0.0	10.3	9.1							
From local governments	13.1	13.2	14.7	22.9	17.6	14.9	11.9	8.8	0.0	20.5	0.0	8.1	7.1							
Total revenues for state-ad hys (mil)	1424.2	1435.8	1489.9	1599.3	1849.3	1860.7	1816.1	1935.9	2360.6	2327.6	2400.8	2837.3	2747.7							

State: Disbursements for State-Admin Roads (SF-4C)	1990.0	1991.0	1992.0	1993.0	1994.0	1995.0	1996.0	1997.0	1998.0	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	sum
Right of Way Acquisition	72.2	73.6	104.2	112.3	130.0	114.7	129.1	181.7	218.6	234.7	231.2	251.2	300.3							
Preliminary and Construction Engineering	113.5	104.7	134.5	144.6	167.9	189.8	196.2	210.8	223.3	273.4	274.1	341.8	308.5							
Construction and Preservation	532.9	583.2	533.9	561.1	640.1	703.9	696.0	770.1	880.7	974.9	958.9	1140.7	1201.7	Sum 90-02						
Sub-total Capital	718.5	761.5	772.6	817.9	937.9	1010.4	1021.3	1162.3	1322.5	1483.0	1464.2	1733.7	1810.5	15016.3						
Sub-total Physical Maintenance	308.8	319.1	330.2	384.2	412.3	400.0	424.1	423.7	521.8	467.9	463.7	499.7	518.3	5454.1						
Traffic Control Operations	19.6	19.7	18.9	0.0	0.0	23.1	0.0	25.0	26.6	27.3	26.5	26.3	26.2	263.6						
Snow and Ice Removal	15.5	16.0	15.6	16.4	16.9	17.5	15.5	16.2	17.0	16.2	17.4	18.2	18.1	216.3						
Other Services	0.0	0.0	0.0	0.3	0.0	0.0	1.1	1.1	0.0	0.0	0.0	0.7	0.4	3.6						
Toll Collection	18.8	7.7	7.5	7.0	7.5	7.3	6.8	7.1	1.0	0.0	18.9	18.9	6.9	115.2						
Sub-total Highway and Traffic Services	54.0	43.4	41.9	23.6	24.4	47.9	23.4	49.4	44.6	43.5	61.8	67.1	53.6	578.7						
Sub-total Administration and Research	93.5	106.9	103.3	115.2	115.1	117.8	136.5	169.7	151.1	152.1	134.3	170.7	227.5	1797.7						
Traffic Supervision	88.9	78.5	82.8	87.1	98.0	99.3	105.3	108.1	122.6	124.2	124.9	128.5	130.3	1378.3						
Highway Safety Driver Ed	19.0	34.7	37.9	24.4	52.0	64.0	71.9	45.0	45.2	10.6	13.8	80.7	69.0	568.2						
Vehicle Inspection	30.2	5.8	6.2	23.3	6.9	5.3	5.3	5.3	5.5	3.4	62.9	0.0	5.9	165.9						
Vehicle Size and Weight Enforcement	0.0	0.0	0.0	21.5	0.3	0.3	18.0	17.9	17.6	27.1	27.7	27.2	23.8	181.3						
Sub-total Highway Law Enforcement	138.0	117.0	126.8	156.4	157.1	168.8	200.5	176.2	190.8	165.4	259.3	236.5	228.9	2311.5						
Interest on Bonds	10.6	9.2	8.3	6.4	4.0	1.8	0.6	0.1	5.5	11.7	10.9	0.0	9.4	78.8						
Bond Retirement/Refunding	27.3	29.9	0.0	31.6	63.2	25.8	24.6	4.9	0.0	18.7	18.7	0.0	18.7	257.4						
Grand Total (ten millions)	1345.1	1387.1	1372.9	1535.3	1714.6	1771.7	1830.9	1986.4	2235.4	2340.2	2410.9	2707.6	2865.9	25504.5						33488.0
Total Capital and Physical Maintenance Spending	1027.4	1080.6	1092.8	1202.2	1350.2	1410.4	1445.3	1586.1	1843.5	1950.9	1927.9	2233.4	2328.8	20480.4						25971.4
% Spent Capital and Physical Maintenance	76.3	77.9	79.6	78.3	78.8	79.6	78.9	79.8	82.5	83.4	80.0	82.5	81.3							
% Spent on Capital	53.4	54.9	56.3	53.3	54.7	57.0	55.8	58.5	59.2	63.4	60.7	64.0	63.2							
% Spent on Maintenance	22.9	23.0	23.3	25.0	24.1	22.6	23.2	21.3	23.3	20.0	19.2	18.5	18.1							

Board of Transportation Representation

NCDOT Board of Transportation History of the Statutory Qualifications of Members		
Year	**Number Of Members**	**Statutory Qualifications**
1982	24	Chairman 14 appointed from highway districts 7 at-large 2 appointed by the General Assembly - Upon recommendation of the Lt. Gov. and the Speaker
1993	24	Chairman 14 appointed from highway districts 6 at-large Chairman of the NC Rail Council 2 appointed by the General Assembly - Upon recommendation of the Lt. Gov. and the Speaker
1995	24	Chairman 14 appointed from highway districts 6 at-large Chairman of the NC Rail Council 2 appointed by the General Assembly - Upon recommendation of the Pres. Pro Tem. and the Speaker
1997	26	Chairman 14 appointed from highway districts 6 at-large Chairman of the NC Rail Council 4 appointed by the General Assembly - Upon recommendation of the Pres. Pro Tem. and the Speaker
1998	19	14 appointed from highway districts 5 at-large, with expertise in the following areas: - The environment - State ports and aviation - Rural transportation - Mass transit - Government-related finance and accounting

Source: NCDOT Website

NCDOT Board of Transportation History of the Statutory Qualifications of Members		
Year	**Number Of Members**	**Statutory Qualifications**
1915	7	Governor Citizen from eastern NC Citizen from central NC Citizen from western NC State Geologist Professor of civil engineering at the University of North Carolina Professor from North Carolina Agricultural and Mechanical College
1921	10	A "practical business man" to serve as chairman 9 members appointed from districts - 6 from majority party - 3 from minority party
1931	7	Chairman 6 at-large members - 1from the minority party
1933	7	Chairman 6 at-large members
1937	11	Chairman 10 members appointed from districts
1953	Up to 16	Chairman Up to 15 members appointed from districts
1957	7	Chairman 6 members "from different areas of the State"
1961	19	Chairman 18 members "from different geographic areas of the State"
1973	13	Chairman 9 members 3 members of the General Assembly
1977	24	Chairman 14 appointed from highway districts 7 at-large - 1 from the minority party (No more than 2 of the 21 above from the same engineering district) 2 members of the General Assembly

NC BOARD OF TRANSPORTATION MEMBERSHIP 1985-2004

COUNTY	DOT DIV	DOT DIST REG	MBR YRS		04	03	02	01	00	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
ALLEGHANY	11	F	0																					
ANSON	10	E	0																					
ASHE	11	F	0																					
AVERY	11	F	0																					
BEAUFORT	2	B	0																					
BERTIE	1	A	0																					
BURKE	13	G	0																					
CABARRUS	10	E	0																					
CAMDEN	1	A	0																					
CASWELL	7	D	0																					
CLAY	14	G	0																					
CLEVELAND	12	F	0																					
COLUMBUS	6	C	0																					
CRAVEN	2	B	0																					
CURRITUCK	1	A	0																					
DAVIDSON	9	D	0																					
DUPLIN	3	B	0																					
FRANKLIN	5	C	0																					
GRAHAM	14	G	0																					
GRANVILLE	5	C	0																					
GREENE	2	B	0																					
HALIFAX	4	A	0																					
HARNETT	6	C	0																					
HERTFORD	1	A	0																					
HOKE	8	E	0																					
HYDE	1	A	0																					
LINCOLN	12	F	0																					
MACON	13	G	0																					
MADISON	14	G	0																					
MCDOWELL	1	G	0																					
MITCHELL	13	G	0																					
MONTGOMERY	8	E	0																					
NORTHAMPTON	1	A	0																					
PAMLICO	2	B	0																					
PASQUOTANK	1	A	0																					
PENDER	3	B	0																					
PERQUIMANS	1	A	0																					
PERSON	5	C	0																					
POLK	14	G	0																					
ROCKINGHAM	7	D	0																					
SCOTLAND	8	E	0																					
STOKES	9	D	0																					
TRANSYLVANIA	14	G	0																					
TYRRELL	1	A	0																					
VANCE	5	C	0																					
WARREN	5	C	0																					
WASHINGTON	1	A	0																					
WATAUGA	11	F	0																					

NC BOARD OF TRANSPORTATION MEMBERSHIP 1985-2004

COUNTY	DOT DIV	DOT DIST REG	MBR YRS		04	03	02	01	00	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
WILKES	11	F	0																					
WILSON	4	A	0																					
YADKIN	11	F	0																					
YANCEY	13	G	0																					
CHOWAN	1	A	1																					
Waff								X																
SAMPSON	3	B	1																					
Strickland																		X						
CARTERET	2	B	2																					
Newsom																	X	X						
DAVIE	9	D	2																					
Brock																							X	X
LEE	8	E	2																					
Darden																	X	X						
MARTIN	13	A	2																					
Roberson																							X	X
HENDERSON	14	G	3																					
Edney																	X						X	X
Youngblood																								
IREDELL	12	F	3																					
Collier					X																			
Johnson						X	X	X																
ALEXANDER	12	F	4																					
Robertson																					X	X	X	X
BLADEN	6	C	4																					
Campbell					X	X	X	X																
CHATHAM	8	E	4																					
Holmes													X	X	X	X								
CHEROKEE	14	G	4																					
Raper													X	X	X	X								
JACKSON	14	G	4																					
Burrell					X	X	X	X																
JOHNSTON	4	A	4																					
Stephenson									X	X	X	X												
RUTHERFORD	13	G	4																					
Thomas																					X	X		
Barbee																							X	X
DARE	1	A	5																					
White					X																			
Owens													X	X	X	X								
JONES	2	B	5																					
Mattocks												X	X	X	X	X								
LENOIR	2	B	5																					
McRae					X	X	X	X																
Poole											X													
RANDOLPH	8	E	5																					
Pugh																				X	X	X	X	X

NC BOARD OF TRANSPORTATION MEMBERSHIP 1985-2004

COUNTY	DOT DIV	DOT DIST REG	MBR YRS		04	03	02	01	00	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
MOORE	8	E	6																					
Paine																	X	X						
Thompson																			X	X	X	X		
ORANGE	7	D	6																					
McCoy									**X**	**X**														
Gilbert													X	X	X	X								
SWAIN	14	G	6																					
Myers																			X	X	X	X	X	X
GATES	1	A	7																					
Godwin																	X	X	X	X	X	X		
Rountree																							X	
HAYWOOD	14	G	7																					
Leatherwood									X	X	X	X												
Hardin																		X						
Palmer																						X	X	
STANLY	10	E	7																					
Nance																	X	X	X	X	X	X		
Garrison																							X	
ROBESON	6	C	8																					
Green									X	X	X	X	X	X	X	X								
ALAMANCE	7	D	10																					
Hunt															**X**	**X**								
Rohadfox																	X	X						
Buchanan																			X	X	X	X	X	X
GASTON	12	F	10																					
Dalpiaz																	X	X						
Younger																			X	X	X	X		
Williams																					X	X	X	X
NASH	4	A	10																					
Betts					X	X																		
Laughery																	X	X						
Bishop																			X	X	X	X	X	X
ONSLOW	3	B	10																					
Sewell					X	X	X	X																
Pollard																			X	X	X	X	X	X
WAYNE	4	A	10																					
Barnes													X	X	X	X								
Lane																	X							
Goodson																		X	X	X	X	X		
BRUNSWICK	3	B	11																					
Stanley									X	X														
Williamson												X	X	X	X	X								
Harrelson																	**X**	**X**	**X**	**X**				
CATAWBA	12	F	11																					
Gaither										X	X	X	X	X	X	X								
Proctor																	X	X	X	X				

NC BOARD OF TRANSPORTATION MEMBERSHIP 1985-2004																								
		DOT																						
	DOT	DIST	MBR																					
COUNTY	DIV	REG	YRS		04	03	02	01	00	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
UNION	10	E	11																					
Helms					X	X	X	X																
Dillon									X	X														
Edwards												X	X	X	X	X								
DURHAM	5	C	12																					
Cox					X	X	X	X																
Michaux									X	X														
Rand																			X	X	X	X	X	X
NEW HANOVER	3	B	12																					
Wilson					X	X	X	X																
McColl									X	X														
Mills												X												
Garrett												**X**	**X**	**X**										
Williams																	X	X						
RICHMOND	8	E	12																					
Kindly					X	X	X	X	X	X	X	X	X	X	X	X								
ROWAN	9	D	12																					
Kluttz						X	X	X	X	X	X	X	X	X	X	X								
Alexander																								X
SURRY	11	F	12																					
Eidson													X	X	X	X								
Vaughn																	X	X	X	X				
Everett																					X	X	X	X
EDGECOMBE	4	A	13																					
Jenkins							X	X	X	X	X	X	X	X	X	X								
Tolson											**X**													
Livesay																		X						
Ray																			X					
CALDWELL	11	F	14																					
Erby					X	X	X	X	X	X	X	X												
Beall																	X	X						
Kincaid																					X	X	X	X
PITT	2	B	15																					
Blount					X	X																		
Moore						X	X	X	X	X	X	X												
Doub																			X	X	X	X	X	X
BUNCOMBE	13	G	20																					
Thornburg						X	X	X																
Myers									X	X	X	X	X	X	X	X								
Brown																	X	X	X					
Sutton																				X	X	X		
Smith																							X	X
FORSYTH	9	D	20																					
Dunn					X	X	X	X																
Ruffin									X	X	X	X	X	X	X	X								
Christopher																	X	X						
Shelton																			X	X	X	X	X	X

NC BOARD OF TRANSPORTATION MEMBERSHIP 1985-2004

COUNTY	DOT DIV	DOT DIST REG	MBR YRS		04	03	02	01	00	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
CUMBERLAND	6	C	22																					
Tippett					**X**	**X**	**X**	**X**																
Tippett									X	X	X	X	X	X	X	X								
McCauley																	X	X	X	X				
Hutchens																			X	X	X	X	X	X
GUILFORD	7	D	22																					
Perkins					X																			
Galyon					X	X	X	X	X	X	X	X	X	X	X	X								
Phillips																	X	X						
Loudermilk																	X	X						
Hutchens																			X					
Thomas																					X	X		
Barbee																							X	X
MECKLENBURG	10	E	26																					
Cowell					X	X																		
Dolby								X																
Emory									X	X	X	X	X	X	X	X								
Hughes									X	X														
Shelton											X													
Pappas											X	X	X	X	X									
Barry																	X	X						
Goode																			X					X
Harris																						X	X	X
WAKE	5	C	36																					
Szlosberg					X	X	X	X																
Shearer-Swink									X	X	X	X	X	X	X	X								
Grant											X	X												
Darden												X	X											
Grady													X	X	X	X								
Burford														X	X	X	X							
Bailey																	X	X						
Peden																			X	X	X	X	X	X
Harrington																					**X**	**X**	**X**	**X**

NOTES:

1-All Board Members, to include at large members, were allocated to their county of residence.

2-Board Members were counted if they served at least 6 months out of the year.

3-Secretaries of Transportation, reflected in bold, are included in the annual figures.

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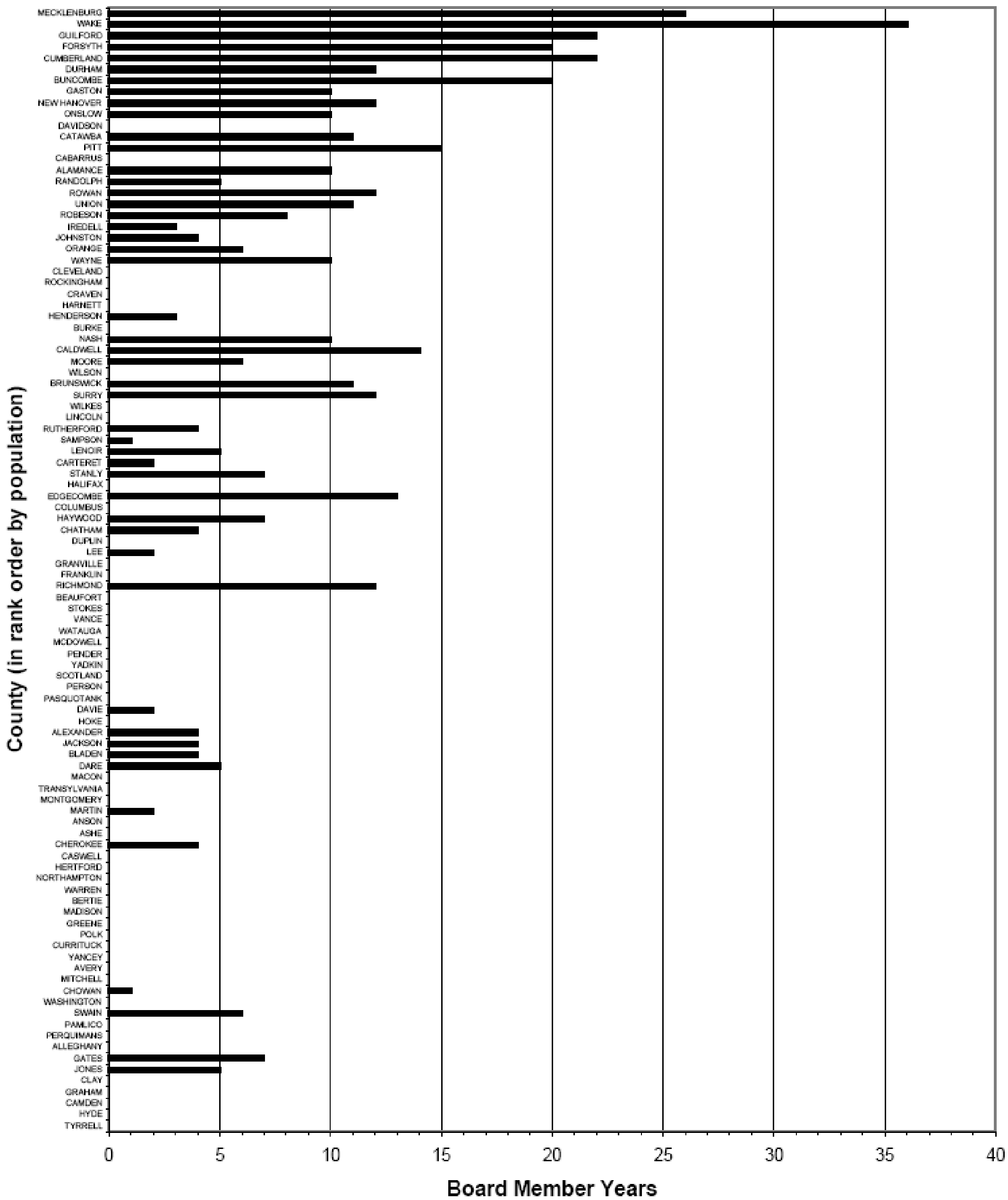
County (in rank order by population)
MECKLENBURG
WAKE
GUILFORD
FORSYTH
CUMBERLAND
DURHAM
BUNCOMBE
GASTON
NEW HANOVER
ONSLOW
DAVIDSON
CATAWBA
PITT
CABARRUS
ALAMANCE
RANDOLPH
ROWAN
UNION
ROBESON
IREDELL
JOHNSTON
ORANGE
WAYNE
CLEVELAND
ROCKINGHAM
CRAVEN
HARNETT
HENDERSON
BURKE
NASH
CALDWELL
MOORE
WILSON
BRUNSWICK
SURRY
WILKES
LINCOLN
RUTHERFORD
SAMPSON
LENOIR
CARTERET
STANLY
HALIFAX
EDGECOMBE
COLUMBUS
HAYWOOD
CHATHAM
DUPLIN
LEE
GRANVILLE
FRANKLIN
RICHMOND
BEAUFORT
STOKES
VANCE
WATAUGA
MCDOWELL
PENDER
YADKIN
SCOTLAND
PERSON
PASQUOTANK
DAVIE
HOKE
ALEXANDER
JACKSON
BLADEN
DARE
MACON
TRANSYLVANIA
MONTGOMERY
MARTIN
ANSON
ASHE
CHEROKEE
CASWELL
HERTFORD
NORTHAMPTON
WARREN
BERTIE
MADISON
GREENE
POLK
CURRITUCK
YANCEY
AVERY
MITCHELL
CHOWAN
WASHINGTON
SWAIN
PAMLICO
PERQUIMANS
ALLEGHANY
GATES
JONES
CLAY
GRAHAM
CAMDEN
HYDE
TYRRELL
0
5
10
15
20
25
30
35
40
Board Member Years

County TIP and Loop Expenditures, 1990-2003

TIP + Loop Expenditures by County and Division, in thousands of dollars

COUNTY	Div.	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Grand Tot by Co/Div
BERTIE	1	2,700.5	3,338.9	1,887.1	1,064.7	280.3	786.7	1,235.7	1,601.0	4,115.7	6,202.1	6,472.3	3,458.9	957.9	1,077.4	35,179.2
CAMDEN	1	14.5	1.2	0.0	9.0	92.8	120.5	383.3	1,132.0	442.3	210.9	314.3	357.8	289.2	237.9	3,590.5
CHOWAN	1	303.2	305.3	334.8	398.5	1,062.8	1,429.0	3,193.9	10,716.8	24,095.7	24,231.5	7,893.3	640.1	177.1	857.8	75,640.8
CURRITUCK	1	5,157.9	1,740.3	746.5	2,861.4	11,891.7	16,380.8	12,254.4	14,750.8	15,350.5	11,292.3	2,349.8	1,478.4	1,737.0	869.2	98,869.4
DARE	1	18,305.7	23,161.9	-810.7	9,421.5	8,709.1	5,830.8	7,700.2	8,404.4	12,914.8	14,832.3	29,949.1	51,171.7	46,786.9	10,442.6	244,613.5
GATES	1	-3.8	22.1	118.2	763.1	354.8	185.0	687.9	352.8	12.6	8.7	41.8	77.9	27.8	129.6	2,776.3
HERTFORD	1	2,728.3	2,300.3	1,489.3	2,336.8	5,903.5	3,153.2	703.7	240.8	1,215.6	1,777.5	2,552.1	514.0	390.9	475.2	25,791.1
HYDE	1	21.9	233.9	349.8	3.1	1,579.7	2,316.4	540.5	1,259.7	1,344.1	391.0	2,343.2	5,123.1	5,397.4	5,143.1	26,046.4
MCDOWELL	1	12,304.4	6,892.2	3,701.9	2,542.7	4,395.5	9,531.7	18,412.7	18,413.8	9,991.3	4,126.9	10,458.0	19,528.7	20,257.3	8,383.6	148,798.8
NORTHAMPTON	1	464.8	3,949.8	5,474.1	1,980.1	1,555.0	4,214.0	2,233.1	8,358.4	12,630.9	7,603.4	1,250.8	384.3	1,063.0	1,222.6	52,382.3
PASQUOTANK	1	265.7	765.5	941.2	5,113.4	3,781.9	474.7	545.8	1,652.2	3,926.4	5,142.4	11,038.2	16,447.3	14,246.2	10,472.1	74,813.9
PERQUIMANS	1	4,317.3	4,276.4	1,960.0	7,567.8	3,353.5	1,409.5	2,777.0	3,357.9	5,226.2	743.7	87.5	22.1	55.3	60.0	35,224.6
TYRRELL	1	0.0	0.0	2.9	208.7	350.5	470.0	835.0	231.0	516.9	18,557.8	3,692.2	2,650.0	8,075.7	12,729.6	48,320.1
WASHINGTON	1	989.0	1,235.7	2,812.0	70.7	92.2	411.2	385.5	494.8	1,024.5	2,256.1	2,311.5	9,855.5	15,891.5	15,536.4	56,167.2
TOTAL		45,569.4	48,032.3	19,216.8	34,141.7	43,494.4	46,403.6	51,876.8	70,976.4	92,807.5	97,246.4	80,683.8	111,706.7	115,153.0	68,907.1	926,213.2
BEAUFORT	2	738.3	1,301.0	1,282.9	839.0	5,471.0	7,209.7	476.3	199.1	802.7	535.8	1,691.2	2,962.4	1,371.0	2,240.9	27,091.1
CARTERET	2	2,827.5	2,761.3	5,041.8	7,257.6	8,413.1	7,817.3	7,081.2	8,320.2	7,965.6	17,157.4	8,856.0	13,748.2	13,317.3	2,061.4	113,257.6
CRAVEN	2	599.6	5,742.1	2,148.2	1,873.4	4,548.8	9,990.9	23,147.4	49,554.3	51,170.5	29,354.2	11,557.6	3,271.1	4,502.3	2,703.0	200,116.4
GREENE	2	122.2	792.0	658.9	274.0	60.8	119.4	694.1	1,538.4	320.0	2,375.7	2,588.3	1,901.4	686.1	1,581.9	13,721.2
JONES	2	152.3	251.2	841.1	924.7	879.1	508.3	198.9	182.0	230.7	226.7	249.0	638.1	322.4	342.5	5,725.0
LENOIR	2	1,284.3	561.6	629.8	498.1	1,798.5	1,826.0	839.2	1,659.5	3,725.9	7,385.6	14,537.6	19,835.6	19,372.3	7,222.9	81,006.9
PAMLICO	2	0.0	435.5	1,330.2	38.7	159.7	237.6	1,856.1	1,438.4	1,998.8	1,749.1	3,213.3	1,370.3	1,036.2	1,640.8	16,465.3
PITT	2	12,399.9	14,103.6	15,082.6	9,268.1	9,370.5	3,178.3	3,110.1	8,884.4	8,755.9	13,904.2	14,493.1	8,774.0	14,567.7	5,067.4	143,979.9
TOTAL		17,924.1	25,989.4	26,843.2	20,773.5	30,801.3	30,697.5	37,405.3	71,794.2	74,808.2	72,688.4	57,188.0	52,499.2	55,175.3	26,795.7	601,363.3
BRUNSWICK	3	9,179.1	16,737.3	13,954.5	11,415.5	7,840.7	7,459.6	12,946.0	9,599.0	6,048.3	8,723.4	4,958.4	1,297.5	2,799.3	2,437.5	115,444.3
DUPLIN	3	7,995.1	3,906.4	4,824.5	10,013.4	11,847.4	15,466.6	8,191.1	5,872.0	6,749.0	6,427.5	5,460.9	6,848.6	8,810.4	5,441.9	106,752.1
NEW HANOVER	3	3,404.6	4,790.0	3,559.3	9,845.7	11,545.8	9,890.2	11,230.1	16,243.0	14,863.1	31,770.5	38,306.9	33,312.3	60,169.2	58,615.8	307,538.4
ONSLOW	3	11,195.1	8,198.6	9,442.5	8,830.6	6,449.6	4,350.9	6,972.6	8,814.7	16,200.0	38,445.4	37,321.2	28,621.4	15,747.1	16,079.7	216,467.4
PENDER	3	2,629.7	3,906.1	660.7	1,176.9	2,739.4	2,598.2	5,964.4	6,692.1	12,367.1	15,203.7	7,665.6	2,651.3	7,143.0	1,571.1	73,074.5
SAMPSON	3	16,346.3	2,764.4	1,677.8	3,154.0	2,408.7	334.5	901.4	5,862.4	2,938.3	710.3	7,721.3	3,143.1	4,369.2	2,157.7	55,487.4
TOTAL		50,749.9	40,203.8	34,119.7	44,238.1	42,839.7	40,199.1	47,205.6	49,083.2	59,153.7	101,280.8	96,479.3	75,872.4	97,038.2	86,303.6	864,764.0
EDGECOMBE	4	5,163.6	2,146.0	1,470.3	2,383.9	4,435.7	9,541.2	18,505.5	17,972.8	8,381.5	2,054.4	4,561.9	4,335.7	8,286.3	5,107.6	90,666.4
HALIFAX	4	957.6	159.8	393.4	6,526.9	6,902.4	2,735.2	6,014.4	9,324.9	5,793.3	6,543.9	6,806.5	5,277.8	4,756.4	3,317.9	64,510.2
JOHNSTON	4	33,339.0	18,883.1	11,327.5	8,295.0	8,821.3	14,068.4	9,427.9	10,515.5	4,227.6	4,404.4	11,883.8	16,642.1	14,967.4	9,345.3	174,271.3
NASH	4	2,409.1	3,010.3	3,588.8	2,635.1	1,988.4	3,354.4	4,408.1	8,522.6	3,994.8	5,659.5	4,657.8	7,657.6	5,034.9	8,863.3	65,780.4
WAYNE	4	3,355.8	1,195.8	1,064.1	2,828.3	2,567.5	6,278.6	3,419.8	2,712.5	3,288.3	6,657.8	9,421.4	15,682.8	24,519.8	15,261.5	98,253.7
WILSON	4	1,065.1	1,179.8	2,262.2	1,882.5	4,388.5	4,189.1	12,276.7	24,184.2	30,091.2	13,357.1	29,702.4	40,537.8	51,826.9	23,636.3	240,568.8
TOTAL		46,290.2	26,574.8	20,104.2	22,351.7	29,103.7	40,166.8	52,349.2	73,235.6	55,776.7	37,706.9	67,133.6	90,333.6	107,171.6	65,532.1	733,850.7
DURHAM	5	10,359.2	11,467.5	14,042.7	26,754.2	30,853.8	27,592.9	24,068.7	18,592.8	18,211.0	22,170.4	34,935.7	37,927.0	60,587.0	60,838.9	398,001.6
FRANKLIN	5	203.2	347.6	518.7	1,769.8	4,361.3	8,374.8	3,051.8	1,850.0	1,721.5	1,378.5	2,214.5	4,089.9	822.8	1,866.9	30,599.5
GRANVILLE	5	210.7	1,476.6	1,757.9	209.6	1,842.3	4,075.5	479.5	2,425.0	13,316.6	11,667.8	2,471.4	4,627.2	15,268.9	10,284.0	70,130.0
PERSON	5	261.9	493.8	556.6	127.6	41.9	704.8	75.5	123.0	338.6	1,175.5	101.7	723.6	585.2	1,506.5	7,036.4
VANCE	5	7,245.1	6,979.5	2,763.9	1,562.1	1,516.3	3,711.5	5,780.4	5,482.3	1,988.1	618.8	809.0	1,248.7	2,268.0	5,470.4	47,432.2
WAKE	5	28,881.9	27,263.6	56,838.8	70,903.5	67,851.2	84,687.9	88,518.1	77,654.5	73,376.0	88,280.2	88,281.8	119,435.5	117,465.0	138,111.6	1,124,929.4
WARREN	5	3.5	40.4	95.3	14.4	81.4	192.2	716.5	958.9	431.2	1,829.5	850.1	1,039.9	885.3	892.3	8,036.9
TOTAL		47,165.5	48,038.0	76,565.7	100,731.4	106,347.9	126,739.5	122,690.5	107,124.7	109,333.0	127,438.9	130,254.3	169,088.8	197,880.2	216,770.6	1,686,167.8
BLADEN	6	1,039.9	2,123.7	584.2	856.4	2,481.6	948.7	4,642.3	12,315.5	6,549.6	5,215.8	4,350.3	2,940.2	5,632.5	3,157.7	53,068.4
COLUMBUS	6	3,833.8	2,522.3	180.2	586.1	790.7	5,045.4	2,293.4	4,047.7	12,979.9	8,353.4	2,984.4	8,955.1	5,069.8	5,378.5	61,021.8
CUMBERLAND	6	19,980.1	12,587.9	10,462.0	11,869.9	18,862.2	23,904.9	18,842.3	20,382.9	19,810.9	21,911.7	34,890.1	62,687.1	62,508.7	48,190.1	375,686.7
HARNETT	6	3,747.1	2,879.7	4,404.9	3,977.3	1,422.4	2,546.9	1,801.1	1,768.2	5,228.3	6,020.9	4,971.9	10,712.9	11,444.3	3,878.2	64,598.0
ROBESON	6	3,452.6	4,119.3	4,582.7	6,561.6	6,034.8	5,192.1	2,318.8	10,627.1	23,595.8	23,623.4	18,939.6	15,822.4	13,298.3	4,847.5	142,984.0
TOTAL		25,093.5	24,032.9	20,199.9	23,631.1	29,591.8	37,632.0	30,095.8	49,121.4	68,164.5	63,125.2	66,166.3	101,118.7	97,953.6	63,452.0	697,338.8
ALAMANCE	7	10,380.0	28,470.0	31,676.4	29,907.0	17,090.8	8,071.8	3,305.7	5,422.1	9,597.4	3,947.1	6,584.5	17,218.8	20,123.7	14,976.8	206,769.9
CASWELL	7	-207.2	209.6	591.4	914.2	2,415.4	3,061.4	1,038.9	1,753.7	1,758.3	1,852.7	4,360.7	3,209.8	6,009.0	2,821.2	29,697.1
GUILFORD	7	14,312.4	21,751.7	33,642.3	53,841.6	62,268.1	64,066.3	51,277.4	62,449.8	88,449.3	110,935.0	113,330.9	126,035.1	149,777.4	97,501.8	1,049,459.1
ORANGE	7	4,604.0	10,353.3	10,729.7	11,874.2	17,067.1	15,290.3	11,180.2	9,247.8	6,025.4	6,816.8	8,869.4	12,330.4	16,271.2	15,882.2	159,522.1
ROCKINGHAM	7	1,551.8	7,941.1	9,262.7	12,678.6	15,604.7	12,679.7	7,775.8	13,777.9	18,086.9	17,858.2	3,289.3	5,153.8	2,608.0	4,251.6	132,510.3
TOTAL		30,641.0	68,725.7	85,602.5	109,215.6	114,445.9	103,169.5	74,584.1	92,651.3	123,917.4	141,409.9	136,434.8	163,947.9	194,789.3	135,233.6	1,577,958.6
CHATHAM	8	8,473.8	5,561.5	3,212.2	3,572.7	5,960.0	9,230.1	16,952.1	29,617.3	29,593.3	35,187.0	23,653.0	20,393.5	11,536.6	5,017.3	206,970.4
HOKE	8	464.6	1,036.1	2,278.7	4,532.9	4,783.0	909.8	72.7	7.8	231.6	114.9	658.6	185.4	6,476.6	258.1	22,080.7
LEE	8	746.6	512.7	1,062.4	865.3	1,610.3	1,400.8	2,738.3	10,099.4	11,061.4	15,492.1	9,348.6	7,082.2	9,632.8	17,864.7	89,298.6
MONTGOMERY	8	2,444.3	4,577.3	4,482.7	8,062.0	2,915.2	5,578.2	9,728.3	2,997.8	484.2	672.0	2,452.0	2,001.8	2,867.8	1,272.9	48,346.3
MOORE	8	1,429.1	977.3	2,258.5	5,117.0	1,549.8	1,544.7	1,028.6	2,031.6	4,801.6	6,696.0	2,161.1	1,579.7	2,723.4	1,285.3	34,981.6
RANDOLPH	8	1,971.2	5,185.7	5,172.7	8,826.9	10,779.8	8,905.2	3,052.6	4,738.3	9,011.3	23,839.1	26,092.4	33,843.5	23,294.4	8,390.1	171,103.2
RICHMOND	8	631.9	1,233.9	552.8	301.6	1,507.2	3,068.8	5,595.9	10,322.9	34,703.4	43,223.3	29,518.9	24,774.8	13,824.5	10,009.3	179,269.2
SCOTLAND	8	88.8	531.5	710.9	776.5	3,255.5	8,528.7	5,013.0	2,237.4	874.0	253.2	2,427.1	557.3	228.6	1,601.1	25,083.8
TOTAL		14,250.3	19,616.0	19,690.9	29,887.8	32,360.5	35,166.3	44,179.6	62,052.4	90,550.8	125,477.6	96,322.0	90,418.3	70,384.7	45,698.6	777,113.8
DAVIDSON	9	4,342.3	20,512.5	12,010.2	9,423.4	10,886.1	3,873.2	8,747.4	12,790.6	11,960.1	9,831.3	14,534.4	12,313.6	21,174.3	14,020.9	166,200.1
DAVIE	9	850.6	1,437.4	385.7	1,912.3	884.9	3,296.5	5,471.3	4,663.5	5,203.7	1,934.9	635.6	853.1	1,721.5	1,066.0	30,296.0
FORSYTH	9	39,663.0	43,920.9	60,484.2	22,340.2	14,254.9	22,699.8	25,655.8	22,291.6	34,735.0	31,483.6	23,822.6	35,678.6	26,112.1	27,593.8	430,936.0
ROWAN	9	4,381.4	7,672.8	5,696.6	3,771.9	8,177.1	7,765.8	10,911.6	12,189.9	21,023.7	30,935.3	30,470.4	31,622.0	34,121.4	22,478.7	231,218.8
STOKES	9	125.8	246.8	164.0	659.4	506.9	371.8	517.0	2,017.8	4,037.6	1,519.7	2,079.1	1,316.4	1,992.2	1,190.5	16,744.8
TOTAL		49,363.0	73,790.3	78,720.7	38,107.2	34,670.0	37,997.0	51,303.2	53,953.4	76,960.1	75,704.8	71,542.0	81,783.6	85,121.5	66,379.0	875,395.8
ANSON	10	216.6	607.1	1,260.4	1,383.3	2,280.7	1,908.6	1,883.8	3,830.2	1,288.8	599.2	200.3	952.2	718.7	190.8	17,100.5
CABARRUS	10	1,749.7	5,548.3	10,674.1	3,878.1	10,226.5	15,896.2	13,238.3	11,350.2	10,428.0	11,499.8	16,590.1	24,827.5	17,816.5	17,815.8	170,948.9
MECKLENBURG	10	59,994.2	69,590.9	85,107.3	111,301.1	128,066.1	110,547.3	111,286.8	91,248.7	99,369.2	77,802.4	93,768.2	129,467.7	157,170.9	117,136.0	1,444,856.5
STANLY	10	2,595.1	5,138.3	1,734.2	1,205.9	1,496.0	2,049.0	1,236.0	2,622.0	8,817.5	5,929.1	3,175.1	7,309.1	17,757.9	9,515.6	70,583.7
UNION	10	3,533.0	689.3	442.2	802.6	1,113.3	2,112.1	4,279.1	9,611.9	7,560.3	4,210.4	5,766.3	6,970.6	7,739.3	6,571.2	61,491.5
TOTAL		68,088.6	81,573.8	102,218.1	118,371.0	143,152.8	132,313.1	131,725.7	118,673.1	127,453.7	100,131.7	119,500.0	169,527.0	201,203.3	151,029.5	1,764,961.1
ALLEGHANY	11	1,483.2	120.2	325.2	775.1	2,097.8	4,323.5	5,046.8	3,950.4	1,226.0	2,345.8	1,629.7	4,164.4	5,448.2	1,086.7	34,054.6
ASHE	11	773.2	385.6	240.4	982.5	1,886.3	1,398.5	1,779.2	1,938.2	2,876.4	3,882.5	5,146.6	4,200.4	4,258.5	3,323.3	32,840.7
AVERY	11	1,524.8	1,514.5	909.5	723.2	815.3	35.2	100.1	517.0	597.1	1,211.4	2,588.1	2,695.9	1,791.2	1,260.2	16,263.7
CALDWELL	11	7,506.4	3,402.6	4,603.3	6,632.6	10,894.8	5,798.2	6,346.2	6,911.0	14,869.7	10,674.6	14,096.8	8,720.9	5,083.1	3,280.3	108,621.4
SURRY	11	965.8	1,962.9	5,866.9	13,363.2	15,011.9	17,322.7	22,925.1	13,115.0	15,103.8	21,633.2	30,043.7	22,146.1	13,749.9	5,674.8	198,905.0
WATAUGA	11	2,144.7	3,880.3	5,919.5	2,808.3	5,054.8	7,328.2	8,507.8	24,988.5	7,060.1	29,533.2	20,115.9	9,318.6	13,048.1	7,835.4	147,320.8
WILKES	11	3,654.3	4,377.8	3,869.7	6,004.6	7,003.8	6,383.7	10,821.7	6,412.0	5,323.5	6,432.2	20,132.4	35,979.3	43,679.6	24,678.7	186,953.1
YADKIN	11	3,515.8	4,888.5	2,475.6	2,142.8	1,790.1	4,014.3	2,639.0	2,757.6	6,842.8	12,556.1	23,733.1	27,998.7	13,437.5	7,546.4	116,138.2
TOTAL		21,568.1	20,353.5	24,210.1	35,442.4	44,334.3	46,604.3	58,166.5	60,595.6	53,499.5	88,249.0	117,486.4	115,224.2	100,696.1	54,685.7	841,097.5
ALEXANDER	12	1,327.5	5,776.1	6,855.5	6,130.5	9,429.1	6,926.7	3,963.0	88.2	26.7	401.7	388.5	132.7	456.8	329.4	42,228.5
CATAWBA	12	7,523.1	8,776.0	14,196.5	9,888.2	14,980.9	20,527.0	19,082.8	24,025.0	18,890.4	14,339.8	16,958.6	23,628.5	20,398.3	14,572.5	227,781.4
CLEVELAND	12	3,571.1	1,661.1	1,027.4	796.6	1,884.8	3,799.6	3,433.3	2,013.1	2,434.7	7,209.3	11,032.7	11,127.9	11,608.8	13,049.0	74,649.2
GASTON	12	20,082.8	17,878.2	11,175.7	8,253.5	17,191.3	28,474.6	18,543.4	9,970.6	8,111.2	11,957.0	20,481.0	20,392.6	13,847.5	8,169.9	214,529.2
IREDELL	12	3,453.4	7,303.4	10,568.6	11,778.3	10,186.3	10,118.0	3,582.7	1,120.5	2,296.0	5,520.7	6,793.3	9,622.5	21,455.9	15,467.3	119,266.8
LINCOLN	12	5,676.5	7,573.8	5,993.7	7,873.9	6,695.1	4,042.9	2,424.6	2,163.7	2,206.3	3,350.5	6,037.9	8,418.1	13,353.5	5,305.6	80,976.4
TOTAL		41,634.4	48,968.6	49,817.4	44,721.1	60,367.3	73,888.8	51,049.9	39,359.2	33,965.3	42,778.9	61,647.9	73,320.4	81,108.7	56,813.6	759,431.5
BUNCOMBE	13	9,800.2	14,359.5	15,984.2	22,459.8	18,047.7	13,896.3	15,594.8	30,249.5	32,811.4	35,280.4	34,678.9	35,974.6	23,378.2	11,550.4	314,446.1
BURKE	13	1,411.8	801.1	441.2	1,116.0	1,576.8	1,692.2	2,574.2	4,001.5	3,572.0	3,400.7	17,005.7	17,841.6	7,401.4	2,304.2	65,139.4
MACON	13	2,962.0	3,129.6	3,528.4	3,098.8	9,309.4	7,544.4	10,450.2	1,872.8	1,049.5	960.1	2,581.5	7,005.7	2,546.4	2,296.0	58,434.8
MARTIN	13	3,949.9	6,351.5	6,292.7	4,286.1	2,433.2	4,888.4	17,132.3	17,855.0	14,238.3	18,618.1	7,893.6	5,614.6	8,563.0	4,540.2	120,635.9
MITCHELL	13	291.2	148.1	254.1	171.6	1,153.0	1,147.9	3,599.6	4,516.5	3,369.3	2,085.5	1,406.8	743.9	2,261.5	1,466.2	22,614.3
RUTHERFORD	13	2,839.5	5,454.8	7,538.1	3,244.5	1,076.4	2,246.9	891.8	1,326.0	2,102.2	1,662.4	6,669.8	5,579.4	8,006.1	3,211.1	49,565.0
YANCEY	13	171.3	539.2	203.2	153.9	377.9	129.4	578.4	806.2	1,287.4	1,314.2	319.7	621.5	1,732.3	905.4	9,140.0
TOTAL		21,225.8	30,783.7	34,239.9	34,509.8	33,972.4	31,444.6	51,621.4	60,627.7	58,230.3	63,201.2	70,575.0	73,381.3	49,889.0	26,273.6	639,975.4
CHEROKEE	14	2,368.4	1,654.0	477.4	125.0	828.5	1,028.3	3,953.7	5,160.4	7,423.5	4,957.8	5,260.5	5,388.8	1,856.3	1,889.9	42,592.5
CLAY	14	211.2	238.3	443.1	1,761.4	2,036.7	103.0	48.7	113.5	570.5	324.9	172.8	897.7	3,444.1	2,508.7	12,874.2
GRAHAM	14	0.0	10.6	96.7	121.4	383.2	521.0	116.5	1,284.4	2,925.6	9,059.8	9,757.0	8,845.9	13,965.9	4,930.5	51,717.5
HAYWOOD	14	1,497.0	4,427.9	8,212.8	14,573.3	17,333.5	14,451.5	13,858.3	13,699.1	8,745.4	5,721.8	4,682.1	13,919.2	13,657.4	5,919.3	143,698.7
HENDERSON	14	5,830.2	6,175.2	8,852.9	11,830.3	11,092.4	13,941.0	5,431.4	7,514.2	11,268.6	12,458.5	10,441.5	12,437.1	13,140.3	5,839.2	136,251.0
JACKSON	14	2,003.4	1,005.8	49.8	202.0	209.7	144.7	487.5	2,100.2	1,622.9	3,430.0	4,107.2	1,814.6	1,397.5	2,995.7	21,570.8
MADISON	14	4,756.4	3,841.5	2,502.4	9,389.2	12,140.7	14,091.5	18,193.9	26,107.4	47,221.4	47,288.4	60,672.0	33,145.9	28,000.8	24,532.5	321,784.1
POLK	14	1,173.2	2,521.3	13,663.5	5,762.8	12,145.4	3,455.6	702.2	715.6	901.8	1,790.4	4,552.2	4,319.3	1,809.4	166.0	53,681.6
SWAIN	14	3,725.1	2,814.5	1,191.4	21.3	294.8	1,732.6	3,989.5	2,850.5	961.9	1,237.2	3,053.0	2,017.4	1,859.7	662.6	26,441.3
TRANSYLVANIA	14	1,225.4	3,757.3	3,155.3	871.3	505.9	1,010.7	2,687.4	2,724.9	2,121.0	2,245.8	982.0	1,667.2	907.5	1,236.6	25,098.0
TOTAL		22,790.4	26,646.5	38,644.1	44,657.9	56,940.6	50,479.9	49,469.2	62,250.2	83,762.7	88,515.4	93,610.0	84,153.1	80,238.8	53,741.1	835,899.8
Grand Totals		500,504.2	583,354.1	630,201.1	700,780.2	802,412.4	835,942.1	853,692.6	971,405.8	1,108,393.3	1,225,955.0	1,265,015.4	1,452,376.1	1,533,803.3	1,117,606.8	13,581,531.3

Source: NC DOT, 2004

Urban Region Traffic Growth Rates, 1995-2002

NORTH CAROLINA AVERAGE DAILY TRAFFIC (ADT)
FOR ALL HIGHWAY FUNCTIONAL CLASSES
(Selected Statistics from the Highway Manual)

OCTOBER 2003

From TABLE HM-62

STATE	RURAL INTERSTATE	RURAL OTHER PRINCIPAL ARTERIAL	RURAL ALL PRINCIPAL ARTERIALS	URBAN INTERSTATE	URBAN OTHER FREEWAYS & EXPRESSWAYS	URBAN OTHER PRINCIPAL ARTERIAL	URBAN ALL PRINCIPAL ARTERIALS	ALL PRINCIPAL ARTERIALS
NC ADT/lane 2002	9,239	3,849	4,721	14,686	8,865	5,618	7,362	6,493

From TABLE HM-61

STATE	RURAL INTERSTATE	RURAL OTHER PRINCIPAL ARTERIAL	RURAL MINOR ARTERIAL	RURAL MAJOR COLLECTOR	RURAL MINOR COLLECTOR	RURAL LOCAL	RURAL TOTAL	URBAN INTERSTATE	URBAN OTHER FREEWAYS & EXPRESSWAYS	URBAN OTHER PRINCIPAL ARTERIAL	URBAN MINOR ARTERIAL	URBAN COLLECTOR	URBAN LOCAL	URBAN TOTAL	Gtot
NC Miles 2002	650	2,214	2,729	8,699	7,394	47,605	69,291	370	291	1,346	2,043	1,084	4,092	9,226	78,517
NC VMt 2002	8,465	9,847	7,031	11,296	4,046	5,472	46,157	9,754	3,761	9,869	8,230	2,404	12,719	46,737	92,894
VMT/mi	35,680	12,185	7,059	3,558	1,499	315	1,825	72,225	35,409	20,088	11,037	6,076	8,516	13,879	3,241
NC miles 1995	631	2,215	2,716	8,618	7,491	46,781	68,452	339	267	1,346	2,001	1,133	4,181	9,267	77,719
NC VMt 1995	6,767	7,762	6,220	9,181	3,473	4,309	37,712	6,977	2,801	8,917	7,173	2,140	10,333	38,341	76,053
VMT/mi	29,381	9,601	6,274	2,919	1,270	252	1,509	56,387	28,741	18,150	9,821	5,175	6,771	11,335	2,681
% Ch/Yr, VMT/mi	3.06	3.86	1.79	3.13	2.68	3.64	2.88	4.01	3.31	1.53	1.77	2.49	3.68	3.21	2.89

From TABLE HM-70

FEDERAL-AID URBANIZED AREA 1/	STATE LOCATION PRI-MARY	STATE LOCATION OTHER(S)	POP	MILES INTERSTATE	MILES OTHER FREEWAYS AND EXPRESSWAYS	MILES OTHER PRINCIPAL ARTERIAL	MILES MINOR ARTERIAL	MILES COLLECTOR	MILES LOCAL	MILES TOTAL	DVMT (THOUSANDS) INTERSTATE	DVMT OTHER FREEWAYS AND EXPRESSWAYS	DVMT OTHER PRINCIPAL ARTERIAL	DVMT MINOR ARTERIAL	DVMT COLLECTOR	DVMT LOCAL	DVMT TOTAL
Charlotte 1995	NC			39	34	136	167	135	1,901	2,412	3,368	1,117	3,215	1,717	539	3,608	13,564
Charlotte,2002	NC	SC	721	56	37	139	183	130	2,268	2,813	6,130	1,732	3,711	2,337	661	5,236	19,807
Vmt/mile 95											86359	32853	23640	10281	3993	1898	5624
Vmt/mile 02											109464	46811	26698	12770	5085	2309	7041
Pct Ch/year, VMT/mi											3.82	6.07	1.85	3.46	3.91	3.08	3.60
Raleigh 1995	NC			40	12	117	175	118	1,370	1,832	3,078	533	2,942	2,325	710	3,253	12,841
Raleigh	NC		507	44	25	116	175	119	1,706	2,185	4,179	944	3,218	2,716	883	3,980	15,919
Vmt/mile 95											76,950	44,417	25,145	13,286	6,017	2,374	7,009
Vmt/mile 02											94,955	37,760	27,741	15,520	7,420	2,333	7,286
Pct Ch/year, VMT/mi											3.34	-2.14	1.47	2.40	3.33	-0.26	0.56
FAYETTEVILLE	NC			1	15	80	130	36	1,061	1,322	37	401	1,958	1,327	222	2,046	5,891
Fayetteville	NC		314	2	14	80	135	36	1,023	1,289	65	458	1,943	1,612	252	2,443	6,773
Vmt/mile 95											37,000	26,733	23,226	10,208	6,343	1,928	4,456
Vmt/mile 02											32,500	32,714	24,288	11,941	7,200	2,388	5,254
Pct Ch/year, VMT/mi											-1.74	3.20	0.65	2.43	1.93	3.41	2.56
DURHAM	NC			25	21	58	142	81	882	1,209	1,491	767	1,076	1,488	406	1,724	6,952
Durham	NC		274	26	22	57	144	76	1,032	1,357	1,887	981	1,247	1,575	386	2,246	8,322
Vmt/mile 95											59,640	36,524	18,552	10,479	5,012	1,955	5,750
Vmt/mile 02											72,577	44,591	21,877	10,938	5,079	2,176	6,133
Pct Ch/year, VMT/mi											3.10	3.16	2.56	0.63	0.19	1.62	0.95
WINSTON-SALEM	NC			16	42	15	81	118	1,126	1,398	932	1,742	232	1,023	918	1,889	6,736
Winston-Salem	NC		265	16	42	14	92	108	1,207	1,479	1,048	2,082	246	1,186	891	2,174	7,627
Vmt/mile 95											58,250	41,476	15,467	12,630	7,780	1,678	4,818
Vmt/mile 02											65,500	49,571	17,571	12,891	8,250	1,801	5,157
Pct Ch/year, VMT/mi											1.78	2.79	1.94	0.30	0.86	1.06	1.00
GREENSBORO	NC			24	24	38	173	102	884	1,245	1,755	741	745	1,546	276	1,751	6,813
Greensboro	NC		240	26	30	33	158	96	970	1,313	2,238	973	751	1,480	245	1,990	7,677
Vmt/mile 95											73,125	30,875	19,605	8,931	2,706	1,981	5,472
Vmt/mile 02											86,077	32,433	22,758	9,367	2,552	2,052	5,847
Pct Ch/year, VMT/mi											2.63	0.72	2.30	0.70	-0.81	0.51	0.98

FEDERAL-AID URBANIZED AREA 1/	STATE LOCATION PRI-MARY	STATE LOCATION OTHER(S)	POP	MILES INTERSTATE	MILES OTHER FREEWAYS AND EXPRESSWAYS	MILES OTHER PRINCIPAL ARTERIAL	MILES MINOR ARTERIAL	MILES COLLECTOR	MILES LOCAL	MILES TOTAL	DVMT (THOUSANDS) INTERSTATE	DVMT OTHER FREEWAYS AND EXPRESSWAYS	DVMT OTHER PRINCIPAL ARTERIAL	DVMT MINOR ARTERIAL	DVMT COLLECTOR	DVMT LOCAL	DVMT TOTAL
GASTONIA	NC			17	2	75	106	36	600	836	1,110	48	1,143	563	117	1,013	3,994
Gastonia	NC		136	17	2	76	112	36	646	889	1,566	79	1,119	778	122	1,168	4,832
Vmt/mile 95											65,294	24,000	15,240	5,311	3,250	1,688	4,778
Vmt/mile 02											92,118	39,500	14,724	6,946	3,389	1,808	5,435
Pct Ch/year, VMT/mi											5.87	9.23	-0.48	4.40	0.61	1.01	1.97
WILMINGTON	NC			1	6	59	48	41	446	601	25	214	1,256	408	209	720	2,832
Wilmington	NC		179	1	6	60	48	40	509	664	32	226	1,605	484	221	964	3,532
Vmt/mile 95											25,000	35,667	21,288	8,500	5,098	1,614	4,712
Vmt/mile 02											32,000	37,667	26,750	10,083	5,525	1,894	5,319
Pct Ch/year, VMT/mi											4.00	0.80	3.67	2.66	1.20	2.47	1.84
HIGH POINT	NC			18	18	68	139	58	686	987	631	298	1,041	647	159	1,177	3,953
High Point	NC		108	18	16	70	140	57	764	1,065	791	304	1,196	802	185	1,405	4,683
Vmt/mile 95											35,056	16,556	15,309	4,655	2,741	1,716	4,005
Vmt/mile 02											43,944	19,000	17,086	5,729	3,246	1,839	4,397
Pct Ch/year, VMT/mi											3.62	2.11	1.66	3.30	2.63	1.03	1.40
JACKSONVILLE	NC			0	0	21	34	12	193	260	0	0	604	415	22	409	1,450
Jacksonville	NC		100	-	-	22	30	12	220	284	-	-	616	474	25	451	1,566
Vmt/mile 95											-	-	28,762	12,206	1,833	2,119	5,577
Vmt/mile 02											-	-	28,000	15,800	2,083	2,050	5,514
Pct Ch/year, VMT/mi											0.00	0.00	-0.38	4.21	1.85	-0.47	-0.16
KANNAPOLIS	NC			14	0	39	52	119	514	738	748	0	608	457	303	653	2,769
Concord	NC		130	14	-	39	62	119	582	816	1,088	-	736	661	390	852	3,727
Vmt/mile 95											53,429	-	15,590	8,788	2,546	1,270	3,752
Vmt/mile 02											77,714	-	18,872	10,661	3,277	1,464	4,567
Pct Ch/year, VMT/mi											6.49	0.00	3.01	3.04	4.10	2.18	3.10
ASHEVILLE	NC			45	10	28	111	63	735	992	1,881	274	466	981	208	1,389	5,199
Asheville	NC		128	45	10	28	103	60	763	1,009	2,350	346	582	1,043	241	1,667	6,229
Vmt/mile 95											41,800	27,400	16,643	8,838	3,302	1,890	5,241
Vmt/mile 02											52,222	34,600	20,786	10,126	4,017	2,185	6,173
Pct Ch/year, VMT/mi											3.56	3.76	3.56	2.08	3.09	2.23	2.54
BURLINGTON	NC			16	0	16	58	122	372	584	1,047	0	219	511	291	748	2,816
Burlington	NC		90	16	-	15	59	120	402	612	1,442	-	227	543	386	894	3,492
Vmt/mile 95											65,438	-	13,688	8,810	2,385	2,011	4,822
Vmt/mile 02											90,125	-	15,133	9,203	3,217	2,224	5,706
Pct Ch/year, VMT/mi											5.39	0.00	1.61	0.64	4.98	1.61	2.62
HICKORY	NC			18	4	50	79	39	497	687	687	89	679	651	137	981	3,224
Hickory	NC		94	18	4	50	80	38	549	739	904	143	722	700	142	1,307	3,918
Vmt/mile 95											38,167	22,250	13,580	8,241	3,513	1,974	4,693
Vmt/mile 02											50,222	35,750	14,440	8,750	3,737	2,381	5,302
Pct Ch/year, VMT/mi											4.61	8.87	0.90	0.88	0.91	2.94	1.85
GOLDSBORO	NC			0	6	21	68	31	234	360	0	203	380	543	117	467	1710
Goldsboro	NC		59	-	6	20	64	31	246	367	-	239	412	531	129	499	1,810
Vmt/mile 95											-	33,833	18,095	7,985	3,774	1,996	4,750
Vmt/mile 02											-	39,833	20,600	8,297	4,161	2,028	4,932
Pct Ch/year, VMT/mi											0.00	2.53	1.98	0.56	1.47	0.23	0.55
GREENVILLE	NC			0	0	27	57	15	213	312	0	0	506	438	24	300	1,268
Greenville	NC		67	-	-	27	60	10	264	361	-	-	565	477	24	384	1,450
Vmt/mile 95											-	-	18,741	7,684	1,600	1,408	4,064
Vmt/mile 02											-	-	20,926	7,950	2,400	1,455	4,017
Pct Ch/year, VMT/mi											0.00	0.00	1.67	0.49	7.14	0.47	-0.17
ROCKY MOUNT	NC			0	8	28	43	25	242	346	0	176	400	337	65	267	1,245
Rocky Mount	NC		56	-	8	29	45	26	264	372	-	232	371	345	82	286	1,316
Vmt/mile 95											-	22,000	14,286	7,837	2,600	1,103	3,598
Vmt/mile 02											-	29,000	12,793	7,667	3,154	1,083	3,538
Pct Ch/year, VMT/mi											0.00	4.66	-1.49	-0.31	3.04	-0.26	-0.24

List of Projects

List of the 750 Sections of the Major Highway Projects (1990-2004)

DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
1	BERTIE	R-2404	Windsor Bypass	E of NC 45	W of Chowan River	Widen 2L to 4L, some NL	13.60	Yes	2000	39.70	4	27.21	6000	44.90	0.060
1	BERTIE	R-2404	Windsor Bypass	E of NC 45	W of Chowan River	Widen 2L to 4L, some NL	2.43	Yes	2000	7.10	4	4.87	6500	8.03	0.052
1	CHOWAN	R-2208	US 17	East of Edenton	Winfall	Widen 2L to 4L, rur a	0.66	Yes	1998	1.92	4	1.32	8800	2.33	0.040
1	CHOWAN	R-2512	US 17, W of Edenton	W.of Chowan Rive	US 17 Bus E.of Edenton	Widen 2L to 4L, rur a	0.83	Yes	1999	4.78	4	1.67	6000	5.48	0.110
1	CHOWAN	R-2512	US 17, W of Edenton	W.of Chowan Rive	US 17 Bus E. of Edenton	Widen 2L to 4L, rur a	2.30	Yes	1999	30.66	4	4.60	6000	35.14	0.304
1	CHOWAN	R-2512	US 17, W of Edenton	W.of Chowan Rive	US 17 Bus E. of Edenton	Widen 2L to 4L, rur a	0.98	Yes	1999	13.01	4	1.95	6000	14.91	0.304
1	CHOWAN	R-2512	US 17, W of Edenton	W.of Chowan Rive	US 17 Bus E. of Edenton	Widen 2L to 4L, rur a	2.04	Yes	1999	27.19	4	4.08	6800	31.16	0.269
1	CHOWAN	R-2512	US 17, W of Edenton	W.of Chowan Rive	US 17 Bus E.of Edenton	Widen 2L to 4L, rur a	1.56	Yes	1999	8.99	4	3.12	6800	10.30	0.116
1	CURRITUCK	R-2228	NC 168	US 158 Barco	VA state line	Widen 2l to 4L, rur a	18.36	Yes	1999	55.10	4	36.72	24000	63.14	0.017
1	CURRITUCK	R-520	NC 158	Barco	Point Harbor	Widen 2l to 5L, urb a	24.55	Yes	1991	23.70	5	73.64	11700	35.08	0.014
1	DARE	R-2227	US 158	NC 12 Whalebone	Southern Shores	Widen 2L to 5L, rur a	15.25	No	1991	2.10	5	45.74	16700	3.11	0.001
1	DARE	R-2304	US 64-264	NC 345	US 158 Whalebone	Const bridge approach	2.17	No	1995	7.20	2	4.33	15700	8.85	0.027
1	DARE	R-2418	Wright Mem Bridge	Point Harbor	Kitty Hawk	Widen Bridge, new par	1.00	Yes	1997	8.65	4	2.00	16000	9.13	0.067
1	DARE	R-2418	Wright Mem Bridge	Point Harbor	Kitty Hawk	Widen Bridge, new par	1.76	Yes	1997	15.23	4	3.52	16000	16.06	0.067
1	DARE	R-2551	US 64-264	US 264	East City Limits of Manteo	4L facil+new bridge o	7.21	No	2003	108.70	4	28.84	5400	107.07	0.272
1	DARE	R-2551	US 64-264	US 264	East City Limits of Manteo	4L facil+new bridge o	1.51	No	2003	9.98	4	6.03	1100	9.83	0.594
1	HERTFORD	R-600	US 158, Murfreesboro	US 158 E of Murf.	US 158 W. of Murf.	New 4L Fry on new loc	2.38	No	1996	9.09	4	9.51	2700	10.73	0.168
1	HERTFORD	R-600	US 158, Murfreesboro	US 158 E of Murf.	US 158 W. of Murf.	New 4L Fry on new loc	1.03	No	1996	3.90	4	4.12	1900	4.60	0.236
1	MCDOWELL	R-2020	US 221/NC 226	SR 1434 n of Marion	NC 226 at Woodlawn	Widen 2L to 5L rur ar	1.01	Yes	1997	2.60	5	3.04	14000	2.74	0.019
1	MCDOWELL	R-2020	US 221/NC 226	SR 1434 n of Marion	NC 226 at Woodlawn	Widen 2L to 5L rur ar	3.48	Yes	1997	9.00	5	10.44	14000	9.49	0.020
1	MCDOWELL	R-204	US 221/NC226, Marion	SR 1154 s of I-40	SR 1434 N of Marion	New 4L rur art on new	0.70	Yes	1995	3.10	4	2.81	11200	3.81	0.049
1	MCDOWELL	R-204	US 221/NC226, Marion	SR 1154 s of I-40	SR 1434 N of Marion	New 4L rur art on new	5.00	Yes	1995	24.35	4	20.00	11200	29.93	0.054
1	MCDOWELL	R-204	US 221/NC226, Marion	SR 1154 s of I-40	SR 1434 N of Marion	New 4L rur art on new	1.71	Yes	1995	5.15	4	6.86	11000	6.33	0.034
1	NORTHAMPTON	U-2813	NC 46 Gaston	NC 48	Gaston City Limits	Widen 2L to 4L	1.03	No	1997	0.90	4	2.06	5400	0.95	0.020
1	PASQUOTANK	R-2244	NC 34, Elizabeth cit	Halston Bvld Ext	Coast Guard Station	Widen 2L to 5L, urb a	2.22	No	1995	3.50	4	4.43	12100	4.30	0.017
1	PASQUOTANK	R-2515	Elizabeth City Bypass	S of SR 1140	US 17-158	New 4L frwy on new lo	7.45	Yes	2002	52.00	4	29.80	8000	52.00	0.088
1	PASQUOTANK	U-1003	Halsted Bvld, Elizab	US 17 Bypass	NC 34	Widen 2L to 4L,urb ar	2.10	No	1993	2.90	4	4.21	16000	4.25	0.015
1	PERQUIMANS	R-1009	US 17	US 17 Bus n of Hertford	Woodville SR 1367	Widen 2L to 4L, rur a	7.66	Yes	1991	11.40	4	15.33	8600	16.87	0.026
1	PERQUIMANS	R-2208	US 17	East of Edenton	Winfall	Widen 2L to 4L, rur a	0.62	Yes	1998	1.79	4	1.23	8800	2.17	0.040
1	PERQUIMANS	R-2208	US 17	East of Edenton	Winfall	Widen 2L to 4L, rur a	5.77	Yes	1998	16.73	4	11.54	8800	20.33	0.040
1	PERQUIMANS	R-2208	US 17	East of Edenton	Winfall	Widen 2L to 4L, rur a	3.19	Yes	1998	9.25	4	6.38	12000	11.23	0.029
2	BEAUFORT	R-2021	US 264	SR 1501 in Washington	NC 32	Widen 2L to 4L rur ar	4.47	No	1994	8.60	4	8.94	10800	12.52	0.031
2	CARTERET	R-2105	NC 24	Swansboro	US 70 at Morehead City	Widen 2l to 4L	15.96	Yes	1998	37.40	4	31.92	13000	45.44	0.027
2	CARTERET	U-2226	Bridges St (Morehead	35th st	Arendell St and w to US 70	Widen 2l to 4L curb-	2.86	No	1997	9.50	4	5.72	39000	10.02	0.011
2	GREENE	R-525	US 264	Wilson Co Line	E. of NC 121 in Pitt Co	New 4L Fry on new loc	3.74	Yes	1997	11.75	4	14.94	4200	12.40	0.082
2	GREENE	R-525	US 264	Wilson Co Line	E. of NC 121 in Pitt Co	New 4L Fry on new loc	0.48	Yes	1997	1.52	4	1.92	4200	1.60	0.082
2	LENOIR	U-2542	US 258	US-70 North	SR 1575 Poole Rd	Widen 2L to 4L	0.13	No	2000	0.30	4	0.27	13000	0.33	0.023
2	PITT	R-1022	US 264 Greenville By	US 264 W. of Gr	US 13 N of Greenville	New 4L Fry on new loc	2.78	Yes	1995	16.65	4	11.11	9900	20.46	0.077
2	PITT	R-1022	US 264 Greenville By	US 264 W. of Gr	US 13 N of Greenville	New 4L Fry on new loc	0.26	Yes	1995	1.57	4	1.06	9900	1.93	0.089

List of the 750 Sections of the Major Highway Projects (1990-2004)

DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
2	PITT	R-1022	US 264 Greenville By	US 264 W. of Gr	US 13 N of Greenville	New 4L Fry on new loc	1.50	Yes	1995	8.99	4	6.01	11000	11.05	0.069
2	PITT	R-1022	US 264 Greenville By	US 264 W. of Gr	US 13 N of Greenville	New 4L Fry on new loc	2.53	Yes	1995	15.19	4	10.13	12000	18.67	0.063
2	PITT	R-218	US 13/NC 11	NC 903 (Greenville NW Loop)	Bethel By Pass	Widen 2L to 4L	9.76	No	2000	31.33	4	19.52	7300	35.43	0.059
2	PITT	R-218	US 13/NC 11	NC 903 (Greenville NW Loop)	Bethel Bypass	Widen 2L to 4L	1.75	No	2000	5.62	4	3.49	8300	6.36	0.052
2	PITT	R-2251	NC 33	US 264 Bypass	SR 1755 (Black Jack Rd.)	Widen to 5L	1.02	No	2001	2.47	5	3.07	26000	2.42	0.011
2	PITT	R-2251	NC 33	US 264 Bypass	SR 1755 (Black Jack Rd)	Widen to 5L	2.20	No	2001	5.33	5	6.60	17000	5.22	0.017
2	PITT	R-2252	NC 43, Greenville	Bells Fork Rd	Grvle South City Limits	Widen 2L to 5L urb ar	1.27	No	1997	2.40	5	3.81	15000	2.53	0.016
2	PITT	R-525	US 264	Wilson Co Line	E. of NC 121 in Pitt Co	New 4L Fry on new loc	2.71	Yes	1997	8.52	4	10.83	4200	8.99	0.082
2	PITT	R-525	US 264	Wilson Co Line	E. of NC 121 in Pitt Co	New 4L Fry on new loc	3.28	Yes	1997	10.31	4	13.14	4200	10.88	0.081
2	PITT	R-526	US 264	New Exit - SR1221	New Exit - SR1221	New Exit	1.20	No	1999	3.40	2	0.00	570	3.90	0.572
2	PITT	R-526	US 264	New Exit - SR1210	New Exit - SR1210	New Exit	0.96	No	1999	3.40	2	0.00	500	3.90	0.816
2	PITT	U-2105	Arlington Bvld, Grnv	Stantonsburg Rd	Mem Drive	New 4L urb art	0.51	No	1998	4.09	4	2.05	26000	4.97	0.044
2	PITT	U-2105	Arlington Bvld, Grnv	Stantonsburg Rd	Mem Drive	New 4L urb art	0.65	No	1998	5.22	4	2.61	26000	6.34	0.044
2	PITT	U-2105	Arlington Bvld, Grnv	Stantonsburg Rd	Mem Drive	New 4L urb art	0.34	No	1998	2.76	4	1.38	24000	3.35	0.048
3	BRUNSWICK	R-3106	NC 179	N of SR 1145	US 17 Business	Widen 2L to 3L w/ c&g	2.72	No	2000	1.92	3	2.72	11000	2.17	0.007
3	BRUNSWICK	R-3106	NC 170	N of SR 1145	US 17 Business	Widen 2L to 3L w/ c&g	2.23	No	2000	1.57	3	2.23	11000	1.78	0.007
3	BRUNSWICK	R-83	US 17	NC 211(supply)	NC 87 (Bell S	Widen 2L-4L+Bypass	13.55	Yes	1992	25.50	4	27.09	11000	37.54	0.025
3	BRUNSWICK	R-97	US 17	SC State Line	NC 211(Supply	Widen 2L to 4L+Bypass	3.22	Yes	1997	6.50	4	6.43	13000	6.86	0.016
3	BRUNSWICK	R-97	US 17	SC State Line	NC 211(Supply	Widen 2L to 4L+Bypass	10.00	Yes	1997	20.36	4	20.01	15100	21.48	0.014
3	BRUNSWICK	R-97	US 17	SC State Line	NC 211(Supply	Widen 2L to 4L+Bypass	8.08	Yes	1997	16.50	4	16.15	18800	17.41	0.012
3	DUPLIN	R-2010	NC 24	Beulaville	Richlands	Widen 2L to 4L Rural	5.25	No	1994	9.28	4	10.50	4100	13.51	0.063
3	DUPLIN	R-2211	NC 24-11-903	I-40	Beulaville	New 4L rur art Bypas	5.42	Yes	1997	8.47	4	10.83	7200	8.94	0.024
3	DUPLIN	R-2211	NC 24-11-903	I-40	Beulaville	Widen 2l to 4L rural	12.32	Yes	1999	19.23	4	24.64	7800	22.04	0.023
3	DUPLIN	R-2524	NC 24	I-40	Warsaw west City Limits	Widen 2l to 4L urb ar	1.10	No	1995	0.50	4	2.20	9100	0.61	0.007
3	DUPLIN	R-2524	NC 24	I-40	Warsaw City Limits	Widen 2L to 4L	0.52	No	1997	0.16	4	1.04	8400	0.17	0.005
3	DUPLIN	R-2524	NC 24	I-40	Warsaw City Limits	Widen 2L to 4L	1.08	No	1997	0.34	4	2.17	8400	0.36	0.005
3	DUPLIN	R-606	US 117	I 40 Exit 355	Mt Olive Connector	New 4L rur art on new	4.50	No	1994	16.11	4	18.02	6600	23.45	0.085
3	DUPLIN	R-606	US 117	I 40 Exit 355	Mt Olive Connector	New 4L rur art on new	1.23	No	1994	4.39	4	4.91	6600	6.39	0.085
3	DUPLIN	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	15.16	No	1990	39.02	4	60.66	15000	58.06	0.031
3	DUPLIN	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	5.01	No	1990	13.23	4	20.04	18000	19.69	0.027
3	DUPLIN	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	3.38	No	1990	8.92	4	13.51	15000	13.27	0.032
3	DUPLIN	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	4.49	No	1990	11.85	4	17.95	17000	17.63	0.028
3	NEW HANOVER	R-536	NC 132	US 421	Shipyard Blvd	Widen 2L to 4L rur ar	4.29	No	1996	6.50	4	8.59	23500	7.67	0.009
3	NEW HANOVER	U-2570	US 17	30 St. Colonial Dr.	CSX Transportation	Widen 2L to 4L Urb Ar	0.42	No	1998	0.57	5	1.27	30000	0.69	0.007
3	NEW HANOVER	U-2570	US 17	30 St. Colonial Dr.	CSX Transportation	Widen 2L to 4L Urb Ar	0.32	No	1998	0.43	5	0.95	30000	0.52	0.007
3	NEW HANOVER	U-2571	US 76	Hinton St	Bagley Ave	Widen 2L to 4L urb ar	0.70	No	1998	0.27	5	2.09	25000	0.32	0.002
3	NEW HANOVER	U-2571	US 76	Pine Grove Rd	52nd Street	Widen 2L to 4L urb ar	0.88	No	1998	0.33	5	2.64	28000	0.41	0.002
3	NEW HANOVER	U-2572	US 76	Military Cutoff	South of US 74	Widen 2L to 4L urb ar	0.28	No	1997	0.49	4	0.56	27000	0.52	0.007
3	NEW HANOVER	U-2572	SR 1409 Military Cut	Bradley Creek Bridge	Military Cutoff	Widen 2L to 4L urb ar	0.58	No	1997	1.01	4	1.16	26000	1.07	0.007

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DOT DIV	County	Proj ID Num	Route/City Name	From Location	To Location	Work Description	Length	Infra Sys	Compl Year	Nom Cost	Lanes After	LM Added	ADT2	2002 Cost	2002 Cost/VMT
3	NEW HANOVER	U-2701	NC 132	US 17-74	SR 2313 - Wilshire Blvd	Widen 2L to 4L urb ar	2.22	No	1991	2.97	4	4.44	37000	4.40	0.006
3	NEW HANOVER	U-2733	US 74	Smith Creek Pkwy	Military Cutoff	Widen 2l to 4L urb ar	2.07	No	1998	1.70	4	4.14	15000	2.07	0.008
3	NEW HANOVER	U-3116	Independence Blvd Ext	US 76 (Oleander Dr)	Randall Parkway	New 5L w/ c&g on new loc	0.99	No	2002	8.80	5	4.94	14000	8.80	0.074
3	NEW HANOVER	U-92	Smith Creek Pkwy	US 117	US 74	New 4L Frwy on new lo	3.86	No	1999	69.96	4	15.44	11000	80.17	0.189
3	NEW HANOVER	U-92	Smith Creek Pkwy	US 117	US 74	New 4L Frwy on new lo	0.63	No	1999	11.42	4	2.52	11000	13.09	0.189
3	NEW HANOVER	U-92	Smith Creek Pkwy	US 117	US 74	New 4L Frwy on new lo	0.50	No	1999	9.06	4	2.00	12000	10.39	0.173
3	NEW HANOVER	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	1.25	No	1990	3.30	4	4.99	25000	4.91	0.019
3	NEW HANOVER	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	1.09	No	1990	2.88	4	4.36	25000	4.29	0.019
3	NEW HANOVER	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	3.16	No	1990	8.34	4	12.64	23000	12.41	0.021
3	NEW HANOVER	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	0.77	No	1990	2.03	4	3.06	23000	3.02	0.021
3	ONSLOW	R-1021	US-258/NC-24	NC-111	NC-24 West of Richlands	Widen 2L to 4L rur ar	8.82	Yes	1992	13.80	4	17.64	6200	20.31	0.044
3	ONSLOW	R-2010	NC 24	Beulaville	Richlands	Widen 2L to 4L Rural	3.63	No	1994	6.42	4	7.25	4100	9.35	0.063
3	ONSLOW	R-2405	US 17	Onslow County Line	Holly Ridge	Widen 2L to 4L rur ar	1.80	Yes	2001	3.15	4	3.60	11000	3.08	0.015
3	ONSLOW	R-2406	US 17	E. of Holly Ridge	4L S of Jacksonville	Widen 2L to 4L rur ar	4.29	Yes	1999	4.29	4	8.58	10600	4.92	0.012
3	ONSLOW	R-2406	US 17	E. of Holly Ridge	4L S of Jacksonville	Widen 2L to 4L rur ar	11.53	Yes	1999	36.24	4	23.07	11100	41.53	0.033
3	ONSLOW	U-1253H	SR 1470 - Western Bl	SR 1308 - Gum Branch Rd	US 17	New 2L	3.54	No	1991	2.80	2	7.08	24000	4.14	0.006
3	PENDER	R-2405	US 17	Scotts Hill	Onslow Couty Line	Widen 2L to 4L rur ar	15.66	Yes	2001	27.40	4	31.33	16000	26.82	0.013
3	PENDER	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	15.33	No	1990	39.47	4	61.30	20000	58.73	0.023
3	PENDER	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	8.21	No	1990	21.67	4	32.82	18000	32.24	0.027
3	PENDER	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	2.26	No	1990	5.97	4	9.06	18000	8.88	0.027
3	SAMPSON	R-2526	NC 24	SR 1216	SR 1216	Widen 2L to 4L rur ar	0.82	Yes	1993	0.97	3	0.82	7600	1.42	0.023
3	SAMPSON	R-606	US 117	I 40 Exit 355	Mt Olive Connector	New 4L rur art on new	1.32	No	1994	4.72	4	5.28	6600	6.87	0.085
3	SAMPSON	U-2526	NC 24	SR 1401	SR 1216	Widen to 3L curb-and-	0.95	No	1993	1.13	3	0.95	7600	1.65	0.023
3	SAMPSON	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	1.17	No	1990	3.09	4	4.67	18000	4.60	0.027
3	SAMPSON	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	2.42	No	1990	6.39	4	9.70	17000	9.51	0.028
3	SAMPSON	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	11.88	No	1990	31.36	4	47.54	16000	46.66	0.030
3	SAMPSON	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	4.61	No	1990	12.17	4	18.45	17000	18.11	0.028
4	EDGECOMBE	R-2111	US 64	US 64 Byp at Tarboro	W of Robersonville	New 4L Fry on new loc	8.52	Yes	1999	33.19	4	34.07	8400	38.03	0.054
4	EDGECOMBE	R-2111	US 64	US 64 Byp at Tarboro	W of Robersonville	New 4L Fry on new loc	1.40	Yes	1999	5.45	4	5.61	8600	6.25	0.053
4	EDGECOMBE	R-218	US 13/NC 11	NC 903 (Greenville NW Loop)	Bethel Bypass	Widen 2L to 4L	0.39	No	2000	1.25	4	0.77	8300	1.41	0.052
4	EDGECOMBE	R-509	US 64	Rocky Mt.	Tarboro	Two new exits - 1207	1.04	No	1998	7.70	2	0.00	800	9.36	1.125
4	EDGECOMBE	R-509	US 64	Rocky Mt.	Tarboro	Two new exits - 1225	1.11	No	1998	7.70	2	0.00	5500	9.36	0.157
4	EDGECOMBE	U-2118	US-64 Bus (Main St.)	NC44	US-64 Bypass	Widen 2L to 5L	1.46	No	1991	2.60	5	4.38	7000	3.85	0.047
4	EDGECOMBE	U-2218	NC 43 Bypass	NC 43	US 64	New 2L, part on new loc	2.18	No	2002	4.30	2	4.36	6000	4.30	0.039
4	HALIFAX	R-2816	NC 481, Enfield Bypass	NC 481	US 301	New 2L on new loc	1.13	No	2002	2.60	2	2.25	1700	2.60	0.158
4	HALIFAX	U-1007	Bolling Rd, Roanoke	SR 1400 (Tenth St.)	NC-48 (Roanoke Ave)	Widen 2L to 4L	2.43	No	1999	4.30	4	4.85	5200	4.93	0.045
4	HALIFAX	U-2720	Old Farm Rd Extensio	NC 152 North	US 158 west of I-95	New 5L urb art	0.75	No	2000	3.40	5	3.76	10000	3.85	0.061
4	JOHNSTON	I-0010	I-40	Raleigh Beltline	I-95 at Benson	New 4L frwy on new lo	16.07	No	1990	33.75	4	64.28	18500	50.22	0.018
4	JOHNSTON	I-0010	I-40	Raleigh Beltline	I-95 at Benson	New 4L frwy on new lo	1.59	No	1990	3.34	4	6.35	22200	4.97	0.015

List of the 750 Sections of the Major Highway Projects (1990-2004)

DOT DIV	County	Proj ID Num	Route/City Name	From Location	To Location	Work Description	Length	Infra Sys	Compl Year	Nom Cost	Lanes After	LM Added	ADT2	2002 Cost	2002 Cost/VMT
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	0.55	Yes	1997	2.36	4	1.11	20000	2.49	0.023
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	0.05	Yes	1997	0.22	4	0.10	20000	0.23	0.023
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	0.26	Yes	1997	1.10	4	0.52	20000	1.16	0.023
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	1.46	Yes	1997	6.21	4	2.92	23000	6.55	0.020
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	1.27	Yes	1997	5.36	4	2.53	23000	5.65	0.020
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	1.04	Yes	1997	4.40	4	2.07	23000	4.64	0.020
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	6.57	Yes	1997	27.92	4	13.15	20000	29.46	0.023
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	0.22	Yes	1997	0.94	4	0.44	23000	0.99	0.020
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	0.21	Yes	1997	0.90	4	0.42	20000	0.95	0.023
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	1.65	Yes	1997	6.99	4	3.29	20000	7.37	0.023
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	0.43	Yes	1997	1.82	4	0.86	20000	1.92	0.023
4	JOHNSTON	R-84	US 70, Smithfield Bypass	US 70 w of Smithfied	US 70 E of Smithfield	4L div facil, part on	5.67	Yes	1997	24.09	4	11.34	23000	25.41	0.020
4	JOHNSTON	U-2114	US-301	US 70 North	Hospital Street	Widen 2L to 5L	0.60	No	1992	1.70	5	1.80	13800	2.50	0.035
4	JOHNSTON	X 3	I-40	I 95	Wilmington	New 4L fway on new lo	12.01	No	1990	31.31	4	48.02	19000	46.59	0.025
4	NASH	U-2111	Falls Rd (NC43-48)	US 301 Business	US 64 Bypass	Establish 1-way	1.18	No	1998	2.10	4	2.36	9500	2.55	0.027
4	NASH	U-2111	Falls Rd (NC43-48)	US 301 Business	US 64 Bypass	Establish 1-way	1.20	No	1998	2.10	4	2.41	9500	2.55	0.027
4	NASH	U-2117	Sunset Ave	SR 1544	Westridge Cir	Widen 2L to 4L	1.03	No	1995	3.00	4	4.10	19500	3.69	0.022
4	NASH	U-2219	Bethlem Rd	SR 1805	Tar River	Widen 2L to 4L	1.41	No	1992	1.90	5	4.22	15700	2.80	0.015
4	NASH	U-2310	NC 97	US 301	Nashville Ave	Widen 2L to 5L	1.46	No	2000	3.30	5	4.37	6400	3.73	0.048
4	NASH	U-2561	NC 43	NC-48 (Gold Rock Rd.)	I-95	Widen 2L to 5L	3.79	No	2001	14.20	5	11.36	13000	13.90	0.034
4	NASH	U-2562	NC 48	NC-43	SR-1535	Widen 2L to 3L	2.00	No	1991	1.60	3	2.00	7900	2.37	0.018
4	WAYNE	R-1030	US 117	US 70	US 301	New 4L rur art, new l	0.93	No	2001	3.50	4	3.73	9500	3.43	0.038
4	WAYNE	R-1030	US 117	US 70	US 301	New 4L rur art, new l	2.34	No	2001	8.80	4	9.36	9500	8.62	0.038
4	WAYNE	R-1030	US 117	US 70	US 301	New 4L rur art, new l	1.00	No	2001	3.76	4	4.00	9500	3.68	0.038
4	WAYNE	R-1030	US 117	US 70	US 301	New 4L rur art, new l	9.85	No	2001	37.01	4	39.38	7800	36.23	0.047
4	WAYNE	R-2422	NC 581	SR 1915	SR 1960 over Neuse River	New 2L rd	1.65	No	2000	8.40	2	3.30	4500	9.50	0.149
4	WAYNE	R-606	US 117	I 40 Exit 355	Mt Olive Connector	New 4L rur art on new	2.99	No	1994	10.68	4	11.95	6600	15.55	0.085
4	WAYNE	U-2409	US 13-70-NC 111	US 70	Spence Rd. SR 1565	New Interchange	1.04	No	1996	5.60	2	0.00	6200	6.61	0.113
4	WILSON	R-1023	US 264, Wilson bypass	I-95	NC 58 s of Wilson	New 4L Fry on new loc	2.06	Yes	2000	15.29	4	8.25	14500	17.29	0.058
4	WILSON	R-1023	US 264, Wilson bypass	I-95	NC 58 s of Wilson	New 4L Fry on new loc	2.02	Yes	2000	15.00	4	8.09	14500	16.97	0.058
4	WILSON	R-1023	US 264, Wilson bypass	I-95	NC 58 s of Wilson	New 4L Fry on new loc	3.41	Yes	2000	25.29	4	13.63	14500	28.60	0.058
4	WILSON	R-1023	US 264, Wilson bypass	I-95	NC 58 s of Wilson	New 4L Fry on new loc	5.70	Yes	2000	42.24	4	22.79	14500	47.77	0.058
4	WILSON	R-1030	US 117	US 70	US 301	New 4L rur art, new l	5.86	No	2001	22.04	4	23.45	7800	21.58	0.047
4	WILSON	R-1030	US 117	US 70	US 301	New 4L rur art, new l	0.61	No	2001	2.29	4	2.43	7800	2.24	0.047
4	WILSON	R-2222	Airport Rd - SR-1320	SR-1321	NC-58	Widen 2L to 4L	1.26	No	1992	3.00	5	3.78	10100	4.42	0.043
4	WILSON	U-2573	NC 58	Wilson City Limits	Silver Lake	Widen 2L to 5L	2.33	No	1999	9.79	5	6.98	14000	11.22	0.040
4	WILSON	U-2573	NC 58	Wilson City Limits	Silver Lake	Widen 2L to 5L	0.26	No	1999	1.11	5	0.79	7000	1.27	0.070
4	WILSON	U-2922	SR 1165 (Forest Hill	SR 1166 (Forest Hills Loop)	US 264	Widen 2L to 4L	1.07	No	1998	10.10	4	2.14	15000	12.27	0.092
4	WILSON	U-3117	SR 1163 (Downing St)	SR 1165 (Forest Hills Dr)	US 264 Bypass	Widen 2L to 4L	1.15	No	2002	4.90	4	2.29	6000	4.90	0.080

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DOT DIV	County	Proj ID Num	Route/City Name	From Location	To Location	Work Description	Length	Infra Sys	Compl Year	Nom Cost	Lanes After	LM Added	ADT2	2002 Cost	2002 Cost/VMT
4	WILSON	U-3118	SR 1515 (Lipscombe Rd)	US 254-NC 58	US 301	Widen 2L to 5L with c	1.01	No	2000	2.90	5	3.03	10000	3.28	0.039
4	WILSON	U-3345	Merck Rd. Wilson	US-264 East of I-95	SR 1158 SW of Wilson	Widen 2L to 4L	2.26	No	1999	7.00	4	4.51	1000	8.02	0.422
4	WILSON	U-3472	NC 42 W (Tarboro St)	I-95	SR 1165 (Forest Hills Rd)	Widen 2L to 4L	2.86	No	2003	8.40	4	5.72	6300	8.27	0.053
4	WILSON	U-3472	NC 42 W (Tarboro St)	I-95	SR 1165 (Forest Hills Rd)	Widen 2L to 4L	2.96	No	2003	8.70	4	5.92	19000	8.57	0.018
5	DURHAM	I-2204	I-40	NC 147 in RTP	Wade Ave (I-40), Raleigh	Widen 4L to 8L frwy	3.20	Yes	1998	16.91	8	12.82	130000	20.55	0.005
5	DURHAM	R-2109	NC-54	NC 55 Lowes Grove	Research Triangle Park	Widen 2L to 4/5	1.02	No	1994	2.47	4	2.04	15000	3.59	0.026
5	DURHAM	U-2102	NC-157 (Guess Rd, N	SR 1407, Carver St	SR 1449, Ulmstead St.	Widen 2L to 4L	3.31	No	2000	13.80	4	6.62	16000	15.61	0.035
5	DURHAM	U-2206	Southern Parkway Int	US 15-501	Shannon Rd	Revise Intercha	0.88	No	1994	19.20	4	0.00	19000	27.96	0.192
5	DURHAM	U-2517	NC 147/Ellis Rd	Ellis Rd Interchange	Ellis Rd Interchange	Construct Inter	0.50	No	1992	1.75	4	0.00	3700	2.58	0.142
5	DURHAM	U-2517	NC 147/Ellis Rd	Ellis Rd Interchange	Ellis Rd Interchange	Construct Inter	0.47	No	1992	1.75	4	0.00	3700	2.58	0.152
5	DURHAM	U-3853	Hopson Page Rd Ext	Peace Haven Interchange	Jones-Town Rd	New 5L w/ c&g	0.59	No	2002	0.90	5	2.96	25000	0.90	0.007
5	DURHAM	U-77	NC 147 (Buck Dean Fr	I-85	Durham Frwy (Erwin Rd.)	New 4L Frwy	0.87	No	1997	24.62	4	3.46	22700	25.97	0.138
5	DURHAM	U-77	NC 147 (Buck Dean Fr	I-85	Durham Frwy (Erwin Rd.)	New 4L Frwy	0.97	No	1997	27.44	4	3.86	29700	28.95	0.105
5	DURHAM	U-77	NC 147 (Buck Dean Fr	I-85	Durham Frwy (Erwin Rd.)	New 4L Frwy	0.12	No	1997	3.33	4	0.47	29700	3.52	0.105
5	DURHAM	W-2306	US 15-501 Business	James St.	Legion Ave	Widen 2L to 5L	0.58	No	1990	2.00	5	1.73	13900	2.98	0.041
5	FRANKLIN	R-205	US 1	1 mi N of Wyatt in Wake Co	US 1A N of Youngsville	Widen 2L to 4L rur ar	2.37	Yes	1994	8.78	4	4.75	12000	12.78	0.045
5	FRANKLIN	R-205	US 1	1 mi N of Wyatt in Wake Co	US 1A N of Youngsville	Widen 2L to 4L rur ar	1.01	Yes	1994	3.75	4	2.03	10300	5.46	0.052
5	FRANKLIN	R-607	US 1	US 1A S of Franklin	US 1 Bus S. of Henderson	Widen 2L to 4L	0.52	Yes	1997	1.10	4	1.04	12000	1.16	0.020
5	GRANVILLE	I-2515	I-85 Exit 189, E of	I-85 Exit 189	I-85 Exit 189	New Exit	0.45	No	1993	1.30	4	0.00	2200	1.90	0.206
5	GRANVILLE	I-2515	I-85 Exit 189, E of	I-85 Exit 189	I-85 Exit 189	New Exit	0.53	No	1993	1.30	4	0.00	2200	1.90	0.177
5	GRANVILLE	R-2257	US 158, Oxford Outer Loop	US 15	US 158	New 2L on new location	2.73	No	1993	7.20	2	5.46	5000	10.54	0.096
5	GRANVILLE	U-233	Spring Street, Oxfor	Hillsboro St.	NC 96 Linden Ave	New 4L on new loc	0.43	No	1998	2.10	4	1.73	3500	2.55	0.205
5	VANCE	R-501	US 1 Henderson Bypass	US 1 Bus s of Henderson	S of US 158, N of H.	Widen 2l to 4L frwy	0.65	Yes	1992	1.70	4	1.30	6400	2.50	0.072
5	VANCE	R-501	US 1 Henderson Bypass	US 1 Bus s of Henderson	S of US 158, N of H.	Widen 2l to 4L frwy	2.77	Yes	1992	7.22	4	5.54	4200	10.63	0.092
5	VANCE	R-501	US 1 Henderson Bypass	US 1 Bus s of Henderson	S of US 158, N of H.	Widen 2l to 4L frwy	1.11	Yes	1992	2.89	4	2.21	5100	4.25	0.076
5	VANCE	R-501	US 1 Henderson Bypass	US 1 Bus s of Henderson	S of US 158, N of H.	Widen 2l to 4L frwy	2.64	Yes	1992	6.88	4	5.28	8100	10.13	0.057
5	WAKE	I-0010	I-40	Raleigh Beltline	I-95 at Benson	New 4L frwy on new lo	1.80	No	1990	3.78	4	7.20	22200	5.62	0.015
5	WAKE	I-0010	I-40	Raleigh Beltline	I-95 at Benson	New 4L frwy on new lo	4.33	No	1990	9.09	4	17.33	43500	13.53	0.007
5	WAKE	I-0010	I-40	Raleigh Beltline	I-95 at Benson	New 4L frwy on new lo	2.83	No	1990	5.90	4	11.32	22200	8.78	0.015
5	WAKE	I-2204	I-40	NC 147 in RTP	Wade Ave (I-40), Raleigh	Widen 4L to 8L frwy	3.47	Yes	1998	27.01	8	13.89	140000	32.82	0.007
5	WAKE	I-2204	I-40	NC 147 in RTP	Wade Ave (I-40), Raleigh	Widen 4L to 8L frwy	0.22	Yes	1998	1.14	8	0.86	147000	1.39	0.005
5	WAKE	I-2204	I-40	NC 147 in RTP	Wade Ave (I-40), Raleigh	Widen 4L to 8L frwy	1.03	Yes	1998	5.43	8	4.12	131000	6.60	0.005
5	WAKE	R-2000	I-540 N Wake Expessway	I-40	US 1	New 4L frwy on new loc	3.38	Yes	2002	55.06	4	13.53	22000	55.06	0.076
5	WAKE	R-2000	I-540 N Wake Expressway	I-40	US 1	New 4L frwy on new loc	3.19	Yes	2002	52.61	4	12.75	31000	52.61	0.055
5	WAKE	R-2000	I-540 N Wake Expressway	I-40	US 1	New 4L frwy on new loc	1.33	Yes	1996	29.94	4	5.34	41000	35.33	0.072
5	WAKE	R-2000	I-540 N Wake Expressway	I-40	US 1	New 4L frwy on new loc	1.11	Yes	1997	18.31	4	4.43	52000	19.31	0.037
5	WAKE	R-2000	I-540 N Wake Express	I-40	US 1	New 4L frwy on new loc	3.02	Yes	1996	49.81	4	12.10	48000	58.78	0.045
5	WAKE	R-2000	I-540 N Wake Expressway	I-40	US 1	New 4L frwy on new loc	3.77	Yes	2001	62.19	4	15.08	37000	60.88	0.046
5	WAKE	R-2026	US-401	4-L in Fuquay Varina	NC-42-55	Widen 2L to 4L	0.84	No	1993	6.00	5	2.51	16500	8.78	0.074

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DOT DIV	County	Proj ID Num	Route/City Name	From Location	To Location	Work Description	Length	Infra Sys	Compl Year	Nom Cost	Lanes After	LM Added	ADT2	2002 Cost	2002 Cost/VMT
5	WAKE	R-205	US 1	1 mi N of Wyatt in Wake Co	US 1A N of Youngsville	Widen 2L to 4L rur ar	1.48	Yes	1994	5.48	4	2.96	21000	7.98	0.031
5	WAKE	R-205	US 1	1 mi N of Wyatt in Wake Co	US 1A N of Youngsville	Widen 2L to 4L rur ar	1.90	Yes	1994	7.04	4	3.81	14400	10.25	0.045
5	WAKE	R-205	US 1	1 mi N of Wyatt in Wake Co	US 1A N of Youngsville	Widen 2L to 4L rur ar	0.69	Yes	1994	2.55	4	1.38	14400	3.71	0.045
5	WAKE	R-2121	Davis Dr. Ext. RTP	SR 1635 Wake	Hopson Rd. SR 1978 Durham (	New 2L on 4L RO	3.45	No	1991	5.40	2	6.90	16000	7.99	0.017
5	WAKE	R-2318	US 64	E. of Lake Jordan	US 1-64 at Cary	Widen 2 to 4L rur art	3.08	Yes	1997	10.07	4	6.16	13000	10.62	0.027
5	WAKE	R-2318	US 64	E. of Lake Jordan	US 1-64 at Cary	Widen 2 to 4L rur art	0.80	Yes	1997	2.62	4	1.61	21000	2.76	0.017
5	WAKE	R-2318	US 64	E. of Lake Jordan	US 1-64 at Cary	Widen 2 to 4L rur art	4.73	Yes	1997	15.47	4	9.46	29000	16.32	0.014
5	WAKE	R-2402	US 70 Interchange	Greenfield Parkway Interchan	Greenfield Parkway Intercha	New Interchange	0.96	No	1991	3.90	4	0.00	3300	5.77	0.215
5	WAKE	R-2416	US 401	NC 42-55	North 1.8 Miles	Widen 2L to 4L	1.82	No	1998	6.70	4	3.64	19000	8.14	0.027
5	WAKE	R-2425	US 401	US 1	N of SR 2044	Widen 2L to 4L	2.08	No	2002	15.88	4	4.16	17000	15.88	0.050
5	WAKE	R-2425	US 401	US 1	N of SR 2044	Widen 2L to 4L	2.32	No	2002	17.72	4	4.65	22000	17.72	0.040
5	WAKE	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	7.69	Yes	1999	18.62	4	15.38	16000	21.34	0.021
5	WAKE	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	0.38	Yes	1999	0.91	4	0.75	20000	1.04	0.014
5	WAKE	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	1.30	Yes	1999	3.14	4	2.59	16000	3.60	0.021
5	WAKE	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	1.21	Yes	1999	2.94	4	2.43	34000	3.37	0.010
5	WAKE	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	1.94	Yes	1999	4.70	4	3.88	34000	5.39	0.010
5	WAKE	R-2541	Holly Springs Bypass	NC 55, S. of Holly Springs	NC 55, N. of Holly Springs	New 2L on ML ROW\	4.53	No	2003	13.70	2	9.06	7000	13.49	0.047
5	WAKE	R-2634	Aviation Pkwy, RDU Airpt	I-540 (N. Wake Expy)	RDU Airport Connector	New 4L frwy on new lo	0.71	No	1999	5.70	4	2.85	12000	6.53	0.092
5	WAKE	R-2826	Fuquay Varina Loop	US 401 South of FV	US 401 N of FV (E. Academy	New 2L rur art	2.10	No	2000	3.00	2	4.20	6000	3.39	0.032
5	WAKE	R-3619	Briar Creek Pkwy	Aviation Pkwy	US 70	New 4L with c&g on new loc	3.84	No	2000	6.00	4	15.36	22000	6.79	0.010
5	WAKE	R-3837	TW Alexander	Development Dr	Kit Creek	New 4L on new loc	1.21	No	2000	3.30	4	4.85	15000	3.73	0.025
5	WAKE	U-2108	I-440 Raleigh Loop	US 70	US 64	Widen 4L to 6L	1.18	Yes	1997	10.15	6	2.37	95000	10.71	0.010
5	WAKE	U-2108	I-440 Raleigh Loop	US 70	US 64	Widen 4L to 6L	1.91	Yes	1997	16.33	6	3.81	81000	17.23	0.012
5	WAKE	U-2108	I-440 Raleigh Loop	US 70	US 64	Widen 4L to 6L	1.22	Yes	1997	10.43	6	2.44	102000	11.00	0.009
5	WAKE	U-2108	I-440 Raleigh Loop	US 70	US 64	Widen 4L to 6L	2.73	Yes	1997	23.43	6	5.47	98000	24.72	0.010
5	WAKE	U-2108	I-440 Raleigh Loop	US 70	US 64	Widen 4L to 6L	1.75	Yes	1997	14.96	6	3.50	105000	15.78	0.009
5	WAKE	U-2109	NC 50 (Creedmore Rd)	US 70	Strickland Rd	Widen 2L to 4L urb ar	4.10	No	1991	17.30	4	8.21	23400	25.60	0.032
5	WAKE	U-2301	Hunter St. Ext., Ape	Salem St.	Old Raleigh Rd.	New 2L	0.33	No	1994	1.30	2	0.66	7000	1.89	0.103
5	WAKE	U-2403	Evans Rd. Ext, Cary	Aviation Pkwy	Weston Pkwy	New 4L urb art	0.65	No	1992	2.50	4	2.62	14000	3.68	0.050
5	WAKE	U-2503	Maynard Rd	High House Rd	NC-54	New 3L Urb Art	1.35	No	1992	1.60	3	4.06	21000	2.36	0.010
5	WAKE	U-2582	SR 3009 Ext	Trinity Rd	Duraleigh Rd	New 4L on new loc	0.58	No	2003	4.80	4	2.32	20000	4.73	0.049
5	WAKE	U-2582	SR 3009 Ext	Trinity Rd	Duraleigh Rd	New 4L on new loc	1.57	No	2003	13.00	4	6.29	30000	12.81	0.033
5	WAKE	U-2804	SR 1652 (Harrison Ave)	NC 54	I-40	Widen 2L to 4L	1.10	No	2003	2.38	4	2.20	24000	2.34	0.011
5	WAKE	U-2804	SR 1652 (Harrison Ave)	NC 54	I-40	Widen 2L to 4L	2.05	No	2003	4.44	4	4.09	15000	4.37	0.017
5	WAKE	U-2824	Duraleigh Rd - Edwar	Blue Ridge Rd	Kidds Hill Plaza Entrance	Widen 2L to 4L	1.55	No	2000	7.70	4	3.10	14500	8.71	0.043
5	WAKE	U-2920	New Hope Rd, SR 2036	Willow Oak Rd., SR 2906	Buffaloe Rd, SR 2215	Widen 2L to 5L	1.78	No	2000	4.50	5	5.33	17000	5.09	0.020
5	WAKE	U-3325	Centennial Pkwy	Lake Wheeler Rd	Avent Ferry Rd.	New 4L urb art	1.60	No	1998	7.00	4	6.41	16000	8.51	0.040
5	WAKE	U-3408	Cary Parkway, Cary	High House Rd	Evans Rd	New 4L urb art	1.77	No	1999	11.70	4	7.07	26000	13.41	0.036
5	WAKE	U-3474	US 1, N of Raleigh	Spring Forest Rd., SR 2041	Old Wake Forest Rd, SR 3555	Widen 4L to 6L	1.12	No	1999	4.50	6	2.24	44000	5.16	0.013

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DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
5	WAKE	U-515	Hammond Rd, Raleigh	US 70	Rush St.	New 4L urb art	1.60	No	1998	25.90	4	6.40	22000	31.47	0.109
5	WAKE	U-604	Timber Dr., Garner	US-70	NC-50	New 4L urb art	3.24	No	1995	10.00	4	12.97	17000	12.29	0.027
6	BLADEN	R-2562	NC-87	NC-20	NC-131 at Tarheel	Widen 2L to 4L	4.96	No	1999	9.30	4	9.93	11000	10.66	0.021
6	BLADEN	R-522	NC 87 Elizabetht	NC 41	Old NC 87 Sou	New 4L	2.27	Yes	1996	6.50	4	9.06	3500	7.67	0.098
6	BLADEN	R-522	NC 87 Elizabetht	NC 41	Old NC 87 Sou	New 4L	4.47	Yes	1996	12.60	4	17.86	5700	14.87	0.059
6	COLUMBUS	R-2558	US 74	NC 41 Robeson Co	US 76 Columbus Co	Widen 2L to 4L rur ar	9.56	Yes	2000	23.77	4	19.12	11000	26.88	0.026
6	COLUMBUS	R-2558	US 74	NC 41 Robeson Co	US 76 Columbus Co	Widen 2L to 4L rur ar	1.95	Yes	2000	4.84	4	3.89	8100	5.47	0.035
6	COLUMBUS	R-61	US 74	Whiteville	E of Bolton	New 4L rur art	9.43	No	1999	27.99	4	37.72	13000	32.08	0.026
6	COLUMBUS	R-61	US 74	Whiteville	E of Bolton	New 4L rur art	1.60	No	1999	4.75	4	6.40	12500	5.44	0.027
6	COLUMBUS	R-61	US 74	Whiteville	E of Bolton	New 4L rur art	1.31	No	1999	3.88	4	5.23	12000	4.45	0.028
6	COLUMBUS	R-61	US 74	Whiteville	E of Bolton	New 4L rur art	1.88	No	1999	5.59	4	7.53	13000	6.41	0.026
6	COLUMBUS	R-61	US 74	Whiteville	E of Bolton	New 4L rur art	2.17	No	1999	6.44	4	8.67	10000	7.38	0.041
6	COLUMBUS	R-61	US 74	Whiteville	E of Bolton	New 4L rur art	0.62	No	1999	1.84	4	2.49	12500	2.11	0.027
6	CUMBERLAND	R-214	US 401	Raeford Bypass in Hoke Cour	71st School Rd Cumberland C	Widen 2L to 4L rur ar	0.70	No	1994	1.45	4	1.39	20000	2.11	0.020
6	CUMBERLAND	R-214	US 401	Raeford Bypass in Hoke Cour	71st School Rd Cumberland C	Widen 2L to 4L rur ar	2.10	No	1994	4.39	4	4.21	22900	6.39	0.017
6	CUMBERLAND	R-214	US 401	Raeford Bypass in Hoke Cour	71st School Rd Cumberland C	Widen 2L to 4L rur ar	0.77	No	1994	1.62	4	1.55	24300	2.35	0.016
6	CUMBERLAND	R-214	US 401	Raeford Bypass in Hoke Cour	71st School Rd Cumberland C	Widen 2L to 4L rur ar	0.79	No	1994	1.64	4	1.57	21000	2.39	0.017
6	CUMBERLAND	R-3456	SR 2333 Walmart Acce	NC 59 just e of I-95	N to Walmart Distribution C	New 2L urb art	2.12	No	1998	0.80	2	4.23	2900	0.97	0.019
6	CUMBERLAND	U-2103	Cliffdale Rd.	Cliffdale Rd/Morganton Rd. sp	Reilly Rd.	Widen 2L to 4L urb ar	4.75	No	1993	11.51	4	9.50	22000	16.85	0.021
6	CUMBERLAND	U-2103	Morganton Rd	Morganton Rd/Cliffdale Rd. sp	Reilly Rd	Widen 2L to 4L urb ar	4.57	No	1993	11.09	4	9.15	21500	16.23	0.021
6	CUMBERLAND	U-2103	Cliffdale Rd	Morganton Rd/Cliffdale Rd spl	Reilly Rd.	Widen 2L to 4L	3.05	No	1993	6.84	4	6.10	22500	10.01	0.019
6	CUMBERLAND	U-2103	Morganton Rd	Morganton Rd/Cliffdale Rd. sp	Reilly Rd.	Widen 2L to 4L	1.23	No	1993	2.77	4	2.47	22000	4.05	0.019
6	CUMBERLAND	U-2103	Morganton Rd	Morganton Rd/Cliffdale Rd spl	Reilly Rd.	Widen 2L to 4L	1.76	No	1993	3.95	4	3.53	22400	5.79	0.019
6	CUMBERLAND	U-2103	Cliffdale Rd	Morganton Rd/Cliffdale Rd. sp	Reilly Rd.	Widen 2L to 4L	1.70	No	1993	3.81	4	3.40	23500	5.58	0.018
6	CUMBERLAND	U-2103	Morganton Rd	Morganton Rd/Cliffdale Rd. sp	Reilly Rd.	Widen 2L to 4L	1.58	No	1993	3.53	4	3.15	18200	5.17	0.023
6	CUMBERLAND	U-2304	SR 1141, Cumberland	NC 59	SR 1007, Owen Dr.	Widen 2L to 5L	3.13	No	1999	8.80	5	9.40	19000	10.08	0.017
6	CUMBERLAND	U-2308	NC 59, Hope Mills Rd	Ex 4L S of Camden Rd.	US 401 Business	Widen 2L to 4L	1.40	No	2003	4.86	4	2.81	21000	4.78	0.018
6	CUMBERLAND	U-2308	NC 59, Hope Mills Rd	Ex 4L S of Camden Rd.	US 401 Business	Widen 2L to 4L	2.65	No	2003	9.18	4	5.31	17100	9.04	0.023
6	CUMBERLAND	U-2518	Bonanza Dr. Fayettev	SR 1404	Santa Fe Rd.	Widen 2L to 5L	0.66	No	1995	1.00	5	1.99	18000	1.23	0.013
6	CUMBERLAND	U-2709	US 401 Business	Rankin Rd.	Rowan	Widen 2L to 4L	0.13	No	1994	0.26	4	0.25	19000	0.37	0.020
6	CUMBERLAND	U-2812	Owen Dr. S. of Fayet	Village Dr., s of All American	CSX RR Tracks	Widen 2L to 4L	0.96	No	1997	1.60	4	1.93	43000	1.69	0.005
6	CUMBERLAND	U-2912	Owen Dr Extension	I-95 Business	SR 2283 e of NC 87	New 4L urb art on new	1.73	No	1999	4.50	4	6.93	12500	5.16	0.031
6	CUMBERLAND	U-3106	SR 1400 Cliffdale Rd	All American Freeway	McPherson Church Rd	New Exit on AAF	0.96	No	2000	3.90	4	0.00	24000	4.41	0.020
6	CUMBERLAND	U-3107	Glensford Dr. Extens	Cliffdale Rd. N to	SR 1404, Morganton Rd.	New 4L urb art	0.73	No	1998	2.50	4	2.93	16000	3.04	0.034
6	CUMBERLAND	U-3421	SR 1427 (Robeson St)	S of Rankin St	S of Rowan St	Widen 4L to 5L	0.09	No	2001	0.54	5	0.09	11000	0.53	0.061
6	CUMBERLAND	U-3421	SR 1427 (Robeson St)	S Rankin St	S of Rowan St	Widen 4L to 5L	0.49	No	2001	2.96	5	0.49	15000	2.90	0.047
6	CUMBERLAND	U-3606	Airport Rd	US 301 Business	Fayettville Regional Airpor	Widen 2L to 4L	0.25	No	1997	0.60	4	0.49	8500	0.63	0.039
6	CUMBERLAND	U-3606	Airport Rd	US 301 Business	Fayettville Regional Airpor	Widen 2L to 4L	0.54	No	1997	1.30	4	1.07	8500	1.37	0.039
6	CUMBERLAND	U-508	CBD Loop	Mountain Dr.	Hay Street	New 4L Freeway	1.73	Yes	1996	24.83	4	6.91	15000	29.30	0.120

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DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
6	CUMBERLAND	U-508	CBD Loop	Mountain Dr.	Hay Street	New 4L Freeway	0.74	Yes	1996	10.61	4	2.95	18000	12.52	0.100
6	CUMBERLAND	U-508	CBD Loop	Mountain Dr.	Hay Street	New 4L Freeway	0.73	Yes	1996	10.54	4	2.93	14000	12.44	0.129
6	CUMBERLAND	U-508	CBD Loop	Mountain Dr.	Hay Street	New 4L Freeway	0.49	Yes	1996	7.04	4	1.96	12000	8.31	0.150
6	HARNETT	R-1025	US 421	NC 27-55 Erwin	SR 1006 s of Buies Creek	Widen 2L to 4L rur ar	4.75	No	1992	9.10	4	9.51	8600	13.40	0.033
6	ROBESON	R-2558	US 74	NC 41 Robeson Co	US 76 Columbus Co	Widen 2L to 4L rur ar	1.00	Yes	2000	2.49	4	2.00	10000	2.82	0.028
6	ROBESON	R-2558	US 74	NC 41 Robeson Co	US 76 Columbus Co	Widen 2L to 4L rur ar	3.62	Yes	2000	8.99	4	7.23	9300	10.17	0.030
6	ROBESON	R-2558	US 74	NC 41 Robeson Co	US 76 Columbus Co	Widen 2L to 4L rur ar	6.39	Yes	2000	15.89	4	12.78	8600	17.97	0.040
6	ROBESON	U-1005	NC 211 (Roberts St,	NC 72	SR 1997 (near I-95)	Widen 2L to 4L	0.75	No	1993	0.84	4	1.50	25300	1.23	0.007
6	ROBESON	U-2415	NC 211 (Roberts St,	Roland Ave.	w of SR 1586	Widen 2L to 4L	0.15	No	2000	0.35	4	0.31	21000	0.40	0.015
6	ROBESON	U-2415	NC 211 (Roberts St,	Roland Ave.	w of SR 1586	Widen 2L to 4L	0.15	No	2000	0.34	4	0.29	21000	0.38	0.015
6	ROBESON	U-2416	NC 72-711 at I-95	SR 1593	SR 2501	Widen 2L to 4L	0.35	No	2000	4.36	4	0.70	21000	4.93	0.070
6	ROBESON	U-2416	NC 72-711 at I-95	SR 1593	SR 2501	Widen 2L to 4L	0.13	No	2000	1.61	4	0.26	21000	1.82	0.070
6	ROBESON	U-2416	NC 72-711 at I-95	SR 1593	SR 2501	Widen 2L to 4L	0.15	No	2000	1.83	4	0.29	21000	2.07	0.070
7	ALAMANCE	I-303	I-85	US 29 in Guilfor	NC 54 in Alam	Widen Frwy 4L to 8L	4.00	Yes	1995	28.84	8	16.00	89000	35.44	0.010
7	ALAMANCE	I-303	I-85	US 29 in Guilford	NC 54 in Alam	Widen Frwy 4L to 8L	0.95	Yes	1995	6.85	8	3.79	93000	8.42	0.010
7	ALAMANCE	I-303	I-85	US 29 in Guilfor	NC 54 in Alam	Widen 4L Fry to	2.15	Yes	1995	15.50	8	8.61	100000	19.05	0.009
7	ALAMANCE	I-303	I-85	US 29 in Guilfor	NC 54 in Alam	Widen 4L Fry to	1.75	Yes	1995	12.62	8	7.00	100000	15.51	0.009
7	ALAMANCE	I-303	I-85	US 29 in Guilfor	NC 54 in Alam	Widen 4L Fry to	1.45	Yes	1995	12.62	8	5.80	100000	15.51	0.011
7	ALAMANCE	I-303	I-85	US 29 in Guilford	NC 54 in Alamance	Widen 4L Fry to	0.30	Yes	1995	0.80	8	1.20	93000	0.98	0.004
7	ALAMANCE	I-304	I-85	NC 54 in Alamanc	W SR 1134 Ora	Widen 4L to 8L	7.17	Yes	1997	50.71	8	28.67	80000	53.49	0.009
7	ALAMANCE	R-2538	NC 54	SR 2106 Whittmore Loop nea	NC 119	Widen 2L to 5L	1.88	No	2001	5.89	5	5.63	11000	5.77	0.029
7	ALAMANCE	R-2538	NC 54	SR 2106 Whittmore Loop nea	NC 119	Widen 2L to 5L	1.21	No	2001	3.81	5	3.64	13200	3.73	0.024
7	ALAMANCE	R-611	US 70 Haw River Bypa	Hanover Rd, W of Haw River	NC 49 E of Haw River	New 4L rur art	1.66	No	1994	7.60	4	6.66	15000	11.07	0.054
7	ALAMANCE	U-2305	Maple St Extension,	Maple St.	Over I-85	New 4L urb art	0.09	No	1992	0.75	4	0.37	21500	1.10	0.070
7	ALAMANCE	U-2305	Maple St Extension,	Maple St.	Over I-85	New 4L urb art	0.10	No	1992	0.75	4	0.39	21500	1.10	0.066
7	ALAMANCE	U-2406	Elon College Bypass	NC 100 (West)	NC 100 (East)	New 2L on new loc	2.50	No	2002	8.80	2	5.01	4000	8.80	0.105
7	ALAMANCE	U-2411	Maple St. Extension,	I-85 n	NC 87 at Moore St.	New 2L urb art	1.75	No	2001	5.60	2	3.51	8000	5.48	0.046
7	ALAMANCE	U-2500	NC 49-54-87	NC 87	SR 1716	2L Existing Rdway to 5L	0.77	No	1991	0.82	5	2.32	11000	1.21	0.018
7	ALAMANCE	U-2500	NC 49-54-87	NC 87	SR 1716	2L Existing Rdway to 5L	0.36	No	1991	0.38	5	1.09	11000	0.56	0.018
7	GUILFORD	GR-1	Vandalia Rd.	Western City Limits	Holden Rd.	Widen 2L to 4L	1.10	No	2000	0.70	4	2.20	15700	0.79	0.005
7	GUILFORD	GR-2	Dolly Madison Rd.	Friendly Ave.	W. Market St.	Widen 2L to 4L	1.07	No	1998	0.60	4	2.15	8000	0.73	0.010
7	GUILFORD	GR-3	Lake Brandt Rd.	Old Battleground Rd.	Lawndale Dr.	Widen 2L to 4L	1.25	No	2001	0.60	4	2.51	6700	0.59	0.008
7	GUILFORD	GR-4	Merritt Dr.	Spring Garden St.	I-40 Bridge	Widen 2L to 4L	0.98	No	1998	2.70	4	1.96	17800	3.28	0.022
7	GUILFORD	GR-5	Wendover Ave. W. of	Clifton Rd.	Big Tree Way	Widen 2L to 3L	1.51	No	1999	1.20	4	3.01	58800	1.38	0.002
7	GUILFORD	GR-6	East West Connector	Cotswold Terrace	Lawndale Dr.	Widen 2L to 4L	1.55	2	1999	1.90	4	3.11	9400	2.18	0.016
7	GUILFORD	GR-7	Lake Brandt Rd.	Lawndale Dr.	New City Limits.	Widen 2L to 4L	0.59	No	1999	0.50	4	1.19	8800	0.57	0.012
7	GUILFORD	GR-8	Old Battleground Rd.	Brandt Ridge Rd.	City Limits	Widen 2L to 4L	0.50	No	2000	0.30	4	1.00	5600	0.34	0.013
7	GUILFORD	I-2402	I-85, Greensboro Bypass	I-85 South	North of I-40/85 East	New 8L frwy on new lo	1.29	Yes	2004	25.11	8	10.30	27900	24.61	0.075
7	GUILFORD	I-2402	I-85, Greensboro Bypass	I-85 South	North of I-40/85 East	New 8L frwy on new lo	4.32	Yes	2004	84.10	8	34.56	27900	82.42	0.075

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DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
7	GUILFORD	I-2402	I-85, Greensboro Bypass	I-85 South	North of I-40/85 East	New 6L frwy on new lo	6.20	Yes	2004	120.70	6	37.18	27900	118.29	0.075
7	GUILFORD	I-303	I-85	US 29 in Guilfor	NC 54 in Alam	Widen Frwy 4L to 8L	1.50	Yes	1995	10.82	8	5.98	81000	13.30	0.011
7	GUILFORD	I-303	I-85	US 29 in Guilfor	NC 54 in Alam	Widen Frwy 4L to 8L	6.57	Yes	1995	47.37	8	26.28	81000	58.22	0.011
7	GUILFORD	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	1.92	No	1993	19.18	4	7.70	48000	28.08	0.032
7	GUILFORD	R-609D	US 311 Bypass	W of HP Reservoir in Forsyth	2000' W of NC 68, Guilford	New 4L frwy on	1.43	No	1997	9.44	4	5.74	7000	9.96	0.116
7	GUILFORD	R-609EA	US 311 Bypass	2000'W of NC 68 Guilford Co	NC 68 in Guilford Co.	New 4L frwy on	0.44	No	2000	12.20	4	1.76	12000	13.80	0.298
7	GUILFORD	U-2012	NC 68 and SR 2085 (Airport	NA	NA	New Exit on NC 68 at	1.08	No	1999	7.90	4	0.00	39000	9.05	0.028
7	GUILFORD	U-202	Freeman Mill Rd.	Lovette St	Hall St.	Widen 2L to 4L	0.52	No	1993	3.30	4	1.05	10900	4.83	0.090
7	GUILFORD	U-2413	Wendover Ave, W. of	Penny Rd., SR 1536	Landmark Center Dr.	Widen 2L to 4L	4.10	No	1995	9.80	4	8.21	19000	12.04	0.018
7	GUILFORD	U-2536	Intermediate Loop, H	US 311 N of High Point	Montlieu Ave	New 4L urb art	1.02	No	2001	6.49	4	4.07	16500	6.35	0.042
7	GUILFORD	U-2536	Intermediate Loop, H	US 311 N of High Point	Montlieu Ave	New 4L urb art	0.59	No	2001	3.77	4	2.37	16500	3.69	0.042
7	GUILFORD	U-2536	Intermediate Loop, H	US 311 N of High Point	Montlieu Ave	New 4L urb art	0.73	No	2001	4.67	4	2.93	16500	4.57	0.042
7	GUILFORD	U-2581A	US 70	SR 2581 (Penry Rd)	SR 2828 (Willowlake Rd)	Widen 2L to 4L	0.62	No	2002	1.52	4	1.25	18000	1.52	0.016
7	GUILFORD	U-2581A	US 70	SR 2851 (Penry Rd)	SR 2828 (Willowlake Rd)	Widen 2L to 4L	0.71	No	2002	1.75	4	1.41	18000	1.75	0.016
7	GUILFORD	U-3429	Vickery Chapel Rd,	I-85 Business N	Wiley Davis Rd.	Widen 2L to 4L	0.28	No	2001	1.00	4	0.56	1900	0.98	0.205
7	GUILFORD	U-3476	SR 1486, Main St. Ja	Wade St.	Teague Dr.	Widen 2L to 4L	0.74	No	1997	1.30	4	1.47	22000	1.37	0.010
7	GUILFORD	U-510	Bryan Blvd Ext	New Garden Rd.	SR 2176 Benjamin Pkwy	New 4L frwy on	3.01	No	1993	26.10	4	12.05	35000	38.21	0.048
7	GUILFORD	U-60	US 220 Greensboro	Vandalia St.	Willmore St. N of I-40	New 4L frwy on	1.11	No	1996	17.29	4	4.46	40000	20.40	0.052
7	GUILFORD	U-60	US 220 Greensboro	Vandalia St.	Willmore St. N of I-40	New 4L frwy on	0.12	No	1996	1.85	4	0.48	40000	2.18	0.053
7	GUILFORD	U-60	US 220 Greensboro	Vandalia St.	Willomore St. N of I-40	New 4L frwy on	0.49	No	1996	7.63	4	1.97	24000	9.00	0.087
7	GUILFORD	U-608	Bryan Blvd Ext	New Garden Rd.	Airport	New 4L frwy on	1.55	No	1998	18.58	4	6.21	25000	22.57	0.075
7	GUILFORD	U-800	West Market St.	NC 68	Jamestown Rd.	Widen 2L to 4L	2.27	No	1995	4.62	4	4.53	14000	5.68	0.022
7	GUILFORD	U-800	West Market St.	NC 68	Jamestown Rd.	Widen 2L to 4L	1.41	No	1995	2.88	4	2.83	18600	3.54	0.015
7	ORANGE	I-304	I-85	Nc 54 Alamance C	W SR 1134 Ora	Widen 4l to 8L	5.65	Yes	1997	40.00	8	22.62	81000	42.20	0.009
7	ORANGE	U-2002	Main, Greensboro, an	Old Fayettville Rd	Carboro Bypass	Widen 2L to 4L	3.25	No	1991	3.50	4	6.49	10500	5.18	0.017
7	ORANGE	U-2003	NC 54 and US 15-501 loop	Old Fayetteville Rd w of Carbo	US 501 Bus n of Chapel Hill	Widen 2L to 4L urb ar	2.06	No	1993	9.21	4	4.13	31000	13.48	0.024
7	ORANGE	U-2003	NC 54 and US 15-501 loop	Old Fayetteville Rd w of Carbo	US 501 Bus n of Chapel Hill	Widen 2L to 4L urb ar	1.78	No	1993	7.96	4	3.57	27000	11.65	0.027
7	ORANGE	U-2003	NC 54 and US 15-501 loop	Old Fayetteville Rd w of Carbo	US 501 Bus n of Chapel Hill	Widen 2L to 4L urb ar	2.13	No	1993	9.53	4	4.26	27000	13.95	0.027
7	ORANGE	U-2302	NC 86, Chapel Hill	I 40	s to SR1777 (Homestead Rd)	Widen 2L to 4L urb ar	1.50	No	2000	7.80	4	2.99	24000	8.82	0.026
7	ORANGE	U-3100	Hillsborough Rd (SR 1009) a	Lorraine St to Old Fay. Rd, an	Along SR 1107 to NC 54	Widen 2L to 3L urb ar	1.02	No	2000	1.95	3	1.02	31000	2.21	0.009
7	ORANGE	U-3100	Hillsborough Rd (SR 1009) a	Lorraine St to Old Fay. Rd, an	Along SR 1107 to NC 54	Widen 2L to 3L urb ar	1.28	No	2000	2.45	3	1.28	12000	2.77	0.022
7	ORANGE	U-624	NC 86, Chapel Hill	US 15-501Bypass	Manning Drive	Widen 2L to 5L urb ar	0.78	No	1999	3.45	5	2.34	15000	3.95	0.038
7	ORANGE	U-624	NC 86, Chapel Hill	US 15-501Bypass	Manning Drive	Widen 2L to 5L urb ar	0.51	No	1999	2.25	5	1.54	11000	2.58	0.055
7	ROCKINGHAM	R-2019	US 220	NC 68	NC 704	Widen 2L to 4L rur ar	6.30	Yes	1992	15.00	4	12.61	14000	22.08	0.026
7	ROCKINGHAM	R-2232	US 220	S of US 220-NC 704	Va State Line	Widen 2L to 4L rur ar	1.42	Yes	2000	3.77	4	2.83	13000	4.26	0.023
7	ROCKINGHAM	R-2232	US 220	S of US 220-NC 704	Va State Line	Widen 2L to 4L rur ar	5.39	Yes	2000	14.25	4	10.78	13000	16.12	0.027
7	ROCKINGHAM	R-2232	US 220	S of US 220-NC 704	Va State Line	Widen 2L to 4L rur ar	2.91	Yes	2000	7.68	4	5.81	18000	8.69	0.017
7	ROCKINGHAM	R-2232	US 220	S of US 220-NC 704	Va State Line	Widen 2L to 4L rur ar	2.27	Yes	2000	6.00	4	4.54	14000	6.79	0.021
7	ROCKINGHAM	R-2401	NC 14	NC 29 Bus n of Reidsville	NC 700-770 in Eden	Widen 2L to 5L rur ar	7.04	No	1995	14.24	5	21.13	10700	17.50	0.027

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DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
7	ROCKINGHAM	R-2401	NC 14	NC 29 Bus n of Reidsville	NC 700-770 in Eden	Widen 2L to 5L rur ar	1.51	No	1995	3.05	5	4.54	13600	3.75	0.022
7	ROCKINGHAM	R-2401	NC 14	NC 29 Bus n of Reidsville	NC 700-770 in Eden	Widen 2L to 5L rur ar	0.56	No	1995	1.14	5	1.69	15500	1.40	0.019
7	ROCKINGHAM	R-2401	NC 14	NC 29 Bus n of Reidsville	NC 700-770 in Eden	Widen 2L to 5L rur ar	0.87	No	1995	1.76	5	2.62	13000	2.16	0.022
7	ROCKINGHAM	U-2418	Reidsville Southern Loop	US 29 Business, e to...	NC 87	New 5L urb art on new	1.56	No	1999	13.90	5	7.81	9000	15.93	0.136
8	CHATHAM	R-2217	US 64	NC 22 in Ramseur	Existing 5L in Siler City	Widen 2L to 4L w/5L in Ram.	4.48	Yes	2002	11.64	4	8.96	7800	11.64	0.033
8	CHATHAM	R-2218	US 64	Siler City	6 mi east	Widen 2L to 4L rur ar	10.71	Yes	2000	17.80	4	21.42	9000	20.13	0.021
8	CHATHAM	R-2218	US 64	Siler City	6 mi east	Widen 2L to 4L rur a	2.21	Yes	2000	3.70	4	4.41	3000	4.18	0.064
8	CHATHAM	R-2218	US 64	Siler City	6 mi east	Widen 2L to 4L rur a	2.34	Yes	2000	3.90	4	4.67	2500	4.41	0.077
8	CHATHAM	R-2219	US 64, Pittsboro Bypass	SR 1514 w of Pittsboro	4 lanes w of Jordan Lake	Widen 2L to 4L rur a	3.61	Yes	2001	22.09	4	7.22	4100	21.63	0.147
8	CHATHAM	R-2219	US 64, Pittsboro Bypass	SR 1514 w of Pittsboro	4 lanes w of Jordan Lake	Widen 2L to 4L rur a	5.75	Yes	2001	30.21	4	11.49	13500	29.58	0.038
8	CHATHAM	R-2318	US 64	E. of Lake Jordan	US 1-64 at Cary	Widen 2 to 4L rur art	3.50	Yes	1997	11.44	4	6.99	13000	12.07	0.027
8	CHATHAM	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	6.65	Yes	1999	16.10	4	13.29	15000	18.45	0.022
8	CHATHAM	R-3114	NC 87 Bypass, s of Pittsbor	NC 87	NC 902	New 2L urb art on new	0.72	No	2000	1.90	2	1.45	4300	2.15	0.081
8	CHATHAM	R-68	US 421, Siler City	Siler City	Staley	New exit	0.66	No	1997	2.67	2	0.00	8500	2.82	0.051
8	CHATHAM	R-68	US 421, Siler City	Siler City	Staley	Widen 2L to 4L rur ar	8.23	Yes	1997	33.03	4	16.46	9100	34.85	0.047
8	CHATHAM	R-68	US 421, Siler City	Siler City	Staley	Widen 2L to 4L rur ar	2.19	Yes	1997	8.79	4	4.38	9600	9.28	0.045
8	HOKE	R-214	US 401	Raeford Bypass in Hoke Cour	71st School Rd Cumberland C	Widen 2L to 4L rur ar	6.01	No	1994	12.55	4	12.03	12000	18.27	0.025
8	LEE	R-2238	NC 24-87	Swan (Harnett Co Line)	US 421 at Sanford	Widen 2L to 4L rur ar	2.87	Yes	1999	5.66	4	5.75	9000	6.49	0.025
8	LEE	R-2238	NC 24-87	Swan (Harnett Co Line)	US 421 at Sanford	Widen 2L to 4L rur ar	0.29	Yes	1999	0.57	4	0.57	28000	0.65	0.010
8	LEE	R-2238	NC 24-87	Swan (Harnett Co Line)	US 421 at Sanford	Widen 2L to 4L rur ar	1.70	Yes	1999	3.37	4	3.40	27000	3.86	0.010
8	LEE	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	1.03	Yes	1999	2.50	4	2.06	13000	2.87	0.023
8	LEE	R-2500	US 1 in Wake, Chatham, Lee	4-Lane N of US 15-501 in Lee	US 64 in Wake Co	Widen 2l to 4L frwy	7.38	Yes	1999	17.89	4	14.77	14000	20.50	0.020
8	LEE	U-2921	US 421 in Sanford	SR 1107 (Fields St)	NC 42 (Main St)	Widen 2L to 5L urb ar	1.36	No	1999	3.40	5	4.07	18000	3.90	0.019
8	MONTGOMERY	R-2107	NC 24-27	Little River	Biscoe	Widen 2L to 4L rur ar	4.58	No	1991	5.70	4	9.16	8600	8.44	0.025
8	MONTGOMERY	R-523	US 220/I -73/I-74	S of Steed	S. of Ulah	New 4L frwy on new lo	4.19	No	1996	17.20	4	16.75	11000	20.30	0.047
8	MOORE	R-2004	US 15-501	US 1 at Aberdeen	NC 2 at Pinehurst	Widen 2L to 5L urb ar	1.70	No	1993	2.38	5	5.11	7500	3.48	0.033
8	MOORE	R-2004	US 15-501	US 1 at Aberdeen	NC 2 at Pinehurst	Widen 2L to 5L urb ar	0.52	No	1993	0.73	5	1.56	7600	1.07	0.032
8	MOORE	R-2004	US 15-501	US 1 at Aberdeen	NC 2 at Pinehurst	Widen 2L to 5L urb ar	0.10	No	1993	0.14	5	0.31	10800	0.20	0.018
8	MOORE	R-2004	US 15-501	US 1 at Aberdeen	NC 2 at Pinehurst	Widen 2L to 5L urb ar	0.30	No	1993	0.43	5	0.89	7500	0.63	0.028
8	MOORE	R-2004	US 15-501	US 1 at Aberdeen	NC 2 at Pinehurst	Widen 2L to 5L urb ar	1.39	No	1993	1.93	5	4.16	7500	2.83	0.033
8	MOORE	U-2420	Morgantown Rd, South	US 15-501	US 1	Widen 2L to 4L urb ar	1.36	No	1999	3.30	4	2.72	15000	3.78	0.022
8	RANDOLPH	R-2217	US 64	NC 22 in Ramseur	Existing 5L in Siler City	Widen 2L to 5L	0.11	Yes	2002	0.27	5	0.34	18500	0.27	0.013
8	RANDOLPH	R-2217	US 64	NC 22 in Ramseur	Existing 5L in Siler City	Widen 2L to 4L	4.68	Yes	2002	11.60	4	9.35	13900	11.60	0.018
8	RANDOLPH	R-2217	US 64	NC 22 in Ramseur	Existing 5L in Siler City	Widen 2L to 5L	1.29	Yes	2002	3.20	5	3.86	20000	3.20	0.012
8	RANDOLPH	R-2217	US 64	NC 22 in Ramseur	Exsisting 5L in Siler City	Widen 2L to 5L	0.78	Yes	2002	1.93	5	2.35	18500	1.93	0.013
8	RANDOLPH	R-523	US 220/I -73/I-74	S of Steed	S. of Ulah	New 4L frwy on new lo	7.62	No	1996	31.40	4	30.47	17000	37.05	0.031
8	RANDOLPH	R-68	US 421, Siler City	Siler City	Staley	Widen 2L to 4L rur ar	0.65	Yes	1997	2.61	4	1.30	8400	2.76	0.054
8	RANDOLPH	U-1558N	Presnell St Extn, As	Farr St	US 64	New 4L urb art	2.12	No	1994	4.80	4	8.47	4000	6.99	0.099
8	RANDOLPH	U-2538	US 311 s of High Poi	I 85 s to...	w if SR 1919	Widen 2L to 5L urb ar	1.72	No	1999	5.12	5	5.16	12000	5.87	0.034

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8	RANDOLPH	U-2538	US 311 s of High Poi	I 85 s to…	w if SR 1919	Widen 2L to 5L urb ar	1.10	No	1999	3.08	5	3.30	12000	3.53	0.032
8	RICHMOND	R-3401	US, Marston to Hoffm	S of SR 1001 at Marston	Sr 1004 in Hoffman	Widen 2L to 3L urb ar	3.26	No	1997	1.70	3	3.26	8000	1.79	0.007
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	2.30	Yes	2000	11.43	4	9.19	12000	12.93	0.047
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	0.44	Yes	2000	2.19	4	1.76	12000	2.48	0.056
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	0.57	Yes	2000	2.83	4	2.30	13000	3.20	0.051
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	0.46	Yes	2000	2.27	4	1.83	13000	2.57	0.043
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	1.38	Yes	2000	6.86	4	5.51	13000	7.76	0.052
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	4.05	Yes	2000	20.13	4	16.19	13000	22.77	0.043
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	0.99	Yes	2000	4.94	4	3.94	13000	5.59	0.044
8	RICHMOND	R-512	US 74/I-73/I-74 Rock	US 74 E of Rock.	US 74 W. of Hamlet	New 4L frwy on new lo	4.03	Yes	2000	20.05	4	16.14	9900	22.68	0.057
8	RICHMOND	U-2217	US 220, Rockingham	SR 1124 Interchange	SR 1124 Interchange	1/2 exit (2 addit ram	0.44	No	1998	1.80	2	0.00	1900	2.19	0.317
8	RICHMOND	U-2583	US 220 in Rockingham	SR 1974 (Forrest St)	s to. US 74 Bypass	Widen 2L to 4L urb ar	0.99	No	2001	3.10	4	1.97	7000	3.03	0.053
8	SCOTLAND	R-613	US 401, Laurinburg B	S of SR 1105	US 401 Bus N of L.	Widen 2L to 4L urb ar	1.90	No	1997	4.20	4	3.79	12000	4.43	0.024
8	SCOTLAND	R-613	US 401, Laurinburg B	S of SR 1105	US 401 Bus N of L.	Widen 2L to 4L urb ar	1.33	No	1997	2.94	4	2.65	9000	3.10	0.032
8	SCOTLAND	R-613	US 401, Laurinburg B	S of SR 1105	US 401 Bus N of L.	Widen 2L to 4L urb ar	2.34	No	1997	5.17	4	4.69	16000	5.45	0.017
8	SCOTLAND	R-613	US 401, Laurinburg B	S of SR 1105	US 401 Bus N of L.	Widen 2L to 4L urb ar	0.60	No	1997	1.33	4	1.19	14000	1.40	0.020
8	SCOTLAND	R-613	US 401, Laurinburg B	S of SR 1105	US 401 Bus N of L.	Widen 2L to 4L urb ar	1.17	No	1997	2.59	4	2.34	12000	2.73	0.024
9	DAVIDSON	R-2220	US 64	I 85Bus in Lexington	I 85	Widen 2L to 4L urb ar	2.39	Yes	1998	6.58	4	4.77	13000	7.99	0.026
9	DAVIDSON	R-2220	US 64	I 85Bus in Lexington	I 85	Widen 2L to 4L urb ar	1.28	Yes	1998	3.55	4	2.56	17000	4.31	0.024
9	DAVIDSON	R-74	NC 52	I 85 in Lexington	Welcome	New 4L frwy on new lo	2.39	Yes	1995	11.45	4	9.55	15700	14.07	0.038
9	DAVIDSON	R-74	NC 52	I 85 in Lexington	Welcome	New 4L frwy on new lo	0.31	Yes	1995	1.48	4	1.24	10600	1.82	0.067
9	DAVIDSON	R-74	NC 52	I 85 in Lexington	Welcome	New 4L frwy on new lo	1.29	Yes	1995	6.18	4	5.15	14100	7.60	0.050
9	DAVIDSON	R-74	NC 52	I 85 in Lexington	Welcome	New 4L frwy on new lo	1.52	Yes	1995	7.28	4	6.09	16100	8.95	0.044
9	DAVIDSON	R-74	NC 52	I 85 in Lexington	Welcome	New 4L frwy on new lo	1.18	Yes	1995	5.65	4	4.72	18600	6.94	0.038
9	DAVIDSON	R-74	NC 52	I 85 in Lexington	Welcome	New 4L frwy on new lo	1.43	Yes	1995	6.85	4	5.74	19700	8.42	0.030
9	DAVIDSON	R-74	NC 52	I 85 in Lexington	Welcome	New 4L frwy on new lo	6.05	Yes	1995	29.01	4	24.19	22500	35.65	0.027
9	DAVIDSON	U-2569	NC 68 at I 85 Busine	I-85 Business	N of I-85 Business	Widen 2L to 4L urb ar	0.07	No	1999	1.93	4	0.14	3200	2.21	1.133
9	DAVIDSON	U-2569	NC 68 at I 85 Busine	I-85 Business	N of I-85 Business	Widen 2L to 4L urb ar	0.03	No	1999	0.83	4	0.06	3200	0.95	1.248
9	DAVIDSON	U-2569	NC 68 at I 85 Busine	I-85 Business	N of I-85 Business	Widen 2L to 4L urb ar	0.04	No	1999	1.10	4	0.08	3200	1.26	1.123
9	DAVIDSON	U-2569	NC 68 at I 85 Busine	I-85 Business	N of I-85 Business	Widen 2L to 4L urb ar	0.06	No	1999	1.65	4	0.13	3200	1.89	1.115
9	DAVIE	I-911	I-40 in Davie and Fo	W of NC 801 (Exit 180)	w of SR 1122 (s of US 421 J	Widen 4L to 6L and pv	1.45	No	1999	7.84	6	2.91	45000	8.98	0.016
9	DAVIE	R-2243	US 601	US 64	I-40	Widen 2L to 3L urb ar	1.77	No	1992	4.10	3	1.77	12300	6.04	0.034
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	5.01	No	1993	50.05	4	20.06	54000	73.27	0.033
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	0.46	No	1993	4.60	4	1.84	54000	6.73	0.033
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	0.72	No	1993	7.19	4	2.90	77000	10.53	0.024
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	0.39	No	1993	3.88	4	1.55	77000	5.68	0.024
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	1.21	No	1993	12.09	4	4.82	69000	17.70	0.026
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	0.75	No	1993	7.49	4	2.99	86000	10.97	0.021
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	1.00	No	1993	9.99	4	3.99	72000	14.63	0.025

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9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	0.41	No	1993	4.09	4	1.66	72000	5.99	0.025
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	5.34	No	1993	53.35	4	21.37	51000	78.10	0.031
9	FORSYTH	I-900	I-40	US 421 (exit 188)	Exit 206 E of Kernersville	New 4L frwy on new lo	1.29	No	1993	12.95	4	5.18	51000	18.96	0.031
9	FORSYTH	I-911	I-40 in Davie and Fo	W of NC 801 (Exit 180)	w of SR 1122 (s of US 421 J	Widen 4L to 6L and pv	3.13	No	1999	16.93	6	6.26	52000	19.40	0.012
9	FORSYTH	I-911	I-40 in Davie and Fo	W of NC 801 (Exit 180)	w of SR 1122 (s of US 421 J	Widen 4L to 6L and pv	3.39	No	1999	18.33	6	6.78	60000	21.01	0.010
9	FORSYTH	R-2709	NC 150 Peters Crk Pk	Clemmonsville Rd	Davidson Co Line	Widen 2L to 4L rur ar	3.09	No	2002	7.20	4	6.18	12000	7.20	0.020
9	FORSYTH	R-511	NC 66	SR2611	I-40 in Kernersville	Widen 2L to 4L urb ar	2.65	No	1993	4.20	4	5.30	6900	6.15	0.034
9	FORSYTH	R-609D	US 311	W of HP Reservoir in Forsyth	2000' W of NC 68, Guilford	New 4L frwy on	0.32	No	1997	2.08	4	1.26	7000	2.19	0.104
9	FORSYTH	U-2115	Bethabara Bypass	NC 67 Reynolda Rd	Univ Pkwy (SR 4000)	New 4L urb art on new	2.24	No	1995	4.50	4	8.97	7000	5.53	0.041
9	FORSYTH	U-2311	US 158, Winston-Sale	SR 1120	SR 1101	Widen 2L to 4L	4.88	No	1995	11.40	4	9.75	14700	14.01	0.023
9	FORSYTH	U-2513	SR1102 (Lewisville-C	US 158, north to...	SR 1891 (N of I-40)	Widen 2L to 4L rur ar	1.45	No	1994	1.90	4	2.90	4000	2.77	0.055
9	FORSYTH	U-2578	Peace Haven - Polo C	Whitaker Rd	Faircloth St	Widen 2L to 4L urb ar	0.64	No	1992	2.00	4	1.27	15000	2.94	0.036
9	FORSYTH	U-2828	M.L.King Dr Ext	MLK Dr	Eigth St.	New 4L urb art on new	0.43	No	1998	3.20	4	1.70	10000	3.89	0.107
9	FORSYTH	U-3120	Hanes Mill Rd Extn	Univ Pkwy (SR 4000)	NC 8 Germantown Rd	New 4L urb art on new	0.97	No	1996	2.00	4	3.89	7000	2.36	0.041
9	FORSYTH	U-3829 (U	US 421	Jonestown Rd	Peacehaven Rd	Widen 4L to 6L fry	1.07	Yes	2001	3.40	6	2.15	70000	3.33	0.005
9	FORSYTH	U-526	Clemmonsville Rd	US 52	I-40	Widen 2L to 4L urb ar	1.44	No	1992	3.60	4	2.88	12000	5.30	0.036
9	ROWAN	I-2511	I-85 widening	US 29 (China Grove Exit)	Jake Alexander Bvld in Sali	Widen 4L to 8L (part	5.01	No	1995	78.70	8	20.04	70000	96.72	0.032
9	ROWAN	I-2511	I-85 widening	US 29 (China Grove Exit)	Jake Alexander Bvld in Sali	Widen 4L to 8L (part	0.22	No	1995	3.30	8	0.86	80000	4.06	0.028
9	ROWAN	I-2511	I-85 widening	US 29 (China Grove Exit)	Jake Alexander Bvld in Sali	Widen 4L to 8L (part	0.51	No	1995	8.00	8	2.05	78000	9.83	0.028
9	ROWAN	U-2113	Jake Alexander Bvld	US 70, s to…	just n of I-85	Widen 2L to 4L urb ar	3.16	No	1995	9.70	4	6.32	3300	11.92	0.135
9	ROWAN	U-2564	US 70, Salisbury	SR 1724 (Hurley Schl Rd), s t	US 601	Widen 2L to 4L urb ar	2.63	No	1991	1.00	4	5.25	13800	1.48	0.004
9	ROWAN	U-613	Jake Alexander Bvld	I-85 s to…	US 52/Stokes Ferry Rd	New 4L urb art on new	0.41	No	1998	2.00	4	1.63	8000	2.43	0.090
9	ROWAN	U-613	Jake Alexander Bvld	I-85 s to…	US 52/Stokes Ferry Rd	New 4L urb art on new	1.22	No	1998	6.00	4	4.89	8000	7.29	0.090
9	ROWAN	U-613	Jake Alexander Bvld	I-85 s to…	US 52/Stokes Ferry Rd	New 4L urb art on new	0.13	No	1998	0.30	4	0.53	8000	0.36	0.042
10	CABARRUS	I-2303	I-85	at I 85 and SR 2126	Dale Earnhart Bvld,	New Exit 60 on I85	0.78	Yes	1993	1.20	4	0.00	4000	1.76	0.057
10	CABARRUS	R-2104	NC 24-27	US 601	Town of Locust	Widen 2L to 4L rur ar	2.44	Yes	1995	7.08	4	4.88	9900	8.70	0.042
10	CABARRUS	R-2215	NC 49	UNC Charlotte	Town of Harrisburg	Widen 2L to 4L rur ar	1.39	No	1998	4.00	4	2.78	25000	4.86	0.014
10	CABARRUS	R-2315	Speedway Bvld	Derita Rd	NC 29 at Spdwy	New 4L rural art+exit	2.95	No	1997	10.60	4	11.79	18000	11.18	0.026
10	CABARRUS	R-615	NC 24-27	NC 51	US 601	Widen 2L to 4L rur ar	6.02	Yes	2000	16.70	4	12.05	13000	18.89	0.028
10	CABARRUS	U-2833	SR 2126 (Dale Earnhardt Blv	I-85	NC 3 (Centergrove Rd)	Widen 2L to 4L urb ar	1.12	No	2002	6.80	4	2.23	15000	6.80	0.048
10	CABARRUS	U-3115	US 29	Charlotte outer belt	Rocky River, just n of Spee	Widen 4L to 6L urb ar	0.30	No	1999	0.94	6	0.61	25000	1.08	0.017
10	CABARRUS	U-3115	US 29	Charlotte outer belt	Rocky River, just n of Spee	Widen 4L to 6L urb ar	0.43	No	1999	1.34	6	0.87	25000	1.54	0.017
10	CABARRUS	U-3115	US 29	Charlotte outer belt	Rocky River, just n of Spee	Widen 4L to 6L urb ar	0.95	No	1999	2.96	6	1.90	25000	3.39	0.017
10	CABARRUS	U-3416	Mall Rd	US 29-601	NC 136 (Branchview Rd)	2L to 3L, some on new loc	0.60	No	2001	4.40	3	0.60	5300	4.31	0.153
10	CABARRUS	U-530	NC 136 in Concord	NC 73	US 601 s of Conc.	New 2L on new locatio	2.36	No	1995	5.10	2	4.72	19000	6.27	0.017
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	2.15	Yes	1997	8.50	6	4.30	143000	8.97	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	2.97	Yes	1997	11.73	6	5.94	152000	12.38	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	1.21	Yes	1997	4.78	6	2.42	140000	5.04	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.61	Yes	1997	2.40	6	1.21	149000	2.53	0.004

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10	MECKLENBURG	R-2012	NC 51 Matthews Bypas	NC 51 e of US 74	NC 51 w of US 74	New 4L rur art on new	1.42	No	1996	13.93	4	5.67	26700	16.44	0.053
10	MECKLENBURG	R-2012	NC 51 Matthews Bypas	NC 51 e of US 74	NC 51 w of US 74	New 4L rur art on new	0.90	No	1996	8.83	4	3.62	30000	10.42	0.045
10	MECKLENBURG	R-203	NC 24-27	SR 3128 (Lawyers Rd)	NC 51	Widen 2L to 4L urb ar	2.53	Yes	1993	8.75	4	5.07	24000	12.81	0.025
10	MECKLENBURG	R-203	NC 24-27	SR 3128 (Lawyers Rd)	NC 51	Widen 2L to 4L urb ar	1.55	Yes	1993	5.36	4	3.11	23000	7.85	0.026
10	MECKLENBURG	R-203	NC 24-27	SR 3128 (Lawyers Rd)	NC 51	Widen 2L to 4L urb ar	0.87	Yes	1993	3.04	4	1.74	23000	4.45	0.023
10	MECKLENBURG	R-203	NC 24-27	SR 3128 (Lawyers Rd)	NC 51	Widen 2L to 4L urb ar	0.94	Yes	1993	3.25	4	1.89	23000	4.76	0.023
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	4.00	Yes	1998	49.44	4	16.01	42000	60.07	0.037
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	1.03	Yes	1998	12.75	4	4.12	61000	15.49	0.026
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	3.30	Yes	1998	40.79	4	13.20	102000	49.56	0.020
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	0.85	Yes	1998	10.51	4	3.40	67000	12.77	0.024
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	1.86	Yes	1998	22.98	4	7.43	60000	27.92	0.027
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	1.85	Yes	1998	23.00	4	7.39	49000	27.95	0.032
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	2.68	Yes	1998	33.12	4	10.70	94000	40.24	0.021
10	MECKLENBURG	R-211	I-485	I-77	US 74	New 4L frwy on new lo	1.02	Yes	1998	12.61	4	4.09	94000	15.32	0.020
10	MECKLENBURG	R-2123	I-485	N of SR 2800	S of I-85	New 4L frwy on new loc	8.29	Yes	2003	108.48	4	33.15	40000	106.85	0.032
10	MECKLENBURG	R-2123	I-485	N of SR 2800	S of I-85	New 4L frwy on new loc	1.53	Yes	2003	20.02	4	6.13	40000	19.72	0.032
10	MECKLENBURG	R-2123	I-485	N of SR 2800	S of I-85	New 4L frwy on new loc	7.26	Yes	2003	95.00	4	29.03	40000	93.58	0.032
10	MECKLENBURG	R-2123	I-485	N of SR 2800	S of I-85	New 4L frwy on new loc	1.16	Yes	2003	15.18	4	4.63	40000	14.95	0.032
10	MECKLENBURG	R-2123	I-485	N of SR 2800	S of I-85	New 4L frwy on new loc	0.27	Yes	2003	3.53	4	1.08	40000	3.48	0.032
10	MECKLENBURG	R-2123	I-485	N of SR 2800	S of I-85	New 4L frwy on new loc	1.30	Yes	2003	17.01	4	5.18	40000	16.75	0.032
10	MECKLENBURG	R-2215	NC 49	UNC Charlotte	Town of Harrisburg	Widen 2L to 4L rur ar	0.78	No	1998	2.24	4	1.55	21000	2.72	0.019
10	MECKLENBURG	R-2215	NC 49	UNC Charlotte	Town of Harrisburg	Widen 2L to 4L rur ar	0.41	No	1998	1.18	4	0.83	21000	1.43	0.017
10	MECKLENBURG	R-2215	NC 49	UNC Charlotte	Town of Harrisburg	Widen 2L to 4L rur ar	1.63	No	1998	4.68	4	3.26	21000	5.69	0.017
10	MECKLENBURG	R-2242	US 521	I-485 Outer Loop	SC state Line	New 4L rur art on new	1.02	No	1994	3.07	4	4.09	33200	4.47	0.015
10	MECKLENBURG	R-2242	US 521	I-485 Outer Loop	SC state Line	New 4L rur art on new	0.59	No	1994	1.75	4	2.34	19900	2.55	0.025
10	MECKLENBURG	R-2242	US 521	I-485 Outer Loop	SC state Line	New 4L rur art on new	1.26	No	1994	3.74	4	5.04	30100	5.45	0.016
10	MECKLENBURG	R-2242	US 521	I-485 Outer Loop	SC state Line	New 4L rur art on new	0.62	No	1994	1.84	4	2.49	30100	2.68	0.016
10	MECKLENBURG	R-2555	(Old) NC 73 Catawba	SR 2144 (s of new 73 jct0	SR 2195 (just w of I-77)	Widen 2L to 3 L, urb	3.42	No	1993	4.60	3	3.42	30000	6.73	0.008
10	MECKLENBURG	R-2624	I-77 and Sam Furr Rd	New Exit	New Exit	New Exit+ upgrade Sam	1.60	No	1993	5.80	4	3.20	25000	8.49	0.023
10	MECKLENBURG	R-58	NC 16	Mt Holly-Huntersville Rd	NC 16 N of Lucia	New 4L rur art on new	0.37	No	1992	1.25	4	1.48	14000	1.84	0.037
10	MECKLENBURG	R-58	NC 16	Mt Holly-Huntersville Rd	NC 16 N of Lucia	New 4L rur art on new	1.94	No	1992	6.61	4	7.75	13000	9.73	0.046
10	MECKLENBURG	R-58	NC 16	Mt Holly-Huntersville Rd	NC 16 N of Lucia	New 4L rur art on new	0.36	No	1992	1.23	4	1.43	13000	1.81	0.046
10	MECKLENBURG	R-58	NC 16	Mt Holly-Huntersville Rd	NC 16 N of Lucia	New 4L rur art on new	2.19	No	1992	7.49	4	8.74	14000	11.03	0.032
10	MECKLENBURG	R-615	NC 24-27	NC 51	US 601	Widen 2L to 4L rur ar	1.88	Yes	2000	5.20	4	3.75	13000	5.88	0.028
10	MECKLENBURG	U-2005	Harris Bvld	Plaza Rd	NC 24-27	Widen 2L to 4L urb ar	0.62	No	1994	1.61	4	1.24	50000	2.34	0.010
10	MECKLENBURG	U-2005	Harris Bvld	Plaza Rd	NC 24-27	Widen 2L to 4L urb ar	1.90	No	1994	4.94	4	3.79	50000	7.19	0.010
10	MECKLENBURG	U-2005	Harris Bvld	Plaza Rd	NC 24-27	Widen 2L to 4L urb ar	0.91	No	1994	2.37	4	1.82	50000	3.45	0.010
10	MECKLENBURG	U-2005	Harris Bvld	Plaza Rd	NC 24-27	Widen 2L to 4L urb ar	1.56	No	1994	4.08	4	3.11	62000	5.94	0.009
10	MECKLENBURG	U-209	US 74 Independence B	I-277	Eastway Bv (NC 4)	Widen 4L fry to 6L fr	0.99	Yes	1998	21.51	6	1.98	93000	26.13	0.035

List of the 750 Sections of the Major Highway Projects (1990-2004)

DOT DIV	County	Proj ID Num	Route/City Name	From Location	To Location	Work Description	Length	Infra Sys	Compl Year	Nom Cost	Lanes After	LM Added	ADT2	2002 Cost	2002 Cost/VMT
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.38	Yes	1997	1.54	6	0.76	116000	1.62	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.51	Yes	1997	2.01	6	1.02	84000	2.12	0.005
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.94	Yes	1997	3.70	6	1.87	152000	3.90	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.18	Yes	1997	0.71	6	0.37	140000	0.75	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	2.62	Yes	1997	10.34	6	5.24	149000	10.91	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.39	Yes	1997	1.54	6	0.78	124000	1.62	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.57	Yes	1997	2.25	6	1.13	152000	2.37	0.004
10	MECKLENBURG	I-2401	I-77	I-85	SC state Line	Widen 4L to 6/8L frwy	0.71	Yes	1997	2.80	6	1.41	152000	2.95	0.004
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	1.55	Yes	1994	17.47	8	6.19	92000	25.44	0.019
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	0.56	Yes	1994	6.31	8	2.24	102000	9.19	0.017
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	4.07	Yes	1994	45.87	8	16.26	143000	66.79	0.013
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	0.99	Yes	1994	11.16	8	3.95	80000	16.25	0.021
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	0.80	Yes	1994	9.00	8	3.19	96000	13.10	0.018
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	3.03	Yes	1994	34.15	8	12.11	96000	49.72	0.018
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	0.76	Yes	1994	8.57	8	3.03	80000	12.48	0.021
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	1.61	Yes	1994	18.15	8	6.44	100000	26.43	0.017
10	MECKLENBURG	I-301	I-85	Catawba River	NC 24-49 Junction	Widen 4L to 8L frwy	1.43	Yes	1994	16.12	8	5.72	100000	23.47	0.017
10	MECKLENBURG	MECK-1	Harris Blvd	NC 49	Plaza Rd	New 4L urb art on new	0.46	No	1992	1.19	4	1.85	45000	1.75	0.011
10	MECKLENBURG	MECK-1	Harris Bvld	NC 49	Plaza Rd	New 4L urb art on new	0.35	No	1992	1.50	4	1.39	45000	2.21	0.018
10	MECKLENBURG	MECK-1	Harris Bvld	NC 49	Plaza Rd	New 4L urb art on new	2.50	No	1992	8.31	4	10.01	45000	12.23	0.019
10	MECKLENBURG	MECK-10	Park Rd	Frederick Place	Sharon Rd	Widen 2L to 4L urb ar	1.08	No	1994	7.13	4	2.16	27000	10.38	0.043
10	MECKLENBURG	MECK-11	Shamrock Dr	Eastway Dr	Sharon Amity Rd	Widen 2L to 4L urb ar	1.89	No	1994	11.10	4	3.78	20000	16.16	0.053
10	MECKLENBURG	MECK-12	Milton Rd	The Plaza	Sharon Amity Rd	Widen 2L to 4L urb ar	1.32	No	1994	2.00	4	2.63	15000	2.91	0.018
10	MECKLENBURG	MECK-13	Colony Rd Ext	Sharon View Rd	Carmel Rd	New 4L urb art on new	0.93	No	1992	3.80	4	3.71	15000	5.59	0.047
10	MECKLENBURG	MECK-14	Colony Rd Ext	Carmel Rd	Rea Rd	New 2L urb art on new	1.83	No	2000	10.00	2	3.67	15000	11.31	0.048
10	MECKLENBURG	MECK-15	Ballantyne Commons P	Lancaster HY	Elm Lane	New 4L urb art on new	0.05	No	1996	1.00	4	0.19	17400	1.18	0.169
10	MECKLENBURG	MECK-15	Ballantyne Commons P	Lancaster HY	Elm Lane	New 4L urb art on new	3.18	No	1996	7.00	4	12.70	17400	8.26	0.018
10	MECKLENBURG	MECK-2	Park Rd	Sharon Rd, s. to..	Johnson Rd (n. of NC 51)	Widen 2L to 6L urb ar	0.60	No	1994	3.96	6	2.38	36000	5.77	0.033
10	MECKLENBURG	MECK-2	Park Rd	Sharon Rd, s. to..	Johnson Rd (n. of NC 51)	Widen 2L to 6L urb ar	1.70	No	1994	11.22	6	6.81	36000	16.34	0.032
10	MECKLENBURG	MECK-2	Park Rd	Sharon Rd, s. to..	Johnson Rd (n. of NC 51)	Widen 2L to 6L urb ar	0.34	No	1994	2.44	6	1.34	36000	3.55	0.036
10	MECKLENBURG	MECK-3	Quail Hollow Rd	Sharon Rd, s. to..	Carmel Rd	Widen 2L to 4L urb ar	1.57	No	1992	1.50	4	3.14	16700	2.21	0.009
10	MECKLENBURG	MECK-4	Carmel Rd	Quail Hollow Rd, s. to..	NC 51	Widen 2L to 4L urb ar	1.76	No	1998	9.35	4	3.52	23800	11.36	0.032
10	MECKLENBURG	MECK-4	Carmel Rd	Quail Hollow Rd, s. to..	NC 51	Widen 2L to 4L urb ar	0.65	No	1998	3.45	4	1.31	23800	4.19	0.032
10	MECKLENBURG	MECK-6	Sardis Rd	Rama Rd	Sardis Rd North	Widen 2L to 4L urb ar	2.24	No	1996	7.00	4	4.49	21950	8.26	0.020
10	MECKLENBURG	MECK-7	Westinghouse Bvld	Downs Rd	South Bvld	Widen 2L to 4L urb ar	1.55	No	1994	8.30	4	3.11	15000	12.08	0.061
10	MECKLENBURG	MECK-8	Monroe Rd	Conference Dr	Village Lake Dr	Widen 2L to 4L urb ar	1.44	No	1994	4.00	4	2.89	28000	5.82	0.018
10	MECKLENBURG	MECK-9	Beatties Ford Rd	I-85	Capps Hill Mine Rd	Widen 2L to 4L urb ar	1.23	No	1993	9.70	4	2.47	19000	14.20	0.071
10	MECKLENBURG	R-2012	NC 51 Matthews Bypas	NC 51 e of US 74	NC 51 w of US 74	New 4L rur art on new	0.33	No	1996	3.24	4	1.31	30000	3.82	0.046
10	MECKLENBURG	R-2012	NC 51 Matthews Bypas	NC 51 e of US 74	NC 51 w of US 74	New 4L rur art on new	0.06	No	1996	0.50	4	0.23	30000	0.59	0.041

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DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
10	MECKLENBURG	U-209	US 74 Independence B	I-277	Eastway Bv (NC 4)	Widen 4L fry to 6L fr	3.00	Yes	1998	65.19	6	5.99	93000	79.21	0.035
10	MECKLENBURG	U-2303	Mallard Crk ChurchRd	Mallard Crk Rd	I-85	Widen 2L to 4L urb ar	1.53	No	1991	4.00	4	3.07	29000	5.92	0.017
10	MECKLENBURG	U-2506	Rea Rd Extension	NC 16	I-485	New 4L urb art on new	0.38	No	2000	14.70	4	1.51	22900	16.63	0.228
10	MECKLENBURG	U-2507	Mallard Crk Rd	Mallard Crk Church Rd	Harris Bvld	Widen 2L to 4L urb ar	0.40	No	1995	0.90	4	0.79	8000	1.11	0.041
10	MECKLENBURG	U-2507	Mallard Crk Rd	Mallard Crk Church Rd	Harris Bvld	Widen 2L to 4L urb ar	0.40	No	1995	0.90	4	0.80	8000	1.11	0.041
10	MECKLENBURG	U-2507	Mallard Crk Rd	Mallard Crk Church Rd	Harris Bvld	Widen 2L to 4L urb ar	0.96	No	1995	2.16	4	1.92	8000	2.65	0.041
10	MECKLENBURG	U-2507	Mallard Crk Rd	Mallard Crk Church Rd	Harris Bvld	Widen 2L to 4L urb ar	0.16	No	1995	0.36	4	0.31	8000	0.44	0.042
10	MECKLENBURG	U-2508	Mallard Crk Church R	I-85	NC 29	Widen 2L to 4L urb ar	1.08	No	1991	4.90	4	2.17	23000	7.25	0.037
10	MECKLENBURG	U-2510	NC 16 (Old Providence	N of McAlpine Creek	N of I-485	Widen 2L to 4L urb a	2.83	No	2001	11.01	4	5.66	29000	10.78	0.015
10	MECKLENBURG	U-2510	NC 16 (Old Providence Rd)	N of McAlpine Creek	N of I-485	Widen 2L to 4L urb ar	2.36	No	2001	9.19	4	4.72	30000	9.00	0.015
10	MECKLENBURG	U-2706	Westinghouse Bvld	Carpet St (w of I-77)	Downs Rd (w 0.5 mi)	Widen 2L to 4L urb ar	0.18	No	1998	1.10	4	0.36	19000	1.34	0.046
10	MECKLENBURG	U-2706	Westinghouse Bvld	Carpet St (w of I-77)	Downs Rd (w 0.5 mi)	Widen 2L to 4L urb ar	0.36	No	1998	2.20	4	0.73	19000	2.67	0.046
10	MECKLENBURG	U-2806	Westinghouse Bvld	W of NC 49	W of I-77	Widen 2L to 4L urb ar	0.19	No	1998	0.45	4	0.38	21000	0.55	0.016
10	MECKLENBURG	U-2806	Westinghouse Bvld	W of NC 49	W of I-77	Widen 2L to 4L urb ar	1.10	No	1998	2.90	4	2.19	21000	3.52	0.018
10	MECKLENBURG	U-2806	Westinghouse Bvld	W of NC 49	W of I-77	Widen 2L to 4L urb ar	0.27	No	1998	0.65	4	0.55	34000	0.79	0.010
10	MECKLENBURG	U-2910	Monroe Rd	Ex milti-lanes s of Rama	John St s of NC 51	Widen 2L to 4L urb ar	0.36	No	1999	2.17	4	0.72	35000	2.49	0.024
10	MECKLENBURG	U-2910	Monroe Rd	Ex ML s of Rama	John St s of NC 51	Widen 2L to 4L urb ar	0.27	No	1999	1.53	4	0.53	35000	1.75	0.023
10	MECKLENBURG	U-3115	US 29	Charlotte outer belt	Rocky River, just n of Spee	Widen 4L to 6L urb ar	0.23	No	1999	0.72	6	0.47	25000	0.83	0.017
10	MECKLENBURG	U-3115	US 29	Charlotte outer belt	Rocky River, just n of Spee	Widen 4L to 6L urb ar	1.91	No	1999	5.96	6	3.82	25000	6.83	0.017
10	MECKLENBURG	U-3307	E-W Circ Rd	US 521	NC 16	2L on 4L ROW, new loc	0.71	No	2002	0.94	2	1.41	7400	0.94	0.021
10	MECKLENBURG	U-3307	E-W Circ Rd	US 521	NC 16	2L on 4L ROW, new loc	0.79	No	2002	1.05	2	1.58	7400	1.05	0.021
10	MECKLENBURG	U-3307	E-W Circ Rd	US 521	NC 16	New 2L on 4L ROW, new loc	3.41	No	2002	4.51	2	6.81	7400	4.51	0.021
10	MECKLENBURG	U-3426	Ballantyne Commons P	Elm Lane	Providence Rd West	Widen 2L to 4L urb ar	0.85	No	1998	1.30	4	1.69	20800	1.58	0.011
10	MECKLENBURG	U-609	Harris Bvld	I-77	I-85	Widen 2L to 4L urb ar	0.35	No	1994	0.70	4	0.70	16300	1.02	0.021
10	MECKLENBURG	U-609	Harris Bvld	I-77	I-85	Widen 2L to 4L urb ar	0.68	No	1994	1.26	4	1.36	16300	1.83	0.020
10	MECKLENBURG	U-609	Harris Bvld	I-77	I-85	Widen 2L to 4L urb ar	0.62	No	1994	1.24	4	1.24	16300	1.81	0.021
10	MECKLENBURG	U-609	Harris Bvld	I-77	I-85	Widen 2L to 4L urb ar	0.16	No	1994	0.32	4	0.31	23000	0.47	0.015
10	MECKLENBURG	U-609	Harris Bvld	I-77	I-85	Widen 2L to 4L urb ar	1.08	No	1994	2.16	4	2.16	23000	3.14	0.015
10	MECKLENBURG	U-609	Harris Bvld	I-77	I-85	Widen 2L to 4L urb ar	3.12	No	1994	6.24	4	6.25	23000	9.09	0.015
10	STANLY	R-2104	NC 24-27	US 601	Town of Locust	Widen 2L to 4L rur ar	0.42	Yes	1995	1.11	4	0.85	9900	1.36	0.038
10	STANLY	R-2530AA	NC 24-27 in Albemarl	St Martin Rd w of Albemarle	Mt Vernon Dr w of US 52	Widen 2L to 4L urb ar	1.71	Yes	2001	4.00	4	3.41	15000	3.92	0.018
10	STANLY	R-2530AA	NC 24-27 in Albemarl	St Martin Rd w of Albemarle	Mt Vernon Dr w of US 52	Widen 2L to 4L urb ar	0.27	Yes	2001	0.50	4	0.53	15000	0.49	0.015
10	STANLY	U-2400	Northeast Connector,	US 52 n of Alb.	NC 24-27 e of Alb	New 2L rur art on new	3.78	No	1999	8.70	2	7.56	12000	9.97	0.027
10	UNION	U-3444	Olive Branch Rd, Mar	US 74	SR 1735 (Union St)	New 2L urb art on new	0.26	No	1997	0.60	2	0.52	3000	0.63	0.098
11	ALLEGHANY	R-3117	Sparta Western Loop	Grandview Dr s of Sparta	US 21 w of Sparta	New 2L rur art on new	1.48	No	1998	3.90	2	2.96	1700	4.74	0.221
11	CALDWELL	R-2237	US 321 (part done)	N of NC 268	Multi-lanes n of Blowing Ro	widen 2L to 4L rur ar	8.49	Yes	2001	26.20	4	16.97	9200	25.65	0.033
11	CALDWELL	R-2626	Connector, US 64, Le	US 64	Abington Rd (SR1310)	New 2L rur art on new	0.87	No	2000	2.90	2	1.75	1700	3.28	0.258
11	CALDWELL	U-2309	SW Loop Extension no	Creekway Drive	US 321 North	Widen 2L to 4L urb ar	1.73	No	1997	8.32	4	3.46	11000	8.78	0.056
11	CALDWELL	U-2309	SW Loop Extension no	Creekway Drive	US 321 North	Widen 2L to 4L urb ar	1.06	No	1997	4.88	4	2.11	8600	5.15	0.065

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DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
12	GASTON	GAST-2	Hoffman Rd Extension	Gaston Day Schl Rd	Hudson Bvld	New 4L urb art on new	0.99	No	1999	4.20	4	3.96	8600	4.81	0.071
12	GASTON	GAST-3	Titman Rd Connector	Hoffman Rd	NC 279 New Hope Rd	New 4L urb art on new	0.05	No	1998	0.14	4	0.21	5000	0.17	0.082
12	GASTON	GAST-3	Titman Rd Connector	Hoffman Rd	NC 279 New Hope Rd	New 4L urb art on new	0.43	No	1998	1.16	4	1.73	5000	1.41	0.082
12	GASTON	GAST-4	Robinwood Rd	NC 274 Union Rd	NC 279 New Hope Rd	Widen 2L to 4L urb ar	0.92	No	1998	3.34	4	1.83	16000	4.06	0.035
12	GASTON	GAST-4	Robinwood Rd	NC 274 Union Rd	NC 279 New Hope Rd	Widen 2L to 4L urb ar	1.24	No	1998	4.48	4	2.48	7100	5.44	0.075
12	GASTON	GAST-4	Robinwood Rd	NC 274 Union Rd	NC 279 New Hope Rd	Widen 2L to 4L urb ar	0.93	No	1998	3.38	4	1.86	12000	4.11	0.042
12	GASTON	GAST-5	NC 274 Union Rd	Robinwood Rd	Niblock Rd	Widen 2L to 4L urb ar	1.28	No	1995	2.48	4	2.56	14000	3.05	0.020
12	GASTON	GAST-5	NC 274 Union Rd	Robinwood Rd	Niblock Rd	Widen 2L to 4L urb ar	0.32	No	1995	0.62	4	0.64	14000	0.76	0.020
12	GASTON	I-2003	Lowell Exit of I-85	US 29/74 (E Wilkinson Blvd)	SR2213 (First St)	New Exit at Lowell-Ma	0.92	No	1994	5.70	2	0.00	3400	8.30	0.234
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	0.55	Yes	2000	1.98	6	1.10	63000	2.24	0.006
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	2.53	Yes	2000	9.10	6	5.05	74000	10.29	0.005
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	1.98	Yes	2000	7.12	6	3.97	87000	8.05	0.005
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	0.66	Yes	2000	2.37	6	1.32	97000	2.68	0.004
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	0.94	Yes	2000	3.37	6	1.87	96000	3.81	0.004
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	3.81	Yes	2000	13.70	6	7.62	67000	15.49	0.006
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	0.95	Yes	2000	3.41	6	1.89	106000	3.86	0.004
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	0.77	Yes	2000	2.76	6	1.54	100000	3.12	0.004
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	2.60	Yes	2000	9.33	6	5.21	100000	10.55	0.005
12	GASTON	I-302	I-85	NC 29/US 74 e of Kings Mtn	NC 273	Widen frwy 4L to 6L	2.69	Yes	2000	9.66	6	5.38	107000	10.93	0.004
12	GASTON	R-212	US 321	NC 275 in Dallas	NC 27 at Lincolnton	New 4L frwy on new lo	6.12	Yes	1994	28.20	4	24.47	36000	41.06	0.020
12	GASTON	R-212	US 321	NC 275 in Dallas	NC 27 at Lincolnton	New 4L frwy on new lo	0.61	Yes	1994	2.80	4	2.44	36000	4.08	0.020
12	GASTON	R-58	NC 16	Mt Holly-Huntersville Rd	NC 16 N of Lucia	New 4L rur art on new	1.00	No	1992	3.42	4	4.00	15300	5.03	0.039
12	GASTON	R-58	NC 16	Mt Holly-Huntersville Rd	NC 16 N of Lucia	New 4L rur art on new	3.42	No	1992	11.70	4	13.67	15300	17.22	0.039
12	GASTON	R-617A	NC 150, Cherryville	NC 279 at Cherryville	Crouse in Lincoln Co	Widen 2L to 4L rur ar	1.75	No	1997	6.67	4	3.51	12000	7.04	0.039
12	GASTON	U-2104	NC 7, Gastonia	Modena St	I-85	Widen 2L to 4L urb ar	0.48	No	1992	1.60	4	0.96	13000	2.36	0.042
12	GASTON	U-215	Hudson Bvld, Gastoni	US 321	New Hope Rd	New 4L urb art on new	1.38	No	1998	4.03	4	5.51	19000	4.90	0.024
12	GASTON	U-215	Hudson Bvld, Gastoni	US 321	New Hope Rd	New 4L urb art on new	1.36	No	1998	3.97	4	5.46	17000	4.82	0.026
12	GASTON	U-215	Hudson Bvld, Gastoni	US 321	New Hope Rd	New 4L urb art on new	1.48	No	1998	4.30	4	5.94	12000	5.22	0.037
12	GASTON	U-2712	SR 2200 Ext	Duke Street	Armstrong Park Rd.	Widen 2L to 4L, part on new lo	0.45	No	2002	3.14	4	0.90	18000	3.14	0.046
12	GASTON	U-2712	SR 2200	Duke Street	Armstrong Park Rd	Widen 2L to 4L, part on new lo	1.35	No	2002	5.66	4	2.69	9500	5.66	0.055
12	IREDELL	R-1017	US 64/NC 90	Alexander Co line	I-40	New 2L rur art on new	6.77	No	1995	13.74	2	13.54	6800	16.89	0.038
12	IREDELL	R-1017	US 64/NC 90	Alexander Co line	I-40	New 2L rur art on new	0.88	No	1995	1.46	2	1.76	6800	1.79	0.036
12	IREDELL	R-2226	NC 150, Mooresville	I-77	NC 152	Widen 2L to 4L urb ar	1.28	No	1996	2.88	4	2.57	22000	3.40	0.013
12	IREDELL	R-2226	NC 150, Mooresville	I-77	NC 152	Widen 2L to 4L urb ar	0.17	No	1996	0.37	4	0.35	25700	0.44	0.012
12	IREDELL	R-2226	NC 150, Mooresville	I-77	NC 152	Widen 2L to 4L urb ar	0.27	No	1996	0.61	4	0.53	25400	0.72	0.011
12	IREDELL	R-2226	NC 150, Mooresville	I-77	NC 152	Widen 2L to 4L urb ar	0.15	No	1996	0.34	4	0.29	25400	0.40	0.013
12	IREDELL	U-2213	NC 150, Mooresville	NC 152	NC 115	Widen 2L to 4L urb ar	1.02	No	1992	3.50	4	2.04	13200	5.15	0.046
12	IREDELL	U-2421	US 70 e of Statesvil	SR 2352 (Barkley Rd)	SR 2318 (Fanjoy Rd)	Widen 2L to 4L urb ar	1.14	No	2000	3.00	4	2.27	19000	3.39	0.019
12	IREDELL	U-2421	US 70 e of Statesvil	SR 2352 (Barkley Rd)	SR 2318 (Fanjoy Rd)	Widen 2L to 4L urb ar	0.69	No	2000	1.80	4	1.38	19000	2.04	0.019

List of the 750 Sections of the Major Highway Projects (1990-2004)

DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
12	LINCOLN	R-212	US 321	NC 275 in Dallas	NC 27 at Lincolnton	New 4L frwy on new lo	0.33	Yes	1994	1.50	4	1.34	12000	2.18	0.057
12	LINCOLN	R-212	US 321	NC 275 in Dallas	NC 27 at Lincolnton	New 4L frwy on new lo	3.96	Yes	1994	18.28	4	15.85	12000	26.62	0.059
12	LINCOLN	R-212	US 321	NC 275 in Dallas	NC 27 at Lincolnton	New 4L frwy on new lo	0.46	Yes	1994	2.12	4	1.85	12000	3.09	0.058
12	LINCOLN	R-617A	NC 150, Cherryville	NC 279 at Cherryville	Crouse in Lincoln Co	Widen 2L to 4L rur ar	0.28	No	1997	1.07	4	0.57	9100	1.13	0.051
12	LINCOLN	R-617A	NC 150, Cherryville	NC 279 at Cherryville	Crouse in Lincoln Co	Widen 2L to 4L rur ar	1.91	No	1997	7.28	4	3.83	10000	7.68	0.047
12	LINCOLN	R-85	US 321	Lincolnton	Hickory	New 4L Freeway,	0.38	Yes	1998	1.22	4	1.52	19000	1.48	0.021
12	LINCOLN	R-85	US 321	Lincolnton	Hickory	New 4L Freeway,	2.92	Yes	1998	9.30	4	11.69	19000	11.30	0.021
12	LINCOLN	R-85	US 321	Lincolnton	Hickory	New 4L Freeway,	2.44	Yes	1998	7.81	4	9.77	21000	9.49	0.019
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	0.66	Yes	2001	6.27	4	2.65	11200	6.14	0.085
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	1.08	Yes	2001	10.32	4	4.31	11200	10.10	0.086
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	0.08	Yes	2001	2.89	4	0.30	11200	2.83	0.341
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	3.44	Yes	2001	30.00	4	13.76	11200	29.37	0.076
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	4.45	Yes	2001	39.78	4	17.80	11200	38.94	0.078
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	0.53	Yes	2001	4.74	4	2.11	10300	4.64	0.086
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	4.24	Yes	2001	37.91	4	16.97	8900	37.11	0.099
13	BUNCOMBE	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	0.49	Yes	2001	4.50	4	1.94	11000	4.41	0.083
13	BUNCOMBE	I-100	I-40 at Sweeten Creek	New Exit 51 on I-40	New Exit 51 on I-40	New Exit 51	1.05	No	1999	9.00	2	0.00	16500	10.31	0.063
13	BUNCOMBE	R-2213	US 25	SR 1361 in Henderson Co	US 25A s of Arden	Widen 2L to 5L urb ar	1.12	No	2001	6.40	5	3.36	16500	6.27	0.035
13	BUNCOMBE	R-2306	US 74A	I-40 s. to…	SR 3136 (Fairview)	Widen 2L to 4L rur ar	0.39	No	2001	1.88	4	0.78	21500	1.84	0.027
13	BUNCOMBE	R-2306	US 74A	I-40 s. to…	SR 3136 (Fairview)	Widen 2L to 4L rur ar	1.29	No	2001	6.22	4	2.58	22500	6.09	0.026
13	BUNCOMBE	R-2306	US 74A	I-40 s. to…	SR 3136 (Fairview)	Widen 2L to 4L rur ar	2.80	No	2001	13.50	4	5.59	21500	13.22	0.027
13	BUNCOMBE	R-2306	US 74A	I-40 s. to…	SR 3136 (Fairview)	Widen 2L to 4L rur ar	1.97	No	2001	9.50	4	3.94	21500	9.30	0.027
13	BUNCOMBE	R-401	NC 280	Mills River	I-26	Widen 2L to 4/5L urb	1.08	No	1993	5.37	4	2.16	20000	7.86	0.041
13	BUNCOMBE	R-401	NC 280	Mills River	I-26	Widen 2L to 4/5L urb	0.15	No	1993	0.75	4	0.30	24000	1.10	0.034
13	BUNCOMBE	R-401	NC 280	Mills River	I-26	Widen 2L to 4/5L urb	0.15	No	1993	0.75	4	0.29	24000	1.10	0.035
13	BUNCOMBE	U-1001	Broadway St, Ashevil	I-240 in Asheville	N. to US 19-23-70	Widen 2L to 4L urb ar	1.58	No	1997	7.60	4	3.16	6900	8.02	0.077
13	BUNCOMBE	U-2000	NC 63 (Leicester	SR 1004	Asheville City limits	Widen 2L to 4L rur ar	0.88	No	1994	2.75	4	1.76	22400	4.00	0.024
13	BUNCOMBE	U-2000	NC 63 (Leicester	SR 1004	Asheville City limits	Widen 2L to 4L rur ar	2.10	No	1994	6.55	4	4.20	22400	9.54	0.024
13	BUNCOMBE	U-2000	NC 63 (Leicester	SR 1004	Asheville Cit	Widen 2l to 4L	3.25	No	1994	9.30	4	6.51	22400	13.54	0.023
13	BUNCOMBE	U-2402	Airport Road	I-26	US 25	Widen 2l to 4L urb ar	1.78	No	1998	9.00	4	3.56	17000	10.94	0.043
13	BUNCOMBE	U-2902	NC 191 Relocation	N of I-40	I-240 Interchange	New 4L on new loc	0.47	No	2001	7.40	4	1.87	12000	7.24	0.130
13	BUNCOMBE	U-529	NC 63 (Leicester Hy,	US 19-23	N. 1.5 miles	Widen 2L to 4L urb ar	1.15	No	1991	5.90	4	2.30	24100	8.73	0.033
13	BUNCOMBE	U-90	US 25	Blue Ridge Pkwy	I 40	Widen 2L to 5L urb ar	2.88	No	1993	16.40	5	8.65	27000	24.01	0.034
13	BURKE	U-2550	NC 18, Morganton	US 70 Bypass Fleming Dr)	I-40	Widen 2L to 5L urb ar	1.76	No	1999	12.20	5	5.27	20000	13.98	0.048
13	MACON	R-2103	US 23-441	GA state line	SR 1652 s of Franklin	Widen 2l to 4L rur ar	10.21	No	1996	20.70	4	20.42	6600	24.43	0.036
13	MACON	R-3626	New Route	SR 1168	SR 1442 (Old US 64)	New 2L on new loc	0.14	No	2001	0.30	2	0.29	4000	0.29	0.060
13	MACON	R-504	US 23-441	SR 1649 near Union	SR 1652 s of Franklin	Widen 2L to 5L urb ar	3.20	Yes	1994	3.60	5	9.59	17300	5.24	0.012
13	MACON	U-621	US 441 Business in F	Int of Palmer and Main to	US 23-441 Bypass	Widen 2L to 4L urb ar	0.13	No	1991	2.02	4	0.27	19300	2.99	0.116
13	MACON	U-621	US 441 Business in F	Int of Palmer and Main to	US 23-441 Bypass	Widen 2L to 4L urb ar	0.74	No	1991	4.38	4	1.48	10200	6.48	0.103

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DOT		Proj						Infra	Compl	Nom	Lanes	LM		2002	2002
DIV	County	ID Num	Route/City Name	From Location	To Location	Work Description	Length	Sys	Year	Cost	After	Added	ADT2	Cost	Cost/VMT
13	MARTIN	R-2111	US 64	US 64 Byp at Tarboro	W of Robersonville	New 4L Fry on new loc	3.12	Yes	1999	12.16	4	12.48	8600	13.94	0.053
13	MARTIN	R-2112	US 64	E. of SR 1303, Robersville	US 17, s of Williamstown	New 4L Fry on new loc	1.18	No	2001	5.79	4	4.71	7300	5.67	0.065
13	MARTIN	R-2112	US 64	E. of SR 1303, Robersville	US 17, s of Williamstown	New 4L Fry on new loc	5.09	No	2001	25.02	4	20.38	6700	24.49	0.071
13	MARTIN	R-2112	US 64	E. of SR 1303, Robersville	US 17, s of Williamstown	New 4L Fry on new loc	8.25	No	2001	40.52	4	33.00	6800	39.67	0.070
13	MARTIN	R-2112	US 64	E. of SR 1303, Robersville	US 17, s of Williamstown	New 4L Fry on new loc	0.85	No	2001	4.17	4	3.40	6300	4.08	0.075
13	MARTIN	R-2112	US 64	E. of SR 1303, Robersville	US 17, s of Williamstown	New 4L Fry on new loc	0.61	No	2001	3.01	4	2.45	6500	2.95	0.088
13	MARTIN	R-405	US 64	US 17 in Williamstown	E. of Jamesville	Widen 2L to 4L, rural	10.46	Yes	1993	62.90	4	20.93	8700	92.09	0.103
13	MITCHELL	R-2119	NC 226, Spruce Pine	US 19	Mimpro	New 4L rur art on new	0.76	Yes	1998	12.07	4	3.05	14000	14.67	0.140
13	MITCHELL	R-2119	NC 226, Spruce Pine	US 19	Mimpro	New 4L rur art on new	0.09	Yes	1998	1.43	4	0.36	9500	1.74	0.205
13	RUTHERFORD	R-99	US 74	Columbus	Forest City	New 4L frwy on new lo	5.26	Yes	1996	20.15	4	21.03	5600	23.78	0.082
13	RUTHERFORD	R-99	US 74	Columbus	Forest City	New 4L frwy on new lo	2.71	Yes	1996	10.43	4	10.85	6500	12.31	0.071
13	RUTHERFORD	R-99	US 74	Columbus	Forest City	New 4L frwy on new lo	0.11	Yes	1996	0.41	4	0.42	6500	0.48	0.085
13	RUTHERFORD	R-99	US 74	Columbus	Forest City	New 4L frwy on new lo	1.02	Yes	1996	3.96	4	4.06	6500	4.67	0.085
13	RUTHERFORD	U-2711	Oak St, Forest City	US 74 Bypass	US 221A (S. Broadway St0	Widen 2L to 5L urb,	1.28	No	2001	5.30	5	3.85	13800	5.19	0.035
14	CHEROKEE	R-2110	NC 60 (SP)	GA state line	UC 64-74	Widen 2L to 5L rur ar	5.07	No	1999	20.20	5	15.22	4000	23.15	0.116
14	CLAY	R-2703	US 64 Bypass, Hayesv	NC 64 Business (SR 1100)	NC 69	Widen 2L to 5L urb ar	0.73	No	2000	0.85	5	2.19	8200	0.96	0.019
14	CLAY	R-2703	US 64 Bypass, Hayesv	NC 64 Business (SR 1100)	NC 69	Widen 2L to 5L urb ar	0.64	No	2000	0.65	5	1.93	8200	0.74	0.016
14	HAYWOOD	I-2103	I-40 at Newfound Roa	Newfound Road Exit	Newfound Road Exit	New Exit (Milepost 33	0.99	No	1995	4.90	2	0.00	500	6.02	1.290
14	HAYWOOD	I-3100	I-40, milepost 34.5-	MP 34.5, w of SR 1599	MP 36.5, w of Buncombe Co l	Widen 4L to 5L by add	2.95	No	2001	2.90	5	2.95	40000	2.84	0.003
14	HAYWOOD	R-2023	US 276	US 23-74 Bypass	US 19-276	Widen 2L to 4L urb ar	0.33	No	1993	1.34	4	0.67	16100	1.96	0.042
14	HAYWOOD	R-2023	US 276	US 23-74 Bypass	US 19-276	Widen 2L to 4L urb ar	1.07	No	1993	4.36	4	2.14	14300	6.38	0.049
14	HAYWOOD	R-2102	US 19-23	Maggie Valley	Dellwood	Widen 2L to 4L urb ar	2.81	No	1995	5.40	4	5.62	21500	6.64	0.013
14	HAYWOOD	R-3328	Access Rd, Beaverdam	SR 1613 (Beaverdam Rd)	SR 1004 (Newfound Rd)	New 2L rur art on new	0.96	No	1998	2.40	2	1.92	12000	2.92	0.030
14	HAYWOOD	U-623	NC 215, Canton	US 19-23	I-40	Widen 2L to 4L urb ar	1.94	No	1992	6.40	4	3.88	5200	9.42	0.099
14	HENDERSON	R-2214B	US 25	N. of I-26	SR 1546 (Blake St)	Widen 2L to 5L	2.38	No	2002	19.30	5	7.15	12000	19.30	0.078
14	HENDERSON	R-401	NC 280	Mills River	I-26	Widen 2L to 4/5L urb	2.81	No	1993	13.95	4	5.63	18000	20.42	0.044
14	HENDERSON	R-401	NC 280	Mills River	I-26	Widen 2L to 4/5L urb	0.06	No	1993	0.29	4	0.12	18000	0.42	0.045
14	HENDERSON	R-401	NC 280	Mills River	I-26	Widen 2L to 4/5L urb	0.08	No	1993	0.39	4	0.16	24000	0.57	0.033
14	HENDERSON	R-402	NC 280	US 64 at Brevard	NC 191 at Mills River	Widen 2L to 4L rur ar	6.27	No	1993	14.15	4	12.54	11300	20.72	0.035
14	HENDERSON	U-2106	US 25, Hendersonvill	NC 191 n to…	SR 1528	Widen 2L to 5L urb ar	2.59	No	1998	21.00	5	7.78	21000	25.52	0.056
14	JACKSON	R-2224	NC 107	Cahsiers, n. to…	s of East Laport	2L to 3L, selected cl	14.34	No	2000	3.00	3	14.34	6800	3.39	0.004
14	JACKSON	R-2409	US 64	NC 107 at Cashiers	NC 178 at Rosman, Transylva	2L to 3L, selected cl	7.17	No	2000	1.45	3	7.17	6600	1.64	0.004
14	MADISON	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	2.71	Yes	2001	24.23	4	10.86	11100	23.72	0.079
14	MADISON	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	0.20	Yes	2001	1.79	4	0.79	10000	1.75	0.089
14	MADISON	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	0.79	Yes	2001	7.10	4	3.18	10000	6.95	0.088
14	MADISON	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	6.55	Yes	2001	58.56	4	26.20	8800	57.33	0.100
14	MADISON	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	3.23	Yes	2001	28.88	4	12.90	7700	28.27	0.114
14	MADISON	A-10	US 19-23	I-240 in Asheville	Tennessee State Line	New 4L frwy on new lo	0.87	Yes	2001	7.80	4	3.48	11000	7.64	0.080
14	MADISON	R-1012	US 25-70	Hot Springs	Tennessee State Line	New 2L rur art on new	6.18	No	1995	13.50	2	12.35	2600	16.59	0.122

List of the 750 Sections of the Major Highway Projects (1990-2004)

DOT DIV	County	Proj ID Num	Route/City Name	From Location	To Location	Work Description	Length	Infra Sys	Compl Year	Nom Cost	Lanes After	LM Added	ADT2	2002 Cost	2002 Cost/VMT
14	POLK	R-99	US 74	Columbus	Forest City	New 4L frwy on new lo	1.79	Yes	1996	6.85	4	7.17	11000	8.08	0.042
14	POLK	R-99	US 74	Columbus	Forest City	New 4L frwy on new lo	4.10	Yes	1996	15.60	4	16.39	11000	18.41	0.042
14	POLK	R-99	US 74	Columbus	Forest City	New 4L frwy on new lo	5.75	Yes	1996	22.10	4	23.01	11000	26.08	0.042
14	SWAIN	A-6	US 19-74-NC28	NC 28	W of Little Tennessee River	Widen 2L to 4L rur ar	0.29	Yes	1992	3.17	4	0.59	3500	4.67	0.460
14	SWAIN	A-6	US 19-74-NC28	NC 28	W of Little Tennessee River	Widen 2L to 4L rur ar	0.45	Yes	1992	4.45	4	0.89	5400	6.55	0.277
14	SWAIN	A-6	US 19-74-NC28	NC 28	W of Little Tennessee River	Widen 2L to 4L rur ar	1.38	Yes	1992	14.08	4	2.77	5400	20.73	0.282
14	SWAIN	R-3625	Qualla Boundary	US 441	US 19	Widen to 5L	0.72	No	2000	2.50	5	2.15	12000	2.83	0.034
14	TRANSYLVANIA	R-2409	US 64	NC 107 at Cashiers	NC 178 at Rosman, Transylva	2L to 3L, selected climbing	12.56	No	2000	2.55	3	12.56	6600	2.88	0.004
14	TRANSYLVANIA	R-402	NC 280	US 64 at Brevard	NC 191 at Mills River	Widen 2L to 4L rur ar	4.99	No	1993	11.25	4	9.99	11300	16.47	0.035

Endnotes and References

[1] "**Major road projects**" are those that would be large enough to attract traffic or otherwise cause changes in development. Includes major widenings, new freeways, exits, major new bridges, and similar projects.

[2] The State Transportation Improvement Program ('**TIP"**) is federally-mandated biennial program of projects that the State and local governments intend to construct over the next 5-7 years. To be eligible or federal funds, projects must be on the TIP. The current TIP is online at http://www.dot.state.nc.us.

[3] DT Hartgen, Highways and Sprawl in North Carolina, A Report for the John Locke Foundation, Raleigh, NC, September 24, 2003. Available on the web at http://www.johnlocke.org

[4] Hertz Corp. The Cost of Driving, Spring 2004.

[5]Campbell B and Humphrey T, Methods of cost-effectiveness analysis for highway projects, Synthesis 142, National Cooperative Highway Research program, Transportation Research Board, Washington DC 20418, December 1988.

[6]Campbell B and Humphrey T, op. cit.

[7]American Association of State Highway Officials, Road User Benefit Analysis for Highway Improvements', Washington DC, 1960.

[8] American Association of State Transportation Officials, Road User Benefit Analysis for Highway Improvements, 444 N. Capitol St., Washington DC 20005, 1977. Revised 2000.

[9] Blensly RC et. al. Application of economic analysis to highway systems and programs, Special Report 56, Highway Research Board, Washington DC 1960.

[10] Winfrey RW and Zellner C, Summary and Evaluation of Economic Consequences of highway improvements, Report 122, National Cooperative Highway Research Program, Washington DC 1971.

[11] Karan M and Haas GCR, User delay cost model for highway rehabilitation, Record 554, Transportation Research Board, Washington DC 1975.

[12] Curry DA and Anderson DG, Procedures for estimating highway user costs, air pollution and noise effects, Report 133, National Cooperative Highway Research Program, Washington DC, 1971.

[13] Memmott JL and Buffington JL, Feasibility of Texas highway economic evaluation model for HOV lanes. Record 887, Transportation Research Board, Washington DC 1982.

[14] Schofer JL, Decision tools for transportation infrastructure reinvestment: user guidelines for microcomputer decision support systems. Report for USDOT, Washington DC 20590, 1982.

[15] Lewis D, Primer on transportation, productivity and economic development, Report 342, National Cooperative Highway Research Program, Transportation Research Board, Washington DC, September 1991.

[16] Barnes J, Review of MicroBencost for WSDOT Mobility, Washington State Transportation Center, Washington University, Seattle WA July 1998.

[17] Daniels G and Stockton WR, Cost-effectiveness of high occupancy vehicle lanes in Texas. Record 1711, Transportation Research Board, Washington DC, 2000, p. 1-5.

[18] Federal Highway Administration, STEAM/SPASM/SMITE Software, USDOT, Washington DC. 2000. Available at http://www.fhwa.dot.gov/steam.

[19] Bekka K, StratBencost Software, HLB Decision Economics, Silver Spring MD 2000. Available from the vendor at 301-565-0391.

[20] Federal Railroad Administration, GradeDec Software, USDOT, Washington DC. Available at http://www.gradedec.net.

[21] California Department of Transportation, CAL/B-C Software, 1120 N. St MS-32, Sacramento, CA 95814, 1995, available at http://www.dot.ca.gov/hq/tpp/offices/ote.htm.

[22] Federal Highway Administration, Highway Economic Requirements System-ST, Version 2.0, US Department of Transportation, Washington DC, 2002.

[23] American Association of State Highway and Transportation Officials, User Benefit Analysis for Highways Software, 444 N Capitol St NW, # 249, Washington DC 20001, 2003. available at http://www.transportation.org.

[24] US General Accounting Office, Highway infrastructure: The Federal Highway Administration's model for estimating highway needs has been modified for state-level planning, USGAO, Report GAO-01-99, Washington DC 2001.

[25] Urban Transportation Monitor, Transportation Evaluation Software, Lawley Publications, 6318 Jeremiah Court, Fairfax Station VA 22039. March 19, 2004. Available from editors@lawleypublications.com.

[26]Winfrey RW and Zellner C op. cit. 1971.

[27] Federal Highway Administration, Economic Analysis Primer, USDOT, Washington DC 2003.

[28] Hall JW et.al. Concerns about use of severity indexes in roadside safety evaluations, Record 1468, Transportation Research Board, Washington DC 1994.

[29] Hartgen DT, The looming crisis in highway funding: comparative performance of state highway systems 1984-2002, John Locke Foundation, February 10, 2004. Available at http://www.johnlocke.org.

[30] Federal Transit Administration, Annual report of new starts: FY 2005. USDOT, Washington DC January 2004.

[31] Marshment R, Major investment analysis of a multimodal project in an urban corridor. Fifth National Conference on Transportation Planning Methods, Seattle WA, 1995

[32] Pravin V and C Chen, The Freeway Congestion Paradox, Access Vol. 20, University of California at Berkeley, Spring 2002.

[33] A 'geographic information system' is a collection of computer-based maps, data and procedures that permit the management of information in real-world geographies. TransCAD© (http://www.caliper.com) is a specialized GIS intended for managing transportation-related information such as road systems. A fuller description of the features of TransCAD is available at the vendor's website.

[34] Federal Highway Administration, Highway Statistics 2002, Washington DC, November 2003. Web version available at http://www.fhwa.dot.gov.

[35] The American Association of State Transportation and Highway Officials distinguish between road functions primarily by access to land and mobility of travelers. Land access is the primary function of the

lower class local roads, while mobility is the primary function of higher-class interstate highways. See, for instance, AASHTO, A Policy on the Geometric Design of Highways and Streets ("Green Book"), AASHTO, 444 N. Capitol St, Washington, DC 20005, 1994 or later editions.

[36] Hartgen , 2004, op. cit.

[37] As of Dec. 31, 2003, 73 percent, or 2630 miles, was either completed or fully funded for completion; at the end of 2001, 71 percent was complete. Source: NCDOT.

[38] Hartgen, DT, On the Road Again: Performance, Needs and Funding Options for North Carolina Highways, John Locke Foundation, Raleigh, NC, October 2000.

[39] North Carolina General Statute, 136-176, "An Act to Implement the North Carolina Moving Ahead Transportation Initiative", July 20, 2003.

[40] Hertz Corporation, information released 4/15/05. In this announcement, the average cost of operating a mid-sized US car over its lifetime was 54 cents/mile.

[41] If a different measure of cost-effectiveness were used, say user benefits, the results would probably be different, perhaps showing the most cost-effective projects in mid-density ranges where increases in capacity typically have the greatest relative impact.

[42] Ideally, we would have liked to match each project with the presence (or absence) of a NCDOT Board Member when the project was first placed on the TIP, but the research involved in this approach was beyond the range of our study.

[43] Angloss Software Systems, KnowledgeSEEKER for Windows Version 3.0 Users Manual, 430 King Street West, Suite 201, Toronto, Canada M5V1J5. 1994.

[44] Hartgen, 2003, op.cit.

[45] For linear models of the form $Y = a + bX$, the 'elasticity' of Y with respect to x is $e = b (x/y)$. Elasticities are usually evaluated at the mean of the data.

[46] Transportation Research Board, Highway Capacity Manual, Washington DC, 20590. 2000.

[47] Hartgen, 2003, op.cit.

[48] Douglass Lee, Induced Demand and Elasticity, Highway Economic Requirements System – ST, version 2.0, Federal highway Administration, Washington DC, 2002.

[49] A "vehicle-mile-of-travel" is a one-mile distance traveled by a single vehicle. It is widely used as a measure of traffic demand. So, for example, a 3-mile road segment that carries 10,000 vehicles per day would serve 30,000 vehicle-miles-of-travel (VMT) per day, or 10.95 million VMT per year. If the forecast traffic is 15,000, then the 20-year VMT served is: _ * (10,000 + 15000)*3.0*20*365 = 273.75 million VMT.

[50] Federal Highway Administration, Price Trends for Federal Aid Highway Construction, Second Quarter 2003, Washington DC 20590, November 2003.

[51] Davis S and Diegel S, Transportation Energy Conservation Data Book Edition 23, Center for Transportation Analysis, Oak Ridge National Laboratory, Oak Ridge TN37831, October 2003.

[52] Angloss Software Systems, Op.cit.