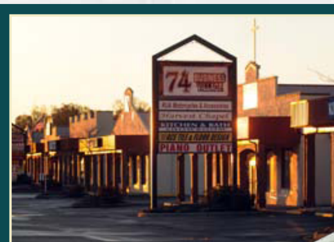
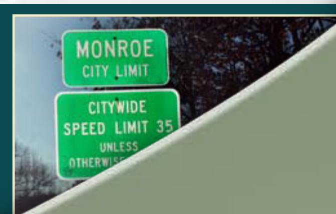
NORTH CAROLINA
Turnpike Authority

A Division of NCDOT





Volume 2
Appendices A, B, D thru G

Monroe Connector/Bypass
Administrative Action
Draft Supplemental Final
Environmental Impact Statement

November 2013

Lead Agencies: US Department of Transportation
Federal Highway Administration
North Carolina Department of Transportation

Cooperating Agency: US Army Corps of Engineers

Submitted Pursuant to the National Environmental Policy Act
23 CFR 771.119 and 42 USC 4332(2)(c)

Monroe Connector/Bypass
Mecklenburg and Union Counties
STIP Projects R-2559 and R-3329

ABSTRACT

This report is a Supplement to the May 25, 2010 Final Environmental Impact Statement for the Monroe Connector/Bypass. The proposed action is the construction of a controlled-access toll facility extending from US 74 near I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, a distance of approximately 20 miles.

On May 3, 2012 the United State Court of Appeals for the Fourth Circuit in North Carolina Wildlife Federation, Clean Air Carolina; Yadkin Riverkeeper v. North Carolina Department of Transportation and Federal Highway Administration, No. 11-2210, held that the Federal Highway Administration (FHWA) and the North Carolina Department of Transportation (NCDOT) had not complied with the provisions of the National Environmental Policy Act (NEPA) by failing to disclose critical assumptions underlying their decision to build the proposed project and by providing the public with incorrect information. Specifically, in addressing public comments on the project as to whether the data set used as the project's no-build scenario for the indirect and cumulative analysis contained the project, the agencies responded "TAZ socioeconomic forecasts for the No Build Scenario did not include the Monroe Connector. [The Mecklenburg Union County Metropolitan Planning Organization (MUMPO) confirmed our assumption regarding the reasonableness of the 2030 TAZ forecasts for use as a No Build basis." The second sentence accurately reflects the agencies' final conclusion, but the first sentence is not correct. Travel time to employment, one of eight land development factors for Union County used to project no-build growth estimates for the year 2030, presumed the presence of the proposed Monroe Connector/Bypass. As a result, the data relied upon to reflect the no build scenario included a build assumption. In response to the court's decision FHWA rescinded the Record of Decision (ROD) for this project on July 3, 2012. NCDOT and FHWA then re-initiated the National Environmental Policy Act (NEPA) process which has led to the development of this Draft Supplemental Final Environmental Impact Statement (EIS).

This Draft Supplemental Final EIS (DSEIS) addresses current environmental conditions and focuses on any changes that have occurred with regards to the project (note: there have been no changes in the proposed action), the alternatives analysis, the affected environment and impacts, and any new issues or information identified since the Final EIS was published. This DSEIS also documents the assumptions and methods underlying the modeling for the quantitative indirect and cumulative effects analysis at issue in the prior litigation, documents the actions taken to test the propriety of using the data set provided by MUMPO, and explains how and why the agencies determined the no-build and build models for the indirect and cumulative effects analysis are reasonable and enable a meaningful comparison of the environmental impacts associate with the build and no-build scenarios.

Requests for project documentation may be directed to the NCDOT at the contact below.

North Carolina Department of Transportation (NCDOT)
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FHWA-NC-EIS-09-01-DS

Monroe Connector /Bypass
From Near I-485 at US 74 to
US 74 Between the Towns of Wingate and Marshville
Mecklenburg and Union Counties

Federal Aid Project No. STP-NHF-74(90)
WBS No. 34533.1.1TA1
STIP Project No. R-3329/R-2559

ADMINISTRATIVE ACTION
Draft Supplemental Final Environmental Impact Statement

November 2013
Submitted Pursuant to 42 USC 4332(2)(c)
UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
&
NC DEPARTMENT OF TRANSPORTATION

Cooperating Agency: US Army Corps of Engineers

Approved

11/8/13
Date

Richard W. Hancock, PE, Manager
Project Development and Environmental Analysis Unit
North Carolina Department of Transportation

11/8/13
Date

for John F. Sullivan, III, PE, Division Administrator
Federal Highway Administration

The FHWA will issue a single Final Environmental Impact Statement and Record of Decision document pursuant to Pub. L. 112-141, 126 Stat. 405, Section 1319(b) unless FHWA determines statutory criteria or practicability considerations preclude issuance of the combined document pursuant to Section 1319.

FHWA-NC-EIS-09-01-DS

Monroe Connector /Bypass
From Near I-485 at US 74 to
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Project Manager, Atkins

For the North Carolina Department of Transportation

11.8.2013
Date

Jennifer Harris, PE, Project Development Section Head – Western Region/Turnpike
NCDOT – Project Development and Environmental Analysis Unit

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***Note**: This Draft Supplemental Final EIS has been published in three volumes:*

VOLUME 1 – Table of Contents, Text and Figures
VOLUME 2 – Table of Contents and Appendices A, B, D thru G
VOLUME 3 – Table of Contents and Appendix C

LIST OF TABLES

LIST OF FIGURES (Figures located at the end of each chapter)

LIST OF EXHIBITS

Section 1

Section 2

APPENDICES
(VOLUME 2 OF THE DRAFT SUPPLEMENTAL FINAL EIS)

(VOLUME 3 OF THE DRAFT SUPPLEMENTAL FINAL EIS)

NOTE: A CD of the approved Draft EIS and Final EIS is included inside the back cover of Volume #2 of this Draft Supplemental Final EIS. These documents can also be view at www.ncdot.gov/projects/monroeconnector.

APPENDIX A
COMMENTS

ORGANIZATION OF APPENDIX A

A-1. Comments since the Final EIS

A-2. Comments on the Final EIS

A-3. Citizens Informational Workshop Materials

Scanned copies of the original documents received are included in this appendix, with the assigned document number placed in the upper right corner of the letters. A table of contents is provided at the beginning of each sub-appendix that list the documents included in that sub-appendix. Each document was reviewed, and comments responded to are bracketed and numbered in the scanned documents. Not all statements made in the documents require a response. Comment response tables are provided following each document.

Two Citizens Informational Workshops were held in June 2012. A meeting summary, along with the presentation slides presented at the meetings and the comment forms received are included in **Appendix A-3**.

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APPENDIX A-1

COMMENTS SINCE THE FINAL EIS

Document Number	Agency/Organization	Date	Page Number
i001	A Closer Look at US 74: Challenges and Opportunities	07/03/13	A1-1
i002	Southern Environmental Law Center	03/06/13	A1-29
i003	Southern Environmental Law Center	12/03/12	A1-42
i004	Southern Environmental Law Center	11/30/12	A1-44

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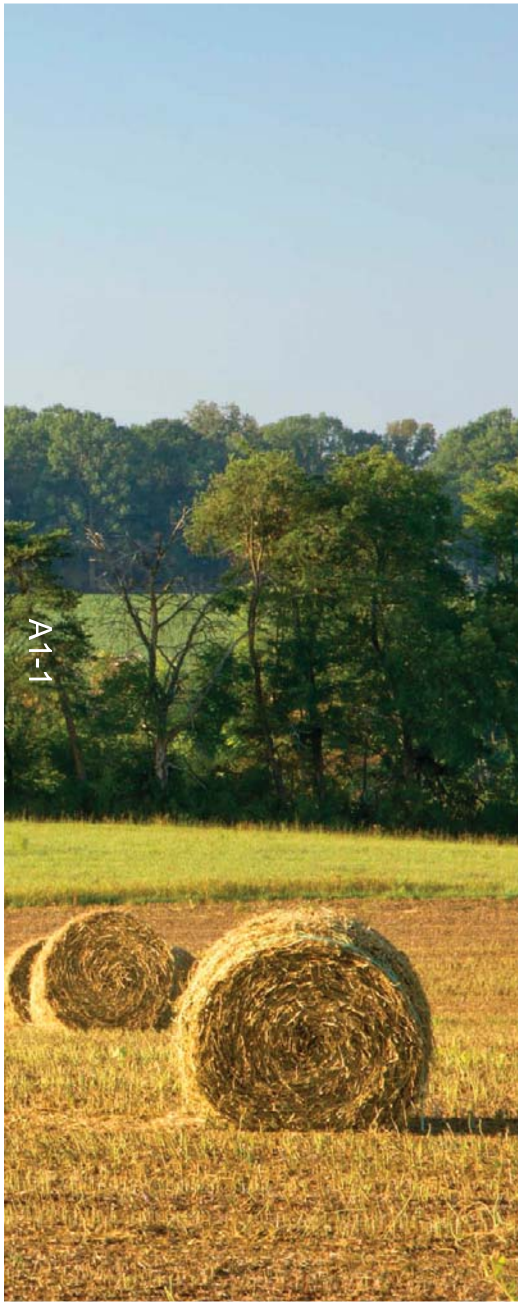

A CLOSER LOOK AT US 74: CHALLENGES & OPPORTUNITIES

i001

Southern Environmental Law Center

O'Connell & Lawrence, Inc., prepared this report at the request of the Southern Environmental Law Center to assist in their review of the proposed Monroe Bypass. O'Connell & Lawrence is a multidisciplinary firm which provides construction consulting, civil engineering, and surveying services to a broad range of both public and private sector clients. Its staff consists of an experienced group of registered engineers, surveyors, and construction specialists with expertise in a wide variety of disciplines. The Southern Environmental Law Center is a non-profit organization dedicated to protecting natural resources and public health in the South.

For additional copies of this report, or for more information about SELC, please visit our website or contact:

Southern Environmental Law Center
Chapel Hill Office
601 West Rosemary Street, Suite 220
Chapel Hill, NC 27516-2356
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SouthernEnvironment.org

A CLOSER LOOK AT US 74: CHALLENGES & OPPORTUNITIES

i001

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The conclusions and opinions expressed in this report were reached with a reasonable degree of engineering certainty.

The Stantec report, commissioned by the North Carolina Department of Transportation, highlights potential improvements to US 74, including signal timing optimization, modifications to signal phasing, turn lane storage expansion/addition, and lane modification, that are projected to significantly reduce overall delay.

The proposed revisions are projected to provide substantial time-delay benefits to local residents over an eight-year window. Stantec's study should be expanded to determine if delay benefits will sustain over a longer timeframe.

O'Connell & Lawrence, Inc. recommends the Wilbur Smith Associates origin-destination study be modified by increasing the number of survey collection points and increasing the time spent collecting origin-destination data. OCL also recommends a separate commercial driver origin-destination study be performed to highlight the differences between passenger vehicle and commercial vehicle traffic patterns.

Information obtained in Stantec's updated delay study and WSA's revised Origin-Destination study should be provided to local decision-makers so an informed decision about the long-term viability of US 74 as a means of providing high-speed, reliable transportation in the area southeast of Charlotte, NC, can be made. Additional study is required to determine if improvements to US 74 could assist in addressing the stated purposes of the Monroe Connector/Bypass.

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INTRODUCTION

Description of US 74 and Associated Reports

US 74, an existing multi-lane divided highway, travels southeast of the city center of Charlotte, NC, in the direction of Wilmington, NC. US 74 is part of the North Carolina Department of Transportation (NCDOT) Strategic Highway Corridor (SHC) and is known as Corridor 24. The section of US 74 reviewed in this report stretches through Union County, NC, from the intersection with I-485 (the Charlotte Outerbelt) to just beyond Wingate, NC. The reviewed location of US 74 is shown in Figure 1 below. The surrounding area is developed with residential, commercial and industrial properties and site/traffic improvements accompanying such development.

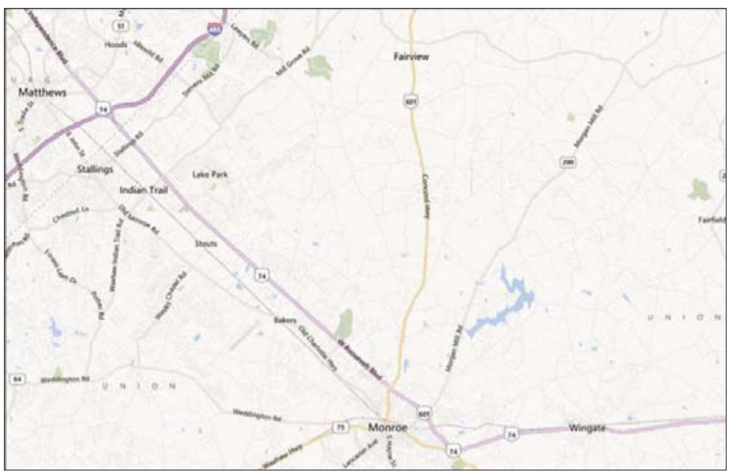


Figure 1 – Location Map
©2012 Nokia, ©2013 Microsoft Corporation

Stantec Consulting Services, Inc. (Stantec) prepared a study of existing US 74 in 2007 entitled the "US 74 Corridor Study" (Stantec report). This study was commissioned by NCDOT. In this study, Stantec reviewed an existing stretch of US 74 from the Charlotte Outerbelt to Highway 601 South. Stantec developed a series of short-term and long-term recommendations for the corridor with the goal of extending the long-term viability of US 74. Stantec used overall delay, defined as the total time spent by a vehicle in queue and lost by having to accelerate and decelerate, and Level of Service (LOS), a common metric used to provide a description of the level of flow at various intersections, as their metric for determining whether the recommendations would provide overall benefits to local users of US 74. O'Connell & Lawrence, Inc. reviewed Stantec's recommendations, detailed later in this report, and provided recommendations on how the study should be improved and expanded.

WSA prepared a report entitled "Final Report – Proposed Monroe Bypass/Connector Comprehensive Traffic and Revenue Study" for the North Carolina Turnpike Authority (NCTA). This report, dated October 22, 2012, details the Origin-Destination Study (O-D Study), a traffic study performed to determine the travel patterns of a local populace, conducted by WSA personnel. OCL reviewed the O-D Study performed by WSA and has commented on both the overall quality/thoroughness of the study and proposed recommendations

for improvements to the WSA study to provide better data about who is on local roads, where drivers are going, and which routes drivers choose to take.

These two studies were performed as part of studies for the Monroe Bypass/Connector Project, a proposed four/six-lane, controlled-access facility with an approximately 300' right-of-way width. The proposed project is located to the north of, and roughly parallel to, existing US 74. The selected alternative of the Monroe Bypass/Connector will stretch from Stallings, NC, to just beyond Wingate, NC, and will start and end at interchanges with US 74. The location of the Monroe Bypass/Connector is shown as a bold red line in Figure 2. According the "Statement of Purpose and Need," prepared by PBS&J for the NCDOT and the NCTA in February 2008, the purpose of the proposed project is to "construct a facility that allows for safe, reliable, high-speed regional travel in the US 74 Corridor between I-485 in Mecklenburg County and the Town of Marshville in Union County, in a manner consistent with the North Carolina Strategic Highway Corridors Vision Plan for US 74 and the designation of US 74 on the North Carolina Intrastate System" and to "improve mobility in the US 74 corridor within the project study area, while maintaining access to properties along existing US 74." The Monroe Bypass/Connector is projected to have substantial economic, environmental and societal impacts on local areas.

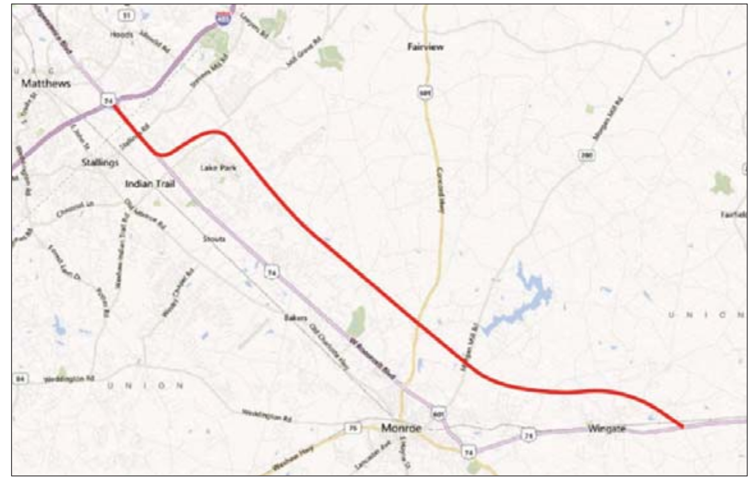


Figure 2 – Monroe Bypass/Connector Location Map
©2012 Nokia, ©2013 Microsoft Corporation

OCL reviewed the Stantec and WSA studies related to US 74 to determine if modifications to existing US 74 could help meet some of the purposes specified for the Monroe Bypass/Connector and to determine if the information currently available to local decision makers is sufficient to make substantial transportation decisions. A full description of OCL's statement of assignment may be found in Appendix A of this report.

Approaches to Congestion Relief

Road congestion is a common problem faced by transportation planners and road designers. Congestion occurs for several reasons, but often occurs when more vehicles travel on a stretch of road than the road is designed to carry. Traffic congestion is commonly cited as a major source of frustration for road users.

Planners and local leaders have the task of providing congestion relief for local residents while maintaining budgets and minimizing adverse environmental and/or societal effects. As a result, new alternatives for cost-effective congestion relief with limited negative impacts are always being explored.

One common approach to providing congestion relief is to simply add additional driving lanes on congested routes, providing additional vehicle capacity. However, adding lanes and/or roads is often expensive and can create other impacts, including right-of-way acquisition opposition and environmental impacts. Planners often look at other solutions, such as managing existing infrastructure, to try and maximize the efficiency of these existing roads.

A1-5

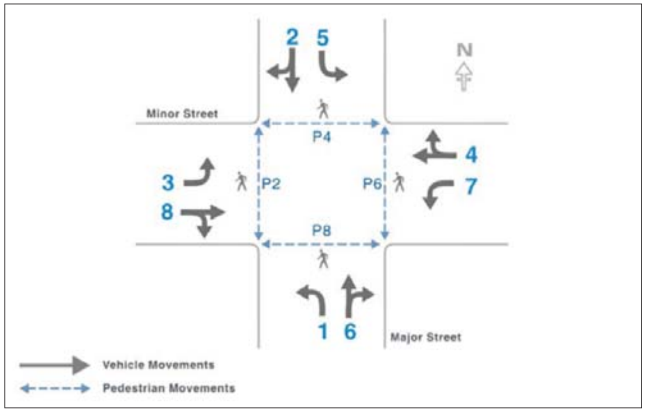


Figure 3 – Typical Vehicular and Pedestrian Movements at a Four-Leg Intersection

U.S. DOT FHWA, "Traffic Signal Timing Manual," Chapter 4–Traffic Signal Design, Section 4.2–Phasing Overview, 2009

As planners have eased away from adding pavement, new approaches to congestion relief have been implemented by planners. Signal timing optimization is one strategy to attempt to reduce overall congestion. Jurisdictions will modify the timing of traffic signals to create an ideal flow situation for vehicles. Several consecutive traffic signals will be modeled and timed together to encourage efficient traffic flow and minimize queuing delay. Planners will make adjustments to signal timing based on road-use data and will run software models to determine projected delay. Signal timing optimization needs to be consistently maintained and adjusted over the long term to maintain the benefits from the original optimization process.

Another common method of congestion relief is phase management for traffic signals. Traffic signals provide "phases," meaning times when certain movements are permitted. By reviewing intersection data and allocating differing amounts of time for different movements based on this data, planners can work to maximize intersection efficiency by minimizing queuing time for turning/through movements. See Figure 3 for a typical vehicular and pedestrian movement diagram. Like signal timing optimization, signal phase management needs to be periodically updated to remain effective. It also needs to be based on relevant traffic data, as the developed phase times are predicated on the demand for individual traffic movements. Adding a left turn phase will not provide an overall benefit to the delay and level of service at a site if no vehicles need to turn left. Present or future models must be based on quality data.

A third means of congestion relief is to modify lane length or revise lane movements. By revising the amount of stacking space in certain lanes or providing additional turning/through lanes, planners can help reduce overall delay at certain intersections by keeping cars making turning movements out of dedicated through lanes, and keeping cars going straight through intersections out of turning lanes, through traffic still may be blocked by a turning vehicle in a through/turn lane. If these lanes are separated, through traffic can continue while turning vehicles wait for safe passage. Software models can project delay based on new intersection configurations, and this data can be compared to determine if the overall delay will be reduced. It is assumed that if this delay is reduced, and the LOS is improved, congestion relief will naturally occur.

Additional means of congestion relief are available to transportation planners, and new, alternative designs are consistently being studied to determine if the assumed effect on congestion can help balance proposed impacts and proposed cost. Newer designs, such as superstreet facilities, roundabouts, and high-occupancy toll facilities can also be considered as a means for overall congestion relief. When dealing with a congestion relief problem, planners should review multiple means and collect reliable data prior to making final decisions so a quality solution can be found for the congestion problem.

One means of congestion relief briefly discussed in the Stantec report is the concept of a superstreet design. Stantec defines a "superstreet-type facility" as "intersections that do not allow left turns from side streets, but require vehicles to turn right and then make a U-turn at an adjacent median opening."

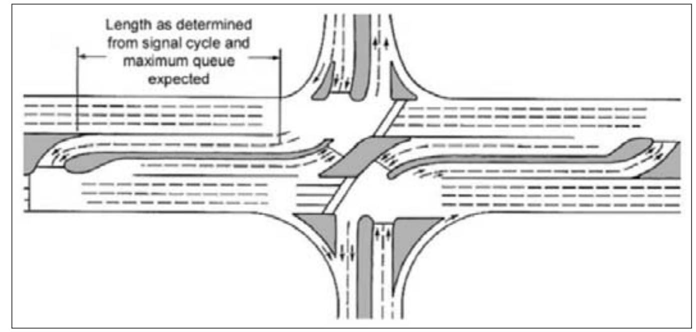


Figure 4 – Illustration of superstreet median crossover

U.S. DOT FHWA, "Signalized Intersections: Information Guide," Chapter 10 – Alternative Intersection Treatments, Section 10.2.5 - Super-Street Median Crossover, 2004

According to NCDOT's SHC page, a superstreet also prohibits through movements on side-streets, forcing all traffic to turn right and make the necessary U-turn at the next intersection. Superstreet design removes left-turning movements from the side streets; by doing this, transportation designers can remove a movement from intersections that either creates a protected phase (causing delay for all other drivers) or causes delay to left-turners who are unable to find a break in which to make a safe turn. See Figure 4 for an illustration of a superstreet median crossover. There are generally two main requirements for this to potentially reduce delay. The first requirement is adequate left turn lane length at adjacent intersections along the corridor to address both left turners from the main road and left turners from the side street. The second requirement is that intersections are close enough that delay experienced from going the "wrong way" on the main road will be less than the saved time from the potential left turning movement. Modeling is required of a length of corridor to determine if these time savings will be felt by the average driver.

Superstreet design is currently under study in North Carolina and in several other locations around the country; the states of North Carolina and Maryland have led this development as an adequate means of traffic and delay control. According to a 2011 study entitled "Operational Effects of Signalized Superstreets in North Carolina" by Dr. Joseph Hummer, a professor at North Carolina State University, studies at intersections with an implemented superstreet design have shown a "20 percent overall reduction in travel time compared to similar intersections that use conventional travel design." This study indicates that superstreet design should be further explored as a means of providing for turning movements in a safe and time-effective manner. Figure 5 shows a constructed superstreet in Michigan.

Figure 5 – Superstreet intersection of W. Big Beaver Rd. and Lakeview Dr., Troy, MI

Imagery ©2013 Digital Globe, GeoEye, U.S. Geological Survey, USDA Farm Service Agency, Map Data ©2013 Google

REVIEW OF REPORTS/ ADDITIONAL STUDY REQUIRED

OCL primarily reviewed and assessed two reports as part of this assignment and has provided comment on these reports herein.

Detailed Review of the Stantec Report

Summary

OCL performed a thorough review of Stantec's US 74 Corridor Study. Based on OCL's review of the Stantec report, OCL believes additional study is required to thoroughly "complete" the study. The current Stantec report provides information on the overall delay vehicles on US 74 experience. This delay is based on software models incorporating proposed short-term and long-term transportation recommendations into the existing US 74 corridor.

Overall, OCL believes the recommendations made by Stantec will have a positive impact on drivers on US 74. However, the recommendations made by Stantec are only projected to 2015. To provide a true long-term study, OCL recommends Stantec revise its study to project proposed time delay to travelers on US 74 several years beyond 2015. OCL also recommends Stantec incorporate two existing interchanges into its software model and re-evaluate its traffic projections to better provide a long-term delay model to local decision makers.

OCL's task in reviewing the Stantec report was to determine the overall feasibility of the proposed upgrades/recommendations and to assess the ability of the stated recommendations to provide short-term and long-term benefits to local residents. Additionally, OCL was tasked with commenting on whether these recommendations could be expanded to provide longer-term benefits to local residents. OCL did not provide an assessment of the study methodology used by Stantec; rather, OCL focused on the intersection improvement recommendations made by Stantec.

Stantec's Study Methodology

Stantec's report was commissioned by NCDOT and was completed in 2007. Stantec's stated goal of its study is as follows:

The ultimate goal of the study is to extend the long-term viability of US 74. Study goals were to identify and develop improvements that, where possible, would provide a LOS of D or better at each signalized intersection for projected 2015 traffic volumes. Because of development along the study corridor and agency budgetary constraints, LOS goals were not attainable at all locations. Where LOS goals could not be attained, reasonable improvements were recommended within the study constraints.

According to Stantec, multiple intersections along US 74 would operate at an unacceptable LOS (defined as either LOS "E" or "F") by 2015 if existing travel conditions are maintained. This point is supported by Stantec's models. The proposed upgrades would be necessary to keep many of the intersections along US 74 operating at an acceptable LOS.

Stantec provided recommendations for 23 intersections along US 74, using existing traffic volumes measured in 2007 as a baseline. Stantec modeled the average delay for each intersection in the study. This average existing conditions delay (2007 delay) was charted for individual intersections. Stantec then projected traffic volumes in 2015 using an annual growth rate of 3% and updated its existing conditions model with these revised traffic volumes, yielding a new average delay (no-build delay) for each intersection. This model assumed that no new modifications had been made to US 74.

Stantec then prepared a series of recommendations for improvements to the US 74 corridor. Stantec split these recommendations into short-term improvements and long-term improvements, defining short-term improvements as remedies that could be implemented within a timeframe of roughly one year and at a cost of less than $250,000, and long-term improvements as improvements requiring several years to implement and at a cost greater than $250,000. Stantec then inserted the proposed short-term and long-term improvements in its software and re-ran the model for each situation using the proposed 2015 traffic volume.

Stantec charted the proposed delay for each situation at individual intersections, yielding delay statistics for the proposed short-term recommendations (short-term delay) and the proposed long-term recommendations (long-term delay).

Short-Term Recommendations

In general, Stantec's short-term recommendations focus on optimizing traffic signal timing, modifying traffic signal phasing, increasing storage length of certain turn lanes, and modifying existing lane alignments for certain intersections. Stantec recommended continuous operations review and maintenance along the corridor to monitor and maintain this reduction in delay. Stantec also recommended eliminating split-side movements and allowing protected-permitted left turn movements where protected-only movements may be warranted. Stantec estimated the total cost of the proposed short-term improvements, excluding right-of-way acquisition and traffic control costs, at $3,100,000.

Per OCL's review, Stantec's short-term recommendations for these intersections are realistic and feasible to complete. Signal timing optimization is included as a short-term improvement for each intersection reviewed by the Stantec study.

Stantec recommends the conversion of an existing traffic signal to an eight-phase traffic signal in four locations. An eight-phase traffic signal provides green time for protected left turns to drivers on all intersection approaches. The Stantec Report does not provide information on the exiting signal timing for these intersections; however, OCL has assumed that Stantec is proposing to expand the total number of phases included at each signal.

A reduction in delay resulting from a signal phase change is documented at the intersection of US 74 and Stallings Road, where the proposed 2015 no-build scenario is projected to have an LOS of F in both the AM and PM Peak Hours, with delays of 138.60 seconds and 197.50 seconds, respectively. If an eight-phase signal modification (along with the signal timing optimization for the entire corridor) is implemented as a short-term improvement, the delay at this intersection is projected to be reduced to 58.10 seconds in the AM peak hour and 99.30 seconds in the PM peak hour. Though the LOS for 2015 short-term situation will still be "E" in the AM and "F" in the PM, the overall reduction in delay time is substantial. The total sum of the differences in delay between the 2015 no build model and the 2015 short-term model is 66.3 seconds for the AM peak hour and 356.4 seconds for the PM peak hour. This is shown in Figure 6.

Peak Hour	2007 Existing		2015 No-Build		Short Term	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
AM	D	43.13	F	138.60	E	58.10
PM	D	48.87	F	197.50	F	99.30

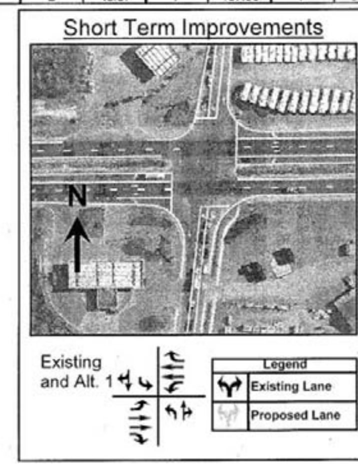


Figure 6 – Recommended Short-Term Improvements, US 74 and Stallings Road

Stantec, US 74 Corridor Study, Final Report, Section 6.3.1 US 74 at Stallings Road

In order to implement the new phasing timing, a current traffic study is required to determine the total length of the phases for individual traffic movements. New traffic signals may need to be installed if the existing signals do not have the appropriate left-turn signalization hardware. Maintenance and evaluation of the phase timing is also required to ensure the timing provided for each phase is in line with the traffic usage. However, this installation could be done in a short period of time and could quickly provide delay benefits to local residents.

Stantec makes several short-term recommendations for the addition of turning lanes or adding lane length for the expansion of existing turning lanes. The following table illustrates the proposed short-term lane addition/lengthening for certain intersections along the US 74 corridor:

Intersection	Proposed Short-Term Improvement(s)
Unionville-Indian Trail Road	Add eastbound left turn lane on US 74
Wesley Chapel-Stouts Road/ Sardis Church Road	Increase northbound Wesley Chapel-Stouts Road left turn lane storage to 250 ft.
Hanover Drive	Increase the westbound US 74 left turn lane storage to 200 ft.
Secrest Short Cut Road	Increase the southbound Secrest Short Cut Road left turn lane storage to 300 ft.
Morgan Mill Road	Increase the Morgan Mill Road left turn and right turn lane storage to 200 ft.
Walkup Avenue	Extend the Westbound US 74 left turn lane to 300 ft.; add an additional left turn Lane to the eastbound approach of US 74; extend the left turn and right turn lane storage on Walkup Avenue to 200 ft.

Additionally, Stantec also recommended modifying specific lane assignments in several locations. The following table illustrates the proposed short-term lane modifications for certain intersections along the US 74 corridor:

Intersection	Proposed Short-Term Improvement(s)
Indian Trail-Fairview Road	Modify the southbound approach of Indian Trail-Fairview Road from the existing right turn, left turn, and left turn/through lane configuration to a left turn lane (with 300 ft of storage), dedicated through lane, and right turn lane
Unionville-Indian Trail Road	Modify the northbound approach on Unionville-Indian Trail Road from the existing configuration (right turn lane, left turn/through lane) to a new configuration (right turn/through lane and left turn/through lane)
Hanover Drive	Convert the existing right turn lane on the westbound US 74 approach to a right turn/through lane

The addition of turning lane storage will help alleviate problems resulting from turning vehicles stacking into through lane storage and delaying through traffic. Adding lane capacity and providing protected left turns will reduce delay for turning drivers, and

Finally, Stantec proposes installing 17 left-overs and closing a single median crossover along US 74. A left-over is a proposed left turn lane protected by a concrete island; a traffic signal is not provided at a left-over. The purpose of a left-over is to provide space for stacking vehicles wishing to make a left turn so vehicles do not stop in the main through lanes while trying to turn left.

Overall, the recommendations for the addition of lanes/storage space or modification of movements in lanes should offer a degree of delay relief to local residents. Most recommendations made by Stantec provide additional storage in turning lanes or dedicated through lanes for drivers. Stantec's overall intent appears to be separate turning traffic from through traffic as often as possible.

moving these turning drivers out of through lanes will reduce delay for through drivers. New dedicated through lanes will provide additional highway capacity, allowing more vehicles to pass certain lights without being stopped and delayed.

In OCL's opinion, the principles behind this short-term recommendation methodology are sound and should help to reduce short-term delay. This opinion is supported by Stantec's delay statistics. The chart on the next page highlights the total delay across the study corridor for the no-build and short-term scenario:

Situation	AM Peak Delay	PM Peak Delay
2015 No-Build Situation	766.0 seconds	1,600.4 seconds
2015 Short Term	715.7 seconds	944.9 seconds

The proposed recommendations made by Stantec offer proposed delay benefits to local residents. Only the AM peak hour delay for the 2015 long term, when compared with the 2015 no-build situation (excluding Stallings Road, Indian Trail-Fairview Road, and Unionville-Indian Trail Road) indicated a minor increase in delay as a result of completion of Stantec's proposed recommendations. The AM peak hour delay reduction for the short-term improvements was 50.3 seconds. Thus, the short-term recommendations offered a small amount of delay relief to local residents.

Significant time savings are projected for the PM peak hour. Upon completion of the short-term recommendations, the average PM peak hour delay for vehicles reduces by 655.5 seconds, a total of nearly 11 minutes. Stantec's short-term recommendations offer real benefits to local residents over this time frame.

The short-term recommendations are relatively easy to evaluate; it is assumed that the recommendations, due to the ease/speed with which they could be installed, could provide benefits whenever NCDOT chooses to implement them.

Long-Term Recommendations

Stantec's long-term recommendations include the conversion of a certain section of US 74 to a superstreet facility, the addition of lanes to several intersections, and the addition of lane storage length in multiple locations. Stantec also recommends the optimization of signal timing and modification of signal phases as individual long-term recommendations. Several of the recommendations mirror the proposed short-term recommendations; however, the overall cost and time of implementation make these recommendations a more time-consuming process that may require additional study. Stantec estimated the total cost of the proposed long-term improvements at $10,200,000.

Stantec recommends signal timing optimization as a long-term recommendation at 15 of the 23 studied intersections, even after proposing signal timing optimization at all 23 intersections for short-term recommendations. In OCL's opinion, signal optimization would likely provide long-term delay benefits to the overall corridor; the long-term benefits are also more pronounced than the short-term recommendations. At certain intersections, this improvement would be significant. The intersection of Pageland Highway and US 74 is shown in Figure 7. At Pageland Highway, the 2015 long-term LOS, through just the implementation of signal timing optimization, is projected to improve from "E" to "C," with a delay savings of over 44 seconds at the PM peak travel hour. However, the intersection directly to the east of the Pageland Highway intersection, Franklin Street, shows an increase in delay between the 2015 no-build and 2015 long-term delay of over 12 seconds. The 2015 no-build LOS is a "C," while the 2015 LOS with the proposed long-term improvement is "D." Delay at certain intersections is increased by signal timing optimization, while other intersections experience reductions in delay from the optimization process.

Figure 7 – Intersection of US 74 and Pageland Highway
U.S. Department of the Interior U.S. Geological Survey, 2007

However, the overall benefit to the corridor by the optimization is real and is a feasible solution that can offer delay relief to local residents. For the ten intersections where Stantec solely proposed optimization of signal timing as a long-term improvement, the projected PM peak delay for the long-term improvement is reduced by a total of 57.58 seconds from the 2015 no-build option. Of these ten intersections, five will experience an improvement in LOS as a result of this optimization. Two of the ten intersections will have an LOS that is worsened. Though certain intersections may experience an increase in delay, OCL believes signal timing optimization will benefit the US 74 corridor, provided it is maintained properly.

Stantec also makes a long-term recommendation to convert existing traffic signals to an eight-phase traffic signal. This recommendation is made at five intersections along US 74. OCL anticipates this recommendation to have a positive effect on local drivers for the same reasons as described in the short-term section. This is backed up by Stantec's provided data. The total sum of the reductions in delay between the 2015 no build model and the 2015 long-term model for these five intersections is 34.4 seconds for the AM peak hour and 367.87 seconds for the PM peak hour.

In addition to the previously-described short-term recommendations, Stantec makes several long-term recommendations for the addition of turning lanes/lane length. The following table illustrates the proposed long-term lane addition/lengthening for certain intersections along the US 74 corridor:

Intersection	Proposed Long-Term Improvement(s)
Wesley Chapel-Stouts Road/Sardis Church Road	Add a right turn lane with 250 ft. of storage on the southbound Sardis Church Road approach; add a second left turn lane on the northbound Wesley Chapel-Stouts Road approach; add a right turn lane along eastbound US 74
Chamber Drive	Add a right turn lane with 175 ft. of storage on Chamber Drive
Rocky River Road	Add a through/right turn lane on the northbound and southbound approach on Rocky River Road with 250 ft. of storage in the left turn lane on the northbound approach and 275 ft. of storage in the left turn lane on the southbound approach
Roland Drive/Round Table Road	Add a through lane along eastbound and westbound US 74
Williams Road	Add a through lane along eastbound and westbound US 74
Hanover Drive	Add a through lane along eastbound and westbound US 74; increase the westbound US 74 left turn lane storage to 200 ft.
Secrest Short Cut Road	Increase the southbound Secrest Short Cut Road left turn lane storage to 300 ft.
Morgan Mill Road	Increase the Morgan Mill Road left turn and right turn lane storage to 200 ft.
Walkup Avenue	Extend the westbound US 74 left turn lane to 300 ft; add an additional left turn lane to the eastbound approach of US 74; extend the left turn and right turn lane storage on Walkup Avenue to 200 ft.

Additionally, Stantec also recommended modifying specific lane assignments in several locations. The following table illustrates the proposed long-term lane modifications for certain intersections along the US 74 corridor:

Intersection	Proposed Improvement(s)
Wesley Chapel-Stouts Road/ Sardis Church Road	Convert the existing through/right turn lane on the southbound approach of Sardis Church Road to a Dedicated Through Lane (Proposed in Conjunction with the Addition of a New Right Turn Lane)
Chamber Drive	Convert the existing right turn/left turn lane on the southbound approach of Chamber Drive to a dedicated left turn lane (proposed in conjunction with the addition of a new right turn lane)
Hanover Drive	Convert the existing right turn lane on the westbound US 74 approach to a right turn/through lane (listed both in ST and LT improvements)

These recommendations are quite similar to those made in the short term, and the expected benefits are similar. The addition of this turning lane storage in the long term will continue to alleviate problems resulting from turning vehicles stacking into through lane storage and delaying through traffic. Adding lane capacity and providing protected left turns in the long term will continue to reduce delay for turning drivers, and moving these turning drivers out of through lanes will continue to reduce delay for through drivers. Essentially, the same benefits will be provided to local drivers. These implementations will simply take longer and are more expensive than the short-term recommendations.

Once again, Stantec's data backs up these assertions. The following chart highlights the total delay across the study corridor for the no-build and long-term scenarios. The No-Build total for this chart excludes three intersections (US 74 with Stallings Road, Indian Trail-Fairview Road, and Unionville-Indian Trail Road) as long-term delays were not provided in the Stantec report for these intersections.

Situation	AM Peak Delay	PM Peak Delay
2015 No Build (Excluding Stallings Road, Indian Trail-Fairview Road, and Unionville-Indian Trail Road	538.0 seconds	1,147.6 seconds
2015 Long Term	538.9 seconds	658.5 seconds

As can be seen from this chart, the construction of the long-term recommendations will provide a PM peak delay reduction of approximately 489.11 seconds for drivers traveling the length of the corridor. The AM peak delay will remain roughly the same. Stantec's long-term recommendations offer delay benefits to local residents over this time frame; residents traveling on US 74 will save substantial time driving US 74 in the PM hours if Stantec's long-term recommendations are implemented.

Stantec also discusses the possibility of converting a portion of US 74 into a "superstreet" as a long-term recommendation. This modification is recommended for the intersections of US 74 with Stallings Road, Indian Trail-Fairview Road, and Unionville-Indian Trail Road. As previously stated, Stantec defines a "superstreet-type facility" as "intersections that do not allow left turns from side streets, but require vehicles to turn right and then make a U-turn at an adjacent median opening." The purpose of this design is to remove left-turning movements from side streets, eliminating an operation that often creates delay for through traffic and right turns on side streets. The concept is reliant on local left turn lanes along the main road having enough stacking space to accommodate travelers wishing to make left and U-turn movements.

No long-term delay figures for these three intersections are provided in the portion of the report reviewed by OCL; according to the Stantec report, LOS, delay, and travel time results from superstreet design implementation is found in Appendix VIII of the report, which was not readily available to OCL personnel. OCL believes this is a design solution worth studying as a means of further reducing delay.

Evaluation of Recommendations

Stantec's recommendations, as made to NCDOT, should benefit local residents by saving driving time along the US 74 corridor. However, Stantec's long-term projections extend only to 2015, eight years later than the existing conditions, and only two years away from the publication of this report. The Monroe Bypass/Connector is proposed as a long-term solution to transportation concerns southeast of Charlotte. In order to accurately determine if US 74 and the proposed recommendations would help solve local, long-term transportation problems, the recommendations for upgrading US 74 should be evaluated over for a longer timeframe. While it is clear that the proposed solutions do offer substantial benefits to residents, it remains unclear if these benefits project over an additional 20 years in the future.

In OCL's opinion, Stantec has provided valid recommendations that could be used to provide delay relief to local residents using US-74 at lesser cost than the proposed Monroe Bypass/Connector project (projected to cost between $749.1 and $824.3 million according to the NCDOT "Monroe Bypass/Connector Final EIS Fact Sheet"). OCL believes it is reasonable to assume that some benefits would extend over a longer term that matches the Monroe Bypass/Connector timeline; therefore, Stantec's report should be projected further in the future to determine if these recommendations could provide necessary long-term relief to residents in a cost-effective manner. These data could help determine if improvements to US 74 are a viable long-term solution that could help meet the goal of high-speed, safe transportation in the US 74 area while still providing local access to properties along US 74.

Interchange Evaluation

The subject stretch of US 74 reviewed by Stantec includes two larger interchanges that are not discussed in the Stantec report. The larger of the two interchanges is located at the crossing of Skyway Drive (State Highway 75) and US 74 in Monroe, NC, and is shown in Figure 8. State Highway 75 passes over US 74, and several exit ramps allow for movement between the two roads. Concord Avenue, northwest of State Highway 75, also crosses over of US 74 and is shown in Figure 9, on the next page. Access is provided between the two roads through two sign-controlled intersections along Concord Avenue. Access is provided to both traveling directions of US 74 via exit ramps. Traffic is allowed to accelerate/decelerate and merge into US 74 from Concord Avenue in dedicated lanes.

Figure 8 – Intersection of Skyway Dr. and US 74, Monroe, NC
U.S. Department of the Interior U.S. Geological Survey, 2007

OCL did not perform any engineering analysis on these interchanges. However, based on a visual evaluation, OCL believes delay may occur on US 74 at the Concord Avenue interchange. Inadequate acceleration/deceleration lane length space may cause drivers from Concord Avenue to enter US 74 at speeds below

Figure 9 – Intersection of Concorde Ave. and US 74, Monroe, NC
U.S. Department of the Interior, U.S. Geological Survey, 2007

the posted speed limit, forcing drivers in the far right lane of US 74 to brake for below-speed drivers or slow down to allow for merging activity. Additionally, the access ramps from US 74 appear short. Drivers turning onto Concord Avenue may stack onto US 74, creating additional delay on US 74. One potential solution to this inadequate lane length is to extend the length of the acceleration/deceleration lanes, allowing drivers to perform full acceleration/deceleration prior to entering/exiting US 74; this should be investigated as either a long-term recommendation. Additional solutions, such as increasing the lengths of the on/off ramps or modifying the interchange configuration, should also be investigated. This interchange should be included in the expanded Stantec study to determine if total overall total delay will be impacted by the current intersection configuration.

Based on a visual review of the interchange between US 74 and State Highway 75, it appears there is an adequate amount of car storage space and acceleration/deceleration lane length; OCL does not believe this interchange, as currently configured, will create undue delay on US 74. However, for the purposes of thoroughness, this interchange should also be included in the revised Stantec report to accurately model overall corridor delay. Notable amounts of congestion resulting from movements at this intersection should be included in this review and in local transportation evaluation.

Clearly, there is some additional information needed to fully evaluate the potential for Stantec's recommendations to alleviate traffic problems found on US 74. An expanded study should be performed on these interchanges to adequately determine whether recommendations are needed at these interchanges to improvement overall movement on US 74.

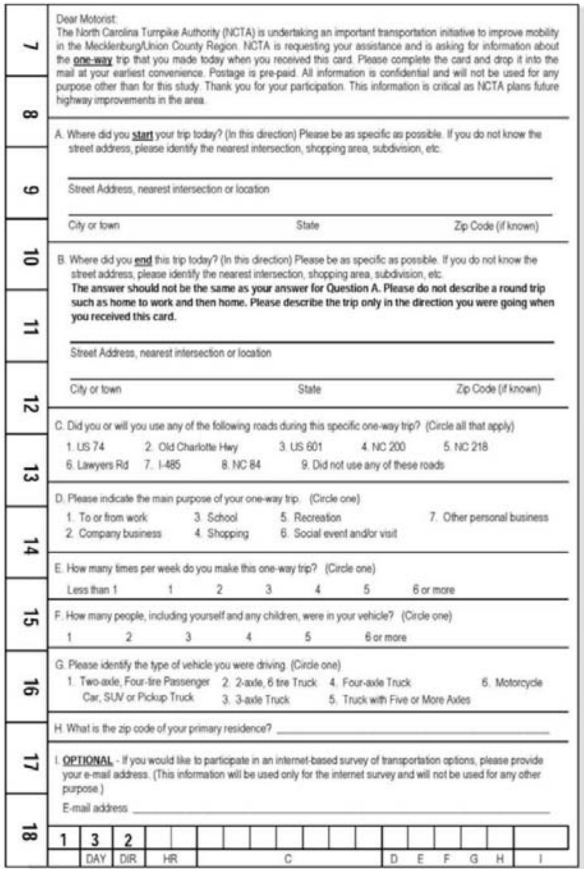
Detailed Review of the Wilbur Smith Associates Report

OCL reviewed the WSA report entitled "Final Report – Proposed Monroe Bypass/Connector Comprehensive Traffic and Revenue Study," prepared for the NCTA by WSA. This report is dated October 22, 2012. In reviewing this report, OCL concluded that the WSA report did not thoroughly answer certain questions and needs to have additional detail added to provide the best possible information to local decision makers. In particular, the information gathered for the O-D Study needs to be expanded and gathered in revised manner to provide useful data on local and regional transportation patterns.

From 2009-10, WSA completed several studies in relation to the Monroe Bypass/Connector project. WSA completed an O-D Study in the area of the proposed Monroe Bypass/Connector using a mail-back survey procedure. A sample survey card is depicted in Figure 10. The O-D Study was performed to catalogue travel patterns and trip characteristics of local residents. This data was later used by WSA to develop a local value of time.

OCL reviewed this report to comment on the relevance and thoroughness of the O-D Study and the need for additional traffic/transportation study. OCL was also asked to comment on the importance of a full O-D Study and limitations of current studies without complete O-D information.

In the report, WSA indicated that the O-D Study was performed based on 3,611 valid surveys returned to WSA from 23,807 distributed surveys. These surveys were distributed to drivers at ten locations in the area


7 Dear Motorist:
The North Carolina Turnpike Authority (NCTA) is undertaking an important transportation initiative to improve mobility in the Mecklenburg/Union County Region. NCTA is requesting your assistance and is asking for information about the **one-way** trip that you made today when you received this card. Please complete the card and drop it into the mail at your earliest convenience. Postage is pre-paid. All information is confidential and will not be used for any purpose other than for this study. Thank you for your participation. This information is critical as NCTA plans future highway improvements in the area.

8 A. Where did you **start** your trip today? (In this direction) Please be as specific as possible. If you do not know the street address, please identify the nearest intersection, shopping area, subdivision, etc.

9 Street Address, nearest intersection or location

City or town | State | Zip Code (if known)

10 B. Where did you **end** this trip today? (In this direction) Please be as specific as possible. If you do not know the street address, please identify the nearest intersection, shopping area, subdivision, etc.
The answer should not be the same as your answer for Question A. Please do not describe a round trip such as home to work and then home. Please describe the trip only in the direction you were going when you received this card.

11 Street Address, nearest intersection or location

12 City or town | State | Zip Code (if known)

C. Did you or will you use any of the following roads during this specific one-way trip? (Circle all that apply)
13 1. US 74 2. Old Charlotte Hwy 3. US 601 4. NC 200 5. NC 218
6. Lawyers Rd 7. I-485 8. NC 84 9. Did not use any of these roads

D. Please indicate the main purpose of your one-way trip. (Circle one)
14 1. To or from work 3. School 5. Recreation 7. Other personal business
2. Company business 4. Shopping 6. Social event and/or visit

E. How many times per week do you make this one-way trip? (Circle one)
Less than 1 1 2 3 4 5 6 or more

15 F. How many people, including yourself and any children, were in your vehicle? (Circle one)
1 2 3 4 5 6 or more

G. Please identify the type of vehicle you were driving. (Circle one)
16 1. Two-axle, Four-tire Passenger Car, SUV or Pickup Truck 2. 2-axle, 6 tire Truck 3. 3-axle Truck 4. Four-axle Truck 5. Truck with Five or More Axles 6. Motorcycle

H. What is the zip code of your primary residence? ____

17 I. **OPTIONAL** - If you would like to participate in an internet-based survey of transportation options, please provide your e-mail address. (This information will be used only for the internet survey and will not be used for any other purpose.)
E-mail address ____

18 1 3 2
DAY DIR HR C D E F G H I

Figure 10 – Sample Survey Card

North Carolina Turnpike Authority Final Report, "Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study," Wilbur Smith Associates, Chapter 3 - Travel Pattern Survey, Figure 3-2 - Sample Survey Card, October 22, 2010

of US 74 in Union County and included queries on starting and ending location of trips, frequency of the trips, types of vehicle making the trip, and the home zip code of the driver. Using this data, WSA created charts showing the trip purpose, frequency, occupancy, and vehicle class based on peak and off-peak hours. WSA also developed overall charts showing origin-destination pairs gleaned from the survey.

In reviewing WSA's O-D Study, OCL noted the locations of the survey drop-off points. All points were located outside of the existing I-485 Charlotte Outerloop. However, no surveys were provided to travelers in Charlotte, Matthews, or other towns within the Charlotte Outerloop. The survey locations are shown in Figure 11 on the next page. OCL recommends providing surveys to drivers at a location nearer to Charlotte. The need for this is indicated by the disparity between the number of trips originating and ending in Charlotte, which is the dominant employment and population center in the region. Only 5.6% of both peak hour and non-peak hour trips used in the O-D Study originated in Charlotte; however, 26.8% of the trips in the study ended in Charlotte. This substantial disparity indicates that the location of the handout locations should have been adjusted to provide a better cross-section of drivers. OCL understands that O-D survey methodologies are not an exact science. However, an accurate representation of the local culture and travel patterns needs to be obtained, and the best way to obtain this accurate information is to survey an accurate cross-section of the local populace.

In OCL's opinion, it is important for the O-D survey to provide an accurate breakdown of the numbers of trucks and passenger vehicles traveling along this stretch of US 74. OCL also considered the types of vehicles selected for this survey. WSA indicated that 98.4% of all peak period trips were made by drivers in two-axle passenger vehicles. 96.1% of the off-peak hour trips were made by drivers in two-axle passenger vehicles. According to Table 2-8 of the WSA report (Figure 12 on the next page), passenger vehicles constitute an average of 91.6% of vehicles in the area.

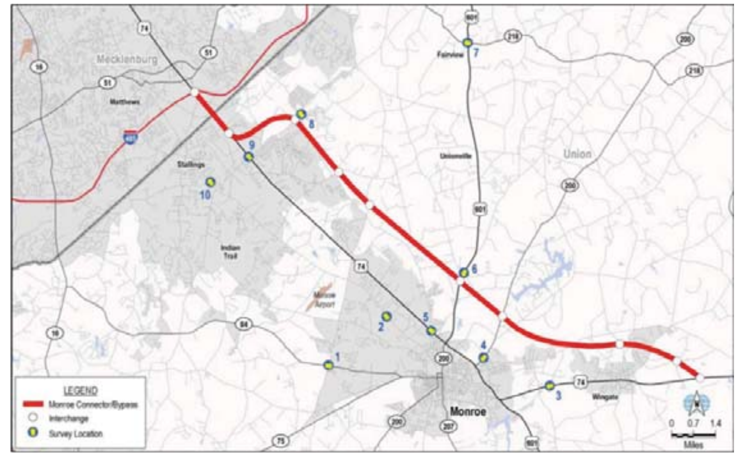


Figure 11 – Travel Pattern Survey Locations

North Carolina Turnpike Authority Final Report, "Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study," Wilbur Smith Associates, Chapter 3 - Travel Pattern Survey, Figure 3-1 – Travel Pattern Survey Locations, October 22, 2010

For the purposes of this report, OCL assumed that "single unit" trucks, as listed in Table 2-8, corresponds with 2-axle, 6-wheel trucks (or trucks with more axles) from the O-D Study. Therefore, the O-D Study vehicle sample shows a difference of several percentage points from the measured vehicle percentages. OCL believes WSA should either collect additional data sets or adjust its data to more accurately model the true vehicle representation patterns in the area; this adjustment would provide a better representation of commercial traffic and thus, better information to evaluate local travel patterns. A better option would be to perform an O-D study on solely

Table 2-8
Vehicle Classifications at Selected Locations

Location	Passenger Vehicles & Light Trucks	Single-Unit Trucks	Multi-Unit Trucks	Total Trucks
NC 84 (Weddington Road) west of Rocky River Road	94.0%	4.0%	2.0%	6.0%
Old Charlotte Highway west of Dickerson Boulevard	93.0%	5.0%	2.0%	7.0%
US 74 east of Old Pageland Monroe Road / Secrest Avenue	89.4%	4.3%	6.3%	10.6%
NC 200 (Morgan Mill Road) north of Sutherland Avenue	95.0%	4.0%	1.0%	5.0%
US 74 west of Secrest Short Cut Road	92.2%	3.4%	4.4%	7.8%
US 601 (Concord Highway) north of Ridge Road / Baucom Deese Road	89.0%	6.0%	5.0%	11.0%
NC 218 (Fairview Road) east of US 601 (Concord Highway)	89.2%	6.1%	4.7%	10.8%
Secrest Short Cut Road south of Indian Trail Fairview Road	95.0%	4.0%	1.0%	5.0%
US 74 east of Indian Trail Road	89.8%	4.5%	5.7%	10.2%
Old Monroe Road east of Indian Trail Road	94.8%	4.0%	1.2%	5.2%
Average	**91.6%**	**4.3%**	**4.1%**	**8.4%**

Source: 7-Day Supplemental Counts in March 2009.

Figure 12 – Table 2.8 Vehicle Classifications at Selected Locations

North Carolina Turnpike Authority Final Report, "Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study," Wilbur Smith Associates, Chapter 2 – Existing Travel Conditions, Table 2-8 Vehicle Classifications at Selected Locations, October 22, 2010 commercial vehicles to truly measure travel patterns of commercial drivers.

The O-D Study performed by WSA indicated that surveys were distributed at individual locations on either one or two specific days for each of the ten survey locations. General O-D study principles indicate that data should be captured every day of the week for a substantial period of time. This longer collection period accounts for travel variations with changes in days, months, and seasons. Though WSA later tries to normalize this data based on trends associated with travel across the months of the year, OCL believes projections should be made based on accurately-assembled data that takes these variations of travel into account.

OCL recognizes that O-D data can be difficult to collect due to limited funds and public participation. However, it appears that WSA could have expanded its study to include additional information that would have yielded more accurate results. It is troubling that WSA collected data for only one day at individual locations; it indicates to OCL that the study was conducted very quickly. The speed of this study may have been done at the expense of completeness.

Overall, OCL recommends WSA revise its O-D Study in the following three ways:

- Perform individual commercial traffic and passenger vehicle traffic O-D studies
- Expand the data collection area to include sites inside the Charlotte Outerloop, including locations in Matthews, Charlotte, and other population centers
- Expand the amount of time spent collecting data to account for variations in travel patterns by collecting data at each location for at least one month

OCL believes a study with additional survey location points and additional study length must be performed to accurately model the trip patterns of the local population. Collecting a larger sample size of data over a longer period of time will help normalize outlying trends and provide an accurate data set.

A complete and accurate O-D study is very important to transportation designers and planners to accurately approximate the travel patterns of local residents. These residents will be done a disservice if a proper O-D study with proper methodology is not performed. The remainder of the study performed by WSA is flawed without quality O-D information.

Additional Studies Required

In order to fully assess the proposed improvements associated with US 74 and the ability of these improvements to turn US 74 into a long-term transportation solution, OCL believes substantial additional research should be performed. Additional study must be conducted to determine if the recommendations proposed by the Stantec report sufficiently meet the long-term travel demands of the local population. OCL recommends the Stantec report be updated to determine if the stated recommendations will reduce delay for an extended period of time. OCL agrees that the provided recommendations likely will improve the corridor in an 8-10 year length of time, but the only way to be certain of the level of improvement over a length of time similar to that proposed for the Monroe Bypass/Connector is to complete a new study with appropriate input data. This is a necessary step in order to evaluate the US 74 recommendations against other potential transportation solutions.

An all-encompassing transportation study for the local area that accurately models future vehicle movement on US 74 would provide invaluable information to NCDOT, NCTA and other local stakeholders, allowing them to make informed decisions about future transportation projects. The current information that is available regarding US 74 is not substantial enough for these decisions to be made. OCL believes the updates proposed to the Stantec report and the WSA report are essential if these documents are to be used in a true evaluation of the potential for US 74 to provide a safe, reliable, and high-speed regional travel route in the existing US 74 corridor that still maintains access to existing properties along US 74.

A complete and accurate O-D study is essential to determine who is driving on US 74, the purposes of their trips, and the starting/ending destinations for their trips. Accurate projections using this data must be made based on Stantec's proposed recommendations to US 74 to determine if Stantec's recommendations will help to alleviate delay on US 74. This information must be considered to determine if US 74 can be improved to provide a long-term solution to local transportation concerns and provide effective transportation in this corridor at an effective price.

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CONCLUSION

Based on OCL's review, a thorough O-D study with high-quality data has not been performed for the area of North Carolina the Monroe Bypass is expected to service. The overall lack of a quality O-D study limits the conclusions that can be drawn from the studies reviewed by OCL.

It is essential for all stakeholders to know and understand the quality of data used to develop conclusions about future transportation projects and the wisest way to spend limited transportation dollars. OCL believes Stantec has provided NCDOT with good ideas about how to reduce delay along the US 74 corridor; these ideas simply need to be expanded over a longer time frame. Additionally, OCL recommends a more comprehensive O-D Study be performed and plugged into the methodologies proposed in the WSA study to accurately model the local population and provide decision makers with better data for moving forward.

Overall, OCL believes the reviewed reports could be improved and could provide better data to those making transportation decisions for the residents of North Carolina. The impacts of modifications to US 74 should be accurately quantified in a long-term fashion so the best decisions about future transportation planning can be made by local authorities. The best information that can be obtained should be made available to those wishing to benefit the drivers of North Carolina.

Moving forward, new studies should be conducted by the NCDOT to accurately assess the potential use of US 74 as a means of travel in the future. An O-D study that adequately models the local travel patterns should be used in conjunction with a software model and the recommendations proposed in the Stantec report to extend Stantec's shortened time frame over a longer period to accurately determine US 74's ability to function as a long-term congestion solution in the area of Charlotte, NC. This should be performed, and this information should be provided to local decision makers and the local populace prior to any further decisions being made on future transportation projects.

NORTH CAROLINA PROFESSIONAL SEAL ENGINEER KENNETH JUDE O'CONNELL

7/3/13

This report was prepared under my direct supervision.

Kenneth J. O'Connell, Ph.D.
State of North Carolina Professional Engineer #22824

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APPENDIX: STATEMENT OF ASSIGNMENT

O'Connell & Lawrence, Inc. (OCL) is a consulting firm which provides construction consulting, construction management, engineering, and surveying services. OCL's staff is comprised of engineers, project managers, construction inspectors, surveyors, information system specialists, as well as support personnel. OCL is located in the Baltimore/Washington, D.C., suburb of Olney, Maryland, and has worked on projects throughout the United States. OCL has extensive experience in heavy civil, highway, transportation, industrial and commercial construction. OCL routinely reviews project documents and completes third-party reviews of proposed projects and/or design documents. OCL routinely performs engineering/surveying projects and prepares construction documents. As part of the preparation of these documents, OCL routinely reviews multiple options for individual design problems and effectively determines the most advantageous solution based on individual site characteristics.

OCL was retained by the Southern Environmental Law Center (SELC) to perform an independent and thorough evaluation of the proposed Monroe Bypass/Connector project, to be located southeast of Charlotte, NC, in both Union and Mecklenberg Counties. In particular, OCL was retained by SELC to review several documents prepared for NCDOT and NCTA regarding the proposed project. OCL reviewed the "US 74 Corridor Study," prepared by Stantec for the NCDOT and received from SELC on August 30, 2012. OCL reviewed a report entitled "Indirect and Cumulative Impact Analysis – R-2559 & R-3329 Monroe Bypass/Connector," prepared by HNTB North Carolina P.C. (HNTB). OCL also reviewed the "Final Report – Proposed Monroe Bypass/Connector Comprehensive Traffic and Revenue Study" prepared for the NCTA by WSA and dated October 22, 2012. OCL reviewed the "Monroe Bypass/Connector Administrative Action Record of Decision," dated August 2010 and prepared by the NCTA. Finally, OCL reviewed other publicly available documentation associated with the Monroe Bypass/Connector project to obtain a full picture of the proposed highway. This list is not all-inclusive.

OCL personnel visited the subject area on August 29, 2012. Kenneth O'Connell, Ph.D., P.E., and Douglas Tilley, P.E., traveled to the Charlotte, NC, area with personnel from SELC and personally examined existing US 74 from the intersection with I-485 to Marshville, NC, beyond the proposed Monroe Bypass/Connector tie-in point with existing US 74.

OCL reviewed the US 74 Corridor Study, prepared by Stantec, and provided commentary on the effectiveness and feasibility of the proposed upgrades/recommendations. Stantec's report focused on providing spot improvements to local roads, most particularly US 74 and its cross-streets, in the area of the proposed Monroe Bypass/Connector. The Stantec Report covers proposed improvements along US 74 from Stallings Road to Highway 601; this stretch of highway travels from just southeast of the intersection of I-485 and US 74 to the center of Monroe, NC. It should be noted that this stretch of road does not fully parallel the proposed Monroe Bypass/Connector; this section of US 74 studied by Stantec parallels roughly half of the proposed Monroe Bypass/Connector, which is proposed to re-intersect with US 74 in the area of Wingate, NC.

The Stantec report is based on a traffic study performed between January and March 2007. Stantec personnel obtained traffic data, determined the AM and PM peak hour periods, and utilized CORSIM, Version 5, a traffic simulation program, to determine total time delay and LOS for each of the studied 23 intersections. Using this information, Stantec developed short-term and long-term improvements for individual intersections to reduce vehicular delay along existing US 74. The Stantec report makes recommendations to improve intersections along this stretch of road so as many of the 23 intersections as possible will function at a LOS of D or better. In this report, OCL comments on the ability of the recommendations made in Stantec's report to provide both short- and long-term benefits to local residents living in the vicinity of the

US 74 project whether these recommendations could be expanded to a longer time frame. Stantec did not propose improvements to the interchanges of US 74 and State Highway 75 and Concord Avenue. OCL will comment on these unchanged interchanges, providing an assessment of the decision to leave these intersections untouched and suggesting potential recommendations for future interchange improvements that may assist local residents in the long term.

OCL also performed a thorough review of the WSA report, which detailed an O-D Study performed in March and April 2009. This O-D Study was used to determine local travel patterns in the area of the proposed Monroe Bypass/Connector. OCL reviewed this report for completeness, thoroughness, and relevance. In addition, OCL reviewed whether additional traffic generation/travel information is required to make an educated decision regarding the need for the Monroe Bypass/Connector project and provided comment on the importance of a full and complete set of Origin-Destination data prior to making costly road construction decisions.

Finally, OCL has provided comment on the need for additional studies and/or data collection prior to making final decisions on the need for the Monroe Bypass/Connector project. OCL believes additional information is required to make an educated decision on the need for the Monroe Bypass/Connector; the reasoning behind this belief may be found in this document.

The principal for this assignment is Kenneth J. O'Connell, Ph.D, P.E. Dr. O'Connell is registered Professional Engineer #22824 in the state of North Carolina.


i001
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SouthernEnvironment.org
A1-14

Table A-1: Southern Environmental Law Center

Document: i001 Report dated July 3, 2013

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Alternatives Analysis	SELC commissioned a report entitled “A Closer Look at US 74: Challenges and Opportunities” to assist in SELC’s review of the Monroe Connector/Bypass project.	NCDOT’s responses to the report are presented in the attached memorandum dated November 5, 2013.

Final Memorandum

To: Jennifer Harris, PE **Date:** November 5, 2013

From: Spencer Franklin, PE, PTOE **Project #:** R-3329, R-2559

Subject: Consideration of the report titled, *A Closer Look at US 74: Challenges and Opportunities*, in the project development process for the Monroe Connector/Bypass

Purpose of this Memorandum

The purpose of the memorandum is to consider the comments and recommendations included in the OCL report and to determine if these comments and recommendations require additional studies or analyses of the Monroe Connector/Bypass project.

As part of this consideration process, Stantec Consulting Services, Inc. and CDM Smith reviewed OCL's comments specific to their technical reports and analyses. Their responses are included in **Attachment A** (Stantec Consulting Services, Inc.) and **Attachment B** (CDM Smith).

Background

The report *A Closer Look at US 74: Challenges and Opportunities* was prepared by O'Connell and Lawrence, Inc. (OCL) at the request of the Southern Environmental Law Center (SELC).

On July 24, 2013, SELC issued a press release on their website announcing the availability of the report (www.southernenvironment.org/uploads/fck/Monroe_Bypass_Report_0613_F.pdf). The North Carolina Department of Transportation (NCDOT) downloaded a copy of the report from the SELC Web site.

"OCL was retained by the Southern Environmental Law Center (SELC) to perform an independent and thorough evaluation of the proposed Monroe Bypass/Connector project, to be located southeast of Charlotte, NC, in both Union and Mecklenburg Counties." (OCL Report, page 21).

Focus of the OCL Report

As stated on page 7 of the OCL report, "OCL primarily reviewed and assessed two reports as part of this assignment and has provided comment on these reports herein." The two reports are:

- *US 74 Corridor Study, Union County, NC*. July 2007. Prepared by Stantec Consulting Services, Inc. (Referred to in this memorandum as the *2007 US 74 Corridor Study*)
- *Final Report – Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study*. October 22, 2010 (not 2012 as cited in the OCL report). Prepared by Wilbur Smith and Associates (now CDM Smith). (Referred to in this memorandum as the *2010 Final Traffic and Revenue Study*).

Discussion

The *2007 US 74 Corridor Study* and the *2010 Final Traffic and Revenue Study* were prepared independently and for different purposes. Both studies present results specific to their intended purposes and were not prepared, nor required, as part of the Monroe Bypass NEPA process. However in response to comments during the NEPA process, the Monroe Connector/Bypass EIS process did review and consider both of the referenced reports, as cited in the Draft EIS, Final EIS, and/or Draft Supplemental Final EIS.

2007 US 74 Corridor Study: The OCL report offers the following comments and recommendations related to the *2007 US 74 Corridor Study*. Many of the same comments and recommendations are repeated throughout the report. Therefore, these are summarized below, and the pages they appear on are noted.

- Stantec's study should be expanded to determine if delayed benefits will sustain over a longer timeframe and if improvements to US 74 could assist in addressing the stated purposes of the Monroe Connector/Bypass. This data could help determine if improvements to US 74 are a viable long-term solution that could help meet the goal of high-speed, safe transportation in the US 74 area while still providing local access to properties along US 74. (Executive Summary, page 7, page 13, page 17, page 19)
- Stantec also discusses the possibility of converting a portion of US 74 into a "superstreet" as a long-term recommendation…..OCL believes this is a design solution worth studying as a means of further reducing delay. (pages 12-13)
- An expanded study should be performed on the interchanges of US 74 at Concord Avenue and US 74 at State Highway 75 to adequately determine whether recommendations are needed at these interchanges to improve overall movement on US 74. (page 7 and page 14)
- This [OCL's recommendations] should be performed, and this information should be provided to local decision makers and the local populace prior to any further decisions being made on future transportation projects. (Executive Summary, page 19)

As noted by Stantec in **Attachment A**, the scope of the 2007 US 74 Corridor Study was to evaluate interim operational improvements for a specific segment of US 74. The US 74 Corridor Study assumes ultimate completion of the Monroe Connector/Bypass subsequent to the near-term (2015) horizon period of the study. The US 74 Corridor study was not intended to evaluate the Monroe Connector/Bypass or any alternative to the connector/bypass. The goal of the study was to make practicable, localized intersection recommendations to improve level of service along US 74, until the Monroe Connector/Bypass could be built, based on 2015 traffic.

The alternatives evaluation process employed for the Monroe Connector/Bypass project assesses alternatives as part of the first tier screening through the use of the project's purposes identified within the long-term transportation planning horizon year of 2035. The multi-step screening process was initially described in detail in the Alternatives Development and Analysis Report (April 2008) and is summarized the Draft EIS. Additional consideration of alternatives also was given in the Final EIS and in the Draft Supplemental Final EIS as a result of comments received from the public and environmental resource and regulatory agencies. This entire process is described in Section 2 of the Draft Supplemental Final EIS. The NCDOT evaluated a range of reasonable alternatives and gave extensive treatment to preliminary and detailed study alternatives in their comparison, including alternatives for upgrading existing US 74.

Appendix B in the Draft Supplemental Final EIS includes a table that summarizes the history of Improve Existing US 74 Alternatives in the project development process for the Monroe Connector/Bypass. The different types of improvements evaluated include TSM Alternatives, widening US 74 as a standard arterial, improving US 74 as a controlled-access highway, and improving US 74 as a superstreet. These alternatives evaluated US 74 from I-485 to just east of Wingate (including the existing interchanges on US 74). As summarized in the appendix, all of these alternatives were eliminated because they were unable to fulfill the project's defined screening measures and therefore were not considered reasonable.

As discussed and listed in Section 2.4 of the Draft Supplemental Final EIS, majority of the *2007 US 74 Corridor Study* short-term recommendations, and other improvements, have been implemented by NCDOT along the existing US 74 corridor, including signal timing optimization, signal phasing modification, increased turn lane storage lengths, and lane assignment modification. Additionally, all recommended long-term improvements, with the exception of converting the intersections of US 74 with Stallings Road, Indian Trail-Fairview Road and Unionville-Indian Trail Road to a superstreet facility, have been implemented, including implementation of a closed loop signal system and addition of lanes at some intersections as listed in Section 2.4 of the Draft Supplemental Final EIS.

As presented in Draft Supplemental Final EIS Section 1.2.4, to account for improvements to the US 74 corridor since the Final EIS was published, travel times have been updated using actual field data, as documented in the memorandum titled *US 74 Corridor Travel Time Comparison* (HNTB, May 2013). The traffic study found that based on the improvements made, the US 74 corridor under current conditions fails to meet the project defined high speed screening measure. In addition, conditions are not expected to improve in the future due to a forecasted increase in volumes ; therefore average travel times in 2035 are expected to be longer and average travel speeds are expected to decrease.

In August 2013, NCDOT authorized $6.1 million in funding from the Highway Safety Improvement Program to convert four intersections on US 74 in Indian Trail to superstreet facilities. These improvements, scheduled for construction in late 2015, will generally complete the long-term improvements recommended in the *2007 US 74 Corridor Study*. It is important to note that the *2007 US 74 Corridor Study* recommended that three intersections on US 74 (Stallings Road, Indian Trail-Fairview Road, and Unionville-Indian Trail Road) be converted to superstreet facilities. The funded NCDOT project will convert four intersections on US 74 (Indian Trail-Fairview Road, Unionville-Indian Trail Road, Faith Church Road, and Sardis Church Road) to superstreet facilities. The Stallings Road intersection will be reconstructed as part of the Monroe Connector/Bypass project.

Even with these additional superstreet improvements, existing US 74 would be overwhelmed by projected 2035 traffic in the corridor, and would not meet the purposes identified as part of the Monroe Connector/Bypass project. As summarized in the Draft Supplemental Final EIS Section 2.4 and Appendix B, improving existing US 74 as a superstreet was evaluated and the study showed that in the design year 2035, US 74 is expected to exceed LOS D in the majority of the corridor and would operate at speeds less than 50 MPH.

In conclusion, as OCL recommends, the short-term recommendations contained in the 2007 US 74 Corridor Study and other improvements have already been implemented along existing US 74. In addition, the long-term recommendation to convert a segment of existing US 74 to a superstreet is scheduled for construction in late 2015. OCL recommends the Stantec report improvements be evaluated for their long-term ability to serve traffic. As described above and as part of the Monroe Connector/Bypass alternatives development process, a variety of improvements to existing US 74 were evaluated through the years 2035 and found to be unable to fulfill the project's purpose to allow for high-speed regional travel consistent with the designations of the NC SHC program and the NC Intrastate System. Upon review of the OCL recommendations in concert with the evaluation completed as part of the development and analysis complete for the Draft Supplemental Final EIS, we have determined that no additional analyses is warranted.

The public, state and federal resource and regulatory agencies were involved throughout the project development process. Numerous opportunities for involvement were provided to solicit and obtain input and comment, beginning at the initial development of the project's purpose and need, and continuing through the determination of the range of reasonable alternatives for detailed study and beyond. Comments were accepted at any time, with formal opportunities provided at milestones in the process. Opportunities for public input will continue to be provided through this Draft Supplemental Final EIS and subsequent NEPA documentation.

2010 Traffic and Revenue Study: The OCL report offers the following comments and recommendations related to the *2010 Traffic and Revenue Study*. Many of the same comments and recommendations are repeated throughout the report and all relate to the origin-destination (O-D) studies performed as part of the *2010 Traffic and Revenue Study*. These comments are summarized below.

- OCL recommended the WSA origin-destination study be modified by: performing individual commercial traffic and passenger vehicle O-D studies, expanding the data collection area, increasing the number of survey collection points, and increasing the time spent collecting origin-destination data. (Executive Summary, page 15, page 16, page 17, page 19)
- This information should be provided to local decision makers and the local populace prior to any further decisions being made on future transportation projects (Executive Summary, page 19)

Comments on the content of the O-D studies are addressed by CDM Smith (formerly Wilbur Smith Associates) in **Attachment B**. As further detailed in the explanation provided by CDM Smith, the O-D studies are one component of comprehensive study process in the development of the Traffic and Revenue forecast. The procedures used in the O-D survey process and the use of O-D survey results are appropriate to the study's scope and purpose. Therefore no additional O-D studies are required.

The traffic projections developed for the *2010 Traffic and Revenue Study* were used to forecast the revenue potential as part of the financial analysis for the project. The Traffic and Revenue forecasts are not used to evaluate environmental impacts and determine facility design for NEPA compliance. Traffic forecasts used in the NEPA process are described in the Draft Supplemental Final EIS Section 2.5.1. It is important to note that the traffic forecasts used in the Monroe Connector/Bypass EIS process were developed based on data including, but not limited to, traffic counts, historic travel trends, the MUMPO Long Range Transportation Plan, the Metrolina Regional Model (MRM), and existing road network operations. A component in developing and calibrating the MRM was an extensive data collection and analysis process. Included in this process was an O-D study as described in the *Metrolina Region External Travel Survey Report* (MUMPO, May 2003).

Therefore, based on a review of the comments provided by OCL in combination with the *2010 Traffic and Revenue Study* it has been determined that no modifications to the original analysis nor addition analysis need be conducted to inform the NEPA decision making process.

Additional Comments on the OCL Report: The OCL report also recommends that an "all-encompassing transportation study for the local area that accurately models future vehicle movement on US 74 would provide invaluable information to NCDOT, NCTA and other local stakeholders, allowing them to make informed decisions about future transportation projects." (page 17). The all-encompassing transportation study for the area is the Mecklenburg-Union Metropolitan Planning Organization's (MUMPO) 2035 Long Range Transportation Plan and the Metrolina Regional Model (MRM) travel demand model. Therefore, no further action is required as a result of the OCL report.

The OCL report states the "total sum of the differences in delay between the 2015 no build model and the 2015 short-term model is 66.3 seconds for the AM peak hour and 356.4 seconds for the peak hour" on page 8 of the report. However, the OCL report does not indicate which intersection it is referring to or if it is referring to the entire corridor. The stated delay differences do not add up to these values in the corresponding figure (Figure 6).

The OCL report makes definitive statements such as "should be", "required" and "must" that are opinions only and not based on fact. The OCL does not support its qualitative statements and assumptions with engineering or planning analysis.

The OCL report makes recommendations on interchange configuration, laneage improvement and operations issues based solely on driving the corridor and visual observations. No detailed engineering studies were performed to reach these recommendations. For example, on page 13, the OCL report states, "OCL did not perform any engineering analysis on these interchanges. However, based on a visual evaluation, OCL believes delay may occur on US 74 at the Concord Avenue interchange." Potential roadway improvements at these two adjacent interchanges located approximately half a mile apart would be localized in nature, located between signalized intersections on US 74 and not be expected to provide substantial overall corridor travel time benefits. Therefore, no further action is required as a result of the OCL report.

OCL report states it thoroughly reviewed "US 74 Corridor Study" report but later notes OCL did not review the report Appendices.

<u>Conclusion</u>

The comments and recommendations included in the OCL report do not provide new information or require additional studies/analyses, nor do they result in a change in the identification of the Preferred Alternative. In fact, as listed in Section 2.4 of the Draft Supplemental Final EIS, many of the recommendations included in the OCL report regarding upgrades to existing US 74 have already been implemented as projects separate from the Monroe Connector/Bypass. No further action is required as a result of the OCL report.

Attachment A – Stantec Comments

Memo

Stantec

To:	Jennifer Harris, PE NCDOT Project Development Western Region / Turnpike	From:	Paul Koch, PE, AICP 801 Jones Franklin Road Suite 300 Raleigh, NC
File:	171000613	Date:	August 29, 2013

Reference: **Responses to Comments Contained in *<u>A Closer Look at US 74: Challenges and Opportunities</u>* (O'Connell & Lawrence, Inc., 2013) on the *<u>US 74 Corridor Study</u>* (Stantec Consulting Services Inc., 2007)**

The following points are included in the O'Connell & Lawrence, Inc. (OCL) report, specific to the Stantec US 74 Corridor Study. Responses are provided below each comment.

- "…OCL believes additional study is required to thoroughly "complete" the study."

  Response: This statement suggests that this study is somehow directly related to the Monroe Bypass project studies. However, the scope of the US 74 Corridor Study was to evaluate interim operational improvements for a specific segment of US 74. The study assumes ultimate completion of the Monroe Bypass subsequent to the near-term (2015) horizon period of the study.

  The US 74 Corridor Study was not intended to evaluate the Monroe Bypass or any alternatives to the bypass. The goal of the study was to improve level of service based on 2015 traffic. The report states that the interim improvements are recognized as an immediate need because of delays to the Monroe Bypass construction schedule.

- "OCL also recommends Stantec incorporate two existing interchanges into its software model and re-evaluate its traffic projections to better provide a long-term delay model to local decision-makers."

  Response: The scope of the US 74 Corridor Study was to identify interim year (2015) operational improvements that could be implemented using local DOT Division funds. The study was not intended to address larger system-wide improvements. Therefore the study area for analysis was limited to the corridor section where smaller-scale improvements could be quickly implemented, with relatively minor right-of-way implications. The selected study area provided the traffic data necessary to satisfy the study's purpose.

- "OCL believes it is reasonable to assume that some benefits would extend over a longer term that matches the Monroe Bypass/Connector timeline; therefore, Stantec's report should be projected further in the future to determine if these recommendations could provide necessary long-term relief to residents in a cost-effective manner."

Reference: **Responses to Comments Contained in _A Closer Look at US 74: Challenges and Opportunities_ (O'Connell & Lawrence, Inc., 2013) on the _US 74 Corridor Study_ (Stantec Consulting Services Inc., 2007)**

Response: The scope of the US 74 Corridor Study is specific to interim improvements that address immediate traffic needs in an attempt to bridge the gap until the completion of the Monroe Bypass. The study assumed that the Monroe Bypass would eventually be constructed, but is not intended to provide alternatives to it. Rather it provides interim congestion relief as a "band-aid" measure until larger system-wide improvements, such as the bypass project, are implemented. Hence the shorter (2015) time frame for the design period.

Based on the specific scope and purpose of the US 74 Corridor Study, there is no plan or intent to expand either the study area or the design period. The study accomplished its stated goal of identifying interim year (2015) operational solutions, many of which have been constructed.

- "The subject stretch of US 74 reviewed by Stantec includes two larger interchanges [Concord Avenue, Skyway Drive] that are not discussed in the Stantec report." … "Additional solutions, such as increasing the lengths of the on/off ramps or modifying the interchange configuration, should also be investigated. This interchange should be included in the expanded Stantec study to determine if total overall total delay will be impacted by the current intersection configuration."

Response: The scope of the US 74 Corridor Study was limited to interim operational improvements to extend the corridor's traffic operations until completion of the Monroe Bypass. These interim improvements would mostly be constructed using local DOT Division funds and have minor, if any, right of way implications. The scope was not intended to address larger-scale items such as interchange reconfigurations.

The anticipated costs and direct impacts of interchange improvements would exceed the cost and schedule constraints associated with the purpose of this study. Such improvements would likely require additional right-of way and trigger environmental review, rendering their implementation during the 2015 design period unrealistic.

Stantec Consulting Services Inc.

Paul Koch, PE, AICP
Principal
paul.koch@stantec.com

cc: File

Attachment B – CDM Smith Comments

CDM Smith
900 Chapel Street, Suite 1400
New Haven, Connecticut 06510
tel: 203 865-2191
fax: 203 624-0484

August 30, 2013

Jennifer Harris
Western Region/Turnpike
Project Development Section Head
Project Development & Environmental Analysis Unit
NC Department of Transportation
Century Center Bldg. A
1000 Birch Ridge Drive
Raleigh, NC 27610

Subject: Southern Environmental Law Center Review of Monroe Investment Grade Traffic and Revenue Study

Dear Ms. Harris:

This letter is in response to a report prepared by O'Connell & Lawrence, Inc. (OCL) titled "A Closer Look at US 74: Challenges & Opportunities". OCL prepared the report at the request of the Southern Environmental Law Center (SELC). In this report, OCL indicates they conducted a detailed review of Wilbur Smith Associates (now CDM Smith) comprehensive traffic and revenue study report for the Monroe Bypass/Connector. However, the report by OCL focuses and comments on only one single element of the comprehensive study, specifically the origin and destination (OD) survey. This letter provides some background on the OD survey process, responds to specific comments and recommendations by OCL, and discusses the general approach of how the OD patterns are reflected in the trip tables used by CDM Smith in our modeling process.

OD Surveys

OD surveys are typically conducted for comprehensive traffic and revenue studies for two main purposes. One purpose is to provide information to the rating agencies and potential investors about the trip attributes and the major commuting patterns of the drivers in the study area. The second purpose is to validate the major travel patterns inherent in the travel demand model against real world observations.

While the collection of travel pattern data has recently advanced due to significant market penetration of cellular phones, it is still common practice in traffic and revenue studies to hand/mail out surveys or provide invitations to on-line surveys to gather information on drivers utilizing specific roadway links in a study area. These links are chosen specifically because they represent critical locations of potential market demand for a new toll road, such as the Monroe Bypass.

For the Monroe Comprehensive traffic and revenue study, nearly 24,000 surveys were handed out at 10 locations, with more than 3,600 (15%) valid surveys returned. Chapter 3 of CDM Smith's Comprehensive Traffic and Revenue Study Report presents a description and summary analysis of the OD survey.

OCL Recommendations and CDM Smith Responses

The following discussion includes OCL's recommendations and CDM Smith responses.

1. OCL Recommendation – "Perform individual commercial traffic and passenger vehicle traffic O-D surveys."

    a. CDM Smith Response - Typically truck drivers do not respond to mail-back survey requests, and it is often problematic to identify the person making the decisions regarding route choice for a truck driver. Survey responses are usually less than 1 or 2 percent at best for trucks. However there are ways to get surveys from trucks, such as visually collecting the phone numbers/company names off of truck-cab doors at survey sites, and conducting phone interviews regarding route patterns and the potential for paying tolls or staying on the non-tolled road. This takes substantially more time and budget compared to mail-back surveys.

       Another approach is to do direct interviews at major rest areas near the corridor. However, under both these approaches, you lose the ability to "tie" the survey to a specific roadway link and therefore lose the ability to "factor" the surveys to a specific count, time of travel, and validate modeled truck patterns. There are pro's and con's to every approach, including cost implications. Since cars account for most of the demand in the corridor, the survey approach was geared toward obtaining a successful survey of passenger vehicles.

2. OCL Recommendation - "Expand the data collection area to include sites inside the Charlotte outer loop, including locations in Mathews, Charlotte, and other population centers."

    a. CDM Smith Response - The ten locations selected by CDM Smith were appropriate because they were identified as having drivers with the most potential to use the proposed Monroe Bypass. For example, survey stations 8, 9, and 10 were setup in the northbound direction near the northern end of where the Monroe Bypass would operate, capturing movements of current demand that would be eligible to use the Monroe Bypass. Stations 3, 5, and 9 were located on the existing US 74 and are most important as these drivers are the critical market for the new toll facility.

Table 3-2 and 3-3 of the Comprehensive Traffic and Revenue Study Report provide a breakdown of the origins and destinations from the survey stations. Since the survey locations at Stations 3, 5, and 9 were performed in the northbound direction only, and account for approximately 50 percent of the total valid surveys returned, cities such as Charlotte would not be shown to include a high percentage of origins as shown in Table 3-2. However, significant destinations are shown for Charlotte and Mathews because of this same reason. Conducting surveys in Charlotte or population centers would have resulted in many survey forms from motorists that would not use the Monroe Bypass. That would have added greatly to the cost of processing the surveys and a significant portion of surveys that would have been discarded.

3. OCL Comment – "Only 5.6% of both peak hour and non-peak hour trips used in the O-D study originated in Charlotte: however, 26.8% of the trips in the study area ended in Charlotte. This substantial disparity indicates that the location of the handout locations should have been adjusted to provide a better cross-section of drivers."

    a. CDM Response - This was not a function of survey locations, but the direction of the survey operation as discussed in our previous response. Also, we assume all reported trips in the surveys are round trips, so the higher representation of trips that ended in Charlotte are also used as trips that originated in Charlotte. The valid survey trips are reversed and assigned to either the opposite peak hour or off-peak hours. This reversing process also accounts for the significant amount of PM return traffic that would be originating in Charlotte and destined for Monroe for example. There is no disparity or need to adjust the location of the surveys.

4. OCL Recommendation - "Expand the amount of time spent collecting data to account for variations in travel patterns by collecting data at each location for at least one month."

    a. CDM Response – Table 2-4 of the Comprehensive Traffic and Revenue Study shows the monthly variations for secondary roadways. This particular corridor is not subject to significant seasonal or monthly variations. The trips in the US 74 corridor mainly consist of work, company business, school, and shopping trips, further indicating a fairly consistent and stable set of travel patterns. Furthermore, most travel demand models represent an "average" condition, and so the O-D survey was conducted during March and April when conditions most resembled an average condition. Other factors need to be taken into consideration as well when thinking of extending a survey for a significant length of time such as the return on the investment of time and cost, delay to motorists, and survey fatigue. Even in our one or two day O-D surveys, motorists stop taking surveys come the second day.

CDM Smith Survey Merging Process

CDM Smith geo-codes the origin and destination of each valid survey to transportation analysis zones (TAZs) of the travel demand model. Larger "superzones" are then developed by aggregating TAZs. The surveys at the specific survey sites are also factored to average weekday volumes. Select links are then performed at the survey links in the travel demand model and model O-D pairs for trips using these links are aggregated to the same superzones. The model superzone to superzone movements are then compared to the survey superzone to superzone movements and the model trip table patterns are adjusted as needed to reflect the survey patterns. This process keeps the smaller TAZ trip distribution within the superzones intact, while providing the benefit of adjusting superzone to superzone patterns to reflect real world measurements and patterns. This process was developed to take out any sample size bias at the TAZ level that might occur from an O-D survey. As with any data collection effort, the level of accuracy diminishes with a finer level of disaggregation.

We sincerely appreciate the opportunity to continue to provide assistance to NCDOT. We trust this response meets your needs.

Sincerely,

Scott A. Allaire

Scott A. Allaire
Vice President
CDM Smith Inc.

Southern Environmental Law Center

Telephone 919-967-1450 | 601 West Rosemary Street, Suite 220, Chapel Hill, NC 27516-2356 | Facsimile 919-929-9421

March 6, 2013

Via E-mail and U.S. Mail
Gen. Anthony J. Tata
Secretary of Transportation
NC Department of Transportation
1501 Mail Service Center
Raleigh, NC 27699-1501
AJTata@ncdot.gov

Re: Monroe Connector/Bypass: Clarification of Purpose and Impacts

Dear Secretary Tata:

I am writing to address the continued confusion surrounding the purpose and impacts of the proposed Monroe Bypass. We appreciated the opportunity to discuss this with you in person in January. Since that time, however, additional facts have come to light which demonstrate that deep misunderstandings about the nature of the project persist in local communities affected by the project. We are therefore asking you, as North Carolina Secretary of Transportation, publicly to set out clearly the purpose and likely impact of the project, so that local decision-makers and the public at large can make informed choices.

As you may be aware, the Union County Chamber of Commerce has recently circulated a resolution supporting the Monroe Bypass to a number of local elected bodies. The resolution lists several reasons as to why Union County residents should support the Bypass. The vast majority of those reasons are directly contradicted by NCDOT's recent findings and analyses.

For example:

- The resolution states that the Bypass will bring significant economic growth to the County.

  By contrast, NCDOT has stated that there will be little change in growth as a result of building the Bypass. In fact, NCDOT has concluded that Union County's current and future growth relates to factors such as available land, high median incomes and good school districts, rather than commute times.

- The resolution states that the Bypass is needed to open U.S. 74 for local traffic.

  By contrast, NCDOT has stated that improving U.S. 74 is not a purpose of the Bypass. Nor does NCDOT expect to see any significant improvement on U.S. 74 compared to today's traffic volumes as a result of construction of the Bypass.

- The resolution states that the Bypass will significantly improve commute times for Union County residents.

  By contrast, NCDOT's most recent analysis shows that only 92% of the region impacted by the Bypass will not see any improvement in commute time greater than one minute in commute time as a result of the Bypass. The average commute time will be improved by just 18 seconds.

The stark differences between the findings in the resolution and NCDOT's own analyses are described in more detail in the attached annotated resolution. As the State agency responsible for disseminating information about proposed transportation projects, we urge the Department to act swiftly to address these persistent misunderstandings. Local support and decision-making concerning the Monroe Bypass should be based on an accurate understanding of the project and its purpose. Similarly, NCDOT's analysis should be based on an accurate representation of the Bypass's true purpose and anticipated impacts.

As an additional matter, it has come to our attention that a number of local elected officials and other decision-makers are under the impression that NCDOT's decision-making process with regard to the Monroe Bypass is "closed." As you know, federal law requires that the decision making process remain fully open until the public has been fully presented with all relevant information and given an opportunity to supply comments and other input. Only when a federal "Record of Decision" has been published is the decision-making period closed. The importance of this public process was underscored by the ruling on this matter last May by the United States Court of Appeals for the Fourth Circuit.

We respectfully request that you issue a public statement correcting the mistaken statements in the resolution and clarify NCDOT's findings and plans for the Bypass, making clear that the decision-making process regarding the Bypass and other alternative solutions remain very much open, and stating that all public input will be carefully considered during that process.

Thank you,

Kym Hunter

Kym Hunter
Staff Attorney

CC (Via E-mail and U.S. Mail):

Tim Gestwicki, NCWF
Dean Naujoks, Yadkin Riverkeeper
June Blotnick, Clean Air Carolina
Scott Slusser, NCDOJ
La Nica Allison, NCDOT
Jennifer Harris, NCDOT
John Sullivan, FHWA
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Marla Chambers, NCWRC
Alan Johnson, NCDWQ
Amy Simes, NCDWQ
Bob Cook, MUMPO
Dana Stoogenke, RRRPO
Lynda Paxton, Mayor of Stallings
Bobby G. Kilgore, Mayor of Monroe
John J. Quinn, Mayor of Indian Trail
James P. Taylor, Mayor of Matthews
Kevin Pressley, Mayor of Hembry Bridge
John Ross, Mayor of Lake Park
Bill Braswell, Mayor of Wingate
Larry Simpson, Mayor of Unionville
Representative Dean Arp
Representative Mark Brody
Representative D. Craig Horn
Representative William Brawley
Senator Fletcher L. Hartsell
Senator Gene McLaurin
Senator Tommy Tucker
Dr. Mary Ellis, Union County Public Schools

Encls.

Resolution for Cities, County, Civic Organizations
Annotated by the Southern Environmental Law Center

WHEREAS, Union County's population is expected to grow to 225,878 in 2016- an increase of 24,000 residents over 2010; and

WHEREAS, Union County is one of fastest-growing areas in North Carolina and the country; and

WHEREAS, 50.2 percent of Union County commuters work inside the county while 49.8 percent of Union County commuters work outside of the county; and

WHEREAS, it takes Union County commuters an average of 29 minutes to get to work; and

- NCDOT most recent data show that commuting times in Union County are **only 2-3 minutes higher** than elsewhere in the Charlotte region.[1]

WHEREAS, it takes one out of five Union County commuters more than 45 minutes to travel to work; and

- NCDOT data show that the Monroe Bypass would have **no practical effect on travel times** in Union County or the rest of the region.
- The **most recent data** show that of the areas that would be impacted by the Bypass:
  - 59% would **experience absolutely no change** in average commute time as a result of the Bypass,
  - 33% would experience **less than 1 minute of change** in average commute time.[2]
  - Only 8% would save more than 1 minute in their average commute time.[3]
  - The data show that the absolute maximum time savings is merely 5.7 minutes, and that **the Bypass will save the average driver <u>only 18 seconds</u>**.[4]

WHEREAS, Union County is not served by a limited-access highway; and

WHEREAS, improving Union County's transportation infrastructure promotes employment opportunities; and

- NCDOT's experts have found that Union County has maintained a comparatively high rate of growth for the past two decades despite slightly longer commutes.[5]
- Because Union County's commute time does not vary significantly from other localities in the region, NCDOT's experts have concluded that development in Union County is based on issues rather than commute time.[6]

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[1] Baker Engineering, Presentation before the Monroe Connector Bypass Agencies, *Monroe Connector/Bypass Agency Update: Indirect and Cumulative Analysis Review*, at slide 16 (October 17, 2012), Attachment 1.
[2] *Id.*
[3] *Id.*
[4] *Id.*
[5] Baker Engineering, Draft, *Union County Growth Factors* Memo, at 15-17 (Sept. 11, 2012), Attachment 2.

- NCDOT's experts have found that Union County's past growth is attributable to factors such as available land, high median income, and good area schools.[7] They predict that growth will continue to be chiefly influenced by these factors rather than commute time.[8]

WHEREAS, According to the Bureau of Labor Statistics, North Carolina's unemployment rate was 9.2 percent in December 2012; and

WHEREAS, Union County's unemployment rate stood at 8.1 percent in December 2012; and

- NCDOT expects less than 1% growth as a result of building the Bypass.[9] The Bypass is not anticipated to bring jobs to the region.

WHEREAS, with the value of residential property at 85 percent of the property tax base, Union County has a limited tax base, making the county highly dependent on property tax collections; and

WHEREAS, a 2010 Union County Chamber of Commerce study found expanding the county's commercial tax base from 15 percent to up to 30-40 percent by 2014 could reduce the need for personal property tax increases and/or reductions in county quality of life; and

WHEREAS, the Union County Chamber of Commerce has identified six major industries for location, growth, and expansion in Union County. The six industries consist of four in the manufacturing sector (Advanced Metals, Aerospace, Medical Products, and Building Products), and two in the retail and business services sectors (Retail E-Commerce and Data Center/Support Services); and

- NCDOT's data show that the Monroe Bypass will have little to no impact on Union County's "attractiveness for development."[10] Of the area impacted by the Bypass,
  - 59% had <u>no</u> change in attractiveness for development,
  - 36% had a less than 1% change in attractiveness for development, and
  - Only 5% had a change of more the 1%. Even in these areas, the greatest change was 3.9%.[11]
  - The study concluded the effect on development was negligible.[12]

WHEREAS, higher education plays a critical role in promoting economic development; and

WHEREAS, Wingate University, located in Union County, is listed 6th among Best Value colleges and universities in the South based on quality and net cost according to the ranking of the nation's top schools in U.S. News & World Report's 2012 Best Colleges; and

[6] *Id.* at 15.
[7] *Id.* at 9-14.
[8] *Id.*
[9] Monroe Connector/Bypass, Final Environmental Impact Statement (FEIS) at 2-45.
[10] Christina Shumate, *STIP R-3329/R-2559 Monroe Connector/Bypass Updates and Additional Analyses Since The Rescinding Of The Record Of Decision*, memorandum to file (Draft) (Feb. 11, 2013), Attachment 3.
[11] *Id.*
[12] *Id.*

WHEREAS, Wingate University is a fast growing higher education institution - growing 145 percent since 1992; and

WHEREAS, Wingate University serves 2,700 students; and

WHEREAS, Wingate University has a goal of growing its student population to 3,500 over the next few years; and

WHEREAS, Wingate University is conducting a $75 million campaign to support scholarships, programs and new buildings; and

WHEREAS, providing a limited access highway would reduce commuter travel time to the University and encourage student population growth;

- NCDOT data show that the Monroe Bypass would have no practical effect on travel times in Union County or the rest of the region.
- The **most recent data** show that of the areas that would be impacted by the Bypass, 59% would **experience absolutely no change** in average commute time as a result of the Bypass, 33% will experience **less than 1 minute of change** in average commute time, and only 8% would save more than 1 minute on their average commute time.[13]
- The data show that the absolute maximum time savings is 5.7 minutes, and that **the Bypass will save the average driver <u>only 18 seconds</u>**.[14]

WHEREAS, having appropriate transportation infrastructure is important to promoting the health and well-being of Union County residents; and

WHEREAS, Union EMS treated and transported 12,345 patients in 2010-11; and

WHEREAS, the average emergency response time increased Union County between 2009-10 and 2010-11, going from 8.65 minutes to 9.08 minutes; and

WHEREAS, according to the American Heart Association, brain death and permanent death start to occur in 4-6 minutes after someone experiences cardiac arrest; and

WHEREAS, studies showing that a victim's chances of survival are reduced by 7-10 percent with every minute that passes without defibrillation and advanced life support intervention. Few attempts at resuscitation succeed after 10 minutes; and

[13] Baker Engineering, Presentation before the Monroe Connector Bypass Agencies, *Monroe Connector/Bypass Agency Update: Indirect and Cumulative Analysis Review*, at slide 16 (October 17, 2012), Attachment 1.
[14] *Id.*

WHEREAS, according to Union EMS, crowded highways are a significant reason for the increase in response times; and

- Building the Bypass might make these problems worse throughout the County. NCDOT has stated that it is not in favor of changes to U.S. 74 that would have a competing interest with the Bypass.[15]
- NCDOT-commissioned studies have shown that there are better, less costly solutions to decrease congestion in Union County. Improvements to U.S. 74, such as superstreet upgrades, better traffic signal optimization, and patching up the locals businesses and side streets with service roads could have significant impacts on Union County.[16]
- Existing U.S. 74 is currently designated as a Strategic Highway Corridor (SHC) by the North Carolina Department of Transportation,[17] a special status which affords the roadway a prioritized avenue for access to funding for improvements.[18] Construction of the Bypass would remove the SHC designation from existing U.S. 74 to the Toll Highway.[19] NCDOT has neither studied nor explained the impact to U.S. 74 of removing this designation.

WHEREAS, 60 percent of Union EMS transports went to CMC Union while 40 percent went out of county in 2010-11; and

WHEREAS, addressing transportation congestion would promote Union County's quality of life; and

- NCDOT's own experts have found that U.S. 74 can be improved without building the Bypass. Improvements to U.S. 74 such as superstreet upgrades, better traffic signal optimization, and patching up the local businesses and side streets with service roads could have significant impacts on Union County.[20]

WHEREAS, U.S. Highway 74 congestion has proved to be a long-term and growing issue; and

- NCDOT states that improving U.S. 74 is not a stated purpose of the Bypass, nor is it an anticipated result.[21]

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[15] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 4 (Jan. 18, 2011), Attachment 4.
[16] Stantec Consulting Services, *US 74 Corridor Study, Union County, NC*, prepared for the NCDOT Division 10 (July 2007), Attachment 5.
[17] NORTH CAROLINA GENERAL STATUTE § 136-178.
[18] *See, e.g.*, NCDOT, Strategic Highway Corridors Project Planning and Design, *available at* http://www.ncdot.gov/doh/preconstruct/tpb/shc/implementation/Project/; NCDOT, Strategic Highway Corridors Long-Range Planning, *available at* http://www.ncdot.gov/doh/preconstruct/tpb/shc/implementation/Systems/.
[19] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 2 (Jan. 18, 2012), Attachment 4.
[20] Stantec Consulting Services, *US 74 Corridor Study, Union County, NC*, prepared for the NCDOT Division 10 (July 2007), Attachment 5.
[21] *Id.* at 3; *see also* PBS&J, *Statement of Purpose and Need: Mecklenburg and Union Counties Monroe Connector/Bypass*, at 2-3 (February 2008).

- NCDOT's analysis indicates that congestion on existing U.S. 74 would not be much improved with construction of the Bypass.[22]
- NCDOT recently confirmed that it does not expect dramatic improvements to congestion on U.S. 74 as a result of the Bypass, recognizing that U.S. 74 would still experience heavy traffic even if the Bypass were constructed.[23]
- There are better, less costly, solutions to improve U.S. 74 such as superstreet upgrades, better traffic signal optimization, and patching up the locals businesses and side streets with service roads could have significant impacts on Union County.[24]

WHEREAS, the Port of Wilmington is one of the few South Atlantic ports with readily available berths and storage areas for containers and cargo; and

WHEREAS, U.S. 74 is the main route between Charlotte and Wilmington and many large commercial trucks use U.S. 74 through Union County to travel to and from the Port of Wilmington; and

- NCDOT has not studied how much traffic on U.S. 74 is local traffic, versus through traffic.[25] There is therefore insufficient data regarding the number of trucks that pass through Union County on U.S. 74.

WHEREAS, heavy usage by commercial vehicles causes damage to roadways; and

WHEREAS, area visitors use U.S. 74 as a route to the coast; and

- NCDOT has not studied the extent to which the corridor is used as a route to the coast.

WHEREAS, out-of-town commuters use the highway to travel across the county; and

- NCDOT has not studied the percentage of travelers who are passing through the county rather than making local trips within the corridor.

WHEREAS, for the economic health of this community, we need a solution to congestion; and

- Improving local congestion is not a stated purpose of the Bypass nor an anticipated result.[26]

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[22] *See, e.g.*, Monroe Connector/Bypass Draft EIS, Table 2-7.
[23] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 4 (Jan. 18, 2011), Attachment 4.
[24] Stantec Consulting Services, *US 74 Corridor Study, Union County, NC*, prepared for the NCDOT Division 10 (July 2007), Attachment 5.
[25] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Realtor Meeting Notes, at 2 (Jan. 18, 2011), Attachment 6.
[26] PBS&J, *Statement of Purpose and Need: Mecklenburg and Union Counties Monroe Connector/Bypass*, at 2-3 (February 2008).

- NCDOT recently stated that the agency "would not be in favor of changes to U.S.-74 [sic] that would have a competing interest with the bypass,"[27] as such improvements would have a negative impact on toll revenue.

WHEREAS, the Monroe Connector-Bypass project has been years in the planning stages; and

WHEREAS, many due to delays in the project, many Union County residents are not able to sell or renovate their homes, properties or businesses; and

WHEREAS, the Monroe Connector-Bypass project, a 19.7-mile long new location roadway from U.S. 74 at 1-485 in eastern Mecklenburg County to U.S. 74 between the towns of Wingate and Marshville in Union County, has been proposed; and

WHEREAS, the Monroe Connector-Bypass will improve mobility and capacity within the area by providing a facility for the U.S. 74 corridor that allows for high-speed regional travel consistent with the designations of the North Carolina Strategic Highway Corridor program and the North Carolina Intrastate System, while maintaining access to properties along existing U.S. 74; and

- Removing U.S. 74's Strategic Highway Corridor designation may have disastrous impacts on U.S. 74's eligibility for funding for improvements.[28]
- NCDOT has neither studied nor otherwise addressed this issue.

WHEREAS, the Monroe Connector-Bypass would provide commuters with another transportation choice that could save them 20 to 50 minutes of drive time; and

- NCDOT's most recent data show no significant travel time savings for locals will result from the Bypass, especially not anything this dramatic.
- The **most recent data** show that of the areas that would be impacted by the Bypass, over 90% would experience less than a minute's difference in their average commute time, and only 8% would save more than 1 minute on their average commute time.[29]
- The data show that the absolute maximum expected time savings is 5.7 minutes, and that **the Bypass will save the average commuter only 18 seconds**.[30]

WHEREAS, according to a study by Texas A&M University, traffic congestion puts 56 billion pounds of additional carbon dioxide- about 380 pounds per auto commuter- into the air; and

- Transportation analysts have consistently found that increased road capacity is correlated with increased traffic volume.[31] Traffic congestion tends to maintain a self-limiting

[27] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 4 (Jan. 18, 2011), Attachment 4.
[28] *Id.* at 2.
[29] Baker Engineering, Presentation before the Monroe Connector Bypass Agencies, *Monroe Connector/Bypass Agency Update: Indirect and Cumulative Analysis Review*, at slide 16 (October 17, 2012), Attachment 1.
[30] *Id.*

equilibrium; while road expansion may reduce congestion in the short term, it attracts additional peak-period trips until congestion again reaches a level that limits further growth.[32]
- Building the Bypass is unlikely to impact congestion over the long run, but is likely to increase overall traffic in Union County. If the growth the Chamber of Commerce expects does occur, the Bypass will result in a much great number of cars on the road. This additional traffic, combined with continued congestion on U.S. 74, may exacerbate these air quality impacts.
- There are better solutions to air quality concerns, such as improving U.S. 74.

WHEREAS, building the Monroe Connector-Bypass would free up the traffic congestion for local residents to shop, entertain, etc; and

- The purpose of the Bypass is not to improve access along U.S. 74.[33]
- NCDOT has stated that it is not in favor of improvements to U.S. 74 that would have a competing interest with the Bypass, as such improvements would have a negative impact on toll revenue.[34]
- Constructing the Bypass may have great impacts on U.S. 74's eligibility for funding for improvements, as the Bypass would remove U.S. 74's Strategic Highway Corridor designation.[35]
- The revised traffic volume estimates presented in the EIS indicate that traffic volume on U.S. 74 would not improve if the Bypass were constructed.[36]

WHEREAS, the Monroe Connector-Bypass would also support and promote already existing local businesses along U.S. 74; and

- NCDOT has been clear that building the Bypass is neither intended nor expected to improve access along US 74.[37]

WHEREAS, the Monroe Connector-Bypass project will create hundreds of jobs in our community, establish a limited-access highway in Union County, and improve transportation and the quality of life in Union County; therefore, be it

- NCDOT's own analysis predicts less than 1% growth as a result of the Bypass.[38]

[31] *See, e.g.*, MARK HANSEN, ET AL. (1993), AIR QUALITY IMPACTS OF URBAN HIGHWAY CAPACITY EXPANSION: TRAFFIC GENERATION AND LAND USE CHANGES, at 2-8–2-14, 2-28–2-29.
[32] *See, e.g.*, Todd Litman, *Generated Traffic and Induced Travel: Implications for Transport Planning*, 38-47 INSTITUTE OF TRANSPORTATION ENGINEERS JOURNAL, vol. 71 no. 4, at 2-3 (2001).
[33] PBS&J, *Statement of Purpose and Need: Mecklenburg and Union Counties Monroe Connector/Bypass*, at 2-3 (February 2008).
[34] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 4 (Jan. 18, 2011), Attachment 4.
[35] *Id.* at 2.
[36] Monroe Connector/Bypass Draft EIS, Table 2-7.
[37] PBS&J, *Statement of Purpose and Need: Mecklenburg and Union Counties Monroe Connector/Bypass*, at 2-3 (February 2008); Stantec Consulting Services, *US 74 Corridor Study, Union County, NC*, prepared for the NCDOT Division 10, at 3 (July 2007), Attachment 5.

RESOLVED, That support the Monroe Connector-Bypass for Union County and encourages state and federal officials to move quickly to begin the construction of the bypass.

[38] Monroe Connector/Bypass, Final Environmental Impact Statement (FEIS), at 2-45.

Table A-2: Southern Environmental Law Center

Document: i002 Letter dated March 6, 2013

COMMENT NO.	COMMENT	RESPONSE
1	• We are therefore asking you, as North Carolina Secretary of Transportation, publicly to set out clearly the purpose and likely impact of the project, so that local decision-makers and the public at large can make informed choices.	The Draft Supplemental Final EIS represents the public statement which addresses the changes and new information that NCDOT has identified and evaluated to determine the impacts of the project. The Draft Supplemental Final EIS will be made available to the public for their review and comment.
2	• As you may be aware, the Union County Chamber of Commerce has recently circulated a resolution supporting the Monroe Bypass to a number of local elected bodies. The resolution lists several reasons as to why Union County residents should support the Bypass. The vast majority of those reasons are directly contradicted by NCDOT's recent findings and analyses. For example: o The resolution states that the Bypass will bring significant economic growth to the County. By contrast, NCDOT has stated that there will be little change in growth as a result of building the Bypass. In fact, NCDOT has concluded that Union County's current and future growth relates to factors such as available land, high median incomes and good school districts, rather than commute times. o The resolution states that the Bypass is needed to open U.S. 74 for local traffic. By contrast, NCDOT has stated that improving U.S. 74 is not a purpose of the Bypass. Nor does NCDOT expect to see any significant improvement on U.S. 74 compared to today's traffic volumes as a result of construction of the Bypass. o The resolution states that the Bypass will significantly improve commute times for Union County residents. By contrast, NCDOT's most recent analysis shows that only 92% of the region impacted by the Bypass will not see any improvement in commute time greater than one minute in commute time as a result of the Bypass. The average commute time will be improved by just 18 seconds.	NCDOT and FHWA appreciate and understand the position of the Union County Chamber of Commerce. However, the Draft Supplemental Final EIS presents data and analysis of the growth likely to occur in the project area. It also highlights and summarizes other research of future growth projections in Union County.
3	• As an additional matter, it has come to our attention that a number of local elected officials and other decision-makers are under the impression that NCDOT's decision-making process with regard to the Monroe Bypass is "closed." As you know, federal law requires that the decision making process remain fully open until the public has been fully presented with all	It is correct that only when a federal "Record of Decision" has been published is the decision-making period closed.

Table A-2: Southern Environmental Law Center

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COMMENT NO.	COMMENT	RESPONSE
	relevant information and given an opportunity to supply comments and other input. Only when a federal "Record of Decision" has been published is the decision-making period closed. The importance of this public process was underscored by the ruling on this matter last May by the United States Court of Appeals for the Fourth Circuit.	
4	• We respectfully request that you issue a public statement correcting the mistaken statements in the resolution and clarify NCDOT's findings and plans for the Bypass, making clear that the decision-making process regarding the Bypass and other alternative solutions remain very much open, and stating that all public input will be carefully considered during that process.	The Draft Supplemental Final EIS represents the NCDOT's public statement on the Monroe Connector/Bypass. Once published, the public will have an opportunity to review and comment on it.
5	• NCDOT most recent data show that commuting times in Union County are **only 2-3 minutes higher** than elsewhere in the Charlotte region.	It is true that Union County has one of the highest commute times in the region. The 2010 Census data shows the average commute time for Union County residents was 27.8 minutes, which was 11 percent higher than the regional average, or approximately 3 minutes higher. This value from the US Census represents average commute times of Union County residents to their actual places of employment (*Indirect and Cumulative Effects Quantitative Analysis Update*, Appendix B, Michael Baker Engineering, Inc., November 2013).
6	• NCDOT data show that the Monroe Bypass would have **no practical effect on travel times** in Union County or the rest of the region. • The **most recent data** show that of the areas that would be impacted by the Bypass: o 59% would **experience absolutely no change** in average commute time as a result of the Bypass, o 33% would experience **less than 1 minute of change** in average commute time. o Only 8% would save more than 1 minute in their average commute time. o The data show that the absolute maximum time savings is merely 5.7 minutes, and that **the Bypass will save the average driver only 18 seconds**.	The commenter's statement that the NCDOT data shows that the Monroe Bypass would have no practical effect on travel times in Union County or the rest of the region is an incorrect interpretation of the project team's work. The commenter's bullets supporting their statement are referencing comparison of results from the MUMPO's Population Projection and Employment Allocation model run without the Monroe Connector/Bypass in the travel time to employment factor to results of the original model run with the Monroe Connector/Bypass in the model, as explained in the Draft Supplemental Final EIS and the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). The ICE Update evaluated the improvements in accessibility and travel time from Union County to employment centers in Mecklenburg County. Expected travel time savings for areas of Union County to and from the US 74/Interstate 485 interchange are displayed in Map 14 of the ICE Update.
7	NCDOT's experts have found that Union County has maintained a comparatively high rate of growth for the past two decades despite slightly longer commutes.	This statement is correct. In addition, many non-NCDOT experts, including Dr. Appold (Assistant Professor at the Kenan Institute at UNC-Chapel Hill) and local planners have found this to be true. Additional information is provided in Section 1.6 and Appendix B of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). In addition, actual census data showed that Union County was the fastest growing county in the state from 2000

Table A-2: Southern Environmental Law Center

Document: i002 Letter dated March 6, 2013

COMMENT NO.	COMMENT	RESPONSE
		to 2010.
8	Because Union County's commute time does not vary significantly from other localities in the region, NCDOT's experts have concluded that development in Union County is based on issues rather than commute time.	The Draft Supplemental Final EIS and Appendix B of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) provide a detailed description of growth trends in the Charlotte region and quantify some of the major growth indicators in the project area. The conclusions presented are based on studies from independent experts and professionals, and not just NCDOT experts.
9	NCDOT's experts have found that Union County's past growth is attributable to factors such as available land, high median income, and good area schools. They predict that growth will continue to be chiefly influenced by these factors rather than commute time.	See response to Comment #8 in this letter (Letter i002).
10	NCDOT expects less than 1% growth as a result of building the Bypass. The Bypass is not anticipated to bring jobs to the region.	NCDOT determined all changes in land use within the project study area from the baseline to the 2030 Build Scenario are within two percent (i.e., between negative one percent and positive one percent) of the change that is predicted for the 2030 No-Build Scenario (ICE Update, Section 5). While NCDOT studied potential changes in land use because the public and resource agencies identified land use changes and their effect on water quality as a potential significant issue for study under NEPA, NCDOT has not specifically projected employment for the project study area, the county, nor the region. Changes in land use that are forecasted related to the project include 1,800 additional residential acres, 300 additional commercial acres, 100 additional industrial acres and 1,100 additional acres of transportation use. These changes in land use would be related to increased employment in the project study area, contrary to the commenter's conclusion.
11	NCDOT's data show that the Monroe Bypass will have little to no impact on Union County's "attractiveness for development." Of the area impacted by the Bypass, • 59% had no change in attractiveness for development, • 36% had a less than 1% change in attractiveness for development, and • Only 5% had a change of more the 1%. Even in these areas, the greatest change was 3.9%. The study concluded the effect on development was negligible.	The commenter's statement that the NCDOT's data show that the Monroe Bypass will have little to no impact on Union County's "attractiveness for development" is an incorrect interpretation of the project team's work. The commenter's bullets supporting their statement are referencing comparison of results from the MUMPO's Population Projection and Employment Allocation model run without the Monroe Connector/Bypass in the travel time to employment factor to results of the original model run with the Monroe Connector/Bypass in the model. The Draft Supplemental Final EIS and the ICE Update explain how NCDOT re-evaluated the effect of the project on results from MUMPO's socioeconomic and land use models. These documents also explain how NCDOT evaluated the project's potential induced growth effect on the project study area.
12	NCDOT data show that the Monroe Bypass would have no practical effect on travel times in Union County or the rest of the region.	This is an incorrect interpretation of the project team's work. See response to Comment #6 in this letter (Letter i002).
13	The **most recent data** show that of the areas that would be impacted by the Bypass, 59% would **experience absolutely no change** in average commute time	See response to Comment #6 in this letter (i002).

Table A-2: Southern Environmental Law Center

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COMMENT NO.	COMMENT	RESPONSE
	as a result of the Bypass, 33% will experience **less than 1 minute of change** in average commute time, and only 8% would save more than 1 minute on their average commute time.	
14	The data show that the absolute maximum time savings is 5.7 minutes, and that **the Bypass will save the average driver only 18 seconds**.	This statement is incorrect. See response to Comment #6 in this letter (i002).
15	Building the Bypass might make these problems worse throughout the County. NCDOT has stated that it is not in favor of changes to U.S. 74 that would have a competing interest with the Bypass.	The commenter has provided no data supporting their conclusion that building the Monroe Connector/Bypass might make these problems worse. Contrary to the commenter's statement, since the Final EIS, numerous improvements have been made to existing US 74, as described in **Section 2.4.** Many of these improvements implement recommendations of the *US 74 Corridor Study* (Stantec, 2007), commissioned by NCDOT Division 10, which has improved traffic flow on the existing facility.
16	NCDOT-commissioned studies have shown that there are better, less costly solutions to decrease congestion in Union County. Improvements to U.S. 74, such as superstreet upgrades, better traffic signal optimization, and patching up the locals businesses and side streets with service roads could have significant impacts on Union County.	As summarized in Section 1 of the Draft Supplemental Final EIS, the NCDOT examined and implemented a variety of minor improvements along existing US 74. In Section 2 of the Draft Supplemental Final EIS, the NCDOT evaluated and re-examined others (i.e. improve existing US 74 alternatives) with a "hard look" and subsequently determined that they were not reasonable and did not require more detailed study. Initial upgrade existing US 74 alternatives included minor TSM improvements and widening as a standard arterial, a superstreet, and a controlled-access highway. Additional evaluations in the Final EIS included TSM Alternative Concept 2 that reflected the recommendations in the *US 74 Corridor Study* (Stantec, 2007). Additional evaluations after the Final EIS included additional analysis of upgrading existing US 74 as a superstreet and a 6-lane superstreet, and widening to a 6-lane arterial. There are no conditions that warrant re-considering new alternatives or updating previous screening decisions. The NCDOT screening-level process and decisions in the EIS remain valid and they are reaffirmed in Draft Supplemental Final EIS, as described in **Section 2**.
17	Existing U.S. 74 is currently designated as a Strategic Highway Corridor (SHC) by the North Carolina Department of Transportation, a special status which affords the roadway a prioritized avenue for access to funding for improvements. Construction of the Bypass would remove the SHC designation from existing U.S. 74 to the Toll Highway. NCDOT has neither studied nor explained the impact to U.S. 74 of removing this designation.	This statement is incorrect. The current Strategic Highway Corridor (SHC) map for NCDOT Division 10 can be downloaded from https://connect.ncdot.gov/projects/planning/Pages/StrategicHighwayCorridors.aspx The Strategic Highway Corridors Map shows the Monroe Connector/Bypass as the designated Strategic Highway Corridor for US 74, not existing US 74. The project is consistent with local planning documents and NCDOT has studied the impacts of building the project in the study area.
18	NCDOT's own experts have found that U.S. 74 can be improved without building the Bypass. Improvements to U.S. 74 such as superstreet upgrades,	See response to Comment #16 in this letter (i002).

Table A-2: Southern Environmental Law Center

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COMMENT NO.	COMMENT	RESPONSE
	better traffic signal optimization, and patching up the local businesses and side streets with service roads could have significant impacts on Union County.	
19	NCDOT states that improving U.S. 74 is not a stated purpose of the Bypass, nor is it an anticipated result.	As presented in **Section 1.1.2** of the Draft Supplemental Final EIS, "The purpose of the project is to improve mobility and capacity within the project study area by providing a facility for the US 74 corridor from near I-485 in Mecklenburg County to between the towns of Wingate and Marshville in Union County that allows for high-speed regional travel consistent with the designations of the North Carolina SHC program and the North Carolina Intrastate System, while maintaining access to properties along existing US 74."
20	NCDOT's analysis indicates that congestion on existing U.S. 74 would not be much improved with construction of the Bypass.	The commenter's statement that the Monroe Connector/Bypass will not improve US 74 is incorrect. As discussed in **Section 2.5.2** of the Draft Supplemental Final EIS, a comparison of future build and no-build traffic forecasts show that some traffic will divert to the Monroe Connector/Bypass and thus reduce congestion and improve traffic operations along existing US 74 compared to the No-Build Scenario forecasts. The project also will provide a high-speed facility for the US 74 corridor that will operate at acceptable levels of service through 2035.
21	NCDOT recently confirmed that it does not expect dramatic improvements to congestion on U.S. 74 as a result of the Bypass, recognizing that U.S. 74 would still experience heavy traffic even if the Bypass were constructed.	See response to Comment #20 in this letter (i002).
22	There are better, less costly, solutions to improve U.S. 74 such as superstreet upgrades, better traffic signal optimization, and patching up the locals businesses and side streets with service roads could have significant impacts on Union County.	See responses to Comments #15 and 16 in this letter (i002).
23	NCDOT has not studied how much traffic on U.S. 74 is local traffic, versus through traffic. There is therefore insufficient data regarding the number of trucks that pass through Union County on U.S. 74.	This statement is incorrect. Traffic forecasts used in the analyses summarized in the Draft Supplemental Final EIS were reviewed and determined valid for the purposes they were used (*Monroe Connector/Bypass Traffic Forecast Summary*, HNTB, November 2013). The comprehensive final traffic and revenue study (*Final Report Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study*, Wilbur Smith and Associates, October 2010) adequately evaluated local, through and truck traffic that would use the corridor.
24	NCDOT has not studied the extent to which the corridor is used as a route to the coast.	See response to Comment #23 in this letter (i002).
25	NCDOT has not studied the percentage of travelers who are passing through the county rather than making local trips within the corridor.	See response to Comment #23 in this letter (i002).

Table A-2: Southern Environmental Law Center

Document: i002 Letter dated March 6, 2013

COMMENT NO.	COMMENT	RESPONSE
26	Improving local congestion is not a stated purpose of the Bypass nor an anticipated result.	See response to Comment #19 in this letter (i002).
27	NCDOT recently stated that the agency "would not be in favor of changes to U.S.-74 [sic] that would have a competing interest with the bypass," as such improvements would have a negative impact on toll revenue.	See response to Comment #15 in this letter (i002).
28	Removing U.S. 74's Strategic Highway Corridor designation may have disastrous impacts on U.S. 74's eligibility for funding for improvements.	See response to Comment #17 in this letter (i002).
29	NCDOT has neither studied nor otherwise addressed this issue [Strategic Highway Corridor].	This statement is incorrect. See response to Comment #17 in this letter (i002).
30	NCDOT's most recent data show no significant travel time savings for locals will result from the Bypass, especially not anything this dramatic.	This statement is incorrect. See response to Comment #6 in this letter (i002).
31	The **most recent data** show that of the areas that would be impacted by the Bypass, over 90% would experience less than a minute's difference in their average commute time, and only 8% would save more than 1 minute on their average commute time.	This statement is incorrect. See response to Comment #6 in this letter (i002).
32	The data show that the absolute maximum expected time savings is 5.7 minutes, and that **the Bypass will save the average commuter only 18 seconds**.	This statement is incorrect. See response to Comment #6 in this letter (i002).
33	Whereas, according to a study by Texas A&M University, traffic congestion puts 56 billion pounds of additional carbon dioxide – about 380 pounds per auto commuter – into the air, and Transportation analysts have consistently found that increased road capacity is correlated with increased traffic volume. Traffic congestion tends to maintain a self-limiting equilibrium; while road expansion may reduce congestion in the short term, it attracts additional peak-period trips until congestion again reaches a level that limits further growth.	As discussed in **Section 4.2.2** of the Draft Supplemental Final EIS, the Monroe Connector/Bypass project is included in a conforming Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP) for National Ambient Air Quality Standards. Traffic forecasts and travel demand modeling for Build and No Build Scenarios are discussed in **Section 2.5** in the Draft Supplemental Final EIS, with further detail provided in the *Monroe Connector/Bypass Traffic Forecast Summary* (HNTB, November 2013).
34	Building the Bypass is unlikely to impact congestion over the long run, but is likely to increase overall traffic in Union County. If the growth the Chamber of Commerce expects does occur, the Bypass will result in a much great number of cars on the road. This additional traffic, combined with continued congestion on U.S. 74, may exacerbate these air quality impacts.	See response to Comment #33 in this letter (i002).

Table A-2: Southern Environmental Law Center

Document: i002 Letter dated March 6, 2013

COMMENT NO.	COMMENT	RESPONSE
35	There are better solutions to air quality concerns, such as improving U.S. 74.	See responses to Comments #16 and 33 in this letter (i002).
36	The purpose of the Bypass is not to improve access along U.S. 74.	See response to Comment #19 in this letter (i002).
37	NCDOT has stated that it is not in favor of improvements to U.S. 74 that would have a competing interest with the Bypass; as such improvements would have a negative impact on toll revenue.	This statement is incorrect. See response to Comment #15 in this letter (i002).
38	Constructing the Bypass may have great impacts on U.S. 74's eligibility for funding for improvements, as the Bypass would remove U.S. 74's Strategic Highway Corridor designation.	See response to Comment #17 in this letter (i002).
39	The revised traffic volume estimates presented in the EIS indicate that traffic volume on U.S. 74 would not improve if the Bypass were constructed.	This statement is incorrect. See response to Comment #20 in this letter (i002).
40	NCDOT has been clear that building the Bypass is neither intended nor expected to improve access along US 74.	This statement is incorrect. See response to Comment #19 in this letter (i002).
41	NCDOT's own analysis predicts less than 1% growth as a result of the Bypass.	See response to Comment #10 in this letter (i002).

SOUTHERN ENVIRONMENTAL LAW CENTER

Telephone 919-967-1450 | 601 WEST ROSEMARY STREET, SUITE 220 CHAPEL HILL, NC 27516-2356 | Facsimile 919-929-9421

December 3, 2012

Via U.S. Mail

Ms. Jennifer Harris
Director of Planning & Environmental Studies
North Carolina Turnpike Authority
1 South Wilmington Street
Raleigh, NC 27601
jhharris1@ncdot.gov

Re: Monroe Connector/Bypass: Supplemental Environmental Analysis

Dear Ms. Harris:

On behalf of the North Carolina Wildlife Federation, Clean Air Carolina, and the Yadkin Riverkeeper, the Southern Environmental Law Center submits the attached letter, which you also received by email on November 30, 2012. The letter details a number of concerns about the ongoing environmental analysis of the Monroe Connector/Bypass pursuant to the National Environmental Policy Act. The letter also presents additional information, not considered in the initial analysis of the Toll Highway, which we urge you to include in your new analysis.

The attached letter references 90 separate attachments. We have included a hard copy of each attachment with this letter, as well as a CD with an electronic copy of each attachment. We have also included CDs to all parties copied on the original letter.

Please note that the attached letter contains the following three minor changes from the letter emailed to you on Nov. 30:

- We have corrected a pinpoint citation in footnote 95.
- Minor corrections to heading numbers.

Please do not hesitate to contact me if you have any questions about this submission.

Thank you,

Kym Hunter
Staff Attorney

CC (via U.S. mail):

Tim Gestwicki, NCWF
Dean Naujoks, Yadkin Riverkeeper
June Blotnick, Clean Air Carolina
Scott Slusser, NCDOJ
Secretary Gene Conti, NCTA
John Sullivan, FHWA
Chris Militscher, USEPA
Liz Hair, USACE
Carl E. Pruitt, USACE
Marella Buncick, USFWS
Marla Chambers, NCWRC
Alan Johnson, NCDWQ
Amy Simes, NCDWQ
Bob Cook, MUMPO
Dana Stoogenke, RRRPO

Encls.

Table A-3: **Southern Environmental Law Center**

Document: **i003 Letter dated December 3, 2012**

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Clarification	Letter corrected items from SELC 11/30/12 letter (i-004)	No response required.

SOUTHERN ENVIRONMENTAL LAW CENTER

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November 30, 2012

Via E-mail and U.S. Mail

Ms. Jennifer Harris
Director of Planning & Environmental Studies
North Carolina Turnpike Authority
1 South Wilmington Street
Raleigh, NC 27601
jhharris1@ncdot.gov

Re: Monroe Connector/Bypass: Supplemental Environmental Analysis

Dear Ms. Harris:

On May 3, 2012, the United States Court of Appeals for the Fourth Circuit ruled that the environmental analysis performed for the Monroe Connector/Bypass was arbitrary and capricious. *N.C. Wildlife Fed'n v. N.C. DOT*, 677 F.3d 596 (4th Cir. 2012). Subsequent to the ruling, on July 17, 2012, the Federal Highway Administration ("FHWA") rescinded the Record of Decision ("ROD") for the toll highway. Since that time, the North Carolina Turnpike Authority ("NCTA") has stated its intent to pursue a new approval from FHWA. On behalf of the North Carolina Wildlife Federation, Clean Air Carolina, and the Yadkin Riverkeeper, the Southern Environmental Law Center ("SELC") has continued to monitor additional steps being taken by NCTA in pursuit of a new ROD. These efforts, like the Environmental Impact Statement ("EIS") that came before, fall far short of meeting the requirements of the National Environmental Policy Act ("NEPA").

After closely monitoring NCTA's continued pursuit of the Monroe Bypass/Connector, we have documented below the flaws that we believe persist in NCTA's analysis. While we have not yet been afforded the opportunity to review NCTA's new documentation in its entirety, we have reviewed some of the agency's communications to state and federal resource agencies over the past several months. The comments below stem from our review of those materials and other statements and presentations made by NCTA at public meetings and in the press. The comments below also address new information that has come to light since the publication of the first EIS, which casts substantial doubt on a number of NCTA's analyses and conclusions.

We were invited by NCTA's counsel, Scott Slusser, to submit comments at this stage and hope that our early submission will allow NCTA to address our concerns as it moves forward with its ongoing analysis of the impacts of the Monroe Connector/Bypass and other alternative solutions to transportation issues in Union County. We submit these comments at this time as a

courtesy to NCTA, and in no way waive our right to supplement our comments at a later date. If NCTA does intend to publish a new environmental document under NEPA for the Monroe Connector/Bypass, we will review that document and comment during the public comment period.

I. INTRODUCTION

In its recent opinion, the United States Court of Appeals for the Fourth Circuit held that the environmental analysis of the Monroe Connector/Bypass was arbitrary and capricious. *N.C. Wildlife Fed'n,* 677 F.3d at 596. The Court found "fundamental" errors in NCTA's analysis, which invalidated both the consideration of alternatives and environmental impacts based on the flawed baseline. *Id.*; *see also Friends of Back Bay v. U.S. Army Corps of Engineers*, 681 F.3d 581, 588 (4th Cir. 2012). Accordingly, the Court vacated the earlier judgment of the District Court and remanded the EIS for the transportation agencies to "reevaluate." *N.C. Wildlife Fed'n*, 677 F.3d at 605 n.5.

Despite the clear mandate from the one of the nation's second highest courts to revisit its earlier flawed analysis, NCTA has unfortunately chosen not to address the key errors head on, but rather to merely re-explain its earlier rejected analysis. Consequently, as detailed below, both the impacts analysis and the alternatives analysis for the Monroe Connector/Bypass remain fundamentally flawed. Further, because NCTA has continued to actively pursue construction of the toll highway prior to any opportunity for new public input and prior to a new ROD, the agency has engaged in illegal pre-determined decisionmaking.

II. NCTA'S IMPACTS ANALYSIS IS ARBITRARY AND CAPRICIOUS

1

NCTA's original EIS concluded that the Monroe Connector/Bypass would have less than a 1% impact on growth outcomes.[1] As the Fourth Circuit noted, this conclusion was reached despite the fact that the NEPA process was "devoid of any evidence establishing that the region is developmentally saturated such that a major toll road will have no appreciable environmental impact." *N.C. Wildlife Fed'n*, 677 F.3d at 603 n.2. Rather, the outcome was obtained by reliance on inaccurate models which assumed the construction of the Monroe Connector/Bypass in both "Build" and "No-Build" scenarios. *Id.* at 600. NCTA has indicated that it will not address the reality of this conclusion, nor will the agency correct the flawed model from which the conclusion sprang.

A) <u>The Conclusion that the Twenty-Mile Toll Highway will not Induce Growth is Inconsistent with all other Analyses.</u>

Rather than disclose the true environmental impact of the Monroe Connector/Bypass in a new environmental document, NCTA has stated its intent to stick to the conclusion reached in the original, rejected EIS, that the Monroe Connector/Bypass will make little difference to growth and development patterns in the study area. As explained in more detail below, this doggedly-held position sits at odds with all other analyses of the proposed Bypass, including:

[1] Monroe Connector/Bypass, Final Environmental Impact Statement (FEIS) at 2-45.

- All public and political justifications for the Monroe Connector/Bypass
- Planned developments dependent on the Monroe Connector/Bypass
- Conclusions in other documents produced by NCTA
- Updated forecasts of growth in Union County
- Academic research into the effects of highway construction

i) Public statements by community leaders about the Monroe Connector/Bypass demonstrate that it will bring growth and development to the region.

1) Local Level

2 Local elected officials and other public figures are near united in their belief that the Monroe Connector/Bypass will bring growth and development to Union County. For example, the Union County Chamber of Commerce has acknowledged the Monroe Connector/Bypass's propensity to induce growth, noting it would provide a significant boost to existing businesses and factor into the decision of any business considering operations in the county.[2] It has noted that the Bypass would "greatly enhance" Union County's "competitiveness for office and
3 industrial development,"[3] and stated that "[t]own leaders are preparing for more commercial and residential growth plus increased traffic with completion of the Monroe Bypass freeway."[4] And when addressing a delay in the Bypass, Union County Chamber of Commerce President Sharon Rosché stated: "That's going to delay progress . . . [i]t will delay Union County from doing the things it needs to do to attract different types of businesses and corporations to enhance our economic tax base."[5]

The Charlotte Chamber of Commerce has also has determined that the Bypass will spur growth. In a recent letter to the Charlotte Observer, Charlotte Chamber Chairman Frank Emory and Chamber President Bob Morgan stated: "That there will be an economic impact of the
4 Garden Parkway and the Monroe Connector is not debatable."[6] They argued that the Bypass is a "critical component" of infrastructure affecting the movement of goods through that area of the state and emphasized that "[t]he fact that road and transportation infrastructure spurs economic development is evident throughout history."[7]

Further, the City of Monroe has recognized that the Bypass "could create new
5 commercial development opportunities along the new roadways."[8] And local elected officials,

[2] Adam Bell, *Bypass Delays Concern Business Leaders*, SOUTH CHARLOTTE NEWS (April 24, 2011), *available at* http://www.charlotteobserver.com/2011/04/24/2240539/bypass-delays-concern-business.html#ixzz1WQdfm7Ul#storylink=cpy, Attachment 1.
[3] Union County Chamber of Commerce, *Preliminary Testing Begins for Long Awaited Monroe Parkway*, BUSINESS NEWS 2010 (Feb. 5, 2010), *available at* http://www.unioncountycoc.com/bn-2010.html, Attachment 2.
[4] Union County Chamber of Commerce, Welcome Guide to Union County 2006-07, at 19, Attachment 3.
[5] Adam Bell, *Bypass Delays Concern Business Leaders*, SOUTH CHARLOTTE NEWS (April 24, 2011), Attachment 1.
[6] Frank Emory and Bob Morgan, *Garden Parkway, Monroe Connector Will Boost Area Economy*, CHARLOTTE OBSERVER (May 10, 2012), *available at* http://www.charlotteobserver.com/2012/05/10/3229861/garden-parkway-monroe-connector.html, Attachment 4.
[7] *Id.*
[8] City of Monroe Downtown Master Plan, at 42 (February 2008), Attachment 5.

5 cont such as Indian Trail's Mayor John Quinn, also believe the Monroe Connector/Bypass would cause growth in Union County, stating that the Bypass would decrease traffic on U.S. 74 by a third and open up opportunities for new development.[9]

Several local government entities are currently engaged in the U.S.-74 Revitalization Study, a coordinated effort among groups within the U.S.-74 Corridor to, among other things, plan for the expected growth that is expected to result from the Bypass.[10] The study analyzes the U.S.-74 Corridor by breaking it down into segments, each of which directly corresponds to a planned interchange with the proposed Toll Highway.[11] The Plan's discussion of each segment is often couched in terms of its relation to the Bypass. Regarding the Indian Trail Segment, for example, the Plan posits that "proposed Monroe Bypass will create opportunities for the Town of Indian Trail as well." It expands:

> 6 The direct access to the heart of the Town via Indian Trail Road will create an opportunity for a Mixed Use Gateway Development around the intersection of U.S.-74 and Indian Trail Road . . . . This mixed use development will complement downtown Indian Trail and will create a draw for the downtown by attracting motorists from the Monroe Bypass and U.S.-74 corridor. This development could comprise of major retail, residential, and office uses organized in a town-center layout with equal emphasis on pedestrians and bicyclists.[12]

Community stakeholders are also anticipating growth from the Bypass. For example, the Charlotte Regional Partnership has called the Monroe Connector/Bypass "a key part of future business growth and prosperity of Union County," stating that the Bypass would be a "business
7 asset" and "a boon for tourists and commuters."[13] And the South Piedmont Community College set out in its Master Plan that "[i]t is anticipated that major growth will occur in the Anson County service area in 2013 when North Carolina Turnpike Authority completes the Monroe Connector/Bypass highway construction project."[14] Recently, a pro-Bypass Facebook group has developed, promoting the Bypass primarily in terms of the road's expected economic impact on Union County.[15]

[9] *Union Co. Official Planning Changes For Major Road*, WSOC-TV (July 27, 2011), *available at* http://www.wsoctv.com/news/news/union-co-officials-planning-changes-for-major-road/nDYzG/, Attachment 6.
[10] HNTB North Carolina, P.C., *U.S.-74 Corridor Revitalization Study: Framework Plan*, at 66 (June 2012), Attachment 7 (noting that "the completion of the Monroe Bypass will create new opportunities for retail development on the north-side of [Union] County").
[11] *Id.* at 83.
[12] *Id.* at 86.
[13] Charlotte Regional Partnership, *Monday Memo: Charlotte Energized* (April 25, 2011), *available at* http://charlotteusa.com/news-media/monday-memo/charlotte-energized/, Attachment 8.
[14] South Piedmont Community College, FACILITIES MASTER PLAN, (May 2008), Attachment 9.
[15] Keep Union County Moving Facebook Group, About, *available at* http://www.facebook.com/KeepUnionCountyMoving#!/KeepUnionCountyMoving/info ("Give drivers a choice! Build the Monroe Connector/Bypass to create jobs, relieve congestion on Highway 74 and improve our economy. . . . Transportation plays a critical role in Union County's economy."), Attachment 10.

2) State Level

8 Analysis from North Carolina State Government, of which NCTA is a part, also contradicts the agency's conclusions. Earlier this year, Lieutenant Governor Dalton and the State's Logistics Task Force published a report that analyzed different transportation and logistics projects in the State of North Carolina.[16] In the report, the Task Force concludes that the Monroe Connector/Bypass is "important or critical" to a number of development projects, including the proposed Legacy Business Park, discussed below, the intermodal Center at the Charlotte Douglas Airport, and the development of potential inland ports in Salisbury and Rowan Counties and Statesville and Iredell Counties.[17]

9 The Logistics Task Force Report also incorporates a study entitled the "Seven Portals Study" which discusses each region of the State in more detail.[18] The report for the Charlotte region describes the connection between the Monroe Connector/Bypass and development in Union County, explaining that manufacturing has been declining in the County and that the additional infrastructure and the proposed Legacy Business Park will be a key piece of bringing it back and attracting new development to the region.[19] Even the North Carolina Maritime strategy cites the Monroe Connector/Bypass as important to increased development in the State.[20]

10 If it were not enough that State level reports predict significant growth and development from the Bypass, statements from *NCTA itself* have echoed the same message. For example, John Collett, a member of the N.C. Board of Transportation and NCTA Board of Directors, stated in an editorial in the Charlotte Business Journal that the Monroe Connector/Bypass "will create jobs" because it will relieve congestion on a major route into Charlotte by providing an alternative to U.S. 74[21] He also explained that the Bypass will result in growth because it "will make the region more attractive to industry and tourism and a better location for commercial shippers."[22]

A1-46

11 Despite statements at every level of Government that the Monroe Connector/Bypass will bring significant growth and development to Union County and beyond, NCTA persists in advancing the fiction in its environmental documents that the project will not impact growth outcomes. NCTA's draft "Union County Growth Factors" Memo states that "transportation infrastructure improvements are not the main driver of the rapid growth in Union County."[23] Rather, the memorandum suggests that income, land availability and school quality are the

[16] *Governor's Logistics Task Force, Final Report*, at 81 (2012), Attachment 11.
[17] *Id.*
[18] S. Gary Teng, Edd Hauser, and Yiping Lu, *Seven Portals Study: An Investigation of Economic Development in North Carolina Through Logistics Villages* (Dec. 31, 2011), Attachment 12.
[19] *Id.* at 40-41.
[20] AECOM, North Carolina Maritime Strategy Final Report, at 86-87, 97, 144-48 (June 26, 2012), Attachment 13.
[21] John Collett, *Bypass Critical in Monroe*, CHARLOTTE BUSINESS JOURNAL (May 13, 2011), *available at* http://www.bizjournals.com/charlotte/print-edition/2011/05/13/bypass-critical-in-monroe.html, Attachment 14.
[22] *Id.*
[23] Baker Engineering, Draft, *Union County Growth Factors* Memo, at 17 (Sept. 11, 2012), Attachment 15.

driving forces behind growth in the area.[24] The memo thus concludes that the previous conclusions about the Monroe Connector/Bypass in the original EIS remain correct.

11 cont NCTA must reconcile these conflicting statements. "The very purpose of public issuance of an environmental impact statement is to 'provid[e] a springboard for public comment.' " *N.C. Wildlife Fed'n*, 677 F.3d at 603 (quoting *DOT v. Public Citizen*, 541 U.S. 752, 768 (2004)). State lawmakers are poised to invest $24 million per year for forty years to the Monroe Connector/Bypass, based on their repeatedly-stated conclusion that the toll road will spur growth and economic development. If that conclusion is untrue, the State must make that clear and explain why the ingrained beliefs of public officials are false and mistaken. Only then can the public know exactly how and why its tax dollars are being spent.

ii) Planned Developments must be accounted for in the EIS

1) Legacy Park

12 As discussed above, numerous high-level state officials and local leaders and stakeholders anticipate significant growth and development from the Bypass. This belief is not derived from vague hopes, but is based on concrete plans. One of the most striking examples of these plans is the proposed Legacy Business Park ("the Park"), a 5,000-acre business park and "inland port" planned to be constructed at the end of the Monroe Connector/Bypass in Wingate.[25] As planned, the Park would be the largest business park in North Carolina and would attempt to bring over 20,000 jobs to the region.[26] Just Phase 1 of the project is itself a massive undertaking involving significant growth: The first stage of Park development involves 1750 acres accommodating 11 rail-served industrial sites, a light industrial site, two office institutional sites, and a rail facility adjacent to the existing CSX rail line.[27] However, the 5,000 acre footprint of the fully built-out park is just a fraction of the development and construction that will result in the event that the Park moves ahead as planned.

13 Plans for the Park make clear that it is integrally connected to the Monroe Connector/Bypass. Indeed, the Park's very feasibility depends on construction of the Toll Highway.[28] A road, "Legacy Parkway," is already planned to connect the park to the Bypass via

[24] *Id.*
[25] Union County Partnership for Progress, *Project Legacy Business Park in Union County, NC, available at* http://www.unioncpp.com/legacy/phase1.html, Attachment 16; Ken Elkins, *Union County Plans Huge Industrial Park*, CHARLOTTE BUSINESS JOURNAL (Nov. 19, 2008), *available at* http://www.bizjournals.com/charlotte/stories/2008/11/17/daily26.html, Attachment 17.
[26] Abby Cavenaugh, *New Union Business Park May Have 'Dramatic Impact'*, AnsonRecord.com (Feb. 25, 2009), *available at* http://ansonrecord.com/bookmark/1990185-New-Union-business-park-may-have-%E2%80%98dramatic-impact%E2%80%99#ixzz1WQg9UIrc, Attachment 18; Union County Partnership for Progress, *Union County Partnership Email Newsletter* (February 2009), *available at* http://www.unioncpp.com/news/Feb2009newsletter.html, Attachment 19.
[27] Union County Partnership for Progress, *Project Legacy Business Park in Union County, NC, available at* http://www.unioncpp.com/legacy/phase1.html, Attachment 16.
[28] Union County Partnership for Progress, *Project Legacy Plans, available at* http://www.unioncpp.com/legacy/index.html, Attachment 20; Dana Stoogenke, Rocky River RPO, *Marshville Special Study* Memo, at 1 (August 20, 2010) (key Park proponent's "main concern is the lack of direct access from the Project Legacy site to the Monroe Connector/Bypass"), Attachment 21.

13 cont the Forest Hill interchange;[29] upon completion of the Monroe Connector/Bypass, the western entrance to Project Legacy would be a short distance to I-485 and allow even faster access to the Charlotte-Mecklenburg area.[30] And even before the Legacy Parkway was publicly proposed, the
14 NCTA recognized the importance of keeping key project proponents engaged in the planning process for the Bypass.[31] As the environmental review process moved forward, NCTA assured
15 local leaders that the Bypass plans would accommodate Park access.[32]

Several key state officials and institutions have underscored the growth expected from the Park. For example, Lt. Governor Dalton highlighted the Legacy Park's economic development potential at the Union County Partnership for Progress's 2011 Annual meeting.[33] Dalton discussed the growth likely to result from the Park and noted that transportation projects like the Park's planned rail connections will ensure that Union County will be a part of statewide
16 initiatives to make North Carolina a key East Coast distribution hub. And Keith Crisco, N.C. Commerce Secretary, praised and promised support for the project.[34] The Anson County Chamber of Commerce has also recognized the of the likelihood of growth impacts associated with the Legacy Park; on February 18, 2009, the Chamber met to discuss the "dramatic impact" expected to result from the project.[35] The Union County Board of Commissioners included the Park in their 2025 Comprehensive Plan, stating that the Wingate-Marshville area "is likely to be
17 a major opportunity area once the new Monroe Connector/Bypass is in place."[36] The Board also incorporated the Park into its employment forecasts.[37] The Park is also assumed in the U.S.-74 Revitalization Study projections for industrial growth in the area.[38]

[29] Seven Portals Study, Attachment 12 ("Management developing this logistics site indicates, however, that the success of their venture will depend very much on the completion of the Monroe Connector/Bypass, a project of the NC Turnpike Authority . . . ."); *see also id.* at 41 ("Considering the estimated values of time shown in Table 3-7, the value per commercial vehicle, generated by time saved using the Monroe Connector/Bypass, can have significant impact on the cost of the future Legacy Park's operations."); *id.* at 40 ("The Monroe Connector/Bypass and Legacy Park both took giant steps forward with the awarding of a $368 million construction contract to contractors on October 28, 2010.").
[30] Union County Partnership for Progress, *Project Legacy Plans*, *available at* http://www.unioncpp.com/legacy/index.html, Attachment 20.
[31] Monroe Connector/Bypass Coordination Meeting, Minutes (Jan. 4, 2007), Attachment 22.
[32] E-mail from Reid Simmons, NC Turnpike Authority, to Radford Thomas, Town of Marshville Town Planner (Oct. 18, 2010), Attachment 23; *see also* Dana Stoogenke, Rocky River RPO, *Marshville Special Study*, at 1 (August 20, 2010) (Rocky River RPO noting that it "spoke to NCTA staff about marking the [Legacy Park] site as a potential interchange, in case the Design-Build team deletes the [Forest Hill] interchange."), Attachment 21.
[33] Union County Partnership for Progress, *Union County Partnership Email Newsletter* (July 2009), *available at* http://www.unioncpp.com/news/July2009newsletter.html, Attachment 24.
[34] Jim Carpenter, *N.C. Commerce Secretary Praises Legacy Park, CEM*, Union County Chamber of Commerce: Jim's Biz Hotline (Jan. 6, 2010), *available at* http://jimsbizhotline.wordpress.com/2010/01/06/n-c-commerce-secretary-praises-legacy-park-cem/, Attachment 25.
[35] Abby Cavenaugh, *New Union Business Park May Have 'Dramatic Impact'*, AnsonRecord.com (Feb. 25, 2009), *available at* http://ansonrecord.com/bookmark/1990185-New-Union-business-park-may-have-%E2%80%98dramatic-impact%E2%80%99#ixzz1WQg9UIrc, Attachment 18.
[36] *Union County, North Carolina 2025 Comprehensive Plan*, at 30-31, Attachment 26.
[37] *Id.* at 70 (noting employment forecasts assume "[l]and has been assembled and rezoned for employment uses in close proximity to Monroe Bypass/Connector interchanges, with a large industrial concentration near the highway's eastern terminus at U.S.-74").
[38] HNTB North Carolina, P.C., *U.S.-74 Corridor Revitalization Study: Framework Plan*, at 72 (June 2012), Attachment 7.

Many other sources have highlighted that the Bypass is critical to the success of Legacy Park. Maurice Ewing, head of Union County Partnership for Progress, the county's economic development arm and champion of the project, has acknowledged that the Park in its current form would not proceed without the Bypass,[39] stating that "[w]ithout the bypass, Legacy doesn't
18 work . . . ."[40] and that the Monroe Connector/Bypass "will be critical" to the Park.[41] Marshville Mayor Franklin Reese also emphasized this connection, explaining recently that if the Bypass is built, it is "90 percent certain" that the Park would follow.[42] And Union County planning director Richard Black stated that the Park is contingent on the Bypass. Black concluded that the Park is a likely development so long as the Bypass is built and that it should have been included in Union County's 2010 long-range land-use plan.[43]

Further, as noted above, the recently released report from the Governor's Logistics Task Force and the associated Seven Portals Study further underscore the connection between the two projects and the dependency of the Park on the Bypass. The studies note that the Bypass is
19 "key" not only to Legacy Park, but to a number of proposed developments in Union County.[44]

In other words, the Park will not move forward without the Monroe Connector/Bypass, and is thus an indirect effect of the Bypass that must be considered in the environmental analysis.

With regard to the analysis of reasonably foreseeable indirect impacts of a project, NEPA guidance states that:

> [I]f there is total uncertainty about the identity of future land owners or the nature of future land uses, then of course, the agency is not required to engage in speculation or contemplation about their future plans. But, in the ordinary course of business, people do make judgments based upon reasonably foreseeable occurrences. It will often be possible to consider the likely purchasers and the development trends in that area or similar areas in recent years; or the likelihood that the land will be used for an energy project, shopping center, subdivision, farm or factory. The agency has the responsibility to make an informed judgment, and to estimate future impacts on that basis, especially if trends are ascertainable or potential purchasers have made themselves known. The agency cannot ignore these uncertain, but probable, effects of its decisions.[45]

[39] Adam Bell, *Bypass Delays Concern Business Leaders*, SOUTH CHARLOTTE NEWS (April 24, 2011), *available at* http://www.charlotteobserver.com/2011/04/24/2240539/bypass-delays-concern-business.html#ixzz1WQdfm7Ul#storylink=cpy, Attachment 1.
[40] Ken Elkins, *Paving Way for Business in Union County*, CHARLOTTE BUSINESS JOURNAL (Nov. 5, 2012), *available at* http://www.bizjournals.com/charlotte/print-edition/2010/11/05/paving-way-for-business.html, Attachment 17,
[41] Union County Partnership for Progress, *Union County Partnership Email Newsletter* (July 2009), Attachment 24.
[42] Steve Harrison, *New Questions Jeopardize Monroe Connector/Bypass*, CHARLOTTE OBSERVER (Nov. 17, 2012), *available at* http://www.charlotteobserver.com/2012/11/17/3672447/new-questions-raised-about-turnpike.html, Attachment 27.
[43] *Id.*
[44] *Governor's Logistics Task Force, Final Report*, at 81 (2012), Attachment 11 ("Key to any of the sites discussed above and in the Seven Portals Study is the completion of the Monroe By-Pass.").
[45] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026 (March 23, 1981).

This guidance makes clear that an analysis of Legacy Park must be included in the Monroe Connector/Bypass EIS. There are a number of highly specific plans for the Park included on the Project website, in the Governor's recently released Logistics Task Force Report, and in other documents obtained by SELC.[46] Furthermore, a task force, including representatives from NCTA and the North Carolina Department of Commerce, has conducted extensive meetings to discuss plans for the Park.[47] The Union County Board of Commissioners has approved a $556 million, 20-year capital improvement project that includes plans to install
20 water and sewer lines to serve the Legacy Park.[48] The Park has also been incorporated into planning for the Centralina Freight-Mobility Plan.[49] In short, NCTA's informed judgment would have to conclude that the Park is a likely result of construction of the Bypass.

Plans for the Park have gone so far that potential private partners have begun to "make themselves known,"[50] including the CSX rail corporation. Indeed, state transportation officials have played a central role in encouraging these private partners to come on board and ensure that Legacy move forward. The Executive Director of the NCTA took a special trip to Jacksonville, Florida in an effort to persuade CSX railway to sign on to the project.[51] His role was to be "wildly enthusiastic" when discussing the Monroe Connector/Bypass and its relation to the Legacy project.[52] And NCDOT executive Roberto Canales has been part of the task working to develop the Park's rail facility.[53]

We also note that more than half of the acreage to be incorporated into the Park is owned by the estate of Carroll Edwards, a former Board of Transportation member who resigned in 1997 after it was revealed that he improperly steered NCTA projects to benefit himself or his businesses, or his family.[54] The project has thus not only been planned in great detail, but NCDOT has been fully involved in those plans for many years.

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[46] *See* Union County Partnership for Progress, Project Legacy Maps and Plans, Attachment 28.
[47] E-mail from Maurice D. Ewing, Union County Partnership for Progress, to Barry Moose, Dana Stoogenke, Gretchen Carson, J. Keith Crisco, John Dillard, Michael Trotter, and Parker McCrary (Nov. 2, 2011), Attachment 29; E-mail from Maurice D. Ewing, Union County Partnership for Progress, to Dan Murphy, Cindy Coto, Dale Carroll, Jed McMillan, Jim Van Derzee, Roberto Canales, Vance Bennett, Barry Moose, Dana Stoogenke, J. Keith Crisco, John Dillard, Michael Trotter, Parker McCrary, Richard M. Hood (Dec. 5, 2011), Attachment 30.
[48] Heather J. Smith, *Plan for Utilities Approved*, THE ENQUIRER JOURNAL (Dec. 26, 2011) Attachment 31.
[49] E-mail from Maurice Ewing to Cindy Cotot, Dale Carroll, Gretchen Carson, Jed McMillan, Jim Van Derzee, Roberto Canales, Vance Bennett, Barry Moose, Dana Stoogenke, J. Keith Crisco, John Dillard, Michael Trotter, Parker McCrary, Richard M. Hood (Jan. 31, 2012), Attachment 32.
[50] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026 (March 23, 1981).
[51] E-mail from Maurice Ewing, Union County Partnership for Progress, to David Joyner, North Carolina Turnpike Authority (Aug. 19, 2010), Attachment 33.
[52] *Id.*
[53] E-mail from Maurice D. Ewing, Union County Partnership for Progress, to Barry Moose, Dana Stoogenke, Gretchen Carson, J. Keith Crisco, John Dillard, Michael Trotter, and Parker McCrary (Nov. 2, 2011), Attachment 30; Steve Harrison, *New Questions Jeopardize Monroe Connector/Bypass*, CHARLOTTE OBSERVER (Nov. 17, 2012), Attachment 27.
[54] SELC Map, Land Parcel Spreadsheet, Attachment 34; North Carolina Board of Transportation, 2011 Minutes, at 2608-09 (Jan. 6, 2011), Attachment 35; Steve Harrison, *New Questions Jeopardize Monroe Connector/Bypass*, CHARLOTTE OBSERVER (Nov. 17, 2012), Attachment 27.

Despite the clear requirement to disclose Legacy Business Park and associated development as an indirect impact of the Bypass, NCTA failed to perform this analysis in its initial EIS. The only reference to the project was a brief mention in the Qualitative ICE study which failed entirely to mention the connection between the Business Park and the Toll Highway. Indeed, the EIS suggests that the decision to build the Park is entirely independent of the proposed Bypass, despite all the evidence to the contrary set out above.

Most troubling, the failure to present the link between the two projects to the public appears to have been purposeful. In an e-mail obtained by SELC through a public records request, one of Legacy Park's key proponents stated that he would heed NCTA's advice and be "guarded" and "cautious" in discussing the essential relationship between the Business Park and the Bypass.[55] This same individual has continued to warn active parties to be "particularly
21 sensitive to the need to keep this project and [their] current level of activity confidential."[56] These comments suggest that NCTA is once more failing to be open and transparent with the public.[57]

As NCTA moves forward with its analysis of the Monroe Connector/Bypass, it is essential that reasonably foreseeable development dependent on the highway's construction be fully examined in a future ICE analysis. NCTA has indicated that it intends to discuss indirect effects with RPOs in the area. A discussion with the Rocky River RPO ("RRRPO") should be informative in this regard. Records indicate that the RRRPO has already generated socio-economic forecasts that anticipate Legacy Park's construction, analyzing the Park's regional impacts over the next 30 years.[58] The RRRPO predicts the creation of thousands of jobs in the area as a result of the Park[59] and recognizes that the Park's likely impact includes a rail facility, distributions centers, increased truck traffic, and the build out of other facilities such as office, institutional, commercial, and manufacturing facilities.[60] The RRRPO also recognizes that the associated growth could prompt offsite housing developments and predicts they would occur mostly north and west of Marshville and to some extent in Anson County.[61]

2) <u>Strategic Plan for Towns of Marshville and Wingate</u>

Plans from the Towns of Wingate and Marshville also demonstrate that the Monroe Connector/Bypass will induce substantial development. The two municipalities began strategic
22 planning efforts in 2008 focused towards capitalizing on the growth expected from the Bypass's

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[55] E-mail from Maurice D. Ewing to Steve Dewitt and Christy Shumate (June 7, 2009), Attachment 36.
[56] E-mail from Maurice D. Ewing, Union County Partnership for Progress, to Dan Murphy, Cindy Coto, Dale Carroll, Jed McMillan, Jim Van Derzee, Roberto Canales, Vance Bennett, Barry Moose, Dana Stoogenke, J. Keith Crisco, John Dillard, Michael Trotter, Parker McCrary, Richard M. Hood (Dec. 5, 2011), Attachment 30.
[57] Kevin Seirs, Turnpike Authority, cartoon, CHARLOTTE OBSERVER (November 19, 2012), *available at* http://www.charlotteobserver.com/2012/11/19/3676952/turnpike-authority.html, Attachment 37.
[58] Dana Stoogenke, Rocky River RPO, *Marshville Special Study*, at 1 (August 20, 2010) (key Park proponent's "main concern is the lack of direct access from the Project Legacy site to the Monroe Connector/Bypass") Attachment 21; *see also* Town of Marshville, TAZ Data (Sept. 9, 2010) (projecting expected growth resulting from the Park), Attachment 38.
[59] Town of Marshville, TAZ Data, Attachment 38.
[60] Dana Stoogenke, Rocky River RPO, *Marshville Special Study*, at 1 (August 20, 2010), Attachment 21.
[61] *Id.*

22 cont construction. Published plans state that the Bypass served as a "catalyst" that prompted the municipalities to join with the Union County Partnership for Progress to commission a Strategic Plan for Economic Development.[62] The study is intended to "create a vision and proactive approach towards future development in this transportation corridor which can completely transform the economic landscape of eastern Union County."[63] The Towns recognize that "major highway improvements are coming" and that these will provide "key infrastructure for both manufacturing and retail growth" as well as open land" to develop the towns into a "[s]uburban fringe area."[64]

To create the plan, consultants engaged with the communities to identify several top priorities to plan for and encourage the growth associated with the Bypass. These included developing business corridors and an industrial park, proactively recruiting targeted businesses, encouraging private investment and developments, and expanding water and sewer availability.[65] The study also specifically focuses on utilizing the Bypass interchanges as "gateways to the communities." [66] It sets out plans to recruit an anchor destination to divert traffic off the highway, such as a major water park, skateboard/BMX bike competition arena, equestrian center, or outlet malls, [67] and details several regional examples of such developments.[68]

22 cont The study expressly recognizes that the Bypass "will be the impetus that creates market demand for many other development projects."[69] The study also stresses that the Bypass is key to any of the outlined developments: "[I]f the road does not start on schedule, other development projects will likely be delayed."[70] The study outlines plans to support and develop the Bypass project and to keep the project on schedule in order to take advantage of the growth expected to result from the Bypass.

A1-49

22 cont In light of this study, which was published before the original EIS for the Monroe Connector/Bypass was put together, NCTA's finding that the Bypass will not induce growth and development is yet again refuted. NCTA should incorporate the predictions of Marshville and Wingate into its next environmental document.

3) Union County 2025 Comprehensive Plan

23 The Union County Board of Commissioners also recognized the Bypass's potential for growth in its 2025 Comprehensive Plan. The Board states that the Bypass "will open many doors for new commerce in Union County."[71] They state that "The U.S.-74 'Monroe'

[62] GREENFIELD, STRATEGIC PLAN FOR ECONOMIC DEVELOPMENT: TOWN OF MARSHVILLE, TOWN OF WINGATE (Oct. 2008), Attachment 39.
[63] *Id.* at 1.
[64] *Id.* at 9.
[65] *Id.* at 2, 7, 13-15.
[66] *Id.* at 17.
[67] *Id.* at 17.
[68] *Id.* at Appendix 7.
[69] *Id.* at 25.
[70] *Id.*
[71] Union County Board of Commissioners, *Union County, North Carolina 2025 Comprehensive Plan*, at 45 (adopted on October 18, 2010), Attachment 40.

23 cont Connector/Bypass will be an important transportation facility and economic generator in the County for years to come."[72] As such, the Plan details strategy and considerations essential to encouraging and facilitating development resulting from the Bypass.

For example, the Plan recognizes that "coordination with multiple jurisdictions in the County, including the North Carolina Turnpike Authority, the governments of Stallings, Hemby Bridge, Lake Park, Indian Trail, Unionville, Monroe, Wingate, and Marshville, the Partnership for Progress, and other entities" will be necessary to ensure "cohesive development at key nodes in the corridor, appropriate design guidelines for future development, and traffic flow in the corridor."[73] The Plan directs the Board to "work with the municipalities to coordinate growth and development along the Monroe Connector/Bypass corridor to encourage economic development"[74] and recommends that "[p]lanning for development at the connector/bypass's interchanges, particularly in areas of shared planning jurisdiction, will be an important focus for the County."[75]

The Plan outlines specific areas for "new residential and non-residential development in [the Monroe Connector/Bypass] corridor," and includes "Future Land Use" maps showing "where market feasibility for non-residential development is highest (mostly near new interchanges)."[76] It notes that the growth is expected in the primarily rural eastern portion of Union County to such an extent that the rural character is likely to change.[77] Growth is also expected in the "marketable retail lands . . . located along the new Monroe Bypass interchanges in the western portions of the County along NC-84 and NC-16 and in the northeastern portions of the County on NC-218."[78] The Plan also recognizes the likelihood of the Legacy Business Park, discussed above, noting that Wingate-Marshville "is likely to be a major opportunity area once the new Monroe Connector/Bypass is in place."[79]

Again, the Union County 2025 Plan, calls NCTA's conclusions into question, and must be considered and included in any future analysis.

iii) NCTA's Assessments of Impacts from the Bypass are Inconsistent and Contradictory

24 The conclusion that the Monroe Connector/Bypass will make little difference to growth outcomes is based on a flawed analysis performed in the Quantitative Indirect and Cumulative Effects ("ICE") analysis. As we explained in our briefs to the Fourth Circuit, this assertion is

[72] *Id.* at 44-45; *see also id.* at 30 ("Growth is envisioned to continue in the areas surrounding Monroe, driven by the availability of water and sewer service and transportation infrastructure (most notably the new Monroe Connector/Bypass).").
[73] *Id.* at 44-45.
[74] *Id.* at 25.
[75] *Id.* at 3.
[76] *Id.* at 30-35.
[77] *Id.* at 1 ("The eastern parts of Union County are primarily rural in character, but this is expected to change as growth continues westward and is spurred by the development of the Monroe Connector/Bypass.").
[78] *Id.* at 9.
[79] *Id.* at 30.

24 cont

contradicted by analysis and conclusions made in other documents compiled to review the Toll Highway, including documents that form part of the EIS.

1) Qualitative ICE

NCTA's Qualitative ICE analysis of the Monroe Connector/ Bypass, unlike its "quantitative" counterpart, actually concludes that the Toll Highway induce growth. The Qualitative study concludes that there is "high potential for new residential growth" in the eastern section of the study area where "build alternatives would improve access and allow for easier and faster commutes to the Charlotte-Mecklenburg urban area" and repeatedly cites the potential for growth in the central and eastern portions "because the project would improve travel time from those areas to Charlotte."[80]

Elsewhere, the Qualitative study expands on these conclusions. In the central section of the study area, the Toll Highway would enhance "access to Charlotte by providing a high-speed freeway in this zone with connection to I-485."[81] The study reports that the City of Monroe was planning "for higher intensity uses along US 601" because of the Toll Highway; land near interchanges and feeder roadways "would be more attractive for commercial and industrial development"; and in Stallings and Indian Trail "it is likely that additional residential development would occur."[82] In the eastern section, "[t]here would be high potential for accelerated growth," "[n]eighborhoods and retail development would likely concentrate in the vicinity of proposed interchanges and along feeder roads," and the Toll Highway "would make this area very attractive for residential development."[83] The qualitative study further concludes: "The project would likely induce an increase in proposed housing density in [the central portion] and pace of development in [the east]."[84]

2) Community Impact Study

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Similarly, the Community Impact Study in the original EIS states that "local planners believe that the project is vital to the economic well-being of Union County. Furthermore, local planners believe the project would benefit them in their goal to actively seek to attract commercial and industrial growth to boost the local tax base."[85] The Study also explains that "[t]he project will introduce a suburban element into what is generally a rural environment."[86]

3) Traffic and Revenue Study

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NCTA's traffic and revenue study for the proposed toll road, a necessary prerequisite for financing the project, also predicts growth and development. The study explains that "[f]uture economic growth potential is particularly important for the study of any new start-up toll facility

[80] Monroe Connector/Bypass FEIS Appendix G, at 6-7.
[81] *Id.* at 54.
[82] *Id.*
[83] *Id.* at 55.
[84] *Id.* at 72.
[85] Monroe Connector/Bypass, DEIS Community Impact Statement, at 58.
[86] *Id.* at 6.

26 cont

such as the proposed Monroe Connector."[87] In the case of the Toll Highway, the study makes clear that "the population and employment forecasts" used to calculate revenue were "directly related to the growth rates of traffic predicted" by the study's model.[88] The study adds, "[o]f particular importance is that the proposed Monroe Connector is included in the model and *influences the growth* forecasts therein."[89]

27

Despite these forecasts of growth attributable to the Toll Highway throughout the NEPA documentation, NCTA's ultimate conclusion in its original EIS was that the Bypass would make little difference to growth outcomes.[90] The document contained no reconciliation of the different conclusions reached in different aspects of the NEPA process. Without explanation, the Quantitative ICE results were adopted as the basis for the ROD, and the Qualitative Study, the Community Impact Study, and the economic revenue forecasts were disregarded. As NCTA has indicated that it will continue to rely on the conclusion of minimal growth reached in the Quantitative ICE, it is imperative that the agency reconcile this conclusion with other statements so that the public can be provided with a clear picture of the impacts attributable to the road.

4) TIFIA Application

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Further, in NCTA's application for federal TIFIA funds for the Bypass, the agency made clear that the project would be a driver of growth. In an attempt to secure federal financing, NCTA told the federal government in its Letter of Interest ("LOI") that construction of the Bypass would "allow the region to continue to be an attractive location for new businesses and additional residents."[91] The LOI put forth the position that by increasing travel-time savings, the Monroe Connector/Bypass would open new areas of eastern Union County, and perhaps even Anson County, for additional development — both residential and commercial/industrial."[92] These areas, the LOI went on to explain:

> are currently predominately rural and have actually lost population in recent years. In fact, Anson County is classified as an economically distressed region and has one of the highest unemployment rates in the state (15.6 percent). Despite recent trends, economic development experts in these areas are hopeful that the Monroe Connector/Bypass will revitalize these areas by providing quick and convenient access to the Charlotte-Mecklenburg urban area.[93]

The LOI touted the benefits of the proposed Legacy Park, explaining that:

> There are plans for new commercial/industrial development near proposed interchange areas in Wingate and Marshville, and the Union County Partnership for Progress is planning for a 5,000-acre business-industrial-educational park – to

[87] Proposed Monroe Connector Preliminary Traffic and Revenue Study Final Report (2006), Attachment 41.
[88] *Id.*
[89] *Id.* (emphasis added).
[90] Monroe Connector/Bypass, FEIS, at 2-45.
[91] North Carolina Turnpike Authority, Letter of Interest, Transportation Infrastructure Finance and Innovation Act, at 10 (March 2010), Attachment 42.
[92] *Id.*
[93] *Id.*

be called Legacy Park – north of U.S. 74 in Wingate. Plans for the Park are preliminary, but the group estimates the project, which would be built over 30 years or more, could employ up to 20,000 workers, and bring $2.3 billion in investment to the area. The Park will include major rail-served industrial sites and a 250-acre intermodal facility adjacent to the existing east west rail line. There are several locations away from the rail-served areas that are proposed for high-tech and educational uses.[94]

28 cont

Just as NCTA must be consistent within its EIS, so it must be consistent in all documents it is submitting to the federal government. Either the Monroe Connector/Bypass will induce growth and development or it will not. We note that an NCTA reviewer looking at the application commented that this section discussing induced growth was "a bit counter to other arguements" [sic].[95] We agree. The agency cannot chose one reality when asking for federal money, and then another reality to avoid rigorous federal environmental permitting and mitigation requirements.

iv) **New Socio-economic Forecasts Show that Growth Patterns are Changing**

1) Dr. Appold's Projections

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Dr. Steve Appold was retained by the Charlotte Regional Alliance For Transportation ("CRAFT"), which includes the Charlotte area's 4 MPOs and 2 RPOs, to develop regional socio-economic projections for the Charlotte Metrolina region for 2015-2045. After reviewing 2010 census data, Dr. Appold projected that future growth trends in the Metrolina region would be increasingly centralized, with the majority of growth occurring in Mecklenburg County and along the surrounding counties' adjacent edges.[96] Dr. Appold projected that the majority of growth in Union County would occur in the central and northwest districts (those abutting Mecklenburg County) rather than the County's more rural South and East districts, such as those in the Monroe Connector/Bypass study area.

NCTA should take these predicted future trends into account when considering the impact of the proposed Toll Highway. If Dr. Appold's projections are correct, then in absence of the Monroe Connector/Bypass we would expect to see minimal growth in Union County, particularly in its rural districts where the Bypass and Legacy Park are currently planned. These new projections directly contradict the demographic and economic forecasts that NCTA relied upon t in the initial Monroe Connector/Bypass EIS.

The "No-Build" scenario in the first Monroe Connector/Bypass FEIS was premised on demographic and economic forecasts for the Charlotte region developed by Dr. Thomas R. Hammer. Dr. Appold's projections call Hammer's estimates into serious question. Hammer's

[94] *Id.*
[95] North Carolina Turnpike Authority, Draft Letter of Interest, Transportation Infrastructure Finance and Innovation Act, at 10 (March 2010), Attachment 43.
[96] E-mail from Stephen Appold to Bjorn Hansen, Scot R. Sibert, Anna Gallup, Ruchi Agarwal, Amy Helms, C. Chorak, Robert Cook, Dana Stoogenke, D. Hooper, D. Ritsema, K. Wolf, Evan Lowry, M. Sandy, Wendy Bell, Bernie Yacobucci, Nadine Bennett, Joe McLelland, R. Black (Oct. 17, 2012), and attached *Metrolina District Densities* PDF, Attachment 44.

29 cont

Union County employment estimates are significantly higher than Appold's for each projection year; in fact, Hammer estimates more than double the jobs in Union County that Appold predicts for 2035, and nearly double Appold's projection for 2030.[97] Though the NCTA has accounted for Hammer's high Union County population estimates based on growth factors such as higher-quality housing stock and schools,[98] these factors do not explain why, in the absence of the Monroe Connector/Bypass, Union County would experience full economic growth including booming job growth, as predicted by NCTA, rather than serving simply as a bedroom community for the Charlotte-Mecklenburg region, as initially predicted by Dr. Appold. NCTA should carefully consider Dr. Appold's analysis in its review of the Monroe Connector/Bypass.

2) 2015-2050 Estimates from Local Planners

Recent socio-economic estimates from local land use planners made in conjunction with Dr. Appolds' forecasts, should also be taken into account by NCTA. For example, the RRRPO, in commenting on Dr. Appold's forecasts stated that "[s]everal infrastructure projects around Anson County will accelerate employment growth in the later years, specifically, the Monroe Bypass, the Wadesboro Bypass and I-73."[99] With regard to the study area specifically, the comments emphasized that "the Monroe Bypass will accelerate employment growth in the rural section of Union County."[100]

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Just like the myriad of other statements and projections noted above, the RRRPO estimates are inconsistent with NCTA's continued insistence that the Monroe Connector/Bypass will have almost no impact on growth outcomes. We hope that NCTA will coordinate with the RRRPO as it reevaluates the Toll Highway We note that during the previous NEPA process, despite two suggestions to discuss socio-economic projections with Ms. Stoogenke at the RRRPO,[101] no such coordination took place.[102]

v) **Academic Research Supports the Conclusion that Highways Induce Development.**

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Academic literature also supports the likelihood that the Monroe Connector/Bypass will spur growth in Union County. Transportation and planning experts have extensively studied the

[97] Dr. Steve Appold, *Projections Compared* Excel Sheet, at "counties" sheet (Sept. 20, 2012), Attachment 45 (Appold projects 70,176 jobs in Union County in 2035, whereas Hammer projects 141,704; Appold projects 66,730 jobs in Union County in 2030, whereas Hammer projects 128,494).
[98] Baker Engineering, *Union County Growth Factors* Memo, (Sept. 11, 2012) Attachment 15.
[99] Letter from Dana Stoogenke, Rocky River RPO, to Dr. Steven Appold, *RE: 2015-2050 Projections- Metrolina Regional Model* (Sept. 26, 2012), Attachment 46.
[100] *Id.*
[101] Monroe Connector/Bypass FEIS Appendix H, Quantitative ICE Analysis Appendix A, at PDF page 101-03 (notes from Baker Engineering's phone interview with Centralina COG, in which the COG directed Baker Engineering to contact "Dana Stoogenky" at the "Rocky River MPO" to discuss to the RPO's TAZ-level forecasting for the Marshville area), and at PDF page 111-13 (notes from Baker Engineering's phone interview with Town of Marshville Planning Department, in which the department directed Baker Engineering to contact Stoogenke concerning a feasibility study developed by the RRRPO).
[102] The Monroe Connector/Bypass ICE Quantitative Analysis does not mention coordinating with Dana Stoogenke or the RRRPO as a result of these suggestions to do so. *See* Monroe Connector/Bypass FEIS Appendix H, Monroe Connector/Bypass Quantitative ICE Analysis, at 8-10.

31 cont concept of "induced growth," finding that often adding capacity to an otherwise congested transportation corridor will initially reduce travel times, but that this increase in the service level will attract additional trips that would not have been made without the improvement.[103] As Todd Litman of the Victoria Transport Policy Institute explains, roadway improvements alleviating congestion reduce the generalized "cost" of driving, which encourages more vehicle use and ultimately greater growth in the affected areas.[104] For example, some trips may be diverted from another facility or added by drivers taking longer or more frequent trips or choosing different destinations.[105]

B) NCTA's Modeling of Growth is Arbitrary and Capricious

As illustrated above, NCTA's continued insistence that the Monroe Connector/Bypass will not induce growth sits at odds with a vast body of materials discussing the impacts of the project. NCTA's arrival at this erroneous conclusion is based, in part, on an arbitrary and capricious modeling process.

To analyze growth from the road NCTA prepared a "No Build" scenario and a "Build" scenario. The difference between those two scenarios was thus the growth that was attributed to the road. In order to reach this conclusion either the "No Build" scenario must be incorrect, and include development that would only occur if the Bypass is constructed; the "Build" scenario must be incorrect, and fail to account for growth that will occur if the road is constructed; or both scenarios must be incorrect.

32 In its recent draft "Union County Growth Factors" Memo, NCTA suggests that it is the "Build" scenario that is incorrect, stating that "it is possible that population and employment growth in Union County will be higher if the Monroe Connector is built."[106] We have not yet been given sufficient access to NCTA's analysis to review the "Build" scenario in detail, but it seems likely that it has been understated. However, we also believe that the "No Build" scenario continues to overstate growth that will occur in the absence of the Monroe Connector/Bypass.

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[103] Todd Litman, *Generated Traffic and Induced Travel: Implications for Transport Planning*, 38-47 INSTITUTE OF TRANSPORTATION ENGINEERS JOURNAL, vol. 71 no. 4, at 2-3 (2001), Attachment 47; *see also* Gilles Duranton & Matthew A. Turner, *The Fundamental Law of Road Congestion: Evidence from US Cities*, AMERICAN ECONOMIC REVIEW, vol. 101(6), at 2616-52 (October 2011), Attachment 48 (finding highway vehicle kilometers traveled increases proportionately to highways and that an increased provision of roads is unlikely to relieve congestion); Robert B. Noland, *Relationships Between Highway Capacity and Induced Vehicle Travel*, Transportation Research Part A 35, at 47-72 (2001), Attachment 49 (finding that approximately 25% of VMT growth is due to added road capacity, supporting the hypothesis that lane mile additions can induce significant additional travel); KENNETH SMALL, URBAN TRANSPORTATION ECONOMICS 113-117 (1992) (arguing that increased highway capacity decreases cost of driving and thereby encourages increased road usage based on latent demand).

[104] Litman, at 2-3, Attachment 47.

[105] *See, e.g.*, DOUGLASS B. LEE, JR., INDUCED DEMAND AND ELASTICITY, at 17 (2002) (prepared for US DOT/FHWA), Attachment 50.

[106] *Union County Growth Factors* Memo, Attachment 15.

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i) NCTA's continued reliance on the Metrolina Travel Demand Model as a "No Build" baseline is arbitrary and capricious

As explained by the United States Court of Appeals for the Fourth Circuit, the "No Build" scenario in the Monroe EIS acted as the "baseline" from which growth was calculated and was a "critical aspect of the NEPA process." *N.C. Wildlife Fed'n*, 677 F.3d at 603. In its opinion, the Court made clear that "'[w]ithout [accurate baseline] data, an agency cannot carefully consider information about significant environment impacts . . . resulting in an arbitrary and capricious decision.'" *Id.* (quoting *N. Plains Res. Council*, 668 F.3d at 1085). Indeed, the accuracy of the no-build baseline is so important that, as recognized in the Fourth Circuit's opinion, "courts not infrequently find NEPA violations when an agency miscalculates the "no-build" baseline or when the baseline assumes the existence of a proposed project. *See id.* (citing *Friends of Yosemite Valley v. Kempthorne*, 520 F.3d 1024, 1037-38 (9th Cir. 2008)).

As the Fourth Circuit made clear, the "No-Build" baseline presented in the invalidated Monroe Connector/Bypass EIS did not provide an accurate reflection of the future study area without the Toll Highway. The Court noted that "the Agencies used MUMPO's projections as the 'no-build' baseline," and "part of MUMPO's data actually *assumed construction of the Monroe Connector*." *Id.* at 599-600 (emphasis in original). "By using MUMPO's data, therefore, the Agencies incorporated 'build' assumptions into the 'no-build' baseline." *Id.* at 600.

There can be no doubt about the basis for, and the scope of, the Court's ruling on this issue, especially in light of the Fourth Circuit subsequent opinion, *Friends of Back Bay v. U.S. Army Corps of Engineers*, 681 F.3d 581 (4th Cir. 2012). In that case, the Court also emphasized the importance of accurate baseline data to the NEPA process. As an example, it cited the flawed Monroe analysis, explaining that the transportation agencies "erroneously adopted the assumption that the road would be built in estimating the consequences resulting from no action being taken." *Id.* at 588. The Court labeled the action taken by the transportation agencies in analyzing the Monroe Connector/Bypass an "obvious and fundamental blunder," and explained that the Court had "had no difficulty remanding the matter for reconsideration." *Id.*

33 As such, the Court made clear that the agencies must create an accurate "No-Build" baseline, and that MUMPO's socioeconomic data, which assumes construction of the Monroe Connector/Bypass, cannot form the basis of such a baseline. Despite this clear mandate, rather than set out to create a new, accurate baseline, NCTA has focused on attempting to explain why the Court of Appeals was in fact mistaken, and why continued reliance on MUMPO's Metrolina Regional Travel Demand model ("MRM") as the baseline is appropriate.

In its new attempt to explain away this error, NCTA discusses three aspects of the MRM model: the "top-down" analysis, the "bottom-up" analysis, and the "expert panel." NCTA contends that each of these three elements illustrate that continued reliance on the MRM as the "no build" baseline is appropriate. Below we detail the flaws in each of these processes that have not been addressed by NCTA and explain why their new arguments and explanations have just as little merit as the initial arguments used during litigation.

1) Top-Down

NCTA continues to represent that the Monroe Connector/Bypass was not assumed in the top-down analysis. This is incorrect. As we explained in our briefs to the Fourth Circuit, the top-down stage *did* assume that a project like the Monroe Connector/Bypass would be constructed.

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The top-down model, which takes a large scale overview of future growth projections, was based on a number of core assumptions. One of those assumptions was that there would be sufficient infrastructure available to accommodate any future growth. With regard to transportation, the model equated distance to travel time at all points in the future. In other words, the model assumed that in the future there would be no increase in the time it would take to get from point A to point B as a result of delays on area roadways, even if there were significantly more people living in the region.

In a situation such as the one predicted by this model, where there is an increasing population and thus increasing traffic, the only way that travel time can remain constant between two geographical points is if additional transportation improvements — such as the Monroe Connector/Bypass — are implemented. Otherwise, roads would eventually reach capacity and travel time would slow between two geographic points. The top-down model was thus premised on the construction of transportation improvements such as the Toll Highway.

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In arguments to the Fourth Circuit, NCTA's counsel contended that because the top-down analysis does not include a transportation network, the Toll Highway cannot have been assumed in the results. This explanation entirely missed the point. As we made clear to the court, it is *precisely because* the top-down process does not include a transportation network, and instead uses proximity distances as a proxy for travel time, that the Toll Highway is part and parcel of the process.

Our concerns regarding top-down modeling were recently confirmed at an October 16, 2012 meeting of CRAFT when Dr. Steve Appold presented the next iteration of the top-down socio-economic forecasts for the Metrolina region. Dr. Appold confirmed that the explanation we provided to the Fourth Circuit is accurate: Top-down forecasts assume that there is sufficient infrastructure in place to keep up with expanding population, and thus inherently assume projects like the Monroe Connector/Bypass.[107]

Dr. Appold's presentation and the accompanying comments from area transportation planners also served to demonstrate that the top-down forecasts are not as "independent" from local planning decisions as NCTA has suggested. While the process is originally based on census data and large scale societal projections, the ultimate top-down numbers are reviewed and modified by local planners based on their assumptions about what growth they hope to see in the future. Documents obtained by SELC concerning the development of the 2040 Metrolina Regional Socio-economic projections confirm this concern.

[107] Charlotte Regional Alliance For Transportation Meeting, Agenda (Oct. 16. 2012), Attachment 51 (Meeting was attended by SELC attorney, Kym Hunter).

The Charlotte region's area planners have engaged Dr. Appold to develop these projections using a top-down model. In the process of developing these projections, Dr. Appold has presented the local planners with at least two rounds of preliminary projections, explaining that they were "meant as a basis for discussion,"[108] with the specific intent that the local planners give feedback and suggestions for Appold to incorporate into the next round of projections.[109]

Though some calls for adjustments were based on legitimate qualms concerning the available data,[110] many of the suggested changes dealt with Dr. Appold's perceived failure to incorporate the growth that planners anticipate may result from local infrastructure projects, such as the Monroe Connector/Bypass. For example, the Rocky River RPO claimed that the 2040 growth projections should show much higher growth and employments rates for the applicable area based on proximity to several specific local infrastructure projects, expressly noting the Monroe Connector/Bypass as an example, as well as other "major projects" that could stimulate growth in the area.[111] Similarly, GUAMPO and the Lake Norman RPO questioned Dr. Appold's interpretation of future projects and historical trends, and advocated different interpretations that would project much higher population growth and employment rates for the counties in the Gaston Urban Area and Lake Norman RPO area.[112] Additionally, each set of comments from the planners in areas surrounding Mecklenburg County expressed serious concerns over Appold's projection of concentrated growth in Mecklenburg County and slowing growth in the surrounding communities.

Following these comments, Dr. Appold "modified his methodology to ensure that most counties grow in population and employment at a[t] least its long-term relationship to the regional growth rate."[113] But he cautioned that he did not "feel fully comfortable with this outcome (particularly in regard to individual districts)," noting that "[t]he pattern over the last decades has been increasing concentration in Mecklenburg County and there is no sign of that trend reversing." He also noted that:

[108] E-mail from Stephen Appold to Bjorn Hansen (Oct. 1, 2012), Attachment 52.
[109] E-mail from Anna Gallup to Steve Appold (October 16, 2012), Attachment 53; e-mail from Steve Appold to Anna Gallup, Ruchi Agarwal, Amy Helms, Bjorn Hansen; C. Chorak, Robert Cook, Dana Stoogenke, D. Hooper, D. Ritsema, K. Wolf, Evan Lowry, M. Sandy, Phil Conrad, Scot R. Sibert, Wendy Bell, Bernie Yacobucci, Nadine Bennett, Joe McLelland, R. Black, and Hank Graham (Sept. 20, 2012), Attachment 54 ("I want to stress that the projections presented last Friday were preliminary and that your feedback and suggestions are most appreciated. They will be taken into account is the next draft round.").
[110] For example, Dr. Appold noted that the initial draft projections were based on incomplete data, specifically noting that he did not have validated employment estimates for the entire region for 2010. *See* e-mail from Steve Appold to Anna Gallup, Ruchi Agarwal, Amy Helms, Bjorn Hansen; C. Chorak, Robert Cook, Dana Stoogenke, D. Hooper, D. Ritsema, K. Wolf, Evan Lowry, M. Sandy, Phil Conrad, Scot R. Sibert, Wendy Bell, Bernie Yacobucci, Nadine Bennett, Joe McLelland, R. Black, and Hank Graham (Oct. 1, 2012), Attachment 55.
[111] Letter from Dana Stoogenke, Rocky River RPO, to Dr. Steven Appold (Sept. 26, 2012), Attachment 46 (conveying the RRRPO's comments on the 2040 draft projections).
[112] Letter from Bernie Yacobucci, Gaston Urban Area MPO, to Dr. Steve Appold (Sept. 28, 2012), Attachment 56 (conveying GUAMPO's comments on the draft 2040 projections); letter from Bjorn E. Hansen to Dr. Steve Appold (Sept. 28, 2012), Attachment 57 (conveying the Lake Norman RPO's comments on the draft 2040 projections).
[113] E-mail form Steve Appold to Anna Gallup, Ruchi Agarwal, Amy Helms, Bjorn Hansen, C. Chorak, Robert Cook, Dana Stoogenke, D. Hooper, D. Ritsema, K. Wolf, Evan Lowry, M. Sandy, Phil Conrad, Scot R. Sibert, Wendy Bell, Bernie Yacobucci, Nadine Bennett, Joe McLelland, R. Black, and Hank Graham (Oct. 15, 2012), Attachment 58.

> Over the last two decades, population and employment have been concentrating in Mecklenburg. District-level density gradients for both population and employment have become steeper from 1990 to 2000 to 2010. If anything, the region is becoming more mono-centric than it was in the past.[114]

And even after Dr. Appold incorporated the planners' initial comments and revised his original projections, many of the planners have continued to voice concerns and sought to further influence the projections.[115]

36 Thus, contrary to NCTA's contentions, even at the top-down stage, local infrastructure, such as the Monroe Connector/Bypass, and local priorities, such as projections of high growth, are factored into future forecasts both implicitly and explicitly. In recent presentations NCTA has made clear that it does not intend to address the use of top-down data that assumes construction of the Monroe Connector/Bypass for its "No Build" scenario. The EIS will thus remain based on an arbitrary and capricious assumption.

2) Bottom-Up

NCTA denied the inclusion of the Monroe Connector/Bypass in the bottom-up analysis throughout the NEPA process despite multiple inquiries from both SELC and resource agencies. After SELC filed suit and documents illustrating that the project had, in fact, been included in the

37 analysis were brought to light, the agency was forced to change its position. During litigation NCTA adopted the position that while the Monroe Connector/Bypass was included in the bottom-up data, its inclusion was insignificant. The Court rejected this assertion. NCTA persists in yet another variation of this same argument.

38 With its initial attempts to demonstrate the insignificance of the inclusion left in tatters by the Fourth Circuit, NCTA has seized on a new explanation. The agency now asserts that in the bottom-up analysis, the proposed Bypass only reduces travel time to employment in the region by an average of 18 seconds and thus has little influence on overall growth patterns.[116] Further, NCTA's materials state that current average Union County commuting times are just 29 minutes, only two or three minutes higher than commuting times elsewhere in the Charlotte region.[117]

These statements are at odds with other NCTA statements about the bypass which assert that it will save drivers between 30-50 minutes.[118] Thus, either (1) NCTA is reconsidering the projected travel time savings from the Toll Highway, or (2) the model has severe inaccuracies

[114] *Id.*
[115] E-mail from Anna Gallup to Steve Appold (October 16, 2012), Attachment 53 ("Hank [Graham, of GUAMPO,] still has concerns with Gaston County projections . . . and Phil [Conrad, of CRMPO,] has concerns that this round of projections showed his inner ring county (Cabarrus) with slowed growth and his outer ring county (Rowan) with increased growth . . . .").
[116] Baker Engineering, Presentation before the Monroe Connector Bypass Agencies, *Monroe Connector/Bypass Agency Update: Indirect and Cumulative Analysis Review*, at slide 16 (October 17, 2012), Attachment 59.
[117] *Id.*
[118] Monroe Connector/Bypass DEIS, Community Impact Assessment for the Monroe Connector/Bypass (Feb. 2009), at 62.

38 cont with regard to predictions of travel-time and the associated impact on population distribution. Such inaccuracies are highly significant as NCTA made clear throughout the NEPA process that travel time is of paramount importance in predicting where people live.

For example, in its Qualitative ICE study, NCTA explained that travel time to major employment centers is one of the most important factors influencing induced development.[119] NCTA further emphasized the importance of Travel Time to Employment in its Quantitative ICE study, stating that "improving accessibility (as measured by travel time) to I-485 and the major employment centers in Mecklenburg County would be the main reason for changes in development patterns" attributable to the Toll Highway.[120]

Indeed, NCTA's insistence on the importance of travel time was recognized by the United States Court of Appeals, which pointed out in its opinion that the agencies had stated throughout the NEPA documents that "decreased travel time to employment often spurs development," and that, accordingly, "the administrative record does not demonstrate the irrelevance of travel time to employment." *N.C. Wildlife Fed'n*, 677 F.3d at 605.

In sum, if we accept NCTA's new reasoning, then either:

a) The modeling process used by NCTA must be fundamentally flawed; or
b) NCTA has dramatically and repeatedly overstated benefits of the proposed Toll Highway.

39 Consequently, it is essential that NCTA restart its ICE analysis. The new study must include a "No-Build" scenario that does not include the Monroe Connector/Bypass in either the
40 top-down or the bottom-up analysis. Further, in keeping with NCTA's conclusion that the travel time metric is an indispensable part of forecasting future growth patterns, the model used must accurately account for the importance of travel time to employment in all scenarios.

3) "Expert Panel"

In addition to minimizing the Toll Highway's inclusion in the modeling process, NCTA has attempted to legitimize its reliance on MUMPO's socio-economic data for the "No-Build" scenario by repeated reference to interviews that were conducted with local planners. For example, in an October 2012 meeting with federal and state resource agencies, an NCTA representative was asked whether the "Expert Panel" assumed construction of the Monroe Connector/Bypass. The NCTA representative responded:

> No. The project team verified with MUMPO and local planners that the land use plans adopted at the time did not include the Monroe Connector/Bypass, and these plans served as the basis for their assumptions.[121]

[119] Monroe Connector/Bypass FEIS Appendix G, at 2, 6-7, 55, 72.
[120] Monroe Connector/Bypass FEIS Appendix H, at 15 (emphasis added).
[121] Agency Coordination Meeting Minutes, at 3 (October 17, 2012), Attachment 60.

This statement completely ignores the finding by the United States Court of Appeals that this verification process was, in fact, "patently inadequate." *N.C. Wildlife Fed'n*, 677 F.3d at 605 n.4. The failures of the interview process were detailed in our briefs to the Court and is recited again for your convenience below.

a) First Round of Interviews

In its initial investigation into the indirect effects of the proposed Bypass, NCTA consultants interviewed a number of local planners. In these interviews the local planners were asked whether the Bypass would induce growth in their respective areas. Not surprisingly, many planners stated that the proposed highway would indeed induce development. This sentiment was shared by planners from outlying locations such as Marshville,[122] Wingate[123] and Unionville[124] and also planners closer to Charlotte such as those in Indian Trail[125] and Stallings.[126]

Specifically, local planners noted that "[b]uilding the [Toll Highway] would help eliminate a barrier to commercial/residential development,"[127] would make a community "attractive as a bedroom community to Charlotte,"[128] and would cause "development pressure if constructed on new location."[129]

Following these interviews, NCTA published its Qualitative ICE study which included the common sense conclusion that a new Toll Highway would likely result in more residential and commercial development in the central and eastern portions of the study area, and in Union County in general, due to the reduced travel time to Charlotte.[130] The study stated that the shorter travel time, along with inexpensive land and water and sewer service, would make the area a prime target for residential development.[131] Improved access to Charlotte and I-485 could encourage new industrial development.[132] The study concluded that this accelerated growth would result in impacts to farmland, water resources, and terrestrial habitat.[133]

The first round of interviews thus concluded that the Monroe Connector/Bypass would induce additional growth in the study area. This fact has never been addressed.

[122] Monroe Connector/Bypass FEIS Appendix G, at 115-16.
[123] *Id.* at 119.
[124] *Id.* at 125.
[125] *Id.* at 109.
[126] *Id.* at 146-47.
[127] *Id.* at 116.
[128] *Id.* at 119.
[129] *Id.* at 125.
[130] *Id.* at 6.
[131] *Id.* at 53-55.
[132] *Id.* at 55.
[133] *Id.*

b) Second Round of Interviews

41 The second round of interviews with local planners conducted in 2009 focused specifically on the appropriateness of reliance on the MUMPO's socio-economic data. NCTA's consultants asked local planners if they believed it would be appropriate to use these MUMPO forecasts to illustrate a future "No-Build" scenario. In the course of this investigation the vast majority of planners were unable to confirm whether or not the current socio-economic forecasts were appropriate for a "No-Build" scenario.[134]

Despite the failure of the local planners to confirm the appropriateness of using the socio-economic data to generate a "No-Build" scenario, NCTA went ahead and published a Quantitative ICE analysis based on this data.[135] Again, this shortcoming has never been addressed.

c) Third Round of Interviews

After questions were raised about the legitimacy of the MRM as a "No Build" scenario, NCTA conducted a third round of interviews to "reconfirm the assumption that the Monroe Connector/Bypass was NOT included in socio-economic projections."[136]

42 NCTA's consultant, Baker Engineering, once more made contact with local area planners. This contact took the form of a brief and biased email questionnaire which asked the planners to endorse the use of the MUMPO's socio-economic data. The questionnaire did not describe the underlying concern about the inclusion of the Toll Highway in the "No-Build" analysis, but rather suggested to planners that they agree with the Turnpike Authority's assumption that the MUMPO's socio-economic forecasts *could* be used for a "No-Build" scenario.

Each e-mail asked: "Based on your understanding of the socio-economic forecasting process that occurred from 2001-2004, would you agree with our assumption that these forecasts represent a future scenario without the Monroe Connector."[137] The consultants assured the planners — many of whom had no personal knowledge of the creation of the TAZ data and many of whom were not in their current positions when the data was produced — that all other planners had agreed with the assumption.[138]

43 While the NCTA reported favorable results from this round of "interviews," the results were in reality not conclusive. Despite the skewed questions, several planners could not confirm that the socio-economic forecasts had been applied in a reasonable manner,[139] and others who

[134] *See, e.g.*, Monroe Connector/Bypass FEIS Appendix H, at 103, 110, 113, 121, 128, 131.
[135] Monroe Connector/Bypass FEIS Appendix H.
[136] Brief for Defendants-Appellees at 21, *N.C. Wildlife Fed'n*, 677 F.3d 596 (4th Cir. 2012), Attachment 61.
[137] Michael Baker Engineering, *Memo re: Confirmation of No-Build Assumptions for Monroe Connector/Bypass*, at 5-6 (July 26, 2010), Attachment 62.
[138] *Id.* at 5-36.
[139] *Id.* at 1-2.

43 cont replied in the affirmative were the very same planners who earlier had stated they were unable to confirm such assumptions.[140]

44 In sum, despite to NCTA's continued assertions to the contrary, the interviews conducted with local planners do not confirm the appropriateness of using MUMPO's socio-economic projections to generate a "No-Build" scenario. Rather, as conclusively found by the Court, the process was "patently inadequate." *N.C. Wildlife Fed'n*, 677 F.3d at 605 n.4. Moving forward, it is imperative the NCTA engage with local planners to present clear and honest "Build" and "No-Build" scenarios. Where local planners do not have sufficient knowledge or expertise to identify the appropriate use of socio-economic data, this fact should be indicated. Similarly, future interviews must provide local planners with sufficient information about the intended use for the data so that they are able to accurately determine the appropriateness of that use. Further, NCTA must insure that <u>all</u> appropriate local planners are contacted. As noted above, the failure to coordinate with the RRRPO during the previous NEPA process led to significant inadequacies in the analysis.

ii) NCTA's "Build" scenario understates growth attributable to the road

As noted above, in the recent Union County Growth Memo, NCTA suggests that the "Build" scenario may under-estimate the level of growth that can be attributed to the Bypass.[141]
45 We agree. As detailed above, significant growth and development is anticipated to occur if the Monroe Connector/Bypass is constructed. However, little of this growth is accounted for the in the "Build" scenario. In addition to revising the "No Build" scenario to ensure that it accurately reflects a future without the Monroe Connector/Bypass, NCTA must ensure that the "Build scenario" accounts for all the reasonably foreseeable future growth that will result from the Bypass.

NCTA has indicated that it does not intend to address the "Build" scenario, or even explain what methodologies were used to create it and how they factored in the road. Instead, the agency has vaguely stated that "various accepted techniques" were used to create the "Build" scenario and that there is no intention of going back to make sure that the project was properly factored in. Given the vast gulf between NCTA's prediction of impacts from the road and all
45 cont other conclusions about the impacts from the road, this assurance is not sufficient. NCTA must clearly explain how the "Build" scenario is calculated, and how it takes into account all predicted future development that can be attributed to the Toll Highway.

C) <u>NCTA Must Revisit its Analysis of Cumulative Impacts</u>

In addition to fully analyzing the indirect impacts of a proposed project, NEPA mandates that agencies analyze the cumulative impacts of "past, present, and reasonably foreseeable future actions regardless of what agency . . . or person undertakes such other actions." 40 C.F.R. § 1508.25(a)(2). Cumulative impacts may result from "individually minor but collectively significant actions taking place over a period of time." *Id.* § 1508.7. In determining whether a project will have a "significant" impact on the environment, an agency must consider "[w]hether

[140] *Compare id. with* Monroe Connector/Bypass FEIS Appendix H, at 110, 125, 128.
[141] *Union County Growth Factors* Memo, at 17, Attachment 15.

the action is related to other actions with individually insignificant but cumulatively significant impacts." *Id.* § 1508.27(b)(7). NCTA's initial analysis of cumulative impacts was incomplete and must be supplemented.

i) NCTA must Consider the Cumulative Impacts from Legacy Business Park

46 As discussed above, the proposed Legacy Park is a reasonably foreseeable future development, and the EIS must consider the cumulative impacts of the Bypass and the business park in combination. Such an analysis would be required even were the Park not dependent on the Bypass. NEPA regulations require that agencies analyze the cumulative impacts of "past, present, and reasonably foreseeable future actions regardless of what agency . . . or person undertakes such other actions."[142] In determining whether a project will have a "significant" impact on the environment, an agency must consider "[w]hether the action is related to other actions with individually insignificant but cumulatively significant impacts."[143] The Legacy Park development will necessarily have such an impact.

ii) NCTA must consider the Cumulative Impacts from the Proposed 601 Connector

47 NCTA must also consider the cumulative impact of the Monroe Connector/Bypass and the proposed 601 Connector — a proposed new location four-lane divided road that would connect the Monroe Connector/Bypass and US 601 South.

The 601 Connector was first proposed and considered by the City of Monroe's Transportation Committee in early 2008.[144] In December 2010, after the publication of the ROD for the Monroe Connector/Bypass, the City of Monroe hired Davenport Transportation Consulting to "develop and evaluate an alignment for the proposed 601 South Connector Project."[145] Davenport was instructed to coordinate with NCTA regarding interchange feasibility, develop location alternatives, review those alternatives with the City of Monroe and MUMPO, and develop final plans for the selected alignment.[146]

Davenport developed four possible locations or "alignments" were proposed by the consulting firm. The City's Transportation Committee determined that Alignment 2 was best. Details for each alignment regarding total length, distance required to travel from the Monroe Connector/Bypass to 601, railroad crossings, floodplain crossings, property impacts, and cost are available in a chart in Attachment 65.[147] Alignment 2 was chosen as the preferred alignment.

[142] 40 C.F.R. § 1508.25(a)(2).
[143] *Id.* § 1508.27(b)(7).
[144] James N. Lloyd, *City of Monroe Staff Report: 601 South Connector Project* Memo to Transportation Committee (March 30, 2011), at 1, Attachment 63.
[145] Contract between the City of Monroe and John Davenport Engineering, Inc., DBA Davenport Transportation Consulting, at 1 (Dec. 9, 2010), Attachment 64.
[146] *Id.* at 11.
[147] 601 Connector Packet, at PDF page 5, Attachment 65.

Several observers have noted that the proposed road would intersect land held by a company called "Monroe Connector/Bypass-Highway 601 LLC" owned by future U.S. Congressman Robert Pittenger.[148] Documents produced by the City of Monroe illustrate exactly where Congressman Pittenger's land is situated in relationship to the proposed road.[149]

In November 2010, City of Monroe staff recommended to the Transportation Committee that the project should be considered for inclusion in the Comprehensive Transportation Plan (CTP) that was currently being developed by MUMPO.[150] The CTP is a multi-modal plan that identifies the future transportation system needs and includes highways, public transportation, rail, and bicycle facilities needed to serve the anticipated travel demand.[151]

Ultimately, after a number of public meetings and other discussions, the Monroe City Council's Transportation Committee tabled the project.[152] The City of Monroe's engineering director sent a letter to the secretary of MUMPO on June 13, 2011 regarding cost share for the project.[153] In the letter, the City states that the unanimous vote at the April city council meeting to "table the project" as "based in part on comments made at the [March 24] workshop.[154]

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While we understand that the 601 Connector project may not proceed immediately, we ask NCTA to determine if there are still any plans for its construction. Statements from the Monroe City Council are that the project is "on hold," suggesting that it has not been abandoned but is planned for construction in the near future. If the intention is still to pursue the project, then NCTA must account for the cumulative impact of the Connector in its analysis of the Monroe Toll Road. We note that an early scoping exercise for the Monroe Connector/Bypass NEPA process included the possibility of pursuing a combined NEPA process for the 601 Connector, the Monroe Bypass and the Monroe Connector.[155] The two projects are intimately connected and should not be pursued on a piece-meal basis.

III. NCTA'S ALTERNATIVES ANALYSIS IS ARBITRARY AND CAPRICIOUS

NCTA's impacts analysis was not the only part of NCTA's analysis found to be flawed by the United States Court of Appeals. Consistent with well-settled NEPA jurisprudence, the Court made clear that "[a]gencies must [r]igorously explore and objectively evaluate all reasonable alternatives." *N.C. Wildlife Federation*, 677 F.3d at 602 (citing 40 C.F.R. § 1502.14(a)). However, in recent presentations and other statements, NCTA has made clear that it does not intend to revisit its alternatives analysis, or the traffic forecasts upon which that analysis is based.

[148] *See id.* at PDF pages 32, 40-41, 49.
[149] *601 Connector Properties LLC* map (March 29, 2011), Attachment 66.
[150] James N. Lloyd, City of Monroe Staff Report: 601 South Connector Project (Nov. 22, 2012), Attachment 63.
[151] *See* Mecklenburg-Union Metropolitan Planning Organization, *Comprehensive Transportation Plan, available at* http://www.mumpo.org/plans-programs/comprehensive-transportation-plan.
[152] E-mail from Wayne Herron, City Manager for the City of Monroe, to Monroe City Council (April 8, 2011), Attachment 67.
[153] Letter from James N. Lloyd to Robert W. Cook (June 13, 2011), Attachment 68.
[154] *Id.*
[155] Monroe Connector, *Project Milestone Estimated Schedules* (August 2, 2005), Attachment 69.

A1-57

A) NCTA's Statement of Purpose and Need should be re-written

The scope of the agency's alternatives analysis depends on the underlying "purpose and need" specified by the agency for the proposed action.[156] This is important, as "[o]nly alternatives that accomplish the purposes of the proposed action are considered reasonable, and only reasonable alternatives require detailed study. So how the agency defines the purpose of the proposed action sets the contours for its exploration of available alternatives." *Webster v. United States Dep't of Agric.*, 685 F.3d 411, 422 (4th Cir. 2012) (internal citation omitted).

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In its recent presentation to federal and state resource agencies, NCTA has indicated a willingness to revisit the purpose and need for the Monroe Connector/Bypass. We urge the agency to take this step. As explained below, not only is the current statement extremely unclear, but recent developments call its very rationale into question. Once NCTA has clarified its purpose and need a full analysis of all reasonable alternatives can begin.

i) The Current Statement of Purpose and Need is Unclear

As articulated in NCTA's original EIS, the stated purposes of the Monroe Connector/Bypass are:

1) To construct a facility that allows for safe, reliable, high-speed regional travel in the U.S. 74 Corridor between I-485 in Mecklenburg County and the Town of Marshville in Union County, in a manner consistent with the North Carolina Strategic Highway Corridors Vision Plan for U.S. 74 and the designation of U.S. 74 on the North Carolina Intrastate System.

2) Improve mobility in the U.S. 74 corridor within the project study area, while maintaining access to properties along existing U.S. 74.[157]

48 cont

Over the past year through our discussions with local community members and others, it has become clear that this statement of "purpose" is confusing, and has created a false impression. Many residents of Union County, including local elected officials, believe that the purpose of the Monroe Connector/Bypass is to decrease congestion and improve mobility on existing U.S. 74. It is understandable that local community members could have reached this false conclusion. The stated purpose of improving "mobility in the U.S. 74 corridor within the project study area" gives the impression that the Toll Highway will improve U.S. 74 itself, rather than just provide a parallel (tolled) road in the corridor that will improve mobility.

For example, Mayor Lynda Paxton of Stallings, one of the communities that will be impacted by the proposed bypass, recently wrote on her website: "The purpose of the Monroe Connector/Bypass is widely misunderstood by residents who mistakenly assumed the toll road

[156] 40 C.F.R. § 1502.13.
[157] *See* Final Statement of Purpose and Need (Feb. 2008).

would improve congestion on Highway 74."[158] Mayor Paxton expanded on this concern in Letters to the Editor of two local papers:

> Many of us bought into the toll road on an expectation that it would bring significant relief for commuters traveling into Charlotte on U.S. 74. We believed the assertion that improving U.S. 74 would wipe out 59 percent of the county's economic base. We reluctantly signed on and worked diligently to minimize the adverse impacts to our rural and town communities, thinking the road was inevitable. But how many Union County residents and regional transportation planners would support construction of the Monroe Connector/Bypass if they knew that the road is expected to provide only minimal and short term relief for congestion on U.S. 74 and that there are viable and much less costly alternatives that would preserve the commercial tax base?[159]

SELC attorneys have been confronted with this misapprehension time and again by members of the local community. In community meetings we have attended in Monroe, Stallings and other Union County locations, members of the community have repeatedly insisted that the purpose of the highway is to improve U.S. 74. This sentiment has been echoed by local elected officials who have been adamant that the key purpose of the Monroe Connector/Bypass, and the reason for their support of the project is because it will improve congestion on U.S. 74.[160]

By contrast, NCTA has acknowledged in recent meetings that the proposed toll highway will not, in fact, improve congestion on U.S. 74. During a meeting of the U.S. 74 Corridor Revitalization stakeholders, NCTA representatives made clear that the Bypass was not planned with the idea to improve or address congestion issues on U.S. 74.[161] That is not a stated purpose of the Bypass, nor is it an anticipated result of the Bypass; instead, the purpose is to create a high speed corridor in the region.[162] This fact is not new. Traffic data in the EIS indicated that congestion on existing U.S. 74 would not be much improved with construction of the Bypass.[163]

In fact, NCTA has stated that the agency "would not be in favor of changes to U.S.-74 that would have a competing interest with the bypass,"[164] as such improvements would have a negative impact on toll revenue. In this same meeting, an NCTA representative stated that he does not expect dramatic improvements to the Level of Service on U.S. 74 as a result of the

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[158] Mayor Lynda Paxton Website, Transportation/Bypass, *available at* http://www.mayorpaxton.com/Transportation_Bypass.php, Attachment 70.
[159] Union County Weekly, Letter to the Editor, November 9, 2012, http://www.unioncountyweekly.com/news/2012/11/union-county-letters-to-the-editor-nov-9/, Attachment 71.
[160] *See, e.g.*, Stallings Town Council Meeting (Sept. 24, 1012), *minutes available at* http://stallingsnc.granicus.com/DocumentViewer.php?file=stallingsnc_391df462d837e8bd3bd5ca9e749afdae.pdf&view=1, Attachment 72; Charlotte Regional Alliance For Transportation Meeting, Agenda (Nov. 1, 2012), Attachment 73; MonroeBypassFacts Community Meeting, Union County Agricultural Center (Oct. 30, 2012).
[161] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 3 (Jan. 18, 2011), Attachment 74.
[162] *Id.*
[163] *See, e.g.*, Monroe Connector/Bypass Draft EIS, Table 2-7.
[164] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 4 (Jan. 18, 2011), Attachment 74.

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Bypass, recognizing that U.S. 74 would still be plagued with heavy traffic even if the Bypass were constructed.[165]

Moreover, the EIS itself presents a confusing and contradictory picture of how existing U.S. 74 will be impacted by the construction of the Bypass. For example, the Community Impact Study states that the project is expected to "reduce traffic volumes on existing U.S. 74 and the local street network."[166] Further, in addressing the concerns of low income communities, the report goes on to explain that the "result of the project would be reduced traffic on existing alternate non-toll routes, including U.S. 74. Completing the project would benefit all motorists, including low-income motorists who may choose not to use the toll facility or may tend to use it less frequently."[167]

Outside of the EIS, NCTA has also been inconsistent about the purpose of the Toll Highway, or its impact on existing U.S. 74. For example, in its 2010 Letter of Interest for a Federal TIFIA loan, the agency stated that "The proposed [Monroe Connector/Bypass] would give U.S. 74 back to the locals, allowing for local trips and improving access to businesses along the corridor."[168]

48 cont

Moving forward, NCTA must articulate and deliver a clear statement of purpose and need to the public, and be clear about the impact of constructing the road to existing U.S. 74.

i) The need for the road should be re-considered in light of recent modeling determinations

NCTA recently engaged Baker Engineer to re-explain the use of MUMPO's socio-economic data in the original "No-Build" scenario.[169] If we take this research and analysis at face value its conclusions cast serious doubt on whether the Bypass can meet its stated purpose and on whether there is a need for the road in the first place.[170]

First, the Bypass is not expected to improve mobility in the U.S. 74 Corridor in any meaningful way. Baker Engineering recently presented data showing that building the Bypass has no practical effect on travel times in Union County or the rest of the region. The data shows that out of the 256 TAZs that would be affected by the Bypass, 59% (150 TAZs) would experience absolutely no change in average commute time as a result of the Bypass, and 33% (85 TAZs) will experience less than 1 minute of change in average commute time.[171] The data demonstrates that only 8% of TAZs (21 TAZs) would save more than 1 minute on their average commute time as a result of the Bypass.[172] But most telling, the data shows that the absolute

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[165] *Id.*
[166] Community Impacts Statement, at 4-5.
[167] *Id.* at 75.
[168] 2010 TIFIA LOI, Attachment 43.
[169] *Union County Growth Factors* Memo, Attachment15; Baker Engineering Presentation, at slide, Attachment 59.
[170] *See* PBS&J, *Statement of Purpose and Need: Mecklenburg and Union Counties Monroe Connector/Bypass* (February 2008).
[171] Baker Engineering Presentation, at slide 16, Attachment 59.
[172] *Id.*

maximum time savings is merely 5.7 minutes, and that the Bypass will save the average driver only 18 seconds.[173]

Second, the analysis indicates that Union County residents are not uniquely affected by an exceptionally onerous commute in the first place. Baker Engineering compiled its research into a memo specifically finding that commuting time is not a factor influencing growth in Union County.[174] The data shows that Union County's 2010 average commute time was not significantly greater than the surrounding areas, being only 2 minutes longer than the regional average and at most 4.8 minutes greater than the lowest average area commute (Rowan County).[175]

Additionally, the memo concludes that the commute time was manageable to the average driver and points to research suggesting Union County falls within a set of communities for which minor increases in commute time do not deter growth because "within a reasonable range of commute time, households will choose locations based more on other preferences, such as school quality."[176] The memo supports its conclusion, noting that this has been the case in the past as Union County has maintained a high rate of growth for the past two decades despite comparatively longer commutes.[177] The memo instead attributes Union County's past growth to factors such as available land, high median income, and good area schools, and predicts future growth will also be chiefly influenced by these factors rather than commute time.[178]

Though this data conveniently supports the NCTA's original finding that the Bypass would result in negligible growth in Union County, it necessarily raises the question: Why build the Monroe Connector/Bypass at all? The NCTA's Statement of Purpose and Need highlights U.S. 74's deficiencies, noting that it does not allow for high-speed regional travel consistent with the designations and goals of several local and state transportation plans.[179] But the Baker Engineering's data demonstrate that the Bypass and its associated high-speed regional travel capabilities do not make any tangible impact on overall travel speed in the corridor. The data also demonstrates that U.S. 74's current and projected Levels of Service have no particularly burdensome effect on commute times through Union County.

We do not yet have sufficient information to draw any conclusions as the reliability of Baker's recent analysis. However, if we take the conclusions to be true, the findings raise serious questions about why North Carolina is spending $700 million on a road that is expected to have a practically imperceptible impact on the region.

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173 *Id.*
174 *Union County Growth Factors* Memo, Attachment 15, at 1.
175 *Id.* at 16.
176 *Id.* at 15.
177 *Id.* at 15-17.
178 *Id.* at 9-14.
179 PBS&J, *Statement of Purpose and Need: Mecklenburg and Union Counties Monroe Connector/Bypass*, at 2-3 (February 2008) (stating need for the Bypass based on "[i]nability to serve high-speed regional travel consistent with the designations and goals of the following state and local transportation plans: the Mecklenburg-Union Metropolitan Planning Organization's (MUMPO's) Long Range Transportation Plan (LRTP), the North Carolina Strategic Highway Corridor Program, and the North Carolina Intrastate System. The existing corridor also has diminished ability to function as part of the Strategic Highway Network (STRAHNET)").

B) NCTA Must Revisit its Traffic Forecasts

49 As we explained in our comment letters during the NEPA process and throughout the litigation, the alternatives analysis for the Monroe Connector/Bypass was based on a fundamentally flawed set of traffic forecasts. The forecasts for both "Build" and "No Build" scenarios were based on a single set of socio-economic data. This approach produced "No-Build" forecasts for U.S. 74 which were dramatically overstated, almost double the true forecast, because the model presented a situation in which the traffic generated by both the Toll Highway and existing U.S. 74 was squeezed onto U.S. 74 alone.

The Fourth Circuit focused on these concerns in its opinion, highlighting the implausible situation presented in the EIS in which the 2035 "build" traffic volumes were "*less* than the 2035 'no-build' baseline traffic volume." *Id.* at 600. The Court noted that NCTA did not respond to our clients' underlying concerns on this issue, but rather "simply issued an errata table lowering the 2035 'no-build' traffic projection baseline to below the 'build' levels." *Id.* The Court went on to detail that "the Agencies offered no explanation as to the source of the error and instead summarily stated that 'the 2035 No-Build Alternative [traffic] forecast was inadvertently overestimated,' " and assured the public and permitting agencies that "all other conclusions and discussions remain valid." *Id.*

In this way, the Court recognized the importance of the flawed "no-build" data used in the traffic forecasts to the alternatives analysis. Importantly, the Court noted the fact that NCTA "eliminated the 'improve U.S. 74' category" based on the 2035 forecasts, which were found to be flawed. *Id.* at 599 n.1. In keeping with the Court's holding regarding the importance of an accurate "No-Build" baseline to the alternatives analysis, NCTA must revisit this fundamental NEPA requirement using a new, accurate baseline. As we have detailed above, significant growth is expected to occur if the Monroe Connector/Bypass is constructed. As such, it is clearly insufficient to use one set of socio-economic data for both "Build" and "No Build" scenarios.

49 cont As it moves forward with a new analysis of the Toll Highway, NCTA must create "Build" and "No Build" scenarios based on two separate sets of socio-economic data — one which reflects a situation in which the Monroe Connector/Bypass is not constructed, and one which accounts for the tremendous amount of growth and development that is expected to result from the Toll Highway. These forecasts must be used as the basis upon which to compare different alternatives, and presented to the public for review and comment.

i) Academic literature supports the conclusion that the traffic forecasts are flawed

Academic literature lends further support to the conclusion that NCTA's traffic forecasts are fundamentally flawed. Induced traffic is a commonly understood phenomenon of a new location highway, and thus reliance on a single-set of socio-economic forecasts is simply untenable.

Mark Hansen of the University of California's Institute of Transport Studies has pointed out that transportation analysts since the 1940s have consistently found that increased road capacity is correlated with increased traffic volume,[180] and that though an expanded facility may improve level of service for a period of time, the traffic generated by a new transportation project's tendency to stimulate more dispersed, automobile-dependent development calls into question the long term efficacy of any such project.[181]

Similarly, Todd Litman argues that as a result, "traffic congestion tends to maintain a self-limiting equilibrium" in that road expansion reducing congestion in the short term attracts additional peak-period trips until congestion again reaches a level that limits further growth.[182] In fact, Litman demonstrates that "[u]nder typical urban conditions, more than half of added capacity is filled within five years of project completion by additional vehicle trips that would not otherwise occur, with continued but slower growth in later years."[183] And many researchers, such as Richard Arnott and Kenneth Small, economics professors at Boston College and the University of California, Irvine, respectively, point out that in many cases, adding capacity increases congestion by concentrating traffic on a few links in the network and by reducing travel alternatives.[184]

The academic literature indicates that traffic forecasts for road projects such as the Monroe Connector/Bypass are generally highly inaccurate, often because they fail to account for induced growth. For example, Bent Flyvbjerg, et al., with the Aalborg University's Department of Development and Planning (Denmark), conducted a sweeping study of traffic forecasting, analyzing 210 projects in 14 nations.[185] The study demonstrated, with very high statistical significance, that forecasters generally do a poor job of estimating the demand for transportation infrastructure projects,[186] and that traffic forecasting have become even less accurate over the past 30 years.[187] Flyvbjerg and others have recognized that one of the most often noted cause for inaccurate traffic forecasts is a failure to account for induced growth.[188]

C) NCTA must consider a full range of reasonable alternatives and combinations of alternatives

50 Once accurate traffic forecasts have been constructed, and a coherent statement of purpose and need been set forth, NCTA must re-consider a full range of reasonable alternatives and combinations of alternatives. Since the ruling by the Fourth Circuit, and the new understanding by local communities that the Bypass will not improve U.S. 74, a range of lower-

[180] MARK HANSEN, ET AL. (1993), AIR QUALITY IMPACTS OF URBAN HIGHWAY CAPACITY EXPANSION: TRAFFIC GENERATION AND LAND USE CHANGES, at 2-8 – 2-14, 2-28 – 2-29, Attachment 75.
[181] *Id.* at 3-29.
[182] Litman, at 3, Attachment 47.
[183] *Id.* at 10.
[184] Richard Arnott and Kenneth Small, *The Economics of Traffic Congestion*, AMERICAN SCIENTIST, Vol. 82, at 446-55 (Sept./Oct. 1994).
[185] Bent Flyvbjerg, et al, *Inaccuracy in Traffic Forecasts*, TRANSPORTATION REVIEWS, vol. 26, no. 1, 1-24 (January 2006), Attachment 76.
[186] *Id.* at 9-11.
[187] *Id.* at 12-13.
[188] *Id.* at 16; *see, e.g.*, Litman at 11, Attachment 47.

50 cont cost alternative solutions have been offered by local community members. We urge NCTA to consider these alternatives.

i) Improvements to Existing U.S. 74

51 As we have emphasized in previous comments, any new analysis by NCTA must give full consideration to upgrades to U.S. 74. As we noted in previous comment letters and during the litigation, NCTA commissioned a study in 2007 which showed that for less than $14 million in short-term and long-term traffic management solutions could yield dramatically reduced congestion and an acceptable level of service along the whole corridor in Union County, except for one interchange. The original rejection of this alternative by NCTA was based on the traffic forecasts that the Fourth Circuit found to be flawed. A new EIS must revisit this and other "functional" alternatives for the corridor, as suggested in detail in our comment letters. *Id.* at 599 n.1

There has been renewed interest in the Superstreet concept as part of a solution to solve traffic problems on U.S. 74. Members of the local community have been very enthusiastic about solutions which will directly address the congestion on U.S. 74, unlike the Bypass which is not intended to improve existing traffic flow. For example, during the stakeholder interviews associated with the U.S. 74 Revitalization Study, a representative for the Town of Monroe stated a preference for superstreets and a desire to study the elimination of signalized intersections on U.S. 74.[189] At this same meeting, a representative from NCDOT stated that the "long term vision" is to convert U.S. 74 to a superstreet-type design, noting the superstreet recommendations in the Stantec study.[190] He explained that though NCDOT has a coordinated traffic system through the length of U.S. 74, upgrading to Superstreet could have a real impact, as the current cycle lengths are very long due to the high volume of traffic on 74, resulting in traffic build up and lengthy waits on the side streets.[191] NCTA presented the Superstreet concept to members of the Stallings Town Council on September 24, 2012.[192] Among the many benefits mentioned during that presentation were improved travel times, improved safety, and the reduced environmental and fiscal costs associated with upgrading the existing infrastructure instead of constructing a new location facility.

Other upgrades to U.S. 74 would include better traffic signal optimization — another issue explored in detail in the 2007 U.S. 74 corridor study. We also urge NCTA to look at patching up the locals businesses and side streets with service roads. This would help residents wishing to visit a number of businesses along U.S. 74. Similar concepts have been suggested for other corridors plagued by local traffic congestion.[193]

[189] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 2 (Jan. 18, 2011), Attachment 74.
[190] *Id.*
[191] *Id.*
[192] Stantec Consulting Services, *Superstreets: A Tool for Safely and Efficiently Managing Congestion* Presentation (Sept. 24, 2012), Attachment 77; Town of Stalling Town Council, Meeting Minutes (Sept. 24, 2012), Attachment 78.
[193] Glatting Jackson Kercher Anglin, Inc., *A New Way To Work: Implementation Analysis* (April 2009), Attachment 79.

As you know, SELC has commissioned an expert to look into upgrades to existing U.S. 74 including an upgrade to a superstreet and other low-cost solutions such as traffic signal optimization. That work is on-going and we will share it with NCTA when it is finalized. We urge NCTA to look at the Superstreet concept, and other recommendations suggested in the 2007 U.S. 74 Study as part of a suite of low-cost solutions to improve congestion on existing U.S. 74.

Since publication of the original EIS, several local government entities have begun their own investigation into improving existing U.S. 74 with the U.S. 74 Revitalization Study. The Study is a coordinated effort on the part of Union County, Town of Stallings, Town of Indian Trail, City of Monroe, MUMPO and NCDOT. They intend to develop a coordinated land use, urban design, economic development, and multi-modal transportation plan, to be implemented by the local governments and NCDOT. They plan to study and integrate existing and projected land use patterns with strategic regional transportation needs for the existing U.S.-74 corridor.[194] The initial Framework Plan was completed in June 2012,[195] and the Final Recommendation and Implementation Strategies are slated to be completed in early 2013.[196] The Framework Plan suggests a series of improvements such as expanded transit, intersection improvements.[197] We urge NCTA to consider the ongoing efforts and incorporate the conclusions and recommendations in NCTA's new environmental review.

ii) Other Union County Road Improvements

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52 Additionally, NCTA should also consider the value of improvements to other Union County roads that could provide alternative routes and thereby lessen traffic congestion on U.S. 74. We have included some examples below that should be considered.

1) *Old Monroe Road*

52 cont Old Monroe Road runs parallel to U.S. 74 along its southwestern side. The road crosses the entire length of the City of Monroe. By improving Old Monroe Road, NCTA could provide local traffic with a proximate alternative to U.S. 74, allowing local residents the option to easily move through Monroe's core business district without getting stuck in U.S. 74's congestion. In fact, during stakeholder interviews conducted during the U.S. 74 revitalization study, residents said that they currently use Old Monroe/Old Charlotte Roads to bypass U.S. 74.[198] And during these same interviews, developers stated that the road had "real development/redevelopment

[194] U.S.-74 Corridor Revitalization Study, Project Overview, *available at* http://www.us74corridor.com/#!__page-0.
[195] HNTB North Carolina, P.C., *U.S.-74 Corridor Revitalization Study: Framework Plan* (June 2012), *available at* http://media.wix.com/ugd/a3265a_773592b3da932a12981c9d670c4d6212.pdf?dn=U.S.-74%2BCorridor%2BStudy%2BFramework%2BPlan%2BReport.pdf, Attachment 7.
[196] U.S.-74 Corridor Revitalization Study, Schedule, *available at* http://www.us74corridor.com/#!__page-0/schedule, Attachment 80.
[197] HNTB North Carolina, P.C., *U.S.-74 Corridor Revitalization Study: Framework Plan*, at 78-100 (June 2012), Attachment 7.
[198] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Residents Meeting Notes, at 1 (Jan. 18, 2011), Attachment 81.

potential, especially if Old Monroe/Old Charlotte Hwy is widened" and noted that the "widening o[f] Old Monroe/Old Charlotte is very important to the success of the area."[199]

2) *Secrest Shortcut*

52 cont NCTA should consider improvements to Secrest Shortcut for the same reason. Because Secrest Shortcut runs parallel to U.S. 74 along itss northeastern side, improvements to the road could provide local drivers with another option to avoid getting stuck in traffic on U.S. 74. In fact, Secrest Shortcut falls almost directly within the proposed pathway of the Monroe Connector/Bypass from Hemby Bridge to Fowler Road, demonstrating that it could service many of the same users expected along the proposed Bypass.

3) *NC 218*

52 cont We also urge NCTA to consider improvements to NC 218. NC 218 begins at U.S. 74, east of Marshville, and connects with US 485 near Mint Hill. The route runs north of the proposed Bypass, but improvements to NC 218 could accomplish many of the same transportation goals as the Bypass and cost much less. Improving NC 218 would serve non-local traffic seeking a quick route through Union County that avoids the in-town congestion through Stallings, Indian Trail, Monroe, Wingate, and Marshville. At the same time, diverting through-traffic that would otherwise rely on U.S. 74 could lessen the congestion on U.S. 74, returning 74 to primarily local use.

iii) Freight Rail Expansion

In previous comments, we have urged NCTA to consider increased rail freight options as an alternative that would help alleviate some of the truck traffic from U.S. 74. In response, NCTA has argued that freight rail expansion would not address the project purpose and that freight rail improvements would not eliminate the truck usage of US 74.[200] While freight rail alone is not the only answer to transportation problems in Union County, we believe it could form an important part of the solution.

53 In light of the recent interest CSX railway has shown in a new terminal at the proposed Legacy Park, we urge NCTA to reconsider freight rail as part of a range of solutions to improve mobility in the corridor. As noted above, the Executive Director of NCTA went to Jacksonville to lobby CSX to come to Union County. Surely if the agency can make such a pitch on behalf of a private development, it can also do so on behalf of the state and the citizens it is charged with serving.

iv) Transit

54 In previous comment letters, we have also suggested that NCTA take a closer look at transit options in the corridor as part of a comprehensive solution to improving mobility. As

[199] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Developers Meeting Notes, at 2 (Jan. 18, 2011), Attachment 82.
[200] Monroe Connector/Bypass FEIS Appendix B, at B-3-34 – B-3-35.

54 cont with the freight options, NCTA rejected this solution without analysis. In particular, NCTA claims that transportation services in the near future and the current and future land use densities in Union County would not support increased transit at a level necessary to improve traffic flow on US 74, and noted that transit could not provide a high-speed facility to serve both individual travelers and freight trips.[201] We urge NCTA to take another look at such options.

55 The viability of transit alternatives has been discussed at length in conjunction with the U.S. 74 Revitalization Study. In the transportation stakeholder meetings for the Study, representatives of the Charlotte Area Transit System ("CATS") noted that they see U.S. 74 as a potential transit market.[202] During these same interviews, local developers also recognized that transit "would make sense" for Union County residents, as a large percentage must commute to work in Mecklenburg County.[203] The CATS representatives noted that while Union County transit users do not save much commute time currently, they do save in gas and parking expenses, as well as driver frustration.[204]

And expanded transit facilities would almost certainly improve the flow of traffic on U.S. 74 by removing commuters from the roads at peak time. In fact, the CATS representatives pointed out that ridership from Union County was steady, and suggested that Union County could entice more ridership by providing more park-and-ride locations and more turn-around locations for buses, thereby making CATS operations easier.[205] The CATS representatives also stated that the current Bus Rapid Transit stations in Union County are not ideally located in relation to U.S. 74, but noted that there will be opportunities in the near future to re-plan more convenient locations.[206] They suggested that park-and-rides could be an interim solution for Union County residents seeking to access the express routes into Mecklenburg County.[207]

In the previous EIS, NCTA stated that combining a Mass Transit Alternative concept with other modes also would not be practicable, as the mass transit element would add substantial costs to any alternative.[208] But as we have noted above, the cost of improving U.S. 74 is significantly lower than the cost to build the Bypass, and we are unconvinced that improving U.S. 74 while also expanding existing bus lines is cost prohibitive when a nearly $800 million road is the alternative. The CATS representative explained that though CATS's current partnership with Union County is focused on bus transit, this understanding could be expanded in the future. Indeed, CATS has expressed the intent to extend rapid transit across the county line.[209] As such, we urge NCTA to take these discussions under advisement and study

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[201] *Id.* at B-3-34.
[202] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 1 (Jan. 18, 2011), Attachment 74.
[203] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Developers Meeting Notes, at 2 (Jan. 18, 2011), Attachment 82.
[204] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 1 (Jan. 18, 2011), Attachment 74.
[205] *Id.*
[206] *Id.*
[207] *Id.*
[208] Monroe Connector/Bypass FEIS, Appendix B, at B-3-34.
[209] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 1 (Jan. 18, 2011), Attachment 74.

55 cont the effect of encouraging greater transit ridership in Union County as a mechanism for managing congestion on U.S. 74.

v) Combinations of alternatives

In addition to looking at each of these alternatives discussed above in isolation, NCTA should consider the ability of combinations of different alternatives to meet the revised, clarified, statement of purpose and need. While one alternative standing in isolation may not meet the objectives articulated in the statement of purpose and need, combinations of different alternatives might. NCTA must look at how a combination of alternatives including upgrades to Union County roads, increased freight rail, and transit improvements could work together as a comprehensive solution. *Davis v. Mineta*, 302 F.3d 1104, 1122 (10th Cir. 2002).

vi) Fewer Exits

In addition to analyzing alternatives to the Monroe Connector/Bypass, we also urge NCTA to analyze alternative designs to the proposed toll road. The current design includes nine separate interchanges. NCTA has failed to articulate why so many interchanges are needed if the purpose of the road is to improve mobility from I-485 to Marshville. Local stakeholders, such as the realtors consulted during the stakeholder interviews accompanying the U.S. 74 revitalization study, believe the Bypass would primarily serve through-traffic, while U.S. 74 would continue to serve the local market.[210] Traffic passing through the corridor does not require intermediate interchanges.

56 Given the lack of need for nine interchanges to meet the stated purpose and need for the toll highway, we urge NCTA to consider designs of the bypass with fewer exits. By reducing the number of exits, the road would become a "true bypass" and would offer less opportunity for sprawling development and associated environmental impact. Thus between different toll road alternatives, a design with fewer exits must be the "Least Environmentally Damaging Practicable Alternative" required by Section 404 of the Clean Water Act. 40 C.F.R. § 230.10(a).

D) <u>NCTA must Perform a Detailed Study of Existing and Future Users of U.S. 74</u>

57 Despite its unshaking commitment to the Monroe Bypass as the best solution for Union County, NCTA has never presented a clear picture of the existing traffic patterns in the U.S. 74 corridor. For example, NCTA does not know what percentage of the traffic in the corridor is "local" versus the percentage of the traffic that is travelling through the corridor from end to end.[211] This deficiency in NCTA's analysis is striking. Because the intent of the Bypass is to speed travel from one end of the corridor to another, knowledge about the percentage of traffic making that trip is tremendously important. Likewise, with regard to future traffic and congestion projections for existing U.S. 74, it is important to know how much local traffic will

[210] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Realtor Meeting Notes, at 2 (Jan. 18, 2011), Attachment 83.
[211] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 3 (Jan. 18, 2012), Attachment 74.

57 cont continue to use that roadway. The Bypass will not be helpful for travelers making local trips. Thus, if the majority of current trips are in fact local, there will be no benefit from the Bypass and little purpose for the Bypass. Similarly, NCTA has indicated that it does not have a good sense of how many trucks will use the bypass if it is constructed,[212] again making the need for and potential success of the Bypass unclear.

NCTA's only attempt to look at this issue was in its analysis of future traffic and revenue projections. The analysis in that document is not encouraging. A survey conducted as part of the study indicated that over 50% of trips in the corridor began in either Monroe or Indian Trail- making the bypass an unlikely option.[213] Furthermore, 28% of trips were from one place in Monroe to another place in Monroe, again a trip that will not be replaced by the Bypass.[214] The survey indicated very little "through traffic," i.e. trips from one end of the Bypass to another. Before NCTA moves any further with this Bypass, it is essential that NCTA analyze who exactly is going to use the proposed Bypass. Only then can it perform a thorough analysis of different alternative solutions.

E) <u>NCTA should Analyze the Impact of Removing the Strategic Highway Corridor and Designation from Existing U.S. 74</u>

As noted in the EIS, existing U.S. 74 is designated as a Strategic Highway Corridor (SHC) by the North Carolina Department of Transportation.[215] This designation accords U.S. 74 a special status. The primary purpose of the Strategic Highway Corridors initiative is to provide a network of high-speed, safe, reliable highways throughout North Carolina. Designation within this program charges NCDOT with the responsibility to ensure that the road remains a "high-speed, safe, reliable highway," and includes it within the Strategic Highway Corridors Initiative's series of planning and implementation efforts.[216] In particular, designation as a Strategic Highway Corridor gives a roadway an additional and prioritized avenue for access to funding for studies and improvements.[217]

58 If the Monroe Connector/Bypass is constructed, however, the SHC designation will be moved from existing U.S. 74 to the Toll Highway.[218] During the transportation stakeholders interviews conducted in the preparation of the U.S. 74 Revitalization Study, a NCDOT representative stated that the Bypass would take the SHC designation from U.S. 74. He noted that based on NCDOT's most recent map, U.S. 74 would lose its SHC designation from its

[212] *Id.*
[213] NCTA, *Final Report: Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study* (October 2010) at 3-5, Attachment 84.
[214] *Id.* at 3-6.
[215] North Carolina General Statute § 136-178.
[216] *See* NCDOT, Strategic Highway Corridors Overview, *available at* http://www.ncdot.gov/doh/preconstruct/tpb/shc/overview/, Attachment 85.
[217] *See, e.g.*, NCDOT, Strategic Highway Corridors Project Planning and Design, *available at* http://www.ncdot.gov/doh/preconstruct/tpb/shc/implementation/Project/; NCDOT, Strategic Highway Corridors Long-Range Planning, *available at* http://www.ncdot.gov/doh/preconstruct/tpb/shc/implementation/Systems/, Attachment 86.
[218] U.S.-74 Corridor Revitalization Study Stakeholder Interviews, Transportation Meeting Notes, at 2 (Jan. 18, 2012), Attachment 74.

58 cont intersection with the Bypass to the middle of Monroe. NCTA should study and explain the impact of removing this designation.

In addition to this state designation, U.S.-74 is currently designated as part of the National Highway System, which includes it within the federal-aid highway system, and in particular, it is part of the Strategic Highway Network ("STRAHNET"). STAHNET is a federal designation given to roads that provide defense access, continuity, and emergency capabilities for movements of personnel and equipment; such routes are required to meet AASHTO (American Association of State Highway Transportation Officials) guidelines for the facility type proposed.[219] It is currently unclear what effect the Bypass would have on these designations or U.S.-74's current eligibility for federal highway funds for improvement or maintenance. NCTA should address this issue as well.

D) NCTA IS ENGAGING IN ILLEGAL PREDETERMINED DECISION-MAKING

The purpose of NEPA is to disclose environmental impacts of project alternatives to decision-makers and the public so that thoughtful informed decisions can be made with regard to major federal actions that will have major impacts on the environment. *Marsh v. Or. Natural Res. Council*, 490 U.S. 360, 371 (1989). As such, NEPA must proceed in a way to inform future decisions, rather than just as a rubber stamp to rationalize or "justify decisions already made." 40 C.F.R. § 1502.5.

59 Recent statements and actions make it clear that NCTA has already made its decision and does not intend to perform the new analysis required by the United States Court of Appeals to revisit that decision. Rather than revisit its analysis, NCTA intends only to "re-explain" its analysis and has no intention of revisiting its pre-determined conclusion that it will construct the Monroe Connector/Bypass.[220] This approach is a clear violation of the mandate that NEPA not be used to justify predetermined decisions. Further, despite the Fourth Circuit's requirement that the agencies revisit their analysis of the project and present that analysis to the public, there will be no true opportunity for the public to be involved in the decisionmaking process because the agency has already determined that the project will proceed exactly as originally planned.

The official NCTA press statement regarding the Fourth Circuit ruling explained that "[w]hile this ruling will cause delays, it does not mean the project will not move forward."[221] In the Union County weekly, NCTA flatly stated the Department's intent to "continue work on bringing the Monroe Bypass to Union County despite recent setbacks for the massive project."[222] At community meetings, NCTA has repeatedly stated that it is "fully committed" to building the

[219] Monroe Connector/Bypass, Final Statement of Purpose and Need, at 10-11 (Feb. 2008).
[220] *See, e.g.*, Stallings Town Council Meeting (Sept. 24, 1012), *minutes available at* http://stallingsnc.granicus.com/DocumentViewer.php?file=stallingsnc_391df462d837e8bd3bd5ca9e749afdae.pdf&view=1, Attachment 72.
[221] NCDOT, *Press Release: Statement from NCDOT Secretary Gene Conti Regarding Monroe Bypass Court Opinion* (May 3, 2012), *available at* https://apps.ncdot.gov/newsreleases/details.aspx?r=6423, Attachment 87.
[222] *NCDOT Keeps Focus On Monroe Bypass Despite Setbacks*, UNION COUNTY WEEKLY (July 20, 2012), *available at* http://www.unioncountyweekly.com/news/2012/07/ncdot-keeps-focus-on-monroe-bypass-despite-setbacks/, Attachment 88.

project and gives no indication that there would be further opportunity for public input or the reconsideration of alternatives.[223] Further, despite NCTA's indication in the presentation to the contrary, right-of-way acquisition continues at a significant pace, under the guise of the "hardship" exception.[224]

This course of action is even more troubling because it ignores completely the very nature of the flawed process that resulted in the decision invalidated by the Fourth Circuit Court of Appeals. The Court's ruling requires a process that ensures that the public and agencies be accurately informed and fully involved in the decision-making process as envisioned by NEPA. *N.C. Wildlife Fed'n*, 677 F.3d at 601-03. The Court made clear that "the broad dissemination of information mandated by NEPA permits the public and other government agencies to react to the effects of a proposed action at a meaningful time." *Id.* at 601-02 (citing *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989)). Indeed, the Court went on to state, "[t]he very purpose of public issuance of an environmental impact statement is to 'provid[e] a springboard for public comment.'" *Id.* at 603 (citing *DOT v. Pub. Citizen*, 541 U.S. 752, 768 (2004)).

59 cont

NCTA's announced course of action has already been rejected by the Fourth Circuit. *N.C. Wildlife Fed'n*, 677 F.3d at 600. In our briefs to the Court we explained that, for the severely flawed DEIS traffic forecasts, the Department's response was to "rig up" some forecasts "for the file" while concurrently proceeding ahead with finalizing the FEIS.[225] There was no application in the FEIS, or otherwise, of the corrected forecasts to revisit the underlying conclusions and no analysis to show how these dramatically reduced forecasts might influence the selection of alternative transportation solutions. It appears that NCTA intends to repeat this course of action.

We appreciate the opportunity to submit these comments at this time. We hope NCTA will find our submittal useful as it continues its environmental review of the Monroe Connector/ Bypass. If it would be helpful to discuss these concerns, we would be more than happy to meet with you at your convenience.

[223] Stallings Town Council Meeting (Sept. 24, 1012), *minutes available at* http://stallingsnc.granicus.com/DocumentViewer.php?file=stallingsnc_391df462d837e8bd3bd5ca9e749afdae.pdf&view=1, Attachment 72.
[224] Josh Whitener, *Citizens Challenge NCDOT's Decisions*, UNION COUNTY WEEKLY (June 22, 2012), *available at* http://www.unioncountyweekly.com/news/2012/06/citizens-challenge-ncdots-decisions/, Attachment 89.
[225] *See* Christy Shumate, email to John Burris & Jennifer Harris (Feb. 25, 2010), Attachment 90.

Sincerely,

Frank Holleman (KH)

Frank Holleman
Senior Attorney

Kym Hunter
Staff Attorney

CC (via e-mail and U.S. mail):

Tim Gestwicki, NCWF
Dean Naujoks, Yadkin Riverkeeper
June Blotnick, Clean Air Carolina
Scott Slusser, NCDOJ
Secretary Gene Conti, NCTA
John Sullivan, FHWA
Chris Militscher, USEPA
Liz Hair, USACE
Carl E. Pruitt, USACE
Marella Buncick, USFWS
Marla Chambers, NCWRC
Alan Johnson, NCDWQ
Amy Simes, NCDWQ
Bob Cook, MUMPO
Dana Stoogenke, RRRPO

Encls.

Table A-4: Southern Environmental Law Center

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Indirect and Cumulative Effects	NCTA's original EIS concluded that the Monroe Connector/Bypass would have less than a 1% impact on growth outcomes. As the Fourth Circuit noted, this conclusion was reached despite the fact that the NEPA process was "devoid of any evidence establishing that the region is developmentally saturated such that a major toll road will have no appreciable environmental impact." *N C. Wildlife Fed'n,* 677 F.3d at 603 n.2. Rather the outcome was obtained by reliance on inaccurate models which assumed the construction of the Monroe Connector/Bypass in both the "Build and "No-Build" scenarios. *Id*. At 600. NCTA has indicated that it will not address the reality of this conclusion, nor will the agency correct the flawed model from which the conclusion sprang.	The Draft Supplemental Final EIS concludes that the difference between future (2030) land use conditions under No-Build or Build conditions would vary by about 1 percent between developed and undeveloped categories within the entire project study area. This conclusion is based on extensive analysis as documented in the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) (ICE Update). The socioeconomic projections that formed part of the basis for the future "No-Build" and "Build" scenarios are extensively analyzed in Section 3.0 of the ICE Update, and the projections were determined to be reasonable and reliable. NCDOT specifically analyzed the supposed "flaw" in the model in Section 3.2 of the ICE Update and determined the issue had no effect on the projections.
2	Indirect and Cumulative Effects	Local elected officials and other public figures are near united in their belief that the Monroe Connector/Bypass will bring growth and development to Union County.	NCDOT completed its quantitative indirect and cumulative effects analysis based on the CEQ regulations and its own guidance manual, *Guidance on Indirect and Cumulative Impacts Assessment*. As documented in Section 1.6 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering Inc., November 2013), numerous local planners and others were interviewed and current adopted planning documents were reviewed to identify potential indirect effects, in particular land use effects. More importantly, NCDOT considered relevant studies and research about growth factors in Union County and summarized this analysis in the Draft Supplemental Final EIS and ICE Update.
3	Indirect and Cumulative Effects	For example, the Union County Chamber of Commerce has acknowledged the Monroe Connector/Bypass's propensity to induce growth, noting it would provide a significant boost to existing businesses and factor into the decision of any business considering operations in the county.[2] It has noted that the Bypass would "greatly enhance" Union County's "competitiveness for office and industrial development,"[3] and stated that "[t]own leaders are preparing for more commercial and residential growth plus increased traffic with completion of the Monroe Bypass freeway."[4] And when addressing a delay in the Bypass, Union County Chamber of Commerce President Sharon Rosche stated: "That's going to delay progress .. . [i]t will delay Union County from doing the things it needs to do to attract different types of businesses and corporations to enhance our economic tax base. "[5]	NCDOT and FHWA appreciate and understand the position of the Union County Chamber of Commerce. However, the Draft Supplemental Final EIS presents data and analysis of the growth likely to occur in the project area. It also highlights and summarizes other research of future growth projections in Union County.

Table A-4: Southern Environmental Law Center

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
4	Indirect and Cumulative Effects	The Charlotte Chamber of Commerce has also has determined that the Bypass will spur growth. In a recent letter to the Charlotte Observer, Charlotte Chamber Chairman Frank Emory and Chamber President Bob Morgan stated: "That there will be an economic impact of the Garden Parkway and the Monroe Connector is not debatable."[6] They argued that the Bypass is a "critical component" of infrastructure affecting the movement of goods through that area of the state and emphasized that "[t]he fact that road and transportation infrastructure spurs economic development is evident throughout history."[7]	See response to Comment #2 in this letter (i004).
5	Indirect and Cumulative Effects	Further, the City of Monroe has recognized that the Bypass "could create new commercial development opportunities along the new roadways."[8] And local elected officials, such as Indian Trail's Mayor John Quinn, also believe the Monroe Connector/Bypass would cause growth in Union County, stating that the Bypass would decrease traffic on U.S. 74 by a third and open up opportunities for new development.[9]	See response to Comment #3 in this letter (i004).
6	Indirect and Cumulative Effects	Regarding the Indian Trail Segment, for example, the Plan posits that the "proposed Monroe Bypass will create opportunities for the Town of Indian Trail as well." It expands: "The direct access to the heart of the Town via Indian Trail Road will create an opportunity for a Mixed Use Gateway Development around the intersection of U.S.-74 and Indian Trail Road .... This mixed use development will complement downtown Indian Trail and will create a draw for the downtown by attracting motorists from the Monroe Bypass and U.S.-74 corridor. This development could be comprised of major retail, residential, and office uses organized in a town-center layout with equal emphasis on pedestrians and bicyclists."[12]	See response to Comment #3 in this letter (i004). Furthermore, specific expectations regarding additional development in the vicinity of interchanges around Indian Trail are discussed in Section 4.2 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). The applicability of the *US 74 Revitalization Study* is discussed in Section 4.2 as well.
7	Indirect and Cumulative Effects	Community stakeholders are also anticipating growth from the Bypass. For example, the Charlotte Regional Partnership has called the Monroe Connector/Bypass "a key part of future business growth and prosperity of Union County," stating that the Bypass would be a "business asset" and "a boon for tourists and commuters."[13] And the South Piedmont Community College set out in its Master Plan that "[i]t is anticipated that major growth will occur in the Anson County service area in 2013 when North Carolina Turnpike Authority completes the Monroe Connector/Bypass highway construction project."[14] Recently, a pro-Bypass Facebook group has developed, promoting the Bypass primarily	See response to Comment #3 in this letter (i004).

Table A-4: Southern Environmental Law Center

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		in terms of the road's expected economic impact on Union County.[15]	
8	Indirect and Cumulative Effects	Analysis from North Carolina State Government, of which NCTA is a part, also contradicts the agency's conclusions. Earlier this year, Lieutenant Governor Dalton and the State's Logistics Task Force published a report that analyzed different transportation and logistics projects in the State of North Carolina.[16] In the report, the Task Force concludes that the Monroe Connector/Bypass is "important or critical" to a number of development projects, including the proposed Legacy Business Park, discussed below, the Intermodal Center at the Charlotte Douglas Airport, and the development of potential inland ports in Salisbury and Rowan Counties and Statesville and Iredell Counties.[17]	The scales of study for the Governor's Task Force and the indirect and cumulative effects analysis for the Monroe Connector/Bypass NEPA EIS study are not comparable. The NEPA EIS study focuses on a localized study area smaller than Union County as a whole where quantifiable indirect and cumulative impacts to land use could occur, while the Governor's Task Force study qualitatively assessed the entire state. Specifically, "The Task Force's purpose was to study the transportation and logistics needs of North Carolina currently and in the future to allow it to compete aggressively in the 21st Century economy. Also, the Task Force was directed to study North Carolina's transportation infrastructure and determine how best to move people and goods in and throughout the state to engage in the national and global marketplace." P. 9. The Governor's Logistics Task Force – Final Report does state "Key to any of the sites discussed above and in the Seven Portals Study is the completion of the Monroe By-Pass. The task force has seen this project referenced as important or critical to multiple regions, and therefore it should be one of the highest priorities for DOT." However, the report provides no specific reasons or supporting data for the key nature of the Monroe Connector/Bypass to the proposed Legacy Business Park, the intermodal Center at the Charlotte Douglas Airport, and the development of potential inland ports in Salisbury and Rowan Counties and Statesville and Iredell Counties. With regards to Legacy Park see response to Comment #12 in this letter (i004).
9	Indirect and Cumulative Effects	The Logistics Task Force Report also incorporates a study entitled the "Seven Portals Study" which discusses each region of the State in more detail. [18] The report for the Charlotte region describes the connection between the Monroe Connector/Bypass and development in Union County, explaining that manufacturing has been declining in the County and that the additional infrastructure and the proposed Legacy Business Park will be a key piece of bringing it back and attracting new development to the region.[19] Even the North Carolina Maritime Strategy cites the Monroe Connector/Bypass as important to increased development in the State.[20]	As documented in Section 1.6 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), numerous local planners and others were interviewed, and current adopted plans were reviewed, to identify potential indirect effects, in particular land use effects. As documented in Section 1 of the *Indirect and Cumulative Effects Assessment* (Final EIS Appendix G), NCDOT worked closely with local officials and resource agencies to define the appropriate study area and scope of analysis for the indirect and cumulative effects analyses. Finally, NCDOT has documented the expected induced land use effects of the proposed project in Sections 4.2 and 5.1 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) and those induced effects include expected additional commercial and industrial development consistent with local approved future land use plan.

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
			With regards to Legacy Park see response to Comment #12 in this letter (i004).
10	Indirect and Cumulative Effects	If it were not enough that State level reports predict significant growth and development from the Bypass, statements from NCTA itself have echoed the same message. For example, John Collett, a member of the N.C. Board of Transportation and NCTA Board of Directors, stated in an editorial in the Charlotte Business Journal that the Monroe Connector/Bypass "will create jobs" because it will relieve congestion on a major route into Charlotte by providing an alternative to U.S. 74.[21] He also explained that the Bypass will result in growth because it "will make the region more attractive to industry and tourism and a better location for commercial shippers. "[22]	There is no quantitative data in this comment that would change conclusions of the indirect and cumulative effects (ICE) analysis. The ICE analysis indicated greater industrial development in certain areas under a Build Scenario as documented in Sections 4.2 and 5.1 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). The expectation of additional commercial and industrial development implicitly assumes there would be more jobs in the study area under a Build Scenario compared to a No-Build Scenario.
11	Indirect and Cumulative Effects	Despite statements at every level of Government that the Monroe Connector/Bypass will bring significant growth and development to Union County and beyond, NCTA persists in advancing the fiction in its environmental documents that the project will not impact growth outcomes. NCTA's draft "Union County Growth Factors'' Memo states that ''transportation infrastructure improvements are not the main driver of the rapid growth in Union County." Rather, the memorandum suggests that income, land availability and school quality are the driving forces behind growth in the area.[24] The memo thus concludes that the previous conclusions about the Monroe Connector/Bypass in the original EIS remain correct. NCTA must reconcile these conflicting statements. "The very purpose of public issuance of an environmental impact statement is to 'provid[e] a springboard for public comment.' '' *N C. Wildlife Fed'n,* 677 F.3d at 603 (quoting *DOT* v. *Public Citizen,* 541 U.S. 752, 768 (2004)). State lawmakers are poised to invest $24 million per year for forty years to the Monroe Connector/Bypass, based on their repeatedly-stated conclusion that the toll road will spur growth and economic development. If that conclusion is untrue, the State must make that clear and explain why the ingrained beliefs of public officials are false and mistaken. Only then can the public know exactly how and why its tax dollars are being spent.	The analyses prepared for this project do not state that the project will not impact growth outcomes as suggested by the commenter. The Draft Supplemental Final EIS and the ICE Update present data and analysis of the growth likely to occur in the project study area. These documents also highlight and summarize other research of future growth projections in Union County.
12	Indirect and Cumulative Effects	One of the most striking examples of these plans is the proposed Legacy Business Park ("the Park"), a 5,000-acre business park and "inland port" planned to be constructed at the end of the Monroe Connector/Bypass in Wingate.[25] As planned, the Park would be the largest business park in	Legacy Park is highly unlikely to develop in the manner described. NCDOT has interviewed numerous officials and other interested parties and has fully considered the likelihood of the development of Legacy Park and has documented that in Section 4.2 of the ICE Update.

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		North Carolina and would attempt to bring over 20,000 jobs to the region.[26] Just Phase 1 of the project is itself a massive undertaking involving significant growth: The first stage of Park development involves 1750 acres accommodating 11 rail-served industrial sites, a light industrial site, two office institutional sites, and a rail facility adjacent to the existing CSX railline.[27] However, the 5,000 acre footprint of the fully built-out park is just a fraction of the development and construction that will result in the event that the Park moves ahead as planned.	
13	Indirect and Cumulative Effects	Plans for the Park make clear that it is integrally connected to the Monroe Connector/Bypass. Indeed, the Park's very feasibility depends on construction of the Toll Highway.[28] A road, "Legacy Parkway," is already planned to connect the park to the Bypass via the Forest Hill interchange;[29] upon completion of the Monroe Connector/Bypass, the western entrance to Project Legacy would be a short distance to I-485 and allow even faster access to the Charlotte-Mecklenburg area.[30]	See response to Comment #12 in this letter (i004).
14	Indirect and Cumulative Effects	And even before the Legacy Parkway was publicly proposed, the NCTA recognized the importance of keeping key project proponents engaged in the planning process for the Bypass.[31]	The meeting minutes referenced do not appear to reference Legacy Parkway or Legacy Park as the commenter suggests.
15	Indirect and Cumulative Effects	As the environmental review process moved forward, NCTA assured local leaders that the Bypass plans would accommodate Park access.[32]	See response to Comment #12 in this letter (i004).
16	Indirect and Cumulative Effects	For example, Lt. Governor Dalton highlighted the Legacy Park's economic development potential at the Union County Partnership for Progress's 2011 Annual meeting.[33] Dalton discussed the growth likely to result from the Park and noted that transportation projects like the Park's planned rail connections will ensure that Union County will be a part of statewide initiatives to make North Carolina a key East Coast distribution hub. And Keith Crisco, N.C. Commerce Secretary, praised and promised support for the project.[34] The Anson County Chamber of Commerce has also recognized the likelihood of growth impacts associated with the Legacy Park; on February 18, 2009, the Chamber met to discuss the "dramatic impact" expected to result from the project.[35]	See response to Comment #12 in this letter (i004).
17	Indirect and Cumulative	The Union County Board of Commissioners included the Park in their 2025 Comprehensive Plan, stating that the Wingate-Marshville area "is likely to be a major opportunity area once the new Monroe	See response to Comment #12 in this letter (i004). The Union County 2025 Comprehensive Plan does not include the Legacy Park

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	Effects	Connector/Bypass is in place."[36] The Board also incorporated the Park into its employment forecasts.[37] The Park is also assumed in the U.S.74 Revitalization Study projections for industrial growth in the area.[38]	development as suggested by the commenter. NCDOT confirmed this conclusion with the Union County Director of Planning.
18	Indirect and Cumulative Effects	Many other sources have highlighted that the Bypass is critical to the success of Legacy Park. Maurice Ewing, head of Union County Partnership for Progress, the county's economic development arm and champion of the project, has acknowledged that the Park in its current form would not proceed without the Bypass,[39] stating that "[w]ithout the bypass, Legacy doesn't work .... "[40] and that the Monroe Connector/Bypass "will be critical" to the Park.[41] Marshville Mayor Franklin Reese also emphasized this connection, explaining recently that if the Bypass is built, it is "90 percent certain" that the Park would follow.[42] And Union County planning director Richard Black stated that the Park is contingent on the Bypass. Black concluded that the Park is a likely development so long as the Bypass is built and that it should have been included in Union County's 2010 long-range land-use plan.[43]	See response to Comment #12 in this letter (i004).
19	Indirect and Cumulative Effects	Further, as noted above, the recently released report from the Governor's Logistics Task Force and the associated Seven Portals Study further underscore the connection between the two projects and the dependency of the Park on the Bypass. The studies note that the Bypass is "key" not only to Legacy Park, but to a number of proposed developments in Union County.[44] In other words, the Park will not move forward without the Monroe Connector/Bypass, and is thus an indirect effect of the Bypass that must be considered in the environmental analysis.	See response to Comment #12 in this letter (i004).
20	Indirect and Cumulative Effects	The Union County Board of Commissioners has approved a $556 million, 20-year capital improvement project that includes plans to install water and sewer lines to serve the Legacy Park.[48] The Park has also been incorporated into planning for the Centralina Freight-Mobility Plan.[49]	See response to Comment #12 in this letter (i004).
21	Indirect and Cumulative Effects	Despite the clear requirement to disclose Legacy Business Park and associated development as an indirect impact of the Bypass, NCTA failed to perform this analysis in its initial EIS. The only reference to the project was a brief mention in the Qualitative ICE study which failed entirely to mention the connection between the Business Park and the Toll Highway. Indeed, the EIS suggests that the decision to build the Park	See response to Comment #12 in this letter (i004). Additionally, the local planners and the MPO did not find the Legacy Park development as reasonably foreseeable and did not include the development in the socio-economic forecasts for its 2035 LRTP and subsequent updates.

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		is entirely independent of the proposed Bypass, despite all the evidence to the contrary set out above. Most troubling, the failure to present the link between the two projects to the public appears to have been purposeful. In an e-mail obtained by SELC through a public records request, one of Legacy Park's key proponents stated that he would heed NCTA's advice and be "guarded" and "cautious" in discussing the essential relationship between the Business Park and the Bypass. This same individual has continued to warn active parties to be "particularly sensitive to the need to keep this project and [their] current level of activity confidential." These comments suggest that NCTA is once more failing to be open and transparent with the public. As NCTA moves forward with its analysis of the Monroe Connector/Bypass, it is essential that reasonably foreseeable development dependent on the highway's construction be fully examined in a future ICE analysis. NCTA has indicated that it intends to discuss indirect effects with RPOs in the area. A discussion with the Rocky River RPO ("RRRPO") should be informative in this regard. Records indicate that the RRRPO has already generated socioeconomic forecasts that anticipate Legacy Park's construction, analyzing the Park's regional impacts over the next 30 years. The RRRPO predicts the creation of thousands of jobs in the area as a result of the Park and recognizes that the Park's likely impact includes a rail facility, distribution centers, increased truck traffic, and the build out of other facilities such as office, institutional, commercial, and manufacturing facilities.[60] The RRRPO also recognizes that the associated growth could prompt offsite housing developments and predicts they would occur mostly north and west of Marshville and to some extent in Anson County.	
22	Indirect and Cumulative Effects	Plans from the Towns of Wingate and Marshville also demonstrate that the Monroe Connector/Bypass will induce substantial development. The two municipalities began strategic planning efforts in 2008 focused towards capitalizing on the growth expected from the Bypass's construction. Published plans state that the Bypass served as a "catalyst" that prompted the municipalities to join with the Union County Partnership for Progress to commission a Strategic Plan for Economic Development. The study expressly recognizes that the Bypass "will be the impetus that	The Draft Supplemental Final EIS and the ICE Update consider plans from Wingate and Marshville. Section 4.2 of the ICE Update documents how the *Strategic Plan for Economic Development, Town of Marshville, Town of Wingate (2008)* was an important contributor to the estimates of induced growth in eastern portions of the study area.

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		creates market demand for many other development projects." In light of this study, which was published before the original EIS for the Monroe Connector/Bypass was put together, NCTA's finding that the Bypass will not induce growth and development is yet again refuted. NCTA should incorporate the predictions of Marshville and Wingate into its next environmental document.	
23	Indirect and Cumulative Effects	The Union County Board of Commissioners also recognized the Bypass's potential for growth in its 2025 Comprehensive Plan. The Board states that the Bypass "will open many doors for new commerce in Union County." They state that "The U.S.-74 'Monroe' Connector/Bypass will be an important transportation facility and economic generator in the County for years to come." As such, the Plan details strategy and considerations essential to encouraging and facilitating development resulting from the Bypass.	NCDOT considered the information available in the Union County 2025 Comprehensive Plan as documented in Section 1.6 and 4.2 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013).
24	Indirect and Cumulative Effects	The conclusion that the Monroe Connector/Bypass will make little difference to growth outcomes is based on a flawed analysis performed in the Quantitative Indirect and Cumulative Effects ("ICE") analysis. As we explained in our briefs to the Fourth Circuit, this assertion is contradicted by analysis and conclusions made in other documents compiled to review the Toll Highway, including documents that form part of the EIS. NCTA's Qualitative ICE analysis of the Monroe Connector/ Bypass, unlike its "quantitative" counterpart, actually concludes that the Toll Highway induces growth. The Qualitative study concludes that there is "high potential for new residential growth" in the eastern section of the study area where "build alternatives would improve access and allow for easier and faster commutes to the Charlotte-Mecklenburg urban area'' and repeatedly cites the potential for growth in the central and eastern portions "because the project would improve travel time from those areas to Charlotte."	The Qualitative ICE states that more residential development would take place in the eastern portion of the project area, and higher density development would take place in the central portion of the project area in the vicinity of interchanges. The ICE Update includes a comparison of Build to No-Build Scenarios for land use in the study area in Map 19 and Table 20. The results show more residential development in the Build Scenario, with most new development occurring in the eastern portions of the study area, consistent with the qualitative assessment.
25	Indirect and Cumulative Effects	Similarly, the Community Impact Study in the original EIS states that "local planners believe that the project is vital to the economic well-being of Union County. Furthermore, local planners believe the project would benefit them in their goal to actively seek to attract commercial and industrial growth to boost the local tax base. "[85] The Study also explains that "[t]he project will introduce a suburban element into what	See responses to Comments #3 and #24 in this letter (i004).

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		is generally a rural environment."	
26	Indirect and Cumulative Effects	NCTA's traffic and revenue study for the proposed toll road, a necessary prerequisite for financing the project, also predicts growth and development. The study explains that "[f]uture economic growth potential is particularly important for the study of any new start-up toll facility such as the proposed Monroe Connector."[87] In the case of the Toll Highway, the study makes clear that "the population and employment forecasts" used to calculate revenue were "directly related to the growth rates of traffic predicted" by the study's model.[88] The study adds, "[o]f particular importance is that the proposed Monroe Connector is included in the model and influences the growth forecasts therein."[89]	NCDOT has fully discussed the relationships between the analyses completed for the Traffic and Revenue Study and the indirect and cumulative effects analysis in Section 3.3 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013).
27	Indirect and Cumulative Effects	Despite these forecasts of growth attributable to the Toll Highway throughout the NEPA documentation, NCTA's ultimate conclusion in its original EIS was that the Bypass would make little difference to growth outcomes.[90] The document contained no reconciliation of the different conclusions reached in different aspects of the NEPA process. Without explanation, the Quantitative ICE results were adopted as the basis for the ROD, and the Qualitative Study, the Community Impact Study, and the economic revenue forecasts were disregarded. As NCTA has indicated that it will continue to rely on the conclusion of minimal growth reached in the Quantitative ICE, it is imperative that the agency reconcile this conclusion with other statements so that the public can be provided with a clear picture of the impacts attributable to the road.	The commenter is referring to a document that was a preliminary Traffic and Revenue Study. That study was superseded by a 2010 Comprehensive Traffic and Revenue Study, which relied upon an independent economist to review the MPO's projections of forecasts. NCDOT considered the results of this study and discussed the relationships between the Comprehensive Traffic and Revenue Study and the indirect and cumulative effects analysis in the ICE update. See responses to Comments #2, 3, 11, 12, 22, 23, 24 and 26 in this letter (i004).
28	TIFIA Application	In NCTA's application for federal TIFIA funds for the Bypass, the agency made clear that the project would be a driver of growth. In an attempt to secure federal financing, NCTA told the federal government in its Letter of Interest ("LOI") that construction of the Bypass would "allow the region to continue to be an attractive location for new businesses and additional residents." Just as NCTA must be consistent within *its* EIS, so it must be consistent in all documents it is submitting to the federal government. Either the Monroe Connector/Bypass will induce growth and development or it will not. We note that an NCTA reviewer looking at the application commented that this section discussing induced growth was "a bit counter to other arguments" [sic]. We agree. The agency cannot chose	The FHWA declined to provide TIFIA financing on this project. Therefore, FHWA is not inconsistent with its analysis.

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		one reality when asking for federal money, and then another reality to avoid rigorous federal environmental permitting and mitigation requirements.	
29	Indirect and Cumulative Effects	Dr. Steve Appold was retained by the Charlotte Regional Alliance For Transportation ("CRAFT"), which includes the Charlotte area's 4 MPOs and 2 RPOs, to develop regional socioeconomic projections for the Charlotte Metrolina region for 2015-2045. After reviewing 2010 census data, Dr. Appold projected that future growth trends in the Metrolina region would be increasingly centralized, with the majority of growth occurring in Mecklenburg County and along the surrounding counties' adjacent edges.[96] Dr. Appold projected that the majority of growth in Union County would occur in the central and northwest districts (those abutting Mecklenburg County) rather than the County's more rural South and East districts, such as those in the Monroe Connector/Bypass study area. NCTA should take these predicted future trends into account when considering the impact of the proposed Toll Highway. If Dr. Appold's projections are correct, then in absence of the Monroe Connector/Bypass we would expect to see minimal growth in Union County, particularly in its rural districts where the Bypass and Legacy Park are currently planned. These new projections directly contradict the demographic and economic forecasts that NCTA relied upon in the initial Monroe Connector/Bypass EIS. Though the NCTA has accounted for Hammer's high Union County population estimates based on growth factors such as higher quality housing stock and schools, these factors do not explain why, in the absence of the Monroe Connector/Bypass, Union County would experience full economic growth including booming job growth, as predicted by NCTA, rather than serving simply as a bedroom community for the Charlotte-Mecklenburg region, as initially predicted by Dr. Appold. NCTA should carefully consider Dr. Appold's analysis in its review of the Monroe Connector/Bypass.	NCDOT has fully analyzed the currently adopted regional forecasts in Section 3 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) and determined they are reasonable representations of future growth of the FLUSA. NCDOT has been following the development of new socioeconomic forecasts for the Charlotte region and is aware of Dr. Appold's projections. NCDOT Guidance on ICE analysis recommends using *adopted* MPO forecasts when available and since Dr. Appold's forecasts have yet to be adopted, it would be premature to immediately incorporate those forecasts into a new or revised indirect and cumulative effects analysis. NCDOT met with Dr. Appold and considered the Draft 2040 socioeconomic projections. Dr. Appold's Union County projections are suggesting that current forecast growth would occur in 2040 instead of 2030. Dr. Appold has not allocated future growth to small area TAZs. Union County was the fastest growing County in the State between 2000-2010. This despite the fact that the county had no freeway miles. Researchers have well documented that the tremendous growth occurring and projected to occur is not dependent on transportation.

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30	Indirect and Cumulative Effects	Just like the myriad of other statements and projections noted above, the RRRPO estimates are inconsistent with NCTA's continued insistence that the Monroe Connector/Bypass will have almost no impact on growth outcomes. We hope that NCTA will coordinate with the RRRPO as it reevaluates the Toll Highway. We note that during the previous NEPA process, despite two suggestions to discuss socio-economic projections with Ms. Stoogenke at the RRRPO, no such coordination took place.	The *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) includes additional industrial, commercial and office development in eastern portions of Union County, as documented in Section 5 of that document. These estimates are not inconsistent with comments from Ms. Stoogenke, Director of the RRRPO. Also, see response to Comment #21 in this letter (i004).
31	Indirect and Cumulative Effects	Academic literature also supports the likelihood that the Monroe Connector/Bypass will spur growth in Union County. Transportation and planning experts have extensively studied the concept of "induced growth," finding that often adding capacity to an otherwise congested transportation corridor will initially reduce travel times, but that this increase in the service level will attract additional trips that would not have been made without the improvement.[103] As Todd Litman of the Victoria Transport Policy Institute explains, roadway improvements alleviating congestion reduce the generalized "cost" of driving, which encourages more vehicle use and ultimately greater growth in the affected areas. [104] For example, some trips may be diverted from another facility or added by drivers taking longer or more frequent trips or choosing different destinations.[105]	The commenter provides selected quotes from a Todd Littman report on "Generated Traffic and Induced Travel, Implications for Transport Planning," 6 November 2011. The selected references from the report discuss general relationships between adding highway capacity and additional highway trips in support of their comment that the Monroe Connector/Bypass will spur growth in Union County. The report does not provide specific data relevant to forecasting land use changes associated with the construction of a toll road in Union County. However, contrary to their comment, the report provides references that actually support the ICE Update conclusions. The report provides a referenced quote on page 23 that states "The available evidence does not support arguments that new transport investment in general has a major impact on economic growth in a country with an already well developed infrastructure (SACTRA 1997)" Additionally our review of the references, offered by the commenter, suggests that the commenter may have missed an important point contained in the reports for implications for transportation planning. The point being that the reports are suggesting a policy preference for pricing as a tool for solving congestion instead of adding new capacity. For example, Mr. Littman offers on page 22 that "The efficient solution to congestion is to use pricing or other incentives to test consumers' willingness to pay for road space and capacity." Gilles Duranton and Matthew A Turner, in their report titled, "The Fundamental Law of Road Congestion: Evidence from US Cities", September 8, 2009 conclude that "Together, these findings strengthen the case for congestion pricing as a policy response to traffic congestion." Therefore, conclusions offered in these reports would support the implementation of the Monroe Connector/Bypass toll road as an effective solution for congestion in Union County.

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32	Indirect and Cumulative Effects	In its recent draft "Union County Growth Factors" Memo, NCTA suggests that it is the "Build" scenario that is incorrect, stating that "it is possible that population and employment growth in Union County will be higher if the Monroe Connector is built."[106] We have not yet been given sufficient access to NCTA's analysis to review the "Build" scenario in detail, but it seems likely that it has been understated.	The Draft Supplemental Final EIS and ICE update are available to the public for review and comment.
33	Indirect and Cumulative Effects	As such, the Court made clear that the agencies must create an accurate "No-Build" baseline, and that MUMPO's socioeconomic data, which assumes construction of the Monroe Connector/Bypass, cannot form the basis of such a baseline. Despite this clear mandate, rather than set out to create a new, accurate baseline, NCTA has focused on attempting to explain why the Court of Appeals was in fact mistaken, and why continued reliance on MUMPO's Metrolina Regional Travel Demand model ("MRM") as the baseline is appropriate.	NCDOT has fully investigated the impact of the inclusion of the roadway in the travel time to employment factor in the bottom up socioeconomic forecasting process. The results of that analysis are documented in Section 3.2 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). NCDOT evaluated the impact of the inclusion of the project in MUMPO's socioeconomic and land use models. MUMPO's socioeconomic models showed no difference in Union County land use between the no-build and build scenarios.
34	Indirect and Cumulative Effects	The top-down model, which takes a large scale overview of future growth projections, was based on a number of core assumptions. One of those assumptions was that there would be sufficient infrastructure available to accommodate any future growth. With regard to transportation, the model equated distance to travel time at all points in the future. In other words, the model assumed that in the future there would be no increase in the time it would take to get from point A to point B as a result of delays on area roadways, even if there were significantly more people living in the region. In a situation such as the one predicted by this model, where there is an increasing population and thus increasing traffic, the only way that travel time can remain constant between two geographical points is if additional transportation improvements - such as the Monroe Connector/Bypass - are implemented. Otherwise, roads would eventually reach capacity and travel time would slow between two geographic points. The top-down model was thus premised on the construction of transportation improvements such as the Toll Highway.	The Commenter's assumptions regarding the inclusion of the Monroe Connector/Bypass project in the "top-down" model are not correct. The many assumptions and analyses completed in the development of the regional socioeconomic projections are fully documented and reviewed in Section 3.2 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013).
35	Indirect and Cumulative	In arguments to the Fourth Circuit, NCTA's counsel contended that because the top-down analysis does not include a transportation	NCDOT met with Dr. Appold to discuss this comment. As Dr. Appold explained in his May 29, 2013 letter to Mr. Alavi of NCDOT that "The socio-economic projections

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	Effects	network, the Toll Highway cannot have been assumed in the results. This explanation entirely missed the point. As we made clear to the court, it is precisely because the top-down process does not include a transportation network, and instead uses proximity distances as a proxy for travel time, that the Toll Highway is part and parcel of the process. Our concerns regarding top-down modeling were recently confirmed at an October 16, 2012 meeting of CRAFT when Dr. Steve Appold presented the next iteration of the top-down socio-economic forecasts for the Metrolina region. Dr. Appold confirmed that the explanation we provided to the Fourth Circuit is accurate: Top-down forecasts assume that there is sufficient infrastructure in place to keep up with expanding population, and thus inherently assume projects like the Monroe Connector/Bypass.[107]	cited in the study were neither build nor no-build scenarios. The projections are not affected by specific infrastructure investment decisions."
36	Indirect and Cumulative Effects	Thus, contrary to NCTA's contentions, even at the top-down stage, local infrastructure, such as the Monroe Connector/Bypass, and local priorities, such as projections of high growth, are factored into future forecasts both implicitly and explicitly. In recent presentations NCTA has made clear that it does not intend to address the use of top-down data that assumes construction of the Monroe Connector/Bypass for its ''No Build" scenario. The EIS will thus remain based on an arbitrary and capricious assumption.	This comment is not correct. The only large scale transportation projects that affected Dr. Hammer's "top-down" forecasts were the Garden Parkway and the Route 16 improvements to Lincoln County. The many assumptions and analyses completed in the development of the regional socioeconomic projections are fully documented and reviewed in Section 3.2 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013).
37	Indirect and Cumulative Effects	During litigation NCTA adopted the position that while the Monroe Connector/Bypass was included in the bottom-up data, its inclusion was insignificant. The Court rejected this assertion. NCTA persists in yet another variation of this same argument.	See response to Comment #33 in this letter (i004).
38	Indirect and Cumulative Effects	With its initial attempts to demonstrate the insignificance of the inclusion left in tatters by the Fourth Circuit, NCTA has seized on a new explanation. The agency now asserts that in the bottom-up analysis, the proposed Bypass only reduces travel time to employment in the region by an average of 18 seconds and thus has little influence on overall growth patterns. Further, NCTA's materials state that current average Union County commuting times are just 29 minutes, only two or three minutes higher than commuting times elsewhere in the Charlotte region. These statements are at odds with other NCTA statements about the	See response to Comment #33 in this letter (i004).

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		bypass which assert that it will save drivers between 30-50 minutes. Thus, either (1) NCTA is reconsidering the projected travel time savings from the Toll Highway, or (2) the model has <u>severe</u> inaccuracies with regard to predictions of travel-time and the associated impact on population distribution. Such inaccuracies are highly significant as NCTA made clear throughout the NEPA process that travel time is of paramount importance in predicting where people live.	
39	Indirect and Cumulative Effects	Consequently, it is essential that NCTA restart its ICE analysis. The new study must include a "No-Build" scenario that does not include the Monroe Connector/Bypass in either the top-down or the bottom-up analysis.	NCDOT and FHWA do not agree with this response. The ICE Update and its appendix provide a rational basis to determine the indirect and cumulative impacts of the project.
40	Indirect and Cumulative Effects	Further, in keeping with NCTA's conclusion that the travel time metric is an indispensable part of forecasting future growth patterns, the model used must accurately account for the importance of travel time to employment in all scenarios.	See response to Comment #33 in this letter (i004). NCDOT addressed the improvement to accessibility / travel time that the proposed project would bring and its impact to induced growth, as documented in Section 4.2 of the ICE Update.
41	Indirect and Cumulative Effects	The second round of interviews with local planners conducted in 2009 focused specifically on the appropriateness of reliance on the MUMPO's socioeconomic data. NCTA's consultants asked local planners if they believed it would be appropriate to use these MUMPO forecasts to illustrate a future "No-Build" scenario. In the course of this investigation the vast majority of planners were unable to confirm whether or not the current socio-economic forecasts were appropriate for a "No-Build" scenario.[134]	For the ICE Update, NCDOT evaluated the effects of the project on the MPO's socioeconomic and land use models. Therefore, the interview responses described in this comment are not relevant to the analysis in the ICE update.
42	Indirect and Cumulative Effects	NCTA's consultant, Baker Engineering, once more made contact with local area planners. This contact took the form of a brief and biased email questionnaire which asked the planners to endorse the use of the MUMPO's socio-economic data. The questionnaire did not describe the underlying concern about the inclusion of the Toll Highway in the "No-Build" analysis, but rather suggested to planners that they agree with the Turnpike Authority's assumption that the MUMPO's socio-economic forecasts could be used for a "No-Build" scenario. Each e-mail asked: "Based on your understanding of the socio-economic forecasting process that occurred from 2001-2004, would you agree with our assumption that these forecasts represent a future scenario without	See response to Comment #41 in this letter (i004).

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		the Monroe Connector."[137] The consultants assured the planners - many of whom had no personal knowledge of the creation of the TAZ data and many of whom were not in their current positions when the data was produced - that all other planners had agreed with the assumption.[138]	
43	Indirect and Cumulative Effects	While the NCTA reported favorable results from this round of "interviews," the results were in reality not conclusive. Despite the skewed questions, several planners could not confirm that the socio-economic forecasts had been applied in a reasonable manner, [139] and others who replied in the affirmative were the very same planners who earlier had stated they were unable to confirm such assumptions.[140]	See response to Comment #41 in this letter (i004).
44	Indirect and Cumulative Effects	Despite NCTA's continued assertions to the contrary, the interviews conducted with local planners do not confirm the appropriateness of using MUMPO's socio-economic projections to generate a ''No-Build" scenario. Rather, as conclusively found by the Court, the process was "patently inadequate." *N.C. Wildlife Fed'n,* 677 F.3d at 605 n.4. Moving forward, it is imperative the NCTA engage with local planners to present clear and honest "Build" and "No-Build" scenarios. Where local planners do not have sufficient knowledge or expertise to identify the appropriate use of socio-economic data, this fact should be indicated. Similarly, future interviews must provide local planners with sufficient information about the intended use for the data so that they are able to accurately determine the appropriateness of that use. Further, NCTA must insure that all appropriate local planners are contacted. As noted above, the failure to coordinate with the RRRPO during the previous NEPA process led to significant inadequacies in the analysis.	See responses to Comments #39 and 41 in this letter (i004).
45	Indirect and Cumulative Effects	Significant growth and development is anticipated to occur if the Monroe Connector/Bypass is constructed. However, little of this growth is accounted for in the "Build" scenario. In addition to revising the "No Build" scenario to ensure that it accurately reflects a future without the Monroe Connector/Bypass, NCTA must ensure that the "Build scenario" accounts for all the reasonably foreseeable future growth that will result from the Bypass. NCTA must clearly explain how the "Build" scenario is calculated, and how it takes into account all predicted future development that can be attributed to the Toll Highway.	It is difficult to determine what the commenter means by "significant growth and development" as commenter has never quantified the growth they feel is expected, and as such it is not appropriate to compare general statements such as "significant growth" to the actual quantified growth projected in the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). Section 4.2 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) documents how the No-Build and Build Scenarios were developed and Section 5 documents the expected induced development that would result from the Build Scenario and the indirect and cumulative impacts that would result from this induced growth. The report is

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			summarized in **Section 4.5** of the Draft Supplemental Final EIS.
46	Indirect and Cumulative Effects	As discussed above, the proposed Legacy Park is a reasonably foreseeable future development, and the EIS must consider the cumulative impacts of the Bypass and the business park in combination. Such an analysis would be required even were the Park not dependent on the Bypass. NEPA regulations require that agencies analyze the cumulative impacts of "past, present, and reasonably foreseeable future actions regardless of what agency ... or person undertakes such other actions."[142] In determining whether a project will have a "significant" impact on the environment, an agency must consider "[w]hether the action is related to other actions with individually insignificant but cumulatively significant impacts."[143] The Legacy Park development will necessarily have such an impact.	See response to Comment #12 in this letter (i004).
47	Indirect and Cumulative Effects	NCTA must also consider the cumulative impact of the Monroe Connector/Bypass and the proposed 601 Connector- a proposed new location four-lane divided road that would connect the Monroe Connector/Bypass and US 601 South. While we understand that the 601 Connector project may not proceed immediately, we ask NCTA to determine if there are still any plans for its construction. Statements from the Monroe City Council are that the project is "on hold," suggesting that it has not been abandoned but is planned for construction in the near future. If the intention is still to pursue the project, then NCTA must account for the cumulative impact of the Connector in its analysis of the Monroe Toll Road. We note that an early scoping exercise for the Monroe Connector/Bypass NEPA process included the possibility of pursuing a combined NEPA process for the 601 Connector, the Monroe Bypass and the Monroe Connector. The two projects are intimately connected and should not be pursued on a	The 601 Connector is not "planned for construction in the near future." There are no current plans to proceed with the 601 Connector project. It is not included in the MUMPO 2012-2018 Transportation Improvement Program, the 2014-2020 draft State Transportation Improvement Program, or the MUMPO 2035 Long Range Transportation Plan as a financially constrained project, even if the counties adopted a tax of 0.25 cent to fund additional transportation improvements. There are projects in the current NCDOT STIP (Project U-4024 and R-2616), that will widen existing US 601. These projects have been included in the quantitative indirect and cumulative effects analysis. CEQ defines a cumulative impact as: "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." As the 601 Bypass project is not included in current plans, NCDOT does not

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		piece-meal basis.	consider the project to be "reasonably foreseeable." NCDOT will revise this consideration if the project is included in future plans before completion of the Monroe Connector/Bypass EIS process.
48	Purpose and Need	In its recent presentation to federal and state resource agencies, NCTA has indicated a willingness to revisit the purpose and need for the Monroe Connector/Bypass. We urge the agency to take this step. As explained below, not only is the current statement extremely unclear, but recent developments call its very rationale into question. Once NCTA has clarified its purpose and need a full analysis of all reasonable alternatives can begin. Many residents of Union County, including local elected officials, believe that the purpose of the Monroe Connector/Bypass is to decrease congestion and improve mobility on existing U.S. 74. It is understandable that local community members could have reached this false conclusion. The stated purpose of improving "mobility in the U.S. 74 corridor within the project study area" gives the impression that the Toll Highway will improve U.S. 74 itself, rather than just provide a parallel (tolled) road in the corridor that will improve mobility. By contrast, NCTA has acknowledged in recent meetings that the proposed toll highway will not, in fact, improve congestion on U.S. 74. During a meeting of the U.S. 74 Corridor Revitalization stakeholders, NCTA representatives made clear that the Bypass was not planned with the idea to improve or address congestion issues on U.S. 74. That is not a stated purpose of the Bypass, nor is it an anticipated result of the Bypass; instead, the purpose is to create a high speed corridor in the region. This fact is not new. Traffic data in the EIS indicated that congestion on existing U.S. 74 would not be much improved with construction of the Bypass. Moving forward, NCTA must articulate and deliver a clear statement of purpose and need to the public, and be clear about the impact of constructing the road to existing U.S. 74.	The Draft Supplemental Final EIS includes an updated purpose and need section based on new information. As stated in the Draft EIS, Final EIS, and Draft Supplemental Final EIS, the purpose of the project is "to improve mobility and capacity within the project study area by providing a facility for the US 74 corridor from near I-485 in Mecklenburg County to between the towns of Wingate and Marshville in Union County that allows for high-speed regional travel consistent with the designations of the North Carolina SHC program and the North Carolina Intrastate System, while maintaining access to properties along existing US 74." As discussed in **Section 2.5.2** of the Draft Supplemental Final EIS, a comparison of future build and no-build traffic forecasts show that some traffic will divert to the Monroe Connector/Bypass and thus reduce congestion and improve traffic operations along existing US 74 compared to the no-build forecasts.
49	Traffic Forecasts	As we explained in our comment letters during the NEPA process and throughout the litigation, the alternatives analysis for the Monroe Connector/Bypass was based on a fundamentally flawed set of traffic forecasts. The forecasts for both "Build" and "No Build" scenarios were based on a single set of socio-economic data. This approach produced	NCDOT used the Metrolina Regional Model to conduct a sensitivity analysis of the raw model output using the MUMPO socioeconomic data set as one scenario and our induced growth forecasts added to MUMPO's data set as another scenario. Results of this analysis are presented in the Draft Supplemental Final EIS in **Section 2.5.2**.

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		"No Build" forecasts for U.S. 74 which were dramatically overstated, almost double the true forecast, because the model presented a situation in which the traffic generated by both the Toll Highway and existing U.S. 74 was squeezed onto U.S. 74 alone. As it moves forward with a new analysis of the Toll Highway, NCTA must create "Build" and "No Build" scenarios based on two separate sets of socio-economic data- one which reflects a situation in which the Monroe Connector/Bypass is not constructed, and one which accounts for the tremendous amount of growth and development that is expected to result from the Toll Highway. These forecasts must be used as the basis upon which to compare different alternatives, and presented to the public for review and comment.	
50	Alternatives Analysis	Once accurate traffic forecasts have been constructed, and a coherent statement of purpose and need been set forth, NCTA must re-consider a full range of reasonable alternatives and combinations of alternatives. Since the ruling by the Fourth Circuit, and the new understanding by local communities that the Bypass will not improve U.S. 74, a range of lower- cost alternative solutions have been offered by local community members. We urge NCTA to consider these alternatives.	NCDOT and FHWA disagree with this comment. NCDOT evaluated the effects of induced growth potential on traffic and determined that there is a small relative difference in MUMPO's travel demand model outputs that would alter our previous traffic forecast. Additional evaluations after the Final EIS included additional analysis of upgrading existing US 74 as a superstreet and a 6-lane superstreet, and widening to a 6-lane arterial. The conclusion of this evaluation is that there are no conditions that warrant re-considering new alternatives or updating previous screening decisions. The NCDOT screening-level process and decisions in the EIS remain valid and they are reaffirmed in Draft Supplemental Final EIS, as described in **Section 2**. The commenter's statement that the Monroe Connector/Bypass will not improve US 74 is incorrect. As discussed in **Section 2.5.2** of the Draft Supplemental Final EIS, a comparison of future build and no-build traffic forecasts show that some traffic will divert to the Monroe Connector/Bypass and thus reduce congestion and improve traffic operations along existing US 74 compared to the no-build forecasts. The project also will provide a high-speed facility for the US 74 corridor that will operate at acceptable levels of service through 2035. NCDOT and FHWA are unaware of a new understanding by local communities that the Monroe Connector/Bypass will not improve US 74 counter to our engineering analysis. The commenter has not offered such evidence nor analysis to support the claim. The project is still a priority of the MPO.
51	Alternatives Analysis	As we have emphasized in previous comments, any new analysis by NCTA must give full consideration to upgrades to U.S. 74. As we noted in previous comment letters and during the litigation, NCTA commissioned	See response to Comment #50 in this letter (Letter i004).

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		a study in 2007 which showed that for less than $14 million in short-term and long-term traffic management solutions could yield dramatically reduced congestion and an acceptable level of service along the whole corridor in Union County, except for one interchange.	As discussed in **Section 2.4** of the Draft Supplemental Final EIS , numerous TSM measures have been implemented along existing US 74 by NCDOT as funds have become available and by developers of adjacent properties as they improve their properties. Overall, improvements have been implemented at all 23 intersections along existing US 74 that were mentioned for improvement in the *US 74 Corridor Study* (Stantec, 2007). As presented in **Section1.2.4**, existing average travel speeds along US 74 within the project corridor are less than 50 mph during peak travel periods, even with implementation of the TSM measures described in **Section 2.4**. TSM improvements, while providing some short-term benefits, would be overwhelmed by projected 2035 traffic in the corridor, and would not provide long-term benefit nor meet the purpose and need for the Monroe Connector/Bypass project.
52	Alternatives Analysis	Additionally, NCTA should also consider the value of improvements to other Union County roads that could provide alternative routes and thereby lessen traffic congestion on U.S. 74. We have included some examples below that should be considered. By improving Old Monroe Road, NCTA could provide local traffic with a proximate alternative to U.S. 74, allowing local residents the option to easily move through Monroe's core business district without getting stuck in U.S. 74's congestion Because Secrest Shortcut runs parallel to U.S. 74 along its northeastern side, improvements to the road could provide local drivers with another option to avoid getting stuck in traffic on U.S. 74. We also urge NCTA to consider improvements to NC 218. NC 218 begins at U.S. 74, east of Marshville, and connects with US 485 near Mint Hill. The route runs north of the proposed Bypass, but improvements to NC 218 could accomplish many of the same transportation goals as the Bypass and cost much less. Improving NC 218 would serve non-local traffic seeking a quick route through Union County that avoids the in-town congestion through Stallings, Indian Trail, Monroe, Wingate, and Marshville. At the same time, diverting through traffic that would otherwise rely on U.S. 74 could lessen the congestion on U.S. 74, returning 74 to primarily local use.	As summarized in **Section 2** of the Draft Supplemental Final EIS, a range of alternatives were considered for the project and reanalyzed as part of the Draft Supplemental Final EIS. Alternatives considered included upgrading existing roadways and combinations of upgrading existing roads with new location segments. Existing corridors considered for upgrading were US 74 (in its entirety or in part), Old Monroe Road/Old Charlotte Highway, and Secrest Shortcut Road and found to not to meet the project purpose and need. Upgrading NC 218 was not considered an option for this project, as it is outside the project study area and too far north to serve regional high speed travel from near I-485 to between Wingate and Marshville. NC 218 is within the Goose Creek basin, which has been identified as a habitat for the federally-endangered Carolina heelsplitter mussel. The selected alternative has no direct impact or indirect impact to the Goose Creek watershed. As documented in Section 2.3 of the Draft EIS, tolling has been identified by the regional transportation planning organization as the funding source for this project. State law prohibits tolling of existing roadways and requires a free alternate route. To accommodate this, constructing the project along an existing roadway corridor would require frontage roads to provide the free alternate route, which would require additional right of way along the existing facility.
53	Alternatives Analysis	In light of the recent interest CSX railway has shown in a new terminal at the proposed Legacy Park, we urge NCTA to reconsider freight rail as	Freight rail would not address the project purpose of improving mobility and capacity within the study area by providing a facility for the US 74 corridor that allows for high-speed regional travel. This conclusion was reviewed and is

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		part of a range of solutions to improve mobility in the corridor	reaffirmed. As discussed in **Section 4.5.3** of the Draft Supplemental Final EIS, Legacy Park was considered in the indirect and cumulative effects (ICE) analysis and update. The ICE study team investigated the proposed industrial park in eastern Union County, called Legacy Park. Based on interviews with Union County officials, CSX staff and researchers familiar with the proposal, the study team determined that the proposal was not reasonably foreseeable at this time and did not include any portion of the proposal in any future land use scenario.
54	Alternatives Analysis	In previous comment letters, we have also suggested that NCTA take a closer look at transit options in the corridor as part of a comprehensive solution to improving mobility. As with the freight options, NCTA rejected this solution without analysis.	This comment is not correct. The Mass Transit Alternative concept and the Multi-Modal Alternative concept were evaluated in the Draft EIS and reevaluated in the Final EIS. The Mass Transit Alternative and Multi-Modal Alternatives were eliminated from further study in the 1st Qualitative Screening due to their inability to meet elements of the project purpose and need. These alternatives would not noticeably improve mobility and capacity in the project study area, nor would they divert enough vehicular traffic. The Mass Transit Alternative is not consistent with the NC SHC program vision for the corridor or the NC Intrastate System, as it would not allow for high-speed freeway travel in the US 74 corridor. The Draft Supplemental Final EIS reaffirms this determination.
55	Alternatives Analysis	The viability of transit alternatives has been discussed at length in conjunction with the U.S. 74 Revitalization Study. As such, we urge NCTA to take these discussions under advisement and study the effect of encouraging greater transit ridership in Union County as a mechanism for managing congestion on U.S. 74.	The purpose of the *US 74 Revitalization Study* is to prepare a coordinated land use, urban design, economic development, and multi-modal transportation plan for the US 74 corridor in light of the possibility that development of the Monroe/Connector Bypass will provide new opportunities for redevelopment. The study is not meant to develop alternatives to the Monroe Connector/Bypass project, but rather to plan for the redevelopment opportunities created by the project. Based on interview notes from the *US 74 Revitalization Study*, rapid transit in Union County is not in the 2030 transit plan. The US 74 Revitalization Study identified a steady demand for buses, but current demand seems to be met and it is hard to predict when a service increase will be needed. The main benefit of transit is not time savings, but savings in gas and vehicle ownership and parking expenses. Furthermore, existing transit ridership is low. To put it in perspective, as presented in the US 74 Corridor Revitalization Study Existing Conditions Report (HNTB, March 2012), the 2011 annual transit ridership on CATS Union County Express (Route 74X), which uses the existing US 74 corridor, was 42,948. The average daily vehicles using US 74 is approximately the same. So there are about the same number of people driving US 74 in one day as there are people who use transit for an entire year.

Table A-4: Southern Environmental Law Center

Document: i004 Letter dated November 30, 2012

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
			As discussed in **Section 4.5.3** of the Draft Supplemental Final EIS, the US 74 Revitalization Study was considered in the ICE Update. Since the study is still draft and has not been adopted, and since the land use and other recommendations would result in minimal changes to the land use scenario results, the study team determined it was not reasonably foreseeable to incorporate the draft plan recommendations into any future land use scenario for the ICE update.
56	Alternatives Analysis	Given the lack of need for nine interchanges to meet the stated purpose and need for the toll highway, we urge NCTA to consider designs of the bypass with fewer exits. By reducing the number of exits, the road would become a "true bypass" and would offer less opportunity for sprawling development and associated environmental impact. Thus between different toll road alternatives, a design with fewer exits must be the "Least Environmentally Damaging Practicable Alternative" required by Section 404 of the Clean Water Act. 40 C.F.R. *§* 230.10(a).	The proposed locations of interchanges along the Preferred Alternative are consistent with those included in the MUMPO 2035 Long Range Transportation Plan (LRTP). Prior to the Final EIS, several interchanges, including Unionville-Indian Trail Road, Rocky River Road, and Forest Hills School Road were reviewed considering both traffic volumes, as well as potential toll revenue, to determine if they could be removed. These proposed interchanges were determined to be necessary to serve projected traffic demand in the design year 2035, as well as to support toll revenue bonds required to finance the project, however it was determined that the Forest Hills Road interchange could be a modified interchange that would have a smaller footprint or be removed altogether. The US Army Corps of Engineers (USACE) is and will continue to be a cooperating agency on this project. No concern regarding the number of interchanges has been expressed by USACE.
57	Traffic Forecasts	Despite its unshaking commitment to the Monroe Bypass as the best solution for Union County, NCTA has never presented a clear picture of the existing traffic patterns in the U.S. 74 corridor. For example, NCTA does not know what percentage of the traffic in the corridor is "local" versus the percentage of the traffic that is travelling through the corridor from end to end. This deficiency in NCTA's analysis is striking. Because the intent of the Bypass is to speed travel from one end of the corridor to another, knowledge about the percentage of traffic making that trip is tremendously important. Likewise, with regard to future traffic and congestion projections for existing U.S. 74, it is important to know how much local traffic will continue to use that roadway. The Bypass will not be helpful for travelers making local trips. Thus, if the majority of current trips are in fact local, there will be no benefit from the Bypass and little purpose for the Bypass. Similarly, NCTA has indicated that it does not have a good sense of how many trucks will use the bypass if it is constructed,[212] again making the need for and potential success of the Bypass unclear.	The MUMPO, the agency in charge of developing and implementing transportation projects of all modes for the region, continues to support the Monroe Connector/Bypass as an important element of the region's roadway network, as included in the 2035 Long Range Transportation Plan. Traffic forecasts used in the analyses summarized in the Draft Supplemental Final EIS were reviewed and determined valid for the purposes they were used (*Monroe Connector/Bypass Traffic Forecast Summary,* HNTB, November 2013). The final traffic and revenue study (*Final Report Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study*, Wilbur Smith and Associates, October 2010) concludes the project is financially feasible with tolls. Details about traffic patterns, mixes and volumes are provided in a response (October 24, 2012) to a letter from Stallings Mayor Lynda Paxton included in **Appendix C** of the Draft Supplemental Final EIS. No additional analyses are necessary.

Table A-4: Southern Environmental Law Center

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		NCTA's only attempt to look at this issue was in its analysis of future traffic and revenue projections. The analysis in that document is not encouraging. A survey conducted as part of the study indicated that over 50% of trips in the corridor began in either Monroe or Indian Trail, making the bypass an unlikely option. Furthermore, 28% of trips were from one place in Monroe to another place in Monroe, again a trip that will not be replaced by the Bypass. The survey indicated very little "through traffic," i.e. trips from one end of the Bypass to another. Before NCTA moves any further with this Bypass, it is essential that NCTA analyze who exactly is going to use the proposed Bypass. Only then can it perform a thorough analysis of different alternative solutions.	
58	Strategic Highway Corridor Designation	If the Monroe Connector/Bypass is constructed, however, the SHC designation will be moved from existing U.S. 74 to the Toll Highway. During the transportation stakeholders interviews conducted in the preparation of the U.S. 74 Revitalization Study, a NCDOT representative stated that the Bypass would take the SHC designation from U.S. 74. He noted that based on NCDOT's most recent map, U.S. 74 would lose its SHC designation from its intersection with the Bypass to the middle of Monroe. NCTA should study and explain the impact of removing this designation.	The current Strategic Highway Corridor (SHC) map for NCDOT Division 10 can be downloaded from https://connect.ncdot.gov/projects/planning/Pages/StrategicHighwayCorridors.aspx The Strategic Highway Corridors Map shows the Monroe Connector/Bypass as the designated Strategic Highway Corridor for US 74, not existing US 74. One of the needs to be addressed by the project is the inability of the existing US 74 corridor to serve high-speed regional travel consistent with the designations and goals of state and local transportation plans. The Strategic Highway Corridor Vision Plan for NCDOT Division 10 specifically recommends a freeway in the US 74 corridor between I-485 and Marshville to serve high-speed regional travel. The implementation strategy for the Strategic Highway Corridors recognizes that "critical to the success of attaining the vision for the corridors is the ability to limit access or impedances to these corridors such as driveways and traffic signals. Both items create conflicts on the facility, which compromise the level of mobility and safety along corridors."

Table A-4: Southern Environmental Law Center

Document: i004 Letter dated November 30, 2012

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
59	EIS Decision Making	Recent statements and actions make it clear that NCTA has already made its decision and does not intend to perform the new analysis required by the United States Court of Appeals to revisit that decision. Rather than revisit its analysis, NCTA intends only to "re-explain" its analysis and has no intention of revisiting its pre-determined conclusion that it will construct the Monroe Connector/Bypass.[220] This approach is a clear violation of the mandate that NEPA not be used to justify predetermined decisions. Further, despite the Fourth Circuit's requirement that the agencies revisit their analysis of the project and present that analysis to the public, there will be no true opportunity for the public to be involved in the decision making process because the agency has already determined that the project will proceed exactly as originally planned. NCTA's announced course of action has already been rejected by the Fourth Circuit. *N* C. *Wildlife Fed'n,* 677 F.3d at 600. In our briefs to the Court we explained that, for the severely flawed DEIS traffic forecasts, the Department's response was to "rig up" some forecasts "for the file" while concurrently proceeding ahead with finalizing the FEIS. There was no application in the FEIS, or otherwise, of the corrected forecasts to revisit the underlying conclusions and no analysis to show how these dramatically reduced forecasts might influence the selection of alternative transportation solutions. It appears that NCTA intends to repeat this course of action.	This comment is incorrect. NCDOT and FHWA reviewed all the information presented in the Final EIS, updated sections where new information has been made available, and provided new analyses for topics where reevaluation was deemed necessary as a result of new information, as summarized in the Draft Supplemental Final EIS. NCDOT has gone well beyond simply "re-explaining" its previous analysis and has provided and will continue to provide full opportunity for public involvement in the decision making process.

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APPENDIX A-2

COMMENTS ON THE FINAL EIS

Document Number	Agency/Organization	Date	Page Number
i005	Southern Environmental Law Center	06/25/10	A2-1
i006	Ed Eason	06/29/10	A2-20
a001	NC Department of Environment and Natural Resources (NCDENR)	07/16/10	A2-28
a002	NC Wildlife Resources Commission	07/13/10	A2-30
a003	NCDENR Division of Water Quality	06/28/10	A2-34
a004	NC Department of Cultural Resources State Historic Preservation Office	07/07/10	A2-38
a005	US Environmental Protection Agency – Region 4	07/12/10	A2-40
a006	NC Department of Crime Control and Public Safety Floodplain Management Program	07/09/10	A2-58

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June 25, 2010

Ms. Jennifer Harris
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(jennifer.harris@ncturnpike.org)
VIA US MAIL AND E-MAIL

Re: Monroe Connector/Bypass – Environmental Impact Statement Comments

Dear Ms. Harris:

On behalf of the Sierra Club Central Piedmont Group, Clean Air Carolina, the Yadkin Riverkeeper, and the North Carolina Wildlife Federation, the Southern Environmental Law Center ("SELC") offers the attached comments on the above-referenced Environmental Impact Statement prepared for the Monroe Connector/Bypass project ("the Toll Road") by the Federal Highway Administration and the North Carolina Turnpike Authority, a division of the North Carolina Department of Transportation (the "Transportation Agencies").

As you know, SELC submitted extensive comments on the draft EIS ("DEIS") in June of 2009. The Final EIS ("FEIS") cures almost none of the substantial omissions and misstatements of the earlier document. The FEIS includes new technical reports on air quality and water quality in the project area, but these reports incorporate the same false assumptions regarding land use and travel demand that appear in the DEIS, resulting in a similarly flawed analysis of how the Toll Road would impact public health, natural resources, and overall quality of life in the project area. These comments accordingly reiterate many of the concerns we expressed in our previous comments of June 2009.

1 Given the fundamental deficiencies of the FEIS, we respectfully request and recommend that your agencies not issue a record of decision based on this document but instead initiate a new environmental review process, with an adequate Draft EIS, which answers the many questions that remain about this project – its benefits, costs and environmental impacts – and whether other alternatives, including common-sense upgrades to US 74, would be preferable.
2 The FEIS does not meet the minimum criteria of NEPA or fulfill the dual purposes of an EIS: (1) to provide decisionmakers with enough information to aid in the substantive decision whether to proceed with a project in light of its environmental consequences; and (2) to provide the public with information and an opportunity to participate in gathering information. *Citizens for a Better Henderson v. Hodel*, 768 F.2d 1051, 1056 (9th Cir. 1982) (the "form, content and preparation [of the EIS] foster both informed decision-making and informed public participation"); 40 C.F.R. § 1502.1 (purpose of EIS is to "provide full and fair discussion of significant environmental

impacts and . . . [to] inform the decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts . . ."). Below, we address the main areas where the FEIS has failed to present an accurate portrayal of key issues in considering the proposed project.

Purpose and Need

3 As we indicated in our comments on the DEIS, the stated project purpose reduces to "build a freeway," which restates the specific project design rather than identifying an actual underlying purpose. Other comments lodged similar objections, pointing out that the use of "high speed" as part of the statement of purpose and need unduly narrows the available range of projects to a controlled access freeway rather than upgrades to existing US 74. In response, the FEIS states that "[t]he term 'high speed' on its own . . . does not unduly narrow alternatives nor preordain any one particular alternative," because "several different types of facilities . . . , for example; controlled-access freeways, Superstreets, or even public transportation on dedicated right of way," could facilitate "high-speed" travel at speeds of over 50 miles per hour (mph). (FEIS 3-7)

This response is unconvincing. The requirement of a "high-speed" facility serves little purpose other than to assure consistency with the North Carolina Turnpike Authority's narrow mandate under N.C. Gen. Stat. § 136-176(b)(2): "construction of the Monroe Connector/Bypass." The other conditions imposed on the project purpose, particularly consistency with the various corridor planning documents, preclude any serious consideration of public transportation or other alternatives to building a freeway. Indeed, the FEIS argues that "numerous local and state plans" support using the term "high speed" in the statement of purpose and need precisely because these plans refer to a "freeway," "which by definition is high speed."
4 (FEIS 3-7) The Transportation Agencies have yet to justify in specific terms how a freeway advances the objectives of these various plans in a way that other alternatives cannot, particularly targeted improvements to improve flow along the US 74 corridor. Nor does the FEIS include any data to support the various issues it identifies along US 74—congestion, lengthy commute times, high percentage of truck traffic—or how the Toll Road would address those needs.

5 The FEIS claims that the DEIS contains "supporting data on the needs to be addressed by the project." (App. B3-27). But the "data" supporting this project's purpose and need largely consist of inaccurate traffic forecasts. These forecasts of traffic volume in the corridor have played a prominent role both in defining the Toll Road's purpose and in evaluating how it compares with various alternatives. In our comments on the DEIS, we noted that the "No Build" traffic forecasts describe an implausibly dire situation, in which the future traffic volumes of both US 74 and the planned Toll Road must squeeze onto US 74 alone. This error resulted primarily from the use of the same socioeconomic forecasts for the project area under both the Build and No-Build scenarios. This error remains uncorrected and continues to distort the formulation of the statement of purpose and need for the Toll Road.

6 The FEIS concedes a significant error in the traffic forecasting presented in the DEIS, but it leaves many other erroneous forecasts in place and fails to revisit the analysis that these forecasts inform. In our comments on the DEIS, we pointed out that the 2030 No-Build traffic

6 projections cited in the statement of purpose and need predict traffic increases of "about 30 to 35 percent along the corridor from 2007 to 2030," even though these same traffic studies indicate that the existing conditions along the US 74 corridor "operate at an undesirable LOS E or F." (DEIS 1-20) We similarly questioned the plausibility of projections for the 2035 No-Build scenario, which estimate that traffic volumes will reach more than double the roadway capacity of various segments along US 74.

7 The FEIS now concedes in an appendix that the "2035 No-Build Alternative forecast was inadvertently overestimated," and it presents corrected estimates in a table. (FEIS A-3). In many cases, the prior forecasts are nearly double the revised traffic volumes. This substantial discrepancy indicates that the DEIS presented a skewed analysis of the need for additional highway capacity in the project area. Yet the Transportation Agencies have not revised their analysis of purpose and need, or any other part of the DEIS, maintaining that "other than corrections noted below for Table 2-7, all other conclusions and discussions remain valid." *Id.* This logic is flawed. Considering that the prior forecasts vastly overstate the traffic congestion likely to affect the US 74 corridor, and the corrected forecasts indicate that the Toll Road will cause a significant increase in vehicle miles traveled (VMT) in the region, both the need for this project, and the optimal means of meeting that need, must be revisited.

Analysis of Alternatives

8 The FEIS continues to promote a flawed analysis of alternatives that unjustifiably omits serious consideration of a combination of feasible upgrades to US 74, access management, improved secondary road connectivity, and increased transit and freight rail in the project area. Such an alternative appears more effective than the Toll Road using virtually any measurable, objective criteria based on the needs of existing communities in the project area. Despite recognizing the various comments calling for consideration of such a combined strategy, however, the Transportation Agencies do little more than repeat the conclusory assertions of the DEIS.

9 In our previous comments, we pointed out that the Transportation Agencies ignored a study recently commissioned by NCDOT, the "Stantec Study," which showed that targeted upgrades along US 74 could greatly reduce congestion at a fraction of the Toll Road's cost to the public. To address this omission, the FEIS now includes a brief discussion of the Stantec study. But the FEIS dismisses the proposed upgrades because "these improvements would not result in high-speed travel through the corridor in 2015." (FEIS 3-14). In other words, upgrading US 74 would not meet the project purpose of building a freeway. The FEIS fails to explain, however, how upgrading US 74 would not address the underlying needs—i.e. congestion relief, reduced commute times, increased freight capacity, etc.—that building a freeway might remedy.

10 The FEIS also explains that "a comparison of the year 2015 traffic volumes used in the US 74 Corridor Study to the year 2035 No-Build volumes used in the Monroe Connector/Bypass Draft EIS, shows that the volumes in 2035 along US 74 would generally be more than double the 2015 traffic volumes." *Id.* This is a major flaw in the analysis. It appears to reference the grossly inflated traffic projects that are revised at Appendix A-3 ("DEIS Errata"). The revised

estimates of 2035 No-Build traffic volumes are less than double existing (2006) traffic volumes, and therefore far less than double the 2015 traffic volumes cited in the Stantec study.

11 In rejecting an alternative of combined upgrade and transit strategies, the FEIS fails to disclose information that is available, such as the $14 million price tag for the improvements detailed in the Stantec study. Instead, the FEIS includes an almost verbatim reproduction of the DEIS' discussion of "TSM measures, TDM alternatives, and Mass Transit/Multi-Modal alternatives," concluding "[c]ombining a Mass Transit Alternative concept with other modes also would not be practicable" because it "would add substantial costs to any alternative that includes road improvements, but would do very little to improve traffic flow on US 74." (3-15) Like the DEIS, the FEIS presents scant support for this conclusion. Moreover, considering that the Toll Road would siphon off $24 million from the Highway Trust Fund every year for the next 30 years, require the state to guarantee hundreds of millions of dollars of additional, highly speculative "toll revenue" debt, and force area drivers to pay hefty tolls for both the highway's construction and ongoing maintenance, the Transportation Agencies should clarify what is meant by "substantial costs."

Substantial Increases in Vehicle Miles Traveled (VMT)

12 Even though the FEIS includes new "No-Build" traffic forecasts that nearly halve previous estimates of traffic volume along US 74, it nevertheless maintains that estimates of VMT based on the previous, erroneous figures are still valid. According to the FEIS, "VMT experienced a slight decrease in the 'Build' Scenario" because the Toll Road is slightly straighter than US 74, and the "vehicles that were previously accessing US 74 from the north now have a shorter route to the Monroe Connector/Bypass." (3-18) This explanation sheds light on how a computer model could have erroneously predicted that building a 20-mile-long toll road to access a sparsely developed area on the metro fringe will reduce traffic volume. It does not, however, show that the modeling is even remotely accurate. In fact, it reveals the failure to consider the role of new highway capacity in generating additional travel. *See Mullin v. Skinner*, 756 F. Supp. 904, 921 (E.D.N.C. 1990) ("It is an irrefutable reality that the easier it is to get somewhere, the more people will be inspired to do so."); *Swain v. Brinegar*, 517 F.2d 766, 777 (7th Cir. 1974) ("[A]lmost any sponsor of a major four lane highway project can say with some assurance that if the highway is built it will be used," because such highways "create demands for travel and expansion by their very existence.").

13 The claim that the Toll Road will reduce VMT is inconsistent with the revised traffic volume estimates presented in the FEIS. Those projections indicate that traffic volumes would increase substantially under the Build scenario. For example, the revised DEIS Table 2-7 (Appendix A-3) estimates traffic on US 74 near Stallings Road for the 2035 No Build scenario at 86,300 vehicles per day (vpd). It estimates the combined traffic on US 74 and the Toll Road under the Build scenario at 135,600 (67,400 plus 48,200, respectively). Thus, according to the revised forecast, building the Toll Road would result in an increase of over 57% in traffic volume along the US 74 corridor, which could be expected to cause an overall VMT increase of similar magnitude. The claim that the Monroe Connector/Bypass will reduce VMT is based on the 2035 No-Build Alternative traffic forecasts, documented in *Traffic Forecast for TIP Projects*

13 *R-3329 and R-2559, Monroe Connector/Bypass* (Wilbur Smith Associates, September 2008), which the FEIS acknowledges to be erroneous.

14 The substantial increases in VMT that would result from this project have far-reaching implications for air quality, energy consumption, and overall quality of life in the Charlotte region. These impacts must be considered in a new Draft EIS. In order to be meaningful, the analysis of this project must rely on different land use forecasts to compare the build and no-build alternatives. In response to SELC's comments, the Transportation Agencies point to a new consultant's study which renders a "quantitative analysis" of this project's secondary impacts. But the study's first "analytical assumption" states "[r]egional TAZ forecasts for 2030 households (i.e., number of dwelling units) and employment (i.e., number of jobs) served as the primary sources of data for developing the 2030 No Build land use estimate."[1] These TAZ forecasts are based on an assumption that the Toll Road will be built. The study thus uses forecasts of sprawl growth patterns, which would be facilitated by the Toll Road, to predict the impacts associated with not building the toll road. This does not satisfy NEPA. *See, e.g. Sierra Club v. United States DOT,* 962 F. Supp. 1037, 1043 (D. Ill. 1997) (rejecting an EIS that included "a socioeconomic forecast that assumes the construction of a highway such as the tollroad and then applies that forecast to both the build and no-build alternatives," resulting in "a self-fulfilling prophecy that makes a reasoned analysis of how different alternatives satisfy future needs impossible.").

Air Quality

15 In our comments on the DEIS, we noted various deficiencies in the analysis of carbon monoxide, ozone, and mobile source air toxics (MSATs) related to this project. The FEIS fails to address these deficiencies. As explained above, the FEIS continues to falsely claim that the Toll Road would reduce VMT in the project area, severely distorting the air quality analysis. Instead, the Transportation Agencies must fully consider and disclose the risks of localized pollution associated with the substantial traffic growth caused by this project. They must also disclose how the increased VMT and sprawl growth patterns facilitated by this project would exacerbate the area's smog problem.

16 The FEIS also claims that "[it] is technically infeasible to accurately model the negligible increases or decreases of carbon dioxide emissions at a project level," and that "the results of such an analysis would not be likely to inform decision-making at the project level, while adding considerable administrative burdens to the NEPA process." (FEIS 3-20). In fact, calculating the tons of greenhouse gas (GHG) emissions that this project would create would require little more than an accurate traffic volume forecast and an estimate of average fuel efficiency standards for the overall vehicle fleet. Moreover, as recent federal regulations have requested that estimates of greenhouse gas emissions factor into cost-benefit analyses for transportation infrastructure projects,[2] the FEIS is inconsistent with current federal transportation project review practices.

[1] *Indirect and Cumulative Effects Quantitative Analysis* (Michael Baker Engineering, April 2010) at iii.
[2] *See, e.g.,* Notice of Funding Availability for Supplemental Discretionary Grants for Capital Investments in Surface Transportation Infrastructure Under the American Recovery and Reinvestment Act, 74 Fed. Reg. 28758 (June 17, 2009); U.S. Dept. of Transportation "Transportation's Role in Reducing U.S. Greenhouse Gas Emissions: Volume

Indirect and Cumulative Impacts

17 Our comments on the DEIS pointed out the contradiction between the agencies' claim that the Toll Road would reduce VMT, yet spur development primarily in the eastern-most section of the project study area. In general, we objected to the conclusory nature of the DEIS analysis, including its characterization of areas surrounding endangered species habitat as "almost completely developed." (DEIS 7-9) The FEIS now includes a new, quantitative report on indirect and cumulative effects, which similarly concludes that construction of the toll road and its many planned intersections would result in "no measurable difference in percent impervious cover" in the study area, and "no direct or indirect effects within the Goose Creek or Sixmile Creek watersheds."[3] The analysis in these reports, like that of the DEIS, is flawed.

18 As indicated above, the FEIS quantitative analysis report inflates estimates of cumulative and indirect effects under the No-Build scenario because it adopts the same baseline socioeconomic forecasts that were developed to predict traffic under the Build scenario. Internal inconsistencies in the FEIS attest to the faulty logic of this analysis. For example, the FEIS "Qualitative Indirect and Cumulative Effects Assessment" reports that population in the easternmost areas of the project area "could actually decline" if the Toll Road is not built. The FEIS quantitative analysis report, however, assumes that development and development-related impacts will continue to proceed in these areas even without the Toll Road.[4] Again, this is because, as the report explains, "[f]uture development was largely calculated based on growth in households and employment as predicted in the MUMPO TAZ forecasts . . ."[5] And these forecasts assume that growth will be facilitated by various road improvements, including the Monroe Connector/Bypass. Not surprisingly, the analysis based on these assumptions yields a finding that "the vast majority of indirect development occurring in the Study Area by 2030 will occur with or without the Monroe Connector/Bypass project."[6]

19 The failure of the FEIS to address mitigation measures adequately further warrants a new Draft EIS. The FEIS includes a lengthy citation to the Council on Environmental Quality (CEQ) "NEPA 40 Frequently Asked Questions," which clarifies that the agencies must identify "all relevant, reasonable mitigation measures . . . even if they are outside the jurisdiction of the lead agency," and discuss "the probability of the mitigation measures being implemented."[7] (FEIS 3-21) Following this citation, one would expect a discussion of measures that other state agencies and local municipalities have taken and may take in the future to mitigate development-related impacts, such as stormwater runoff. The discussion might identify, for example, the likelihood that existing measures in the Goose Creek site-specific management plan will remain in place,

1, Synthesis Report" (April 2010) *available at* http://ntl.bts.gov/lib/32000/32700/32779/DOT_Climate_Change_Report_-_April_2010_-_Volume_1_and_2.pdf.
[3] *Indirect and Cumulative Effects Quantitative Analysis* (Michael Baker Engineering, April 2010) at 49.
[4] *See, e.g., id.* at 27, Table 13 (depicting significant increase in impervious surface cover within various watersheds in easternmost section of study area under No-Build scenario, e.g. 4% increase predicted within Salem Creek and Richardson Creek watersheds).
[5] *Id.* at 12.
[6] *Id.* at v.
[7] NEPA 40 Frequently Asked Questions, Question 19b.

and the likelihood of new measures taking place, such as stormwater retrofit programs to mitigate impacts associated with existing development.

20 The FEIS, however, fails to identify a single mitigation measure in the current affected area. And it fails to discuss the probability of state or local agencies implementing or continuing to implement current or potential measures, instead asserting that it is not necessary to discuss mitigation because there is "little difference" between the Build and No-Build scenarios. This conclusion, in turn, is based on the quantitative analysis of indirect and cumulative impacts, which explains that "it is assumed that mitigation requirements would offset any impacts" resulting from exemptions to stream buffer rules.[8] In other words, because the FEIS assumes that effective mitigation measures will be implemented, there is little difference between the Build and No-Build scenarios, and thus no need to discuss whether effective mitigation measures will in fact be implemented.

21 Various other assumptions in the FEIS analysis of indirect and cumulative impacts deserve reconsideration. With scant support, the FEIS assumes that development would concentrate around the intersections of the Toll Road to such an extent that higher density development patterns would result in a reduction of forest fragmentation compared to the No Build scenario.[9] This claim strains credulity. One need look no further than the project area itself, and the pervasive low-density development spurred by I-485, to discredit this farfetched theory. Similarly, the FEIS's assumptions that the various local zoning and land use restrictions will remain static[10] despite development pressures is "so utterly devoid of common sense and inconsistent with NEPA that it cannot be taken seriously." Mullin v. Skinner, 756 F. Supp. 904, 921 (E.D.N.C. 1990).

Water Quality and Endangered Species

22 The FEIS fails to address the concerns we raised in our comments on the DEIS regarding the induced growth impacts of this project on water quality and endangered species habitat. Although the FEIS includes quantitative analyses of these impacts, the flawed nature of these analyses confounds any precise assessment of the Toll Road's real impacts for reasons discussed above. The Indirect and Cumulative Effects Quantitative Analysis and Water Quality Analysis conclude that the impervious surface increases, streamflow, runoff, and pollutant loadings of 2030 No-Build and 2030 RPA scenarios are equal. Again, such a result is not surprising given that both scenarios assume that major new highway capacity, including this project, will be built in the area and will result in sprawl growth patterns throughout the area. The FEIS interprets the similarity between the Build and No-Build scenario to signify that the Toll Road will not result in any adverse effects on water quality generally or to the Carolina heelsplitter's habitat specifically. But if anything, the pollution increases depicted in the modeling confirm that this

[8] *Quantitative Analysis*, *supra*, note 3, at 12.
[9] *See id.* at 50 ("the No-Build scenario findings show a 36 percent increase, while the Build Alternative findings show a 35 percent increase [in forest fragmentation] . . . This is a result of greater contiguous buildout (resulting in less fragmentation) in interchange areas.").
[10] *See id.* at 16 ("Distribution of induced development was determined based on capacity of available land, local plans, zoning and additional analysis.").

22 project would cause significant degradation, as it is a central feature of the growth characterized in both the Build and No-Build scenarios.

23 Indeed, keeping in mind that a true No-Build scenario is not presented in the FEIS, the analysis makes clear that the Toll Road would result in indirect and cumulative impacts to water quality and endangered species. For example, the baseline levels of impervious surfaces in two watersheds where the Carolina heelsplitter is found, Goose Creek and Sixmile Creek, are 13% and 25% respectively. The ICE Quantitative Analysis predicts impervious surfaces to increase in the Goose Creek watershed by 4% and in the Sixmile Creek watershed by 5% under both the 2030 No-Build and Build scenarios. Once again, since both scenarios are premised on the construction of major highway improvements, including the Toll Road, the modeling supports a conclusion that this project will contribute to impervious surface increases of 4% and 5% in the Goose Creek and Sixmile Creek watersheds respectively.

24 Using the findings from the ICE analyses, a biological assessment was prepared to determine the effects of the project on endangered species. However, in light of the flaws in those reports, the Biological Assessment ("BA") for this Project lacks sufficient information to justify the "May Affect, Not Likely to Adversely Affect" determination for the Carolina heelsplitter. The BA states that "the amount of imperviousness is expected to continue increasing" but that "these changes are independent of the project as there are no measurable changes in the level of imperviousness between build and no-build scenarios."[11] Again, this conclusion is unsupported because the 2030 No-Build and Build scenarios adopt the same baseline socioeconomic forecasts to predict impacts. And given that the modeling depicts increases in impervious surfaces in the Goose Creek and Sixmile Creek watersheds, an accurate assessment of the No-Build scenario could very well support a "May Affect, Likely to Adversely Affect" determination. Such a determination requires formal consultation with the United States Fish and Wildlife Service, and consideration of additional conservation measures, which may be required in designated watersheds.

25 The conservation measures proposed for the Goose Creek watershed and Carolina heelsplitter include funding of the USGS monitoring station at the US 601 crossing of Goose Creek and funding to the Carolina Heelsplitter Conservation Bank in Lancaster County, South Carolina.[12] We strongly support such measures, but more mitigation is warranted in the affected watersheds themselves. The BA notes that the baseline data indicate that the Goose Creek watershed is already above the imperviousness threshold at which habitat degradation begins to occur and seems to suggest that the watershed is a lost cause not worthy of additional conservation measures.[13] Because the Goose Creek watershed is designated critical habitat for the Carolina heelsplitter and identified as essential to recovery, measures must be implemented to begin restoring stream functions.

[11] Catena Group, *Biological Assessment of Carolina heelsplitter (Lasmigona decorata) and Designated Critical Habitat, Schweinitz's Sunflower (Helianthus schweinitzii), Michaux's Sumac (Rhus michauxii), and Smooth Coneflower (Echinacea laevigata)*, Monroe Bypass pg. 59 (May 25, 2010).
[12] *Id.* at 64.
[13] *See id.* at 63.

26 Although there is a site-specific management plan that mandates buffer widths and other measures to protect the Goose Creek watershed from new development pressures, additional improvements could be made by retrofitting existing development to upgrade stormwater control measures. Much of the imperviousness already existing in the Goose Creek watershed resulted from development induced by other highway projects such as I-485. Given that the transportation agencies are responsible for the extent of existing development in the watershed, these agencies should fund mitigation measures to improve conditions. If the Turnpike Authority funded a stormwater retrofit program that would both preserve and enhance the environmental baseline to a level equating to a protective imperviousness threshold below 6%,[14] the stream function could be significantly improved in Goose Creek.

In closing, the FEIS does not provide the basis needed for a rational appraisal of this project's costs, benefits, or alternatives. We urge you to issue a new Draft EIS that addresses the issues raised by these comments and the comments of others.

Thank you for your consideration.

Sincerely,

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[14] The BA notes that studies support a threshold of 10% but that the resource agencies recommend 6%. A new study by the USGS that included a study location in North Carolina indicates that even 5% imperviousness corresponds to a change of 13-23% from background conditions. Cuffney, Thomas, et al., *Responses of benthic macroinvertebrates to environmental changes associated with urbanization in nine metropolitan areas*, accepted for publication in Ecological Society of America Journal, available at http://pubs.usgs.gov/sir/2009/5049/pdf/Cuffney.pdf.

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	General	Given the fundamental deficiencies of the FEIS, we respectfully request and recommend that your agencies not issue a record of decision based on this document but instead initiate a new environmental review process, with an adequate Draft EIS, which answers the many questions that remain about this project - its benefits, costs and environmental impacts - and whether other alternatives, including common-sense upgrades to US 74, would be preferable.	A Draft Supplemental Final EIS has been prepared for the project. During the course of the analysis for this document, a review was conducted of the Draft EIS and Final EIS, as well as any new or updated information made available since these documents were published. The Draft Supplemental Final EIS provides updates to existing conditions, explains the reasons for selecting the Preferred Alternative, updates impact analyses for the Preferred Alternative, and summarizes additional studies performed, including additional analysis of upgrades to US 74.
2	General	The FEIS does not meet the minimum criteria of NEPA or fulfill the dual purposes of an EIS: (1) to provide decision makers with enough information to aid in the substantive decision whether to proceed with a project in light of its environmental consequences; and (2) to provide the public with information and an opportunity to participate in gathering information.	A Draft Supplemental Final EIS has been prepared for the project. Numerous public involvement opportunities were provided throughout the extent of this project. These opportunities are documented in Sections 1.4, 3.1 and 3.2 of the Final EIS and **Section 5** and **Appendix A** of the Draft Supplemental Final EIS. The Draft Supplemental Final EIS will be made available for public review and comment.
3	Purpose and Need	As we indicated in our comments on the DEIS, the stated project purpose reduces to "build a freeway," which restates the specific project design rather than identifying an actual underlying purpose. Other comments lodged similar objections, pointing out the use of "high speed" as part of the statement of purpose and need unduly narrows the available range of projects to a controlled access freeway rather than upgrades to existing US 74. In response, the FEIS states that "[t]he term 'high speed' on its own… does not unduly narrow alternatives nor preordain any one particular alternative," because "several different types of facilities…, for example; controlled-access freeways, Superstreets, or even public transportation on a dedicated right of way," could facilitate "high-speed" travel at speeds of over 50 miles per hour (mph). (FEIS 3-7) This response is unconvincing.	The term "high speed" in relation to this project is defined as 50 mph and is supported by numerous local and state plans, including the MUMPO *2035 LRTP*, the NC Intrastate System (NC General Statutes 136-178), and the NCDOT Strategic Highway Corridor initiative; as described in detail in Section 1 of the Draft EIS and *Final Statement of Purpose and Need for the Monroe Connector/Bypass* (PBS&J February 2008) which is incorporated into the Final EIS by reference. The previous response to this comment, which is included in Section 3.3.1 of the Final EIS, is still valid.
4	Purpose and Need	The Transportation Agencies have yet to justify in specific terms how a freeway advances the objectives of these various plans in a way that other alternatives cannot, particularly targeted improvements to improve flow along the US 74 corridor. Nor does the FEIS include any data to support the various issues it identifies along US 74 - congestion, lengthy commute times, high percentage of truck traffic - or how the Toll Road would address those needs.	The purpose of the project is clearly stated in the Draft EIS, Final EIS, and this Draft Supplemental Final EIS. Supporting information has been updated in the Draft Supplemental Final EIS **Section 1**, and includes data on social and economic conditions (**Section 1.2.2**), transportation and land use plans (**Section 1.2.3**), and existing and future roadway conditions and operations (**Section 1.2.4**). Based upon a review of the Draft EIS, Final EIS, new information, and public and agency comments received, the purpose and need for the project remains unchanged.

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
			Since the Final EIS, numerous improvements have been made to existing US 74, as described in **Section 2.4.** Many of these improvements implement the recommendations of the *US 74 Corridor Study* (Stantec, 2007). The *US 74 Corridor Travel Time Comparison* (HNTB, October 2013) details the existing travel time conditions on US 74 with these improvements in place. Based on travel time studies, existing US 74 has operating speeds of less than 50 mph. The ability of a controlled-access facility to meet the project's purpose and need is described in **Section 2.2.1** of the Draft Supplemental Final EIS. The controlled-access highway enhances mobility and increases capacity, serves high speed regional travel, is consistent with the NC Strategic Highway Corridor and NC Intrastate Systems, and maintains access to properties along existing US 74.
5	Purpose and Need	The FEIS claims that the DEIS contains "supporting data on the needs to be addressed by the project." (App. B3-27) But the "data" supporting this project's purpose and need largely consist of inaccurate traffic forecasts. Those forecasts of traffic volume in the corridor have played a prominent role both in defining the Toll Road's purpose and in evaluating how it compares with various alternatives. In our comments on the DEIS, we noted that the "No Build" traffic forecasts describe an implausibly dire situation, in which the future traffic volumes of both US 74 and the planned Toll Road must squeeze onto US 74 alone. This error resulted primarily from the use of the same socio-economic forecasts for the project area under both the Build and No-Build scenarios. This error remains uncorrected and continues to distort the formulation of the Statement of purpose and need for the Toll Road.	This issue is addressed in Appendix A, Page A-2 and A-3 of the Final EIS. See also response to Comment #6 in the Southern Environmental Law Center letter (i005). The statement that the erroneous 2035 No-Build traffic forecast "played a prominent role in defining the Toll Road's purpose and in evaluating how it compares with various alternatives" is incorrect. The incorrect 2035 No-Build traffic forecasts presented in Table 2-7 of the Draft EIS were not used in any subsequent analyses reported in the Draft EIS or Final EIS. The No-Build traffic forecasts were corrected in the *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector/Bypass No-Build Traffic Forecast Memorandum* (HNTB, March 2010). A corrected Draft EIS Table 2-7 was published in Appendix A of the Final EIS, and upon review of the Draft EIS, it was determined that all other conclusions and discussions remain valid. The incorrect 2035 No-Build Alternative forecast was not used to document the purpose and need for the project, nor was it used in the development or analysis of alternatives. A summary of traffic forecasts developed during the project development process and how they were used is presented in **Section 2.5**. Traffic forecasts involve numerous steps and data sources, and the MRM regional model is just one of the many data sources used to create forecasts for the project. The forecasting error that generated the initially incorrect data in Table 2-7 of the Draft EIS was an inadvertent overestimation that occurred outside the MRM regional model and does not have any connection to the socioeconomic data used in the regional model. As part of the Draft Supplemental Final EIS, the various traffic forecasts prepared for the project were given an in-depth hard look considering new data and updated regional travel demand models. This review specifically evaluated how changes in socioeconomic data could affect the traffic forecasts for the project. Changes in the socioeconomic data due to potential induced growth from the Monroe Connector/Bypass would not

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			substantially or significantly alter the future Build scenario traffic forecasts for the project study area. The full review is presented in the *Monroe Connector/Bypass Traffic Forecast Summary* (HNTB, November 2013) and summarized in **Section 2.5.2** of the Draft Supplemental Final EIS.
6	Purpose and Need	The FEIS concedes a significant error in the traffic forecasting presented in the DEIS, but it leaves many other erroneous forecasts in place and fails to revisit the analysis that these forecasts inform. In our comments on the DEIS, we pointed out that the 2030 No-Build traffic projections cited in the statement of purpose and need predict traffic increases of "about 30 to 35 percent along the corridor from 2007 to 2030," even though these same traffic studies indicate that the existing conditions along the US 74 corridor "operate at an undesirable LOS E or F." (DEIS 1-20). We similarly questioned the plausibility of projections for the 2035 No-Build scenario, which estimates the traffic volumes will reach more than double the roadway capacity of various segments along US 74.	See response to Comment #5 in the Southern Environmental Law Center letter (i005). The statement that the Final EIS "leaves many other erroneous forecasts in place and fails to revisit the analysis that these forecasts inform" is incorrect. As presented in **Section 2.5.2** of the Draft Supplemental Final EIS and documented in the *Monroe Connector/Bypass Traffic Forecast Summary* (HNTB, November 2013), the current No-Build and Build traffic forecasts for the project were reviewed in light of new information and analyses since the Final EIS and were found to still be valid for the purposes they were used.
7	Purpose and Need	The FEIS now concedes in an appendix that the "2035 No-Build Alternative forecast was inadvertently overestimated and it presents corrected estimates in a table. (FEIS A-3). In many cases, the prior forecasts are nearly double the revised traffic volumes. This substantial discrepancy indicates that the DEIS presented a skewed analysis of the need for additional highway capacity in the project area. Yet the Transportation Agencies have not revised their analysis of purpose and need, or any other part of the DEIS, maintaining that "other than corrections noted below for Table 2-7, all other conclusions and discussions remain valid." *Id.* The logic is flawed.	See response to Comment #5 in the Southern Environmental Law Center letter (i005).
8	Analysis of Alternatives	The FEIS continues to promote a flawed analysis of alternatives that unjustifiably omits serious consideration of a combination of feasible upgrades to US 74, access management, improved secondary road connectivity, and increased transit and freight rail in the project area. Such an alternative appears more effective than the Toll Road using virtually any measurable, objective criteria based on the needs of existing communities in the project area.	The commenter does not provide any data or analyses to support the assertions made in this comment, and neither FHWA nor NCDOT is aware of any data or analysis that supports these assertions. As documented in **Section 2** of the Draft Supplemental Final EIS, a range of alternatives were rigorously considered for the project, including mass transit, upgrading existing roadways and combinations of upgrading existing roads with new location segments, and multi-modal alternatives. Existing corridors considered for upgrading were US 74 (in its entirety or in part), Old Monroe Road/Old Charlotte Highway, and Secrest Shortcut Road. These alternatives were found to not to meet the project purpose and need, as

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			reaffirmed in this Draft Supplemental Final EIS. It should also be noted that the region's 2035 Long Range Transportation Plan considers all transportation modes, including transit and freight movement, along with roadway improvements, in a comprehensive transportation plan for the area. The MUMPO, the agency in charge of developing and implementing transportation projects of all modes for the region, continues to support the Monroe Connector/Bypass as an important element of the region's roadway network, as included in the 2035 Long Range Transportation Plan.
9	Analysis of Alternatives	In our previous comments, we pointed out that the Transportation Agencies ignored a study recently commissioned by NCDOT, the "Stantec Study," which showed that targeted upgrades along US 74 could greatly reduce congestion at a fraction of the Toll Road's cost to the public. To address this omission, the FEIS now includes a brief discussion of the Stantec study. But the FEIS dismisses the proposed upgrades because "these improvements would not result in high-speed travel through the corridor in 2015." (FEIS 3-14). In other words, upgrading US 74 would not meet the project purpose of building a freeway. The FEIS fails to explain, however, how upgrading US 74 would not address the underlying needs – i.e. congestion relief, reduced commute times, increased freight capacity, etc. - that building a freeway might remedy.	See response to Comment #4 in the Southern Environmental Law Center letter (i005). As discussed in **Section 2.4** of the Draft Supplemental Final EIS , numerous TSM measures have been implemented along existing US 74 by NCDOT as funds have become available and by developers of adjacent properties as they improve their properties. Overall, improvements have been implemented at all 23 intersections along existing US 74 that were mentioned for improvement in the *US 74 Corridor Study*. As presented in **Section1.2.4**, existing average travel speeds along US 74 within the project corridor are less than 50 mph during peak travel periods, even with implementation of the TSM measures described in **Section 2.4**. TSM improvements, while providing some short-term benefits, would be overwhelmed by projected 2035 traffic in the corridor, and would not provide long-term benefit nor meet the purpose and need for the Monroe Connector/Bypass project. Also, the improvements recommended in the *US 74 Corridor Study* (Stantec, 2007) were not intended as a replacement of the Bypass, but rather a "stop gap" measure until the Bypass could be built. As stated in the Executive Summary of the *US 74 Corridor Study*: *This study was a direct result of continued delays to the Monroe Bypass project (TIP #R-2559)…* *These delays have resulted in the immediate need to address traffic operational issues along the highly congested US 74 corridor with the goal to improve safety and efficiency of the existing roadway infrastructure <u>until construction of the Monroe Bypass can begin</u>. Without any improvements, US 74 will be operating at an unacceptable LOS at most signalized intersections by year 2015.* It is clear that the purpose of the *US 74 Corridor Study* was to provide recommendations for interim and immediate actions until such time as the Monroe Bypass was constructed.

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			In addition, various scenarios for improving existing US 74 have been evaluated in the EIS process. These are discussed in Section 2.4 of the Draft EIS, Section 3.3 of the Final EIS, and **Section 2.4** of the Draft Supplemental Final EIS. None of these alternatives were advanced as Detailed Study Alternatives, because they did not meet the purpose and need and/or they were determined not to be reasonable or practicable.
10	Analysis of Alternatives	The FEIS also explains that "a comparison of the year 2015 traffic volumes used in the US 74 Corridor Study to the year 2035 No-Build volumes used in the Monroe Connector/Bypass Draft EIS, shows that the volumes in 2035 along US 74 would generally be more than double the 2015 traffic volumes." *Id.* This is a major flaw in the analysis.	See response to Comment #5 in the Southern Environmental Law Center letter (i005).
11	Analysis of Alternatives	In rejecting an alternative of combined upgrade and transit strategies, the FEIS fails to disclose information that is available, such as the $14 million price tag for the improvements detailed in the Stantec study. Instead, the FEIS includes an almost verbatim reproduction of the DEIS' discussion of "TSM measures, TDM alternatives, and Mass Transit/Multi-Modal alternatives," concluding "[c]ombining a Mass Transit Alternative concept with other modes also would not be practicable" because it "would add substantial costs to any alternative that includes road improvements, but would do very little to improve traffic flow on US 74." (3-15) Like the DEIS, the FEIS presents scant support for this conclusion. Moreover, considering that the Toll Road would siphon off $24 million from the Highway Trust Fund every year for the next 30 years, require the state to guarantee hundreds of millions of dollars of additional, highly speculative "toll revenue" debt, and force area drivers to pay hefty tolls for both the highway's construction and ongoing maintenance, the Transportation Agencies should clarify what is meant by "substantial costs."	As discussed in **Section 2.2.1** and **Section 2.3** of the Draft Supplemental Final EIS, the Mass Transit Alternative was eliminated not for cost, but because it would not meet the project's purpose and need, as it would not provide for high-speed regional travel or be consistent with the Strategic Highway Corridor program vision for the US 74 corridor. See also response to Comment #9 in the Southern Environmental Law Center letter (i005).
12	Travel Demand Model	Even though the FEIS includes new "No-Build" traffic forecasts that nearly halve previous estimates of traffic volume along US 74, it nevertheless maintains that estimates of VMT based on the previous, erroneous figures are still valid. According to the FEIS, "VMT experienced a slight decrease in the 'Build' Scenario" because the Toll Road is slightly straighter than US 74, and the 'vehicles that were previously accessing US 74 from the north now have a shorter route	VMT (vehicle miles traveled) is a direct output from the Metrolina Regional Model (MRM) for a region or area, not a specific roadway. The forecasting error that generated the initially incorrect 2035 No-Build Scenario data in Draft EIS Table 2-7 was an inadvertent overestimation that occurred in a step in the forecasting process that was outside the MRM regional model, and the error does not have a connection to VMT output from the regional model. See response to Comment #5 in the Southern Environmental Law Center letter (i005).

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		to the Monroe Connector/Bypass." (3-18). This explanation sheds light on how a computer model could have erroneously predicted that building a 20-mile long toll road to access a sparsely developed area on the metro fringe will reduce traffic volume. It does not, however, show that the modeling is even remotely accurate. In fact, it reveals the failure to consider the role of new highway capacity in generating additional travel.	**Section 2.5.** of the Draft Supplemental Final EIS provides a summary of the travel demand modeling conducted for the project.
13	Travel Demand Model	The claim that the Toll Road will reduce VMT is inconsistent with the revised traffic volume estimates presented in the FEIS. Those projections indicate that traffic volumes would increase substantially under the Build scenario. For example, the revised DEIS Table 2-7 (Appendix A-3) estimates traffic on US 74 near Stallings Road for the 2035 No Build scenario at 86,300 vehicles per day (vpd). It estimates the combined traffic on US 74 and the Toll Road under the Build scenario at 135,600 (67,400 plus 48,200, respectively), thus, according to the revised forecast, building the Toll Road would result in an increase of over 57% in traffic volume along the US 74 corridor, which could be expected to cause an overall VMT increase of similar magnitude. The claim that the Monroe Connector/Bypass will reduce VMT is based on the 2035 No-Build Alternative traffic forecasts, documented in *Traffic Forecast for TIP Projects R-329 and R-2559, Monroe Connector/Bypass* (Wilbur Smith Associates, September2008), which the FEIS acknowledges to be erroneous.	The statement that the VMT analysis is based on an erroneous 2035 No-Build Alternative traffic forecast is incorrect. The 2035 No-Build traffic forecast was not used in the VMT analysis. See response to Comment #12 in the Southern Environmental Law Center letter (i005). Further, it is incorrect to directly compare the No-Build traffic forecasted on US 74 to the sum of the Build traffic forecast on both US 74 and the Monroe Connector/Bypass. This is because both facilities need to be considered as part of the larger network. For example, as traffic diverts from US 74 to the Monroe Connector/Bypass it opens capacity on US 74 to receive traffic from other competing facilities like Old Monroe Road (SR 1009). Due to the effect of traffic rebalancing based on different network conditions and capacity, VMT is an appropriate metric to compare differences in network configurations.
14	Travel Demand Model	The substantial increases in VMT that would result from this project have far-reaching implications for air quality, energy consumption, and overall quality of life in the Charlotte region. These impacts must be considered in a new Draft EIS. In order to be meaningful, the analysis of this project must rely on different land use forecasts to compare the build and no-build alternatives. In response to SELC's comments, the Transportation Agencies point to a new consultant's study which renders a "quantitative analysis" of this project's secondary impacts. But the study's first "analytical assumption" states "[r]egional TAZ forecasts for 2030 households (i.e., number of dwelling units) and employment (i.e., number of jobs) served as the primary sources of data for developing the 2030 No Build land use estimate." These TAZ forecasts are based on an assumption that the Toll Road will be built. The study uses forecasts of sprawl growth	NCDOT has undertaken a substantial review of the process used to develop the TAZ forecasts for Mecklenburg and Union Counties (see Section 4 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), for a complete discussion of this issue). This review demonstrated that the Monroe Connector/Bypass did not affect the forecast or allocation of households or employment in the Metrolina socioeconomic forecasts used in both the prior and updated ICE analyses. As part of the *Monroe Connector/Bypass Traffic Forecast Summary* (HNTB, November 2013), the impact to Build Scenario traffic forecasts and VMTs of changes in the socioeconomic data (SE) based on the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) were analyzed. The analysis concludes that the changes in SE data would have an approximate 3 percent increase in Union County VMT, and a zero percent change in VMT and VHT across the

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		patterns, which would be facilitated by the Toll Road, to predict the impacts associated with not building the toll road. This does not satisfy NEPA.	MRM network. These are not considered substantial increases. Regarding air quality, see response to Comment #15 in the Southern Environmental Law Center letter (i005).
15	Air Quality	In our comments on the DEIS, we noted various deficiencies in the analysis of carbon monoxide, ozone, and mobile source air toxics (MSATs) related to this project. The FEIS fails to address these deficiencies. As explained above, the FEIS continues to falsely claim that the Toll Road would reduce VMT in the project area, severely distorting the air quality analysis. Instead, the Transportation Agencies must fully consider and disclose the risks of localized pollution associated with the substantial traffic growth caused by this project. They must also disclose how the increased VMT and sprawl growth patterns facilitated by this project would exacerbate the area's smog problem.	As discussed in **Section 4.2.2** of the Draft Supplemental Final EIS, MUMPO'S *2035 LRTP* includes the proposed project as a toll facility consistent in design concept and scope with the Preferred Alternative. A conformity determination for carbon monoxide and ozone was issued by USDOT on May 29, 2013. As discussed in **Section 4.2.2** of the Draft Supplemental Final EIS, new MSAT guidance was issued on December 6, 2012. The qualitative MSAT analysis conducted for this project, as described in Appendix E of the Final EIS was reviewed and determined to still be valid. As a result of the qualitative MSAT analysis, it is expected there would be either minor changes or a slight reduction in MSAT emissions in the immediate area of the project, relative to the No-Build Alternative. In comparing the alternatives, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify them. On a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today. Based on these findings, no MSAT mitigation is warranted.
16	Air Quality	The FEIS also claims that "[it] is technically infeasible to accurately model the negligible increases or decreases of carbon dioxide emissions at a project level," and that "the results of such an analysis would not be likely to inform decision-making at the project level, while adding considerable administrative burdens to the NEPA process." (FEIS 3-20). In fact, calculating the tons of greenhouse gas (GHG) emissions that this project would create would require little more than an accurate traffic volume forecast and an estimate of average fuel efficiency standards for the overall vehicle fleet. Moreover, as recent federal regulations have requested that estimates of greenhouse gas emissions factor into cost-benefit analyses for transportation infrastructure projects, the FEIS is inconsistent with current federal transportation project review practices.	There are no federal regulations requesting incorporation of estimates of greenhouse gas emissions from transportation infrastructure into benefit cost analysis. The commenter points to a notice of funding availability which outlines requirements for grant applicants for the TIGER Discretionary Grant Program under the American Recovery and Reinvestment Act. Estimating changes in greenhouse gas emissions resulting from construction of a highway facility is more complex than the commenter suggests. In addition to the traffic volume forecast of the new facility, and analysis would need to factor in changes in traffic in the entire affected project area, as well as changes in speeds. Climate change is an important national and global concern. However, under NEPA, detailed environmental analysis should be focused on issues that are significant and meaningful to decision-making. FHWA has concluded, based on the nature of GHG emissions and the exceedingly small potential climate change impacts of the proposed action, as discussed below, that the GHG emissions from the proposed action will not result in "reasonably foreseeable significant adverse impacts on the human

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			environment" (40 CFR 1502.22(b)). The GHG emissions from the project build alternatives will be insignificant, and will not play a meaningful role in a determination of the environmentally preferable alternative or the selection of the preferred alternative. More detailed information on GHG emissions "is not essential to a reasoned choice among reasonable alternatives" (40 CFR 1502.22(a)) or to making a decision in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no alternatives-level GHG analysis has been performed for this project. To help address the global issue of climate change, USDOT is committed to reducing GHG emissions from vehicles traveling on our nation's highways. USDOT and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward lower carbon intensive fuels. The agencies have jointly established new, more stringent fuel economy and first ever GHG emissions standards for model year 2012-2016 cars and light trucks. The agencies have issued a notice to propose even more stringent standards for model year 2017-2025 vehicles, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on August 9, 2011, the agencies jointly proposed the first ever fuel economy and GHG emissions standards for heavy-duty trucks and buses.[1] Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce CO_2 emissions future years. FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. In an effort to assist States and MPOs in performing GHG analyses, FHWA has developed a Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process. The Handbook presents methodologies reflecting good practices for the evaluation of GHG emissions at the transportation program level, and demonstrates how such evaluation may be integrated into the transportation planning process. FHWA also refined a web-based tool, The Energy and Emissions Reduction Policy Analysis Tool (EERPAT), for use at the statewide level to model a large number of GHG reduction scenarios and alternatives for use in transportation planning, climate action plans, scenario planning exercises, and in meeting state GHG reduction targets and goals. To assist states and MPOs in assessing climate change vulnerabilities to their transportation networks, FHWA has developed a climate change and extreme weather vulnerability and risk assessment framework.

[1] For more information on fuel economy proposals and standards, see the National Highway Traffic Safety Administration's Corporate Average Fuel Economy website: http://www.nhtsa.gov/fuel-economy/.

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			This document does not incorporate an analysis of the GHG emissions or climate change effects of each of the alternatives because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the GHG impacts, those impacts will not be meaningful to a decision on the environmentally preferable alternative or to a choice among alternatives. As outlined above, FHWA is working to develop strategies to reduce transportation's contribution to GHGs—particularly CO2 emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue.
17	Indirect and Cumulative Impacts	Our comments on the DEIS pointed out the contradiction between the agencies' claim that the Toll Road would reduce VMT, yet spur development primarily in the eastern-most section of the project study area. In general, we objected to the conclusory nature of the DEIS analysis, including its characterization of areas surrounding endangered species habitat as "almost completely developed." (DEIS 7-9) The FEIS now includes a new, quantitative report on indirect and cumulative effects, which similarly concludes that construction of the Toll Road and its many planned intersections would result in "no measurable difference in percent impervious cover" in the study area, and "no direct or indirect effects within the Goose Creek or Sixmile Creek watersheds." The analysis in these reports, like that of the DEIS, is flawed.	The *Indirect and Cumulative Effects Quantitative Analysis* (Michael Baker Engineering, Inc., April 2010), summarized in Final EIS Section 2.5.5, and the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), summarized in **Section 4.5** of the Draft Supplemental Final EIS, were prepared in accordance with FHWA and NCDOT guidelines. Impervious cover and direct and indirect effects in Goose Creek and Sixmile Creek are addressed in the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). **Sections 4.5.4, 4.5.5.1, and 4.5.5.3** of the Draft Supplemental Final EIS summarize the analysis results relating to these topics.
18	Indirect and Cumulative Impacts	As indicated above, the FEIS quantitative analysis report inflates estimates of cumulative and indirect effects under the No-Build scenario because it adopts the same baseline socioeconomic forecasts that were developed to predict traffic under the Build scenario. Internal inconsistencies in the FEIS attest to the faulty logic of this analysis. For example, the FEIS "Qualitative Indirect and Cumulative Effects Assessment" reports that population in the easternmost areas of the project area "could actually decline" if the Toll Road is not built. The FEIS quantitative analysis report, however, assumes that development and development-related impacts will continue to proceed in these areas even without the Toll Road. Again, this is because, as the report explains, "[f]uture development was largely calculated based on growth in households and unemployment as predicted in the MUMPO TAZ forecasts…" And these forecasts assume that growth will be facilitated by various road	The statement that estimates of cumulative and indirect effects under the No-Build scenario are inflated is incorrect. See responses to Comments #6, #14 and #17 in the Southern Environmental Law Center letter (i005). The *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), summarized in **Section 4.5** of the Draft Supplemental Final EIS, updates the indirect and cumulative effects analysis for the Monroe Connector/Bypass project summarized in the Final EIS. As evaluated in detail in the ICE Update, it was determined that the MUMPO models did not incorporate the induced land use effects of the Monroe Connector/Bypass; therefore, it was appropriate to use the MUMPO socioeconomic projections, along with other information, to develop the No-Build Scenario used in the ICE analysis. As described in Section 4 of the ICE Update, the study team estimated the induced growth potential of the project and added that estimated induced growth to the No-Build Scenario to develop the Build Scenario, which represents future conditions with the project and its growth-inducing impacts. The study team elected to use a more conservative approach (i.e., assuming higher possible

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		improvements, including the Monroe Connector/Bypass. Not surprisingly, the analysis based on these assumptions yields a finding that "the vast majority of indirect development occurring in the Study Area by 2030 will occur with or without the Monroe Connector/Bypass project."	cumulative effects across the entire study area) by choosing not to reallocate growth within the study area, but rather to add the estimated induced growth over and above the growth expected under the No-Build Scenario.
19	Indirect and Cumulative Impacts	The failure of the FEIS to address mitigation measures adequately further warrants a new Draft EIS. The FEIS includes a lengthy citation to the Council on Environmental Quality (CEQ) "NEPA 40 Frequently Asked Questions," which clarifies that the agencies must identify "all relevant, reasonable mitigation measures… even if they are outside the jurisdiction of the lead agency," and discuss "the probability of the mitigation measures being implemented." (FEIS 3-21) Following this citation, one would expect a discussion of measures that other state agencies and local municipalities have taken and may take in the future to mitigate development-related impacts, such as stormwater runoff. The discussion might identify, for example, the likelihood that existing measures in the Goose Creek site-specific management plan will remain in place, and the likelihood of new measures taking place, such as stormwater retrofit programs to mitigate impacts associated with existing development.	Potential measures to minimize indirect and cumulative effects are discussed in Section 6 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), and summarized in **Section 4.5.6** of the Draft Supplemental Final EIS.
20	Indirect and Cumulative Impacts	The FEIS, however, fails to identify a single mitigation measure in the current affected area. And it fails to discuss the probability of state or local agencies implementing or continuing to implement current or potential measures, instead asserting that it is not necessary to discuss mitigation because there is "little difference" between the Build and No-Build scenarios. This conclusion, in turn, is based on the quantitative analysis of indirect and cumulative impacts, which explains that "it is assumed that mitigation requirements would offset any impacts" resulting from exemptions to stream buffer rules. In other words, because the FEIS assumes that effective mitigation measures will be implemented, there is little difference between the Build and No-Build scenarios, and thus no need to discuss whether effective mitigation measures will in fact be implemented.	See response to Comment #19 in the Southern Environmental Law Center letter (i005).

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
21	Indirect and Cumulative Impacts	Various other assumptions in the FEIS analysis of indirect and cumulative impacts deserve reconsideration. With scant support, the FEIS assumes that development would concentrate around the intersections of the Toll Road to such an extent that higher density development patterns would result in a reduction of forest fragmentation compared to the No Build scenario. This claim strains credulity. One need look no further than the project area itself, and the pervasive of low-density development spurred by 1-485, to discredit this farfetched theory. Similarly, the FEIS's assumptions that the various local zoning and land use restrictions will remain static despite development pressures is "so utterly devoid of common sense and inconsistent with NEPA that it cannot be taken seriously." Mullin v. Skinner, 756 F. Supp. 904, 921 (E.D.N.C. 1990).	Forest fragmentation impacts are summarized in **Section 4.5.5.5** of the Draft Supplemental Final EIS and discussed in detail in Section 5.7 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). The analysis concluded that most habitat fragmentation in the project area will occur with or without the proposed project. The results indicate that indirect impacts are generally small to negligible while the cumulative results vary from small to substantial. However, the cumulative impacts are likely to occur with or without the proposed project. The matter in <u>Mullin v. Skinner</u> (1990) is distinguishable from this project. In <u>Mullin</u> the agencies prepared a 43 page Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the construction of a high-rise bridge to Sunset Beach. In the EA, the agencies concluded without analysis that the bridge was "not expected to cause significant alterations in land use, development pressures, or traffic volumes." <u>Mullin</u> at 910. The agencies stated that "significant changes in development patterns can be brought about <u>only</u> through zoning changes enacted by local officials, not by the building of a bridge by NCDOT." <u>Id</u>. at 915. It was this conclusion that the Court held was "so utterly devoid of common sense and inconsistent with NEPA that it cannot be taken seriously." It was not assumed that zoning and land use restrictions would remain static, rather modifications were made to future land use scenarios based on interviews and documents provided by local planners. As documented in Section 1.6 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), a review and assessment of local land use conditions and land use regulations was completed, along with interviews with local planners, to gain an understanding of existing land use and applicable land use ordinances and regulations. This information was used in the development of future land use scenarios. Detailed methodology regarding future land use scenarios can be found in Section 4.2 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). As stated in Section 6 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), "…one should note that the assumptions used in the methodology of this report and the reports summarized herein were generally designed to overestimate impacts to sensitive resources and water quality. For example, the water quality analysis assumed that relevant stream buffer regulations would be maintained through the design year of the project, but did not apply other land use or zoning controls that are currently in place or may be adopted in the future." Therefore, the commenter's statement that zoning and land use restrictions

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			were assumed to remain static is incorrect. While NCDOT does not have the authority to regulate land use, as stated in Section 6 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), the North Carolina Wildlife Resources Commission (NCWRC) has developed the Green Growth Toolbox (NCWRC, 2012) to promote "nature friendly" land use practices. The ICE Update did not assume such practices would be used where not already adopted to ensure a conservative analysis, but in interviews with area planners, respondents stated that they would consider aspects of the Toolbox approach as appropriate, and NCDOT encourages local governments in the project area to consider the Toolbox (Draft Supplemental Final EIS **Section 4.5.6**).
22	Water Quality and Endangered Species	The FEIS fails to address the concerns we raised in our comments on the DEIS regarding the induced growth impacts of this project on water quality and endangered species habitat. Although the FEIS include quantitative analyses of these impacts, the flawed nature of these analyses confounds any precise assessment of the Toll Road's real impacts for reasons discussed above. The Indirect and Cumulative Effects Quantitative Analysis and Water Quality Analysis conclude that the impervious surface increases, streamflow, runoff, and pollutant loadings of 2030 No-Build and 2030 RPA scenarios are equal. Again, such a result is not surprising given that both scenarios assume that major new highway capacity, including this project, will be built in the area and will result in sprawl growth patterns throughout the area. The FEIS interprets the similarity between the Build and No-Build scenario to signify that the Toll Road will not result in any adverse effects on water quality generally or to the Carolina heelsplitter's habit specifically. But if anything, the pollution increases depicted in the modeling confirm that this project would cause significant degradation, as it is a central feature of the growth characterized in both the Build and No-Build scenarios.	See response to Comment #17 in the Southern Environmental Law Center letter (i005). In addition, in response to ongoing coordination with the USFWS, the *Technical Report on Direct, Indirect and Cumulative Impacts to Federally Listed Species* (Michael Baker Engineering, Inc., October 2013) provides an updated analysis of potential direct, indirect and cumulative effects to federally listed species (including the Carolina heelsplitter) associated with the proposed project. As presented in **Section 4.4.5** of the Draft Supplemental Final EIS, a new Biological Assessment was submitted to USFWS in October 2013 and the biological conclusions were consistent with those presented in the Final EIS and the *Biological Assessment for the Monroe Connector-Bypass Project (R-3329/R-2559)* (The Catena Group, May 2010). NCDOT and FHWA are currently working with USFWS to reach concurrence on the biological conclusions presented in the new (October 2013) *Biological Assessment*. USFWS consultation will be complete prior to issuance of the Combined Final Supplemental Final EIS/ROD.
23	Water Quality and Endangered Species	Indeed, keeping in mind that a true No-Build scenario is not presented in the FEIS, the analysis makes clear that the Toll Road would result in indirect and cumulative impacts to water quality and endangered species.	See responses to Comments #6, #14, #17, and #22 in the Southern Environmental Law Center letter (i005).

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24	Water Quality and Endangered Species	Using the findings from the ICE analyses, a biological assessment was prepared to determine the effects of the project on endangered species. However, in light of the flaws in those reports, the Biological Assessment ("BA"') for this Project lacks sufficient information to justify the "May Affect, Not Likely to Adversely Affect" determination for the Carolina heelsplitter. The BA states that "the amount of imperviousness is expected to continue increasing" but that "these changes are independent of the project as there are no measurable changes in the level of imperviousness between build and no-build scenarios." Again, this conclusion is unsupported because the 2030 No-Build and Build scenarios adopt the same baseline socioeconomic forecasts to predict impacts. And given that the modeling depicts increases in impervious surfaces in the Goose Creek and Sixmile Creek watersheds, an accurate assessment of the No-Build scenario could very well support a "May Affect, Likely to Adversely Affect" determination. Such a determination requires formal consultation with the United States Fish and Wildlife Service, and consideration of additional conservation measures, which may be required in designated watersheds.	See response to Comment #22 in the Southern Environmental Law Center letter (i005).
25	Water Quality and Endangered Species	The conservation measures proposed for the Goose Creek watershed and Carolina heelsplitter include funding of the USGS monitoring station at the US 601 crossing of Goose Creek and funding of the Carolina Heelsplitter Conservation Bank in Lancaster County, South Carolina. We strongly support such measures, but more mitigation is warranted in the affected watersheds themselves. The BA notes that the baseline data indicate that the Goose Creek watershed is already above the imperviousness threshold at which habitat degradation begins to occur and seems to suggest that the watershed is a lost cause not worthy of additional conservation measures. Because the Goose Creek watershed is designated critical habitat for the Carolina heelsplitter and identified as essential to recovery, measures must be implemented to begin restoring stream functions.	The commenter is incorrect. The purpose of including the statements regarding the exceeding of the imperviousness threshold is simply to convey the existing conditions (Environmental Baseline) of the watershed, and in **no way** should be taken to imply that the watershed is a "lost cause". As the Endangered Species Act Section 7 Consultation guidance indicates, the Environmental Baseline is an essential component of a BA, and the "Best Available Scientific and Commercial Data" is to be used when preparing a BA, the threshold level that was highlighted is what is currently accepted by the scientific community as being needed to sustain populations of sensitive aquatic species. Failing to point out that both Goose Creek and Sixmile Creek currently exceed the imperviousness threshold would be a misrepresentation of the Environmental Baseline. In addition, see response to Comment #22 in the Southern Environmental Law Center letter (i005).
26	Water Quality and Endangered Species	Although there is a site-specific management plan that mandates buffer widths and other measures to protect the Goose Creek watershed from new development pressures, additional improvements could be made by retrofitting existing development to	NCDOT and FHWA will continue to coordinate with USACE and NCDWQ to determine appropriate mitigation requirements through the permitting process. Compensatory mitigation is planned to be provided through the NC EEP in-lieu fee program. In addition, the NCDOT and FHWA will implement BMPs in accordance with the NCDOT's *Design*

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		upgrade storm water control measures. Much of the imperviousness already existing in the Goose Creek watershed resulted from development induced by other highway projects such as I-485. Given that the transportation agencies are responsible for the extent of existing development in the watershed, these agencies should fund mitigation measures to improve conditions. If the Turnpike Authority funded a stormwater retrofit program that would both preserve and enhance the environmental baseline to a level equating to a protective imperviousness threshold below 6%, the stream function could be significantly improved in Goose Creek.	*Standards in Sensitive Watersheds* to minimize water quality impacts where applicable. It should be noted that the Monroe Connector/Bypass avoids any direct impacts to Goose Creek, and no indirect or cumulative impacts to Goose Creek are anticipated as a result of this project. Also, see response to Comment #19 in the Southern Environmental Law Center letter (i005).

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1578 Mail Service Center
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Re: Questions & comments regarding the FEIS for the Monroe Connector/Bypass STIP R-3329 & R-2559

1 The EPA is set to finalize the 2008 reconsidered 8 hour Ozone NAAQS on August 31, 2011, which is anticipated to range from 0.060 – 0.070 parts per million (ppm). How can the Charlotte Metro area possibly meet this standard in the future with the construction of this facility, and others, proposed in the area? This additional road construction will certainly increase the vehicle miles traveled, and additional ozone pre-cursors (NOx and VOC) to an area that has shown difficulty maintaining the 1997 8- hour Ozone standard at 0.085ppm. The 2009 monitoring data for Mecklenburg and Union County showed improvements, largely due to favorable weather conditions, and the economic down-turn.

2 Who is to say the economic conditions will not turn the new toll facility into the road less taken, despite any major improvements taken place (most likely never will) to Highway 74. The Connector 2000 Association Inc. filed for Chapter 9 bankruptcy. The nonprofit operates the Southern Connector (Toll Road) in Greenville SC. Even after toll rates were increased in 2005 and 2009, they could not generate enough revenue. Everyone in North Carolina is aware of the gas tax, the highest in the southeast. Everyone is also aware that revenues for the Department of Transportation are declining and there is little political will to raise taxes. The State's overall financial situation is no better. My concern is that by borrowing (TIFIA loans) and selling bonds and paying them back with toll revenue, will have the same result, as what happened to Greece(defaulted on loans creating junk bonds). Who is to say that investment banks could not open debt-masking derivatives for NC road debt, to make a huge profit, at the taxpayer's expense? Would the credit rating for NC and its entire Counties decline? The Short term gain in jobs for these road projects will pail when businesses decide the extra taxes will hurt the bottom line, so
2 they will leave and take the jobs with them. The economic reality is that this is a project that North Carolina cannot afford.

Currently Mecklenburg County is 14.9µg/m3 for the annual standard for PM 2.5. On February 24, 2009, the U.S. Court of Appeals for the D.C. Circuit remanded the National Ambient Air Quality Standards (NAAQS) for fine particulate matter (PM2.5) to EPA for reconsideration of the annual level of the standard (which EPA left at 15 micrograms per cubic meter (µg/m3)) and reconsideration of the secondary PM2.5 NAAQS. With respect to the annual PM2.5 NAAQS, the court held that the agency "failed to explain adequately why an annual level of 15 µg/m3 is 'requisite to protect the public health,' including the health of vulnerable subpopulations, while providing 'an adequate margin of safety.' 42 U.S.C. § 7409(b)(1)." The Clean Air Scientific Advisory Committee Recommendations Concerning the Final Rule for the National Ambient Air Quality Standards for particulate matter was between 12 and 14 µg/m3 and had this to say: " The CASAC recommended changes in the annual fine-particle standard because *there is clear and convincing scientific evidence that significant adverse human-health effects occur in response to short-term and chronic particulate matter exposures at and below 15 µg/m^3, the level of the current annual $PM_{2.5}$ standard.* The current administration stated that they would use sound science and the rule of law, and follow the advice of scientific advisors in

making their decisions. Based on previous monitoring data, an annual standard of 12 and 14 µg/m3 would place the Charlotte Metro area in non-attainment for particulate matter. Recently, North Carolina was successful in an injunction against the Tennessee Valley Authority and successful in litigation against EPA regarding the Clean Air Interstate Rule. The TVA was required to install millions of dollars in pollution control equipment for a few facilities to prevent particulate matter from affecting the health of NC citizens. I find it more than disingenuous that the State of North Carolina does not do more regarding mobile source emissions and to maintain an increased separation from these harmful emissions (PM & MSATS) that occur in the breathing zone

Could the FHWA give a detailed explanation of their rational for dismissing hundreds of independent peer reviewed studies of near roadway exposures of vehicular pollutants, as well as, all the studies below, as irrelevant to the proposed federal actions?

According to the final technical air quality memorandum, the FHWA had this to say about unavailable or incomplete information: "Some recent studies have reported that proximity to roadways is related to adverse health outcomes, particularly respiratory problems[3,4]. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they **do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.**"

3 South Coast Air Quality Management District, Multiple Air Toxic Exposure Study II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.
4 Department of Preventive Medicine, University of Southern California Los Angeles, Gauderman et. al. *Effect of exposure to traffic on lung development from 10 to 18 years of age: a cohort study.* The Lancet, (2007).

Miller KA, Siscovick DS, Sheppard L, Shepherd K, Sullivan JH, Anderson GL, Kaufman JD. Long-term exposure to air pollution and incidence of cardiovascular events in women. *N Engl J Med* 2007; 356:447-458 Dockery DW and Stone PH. Cardiovascular Risks from Fine Particulate Air Pollution *N Engl J Med* 2007; 356:511-513.)

Pope, C. Arden III. Mortality effects of longer term exposures to fine particulate air pollution: review of recent epidemiological evidence. Inhalation Toxicology 2007; 19 (Suppl. 1): 33-38.

Schwartz J, Coull B, Laden F, Ryan L. The Effect of Dose and Timing of Dose on the Association between Airborne Particles and Survival. *Environ Health Perspect* 2008; 116:64-69

Samet, Jonathan M. (2007) 'Traffic, Air Pollution, and Health', Inhalation Toxicology, 19:12, 1021 – 1027)

Adar, S. D. and Kaufman, J. D. 2007 'Cardiovascular Disease and Air Pollutants: Evaluating and Improving Epidemiological Data Implicating Traffic Exposure', Inhalation Toxicology, 19:1, 135–149

PM2.5 exposure has significant negative impacts on human health, even when the exposure occurs at levels at or below the NAAQS (Transcript at 1076-77; NC Exh. 467 at 1, 3)
NC Exh. 242 is a 2006 expert report commissioned by the EPA for reasons entirely unrelated to this lawsuit. In light of the resulting objectivity, the Court finds the report to be uniquely compelling in the area of premature mortality resulting from PM2.5 exposure

Premature Mortality Exposure to – and inhalation of – air containing PM2.5 is 90-100% certain to cause premature mortality in humans (Transcript at 1037-38, 1130-31; NC Exh. 242 at viii, 3-23, 3-24.5)
(include all transcripts submitted in the DEIS relating to this TVA vs NC nuisance in FHWA response)

Künzli N, Jerrett M, Garcia-Esteban R, Basagaña X, Beckermann B, et al. (2010) Ambient Air Pollution and the Progression of Atherosclerosis in Adults. PLoS ONE 5(2): e9096. doi:10.1371/journal.pone.**0009096** **The paper is the first to link automobile and truck exhaust to the progression of atherosclerosis -- the thickening of artery walls -- in humans. The study was conducted by researchers from USC and UC Berkeley, along with colleagues in Spain and Switzerland.**

Jerrett et al "Long-Term Ozone Exposure and Mortality," New England Journal of Medicine, Volume 360:1085-1095. March 12, 2009, number 11). http://content.nejm.org/cgi/content/abstract/360/11/1085

Ryan, Patrick H. and LeMasters, Grace K. (2007) 'A Review of
Land-use Regression Models for Characterizing Intra urban Air Pollution Exposure',
Inhalation Toxicology, 19:1, 127 - 133

Traffic related pollutants in Europe and their effect on allergic disease
Joachim Heinrich and Heinz-Erich Wichmann
Curr Opin Allergy Clin Immunol 4:000–000. # 2004 Lippincott Williams & Wilkins

The concentration of benzene in air samples from metropolitan areas was 0.58 ppb, but this does not address near roadways concentrations. A Minimum Risk Level of 0.003 ppm has been derived for chronic- duration inhalation exposure (≥1 year). It is not known if children are more susceptible to benzene poisoning than adults"
(http://www.atsdr.cdc.gov/toxguides/toxguide-3.pdf)

Qing L., L. Zhang, M. Shen, W.J. Jo, R. Vermeulen, G. Li, C. Vulpe, S. Lim, X. Ren, S.M. Rappaport, S.I. Berndt, M. Yeager, J. Yuenger, R.B. Hayes, M. Linet, S. Yin, S. Chanock, M.T. Smith, and N. Rothman. 2009. Large-scale evaluation of candidate genes identifies associations between DNA repair and genomic maintenance and development of benzene hematotoxicity. *Carcinogenesis* ; 30(1) :50-58. Available online: DOI: 10.1093/carcin/bgn249

Rappaport, S.M., S. Kim, Q. Lan, R. Vermeulen, S. Waidyanatha, L. Zhang, G. Li, S. Yin, R.B. Hayes, N. Rothman, and M.T. Smith. In Press (Online 18 February 18, 2009). Evidence that Humans Metabolize Benzene via Two Pathways. *Environmental Health Perspectives*
DOI:10.1289/ehp.0800510
Available online: http://www.ehponline.org/docs/2009/0800510/abstract.html

Ren X, Lim S, Smith MT, Zhang L. 2009. Werner syndrome protein, WRN, protects cells from DNA damage induced by the benzene metabolite hydroquinone. *Toxicol Sci* ; 107(2) :367-75. Available online: http://www.ncbi.nlm.nih.gov/pubmed/19064679

The EPA states: "Several studies have measured elevated concentrations of pollutants emitted directly by motor vehicles near roadways as compared to overall urban background levels.

Elevated concentrations of particulate matter, criteria pollutants, and mobile source air toxics, through monitoring, have been found to be significantly higher within 1000 to 1500 feet (particulate matter) from a major roadway. Meteorology, traffic type and volume, and topography are factors that can alter this distance. Pollutants measured with elevated concentrations include benzene, polycyclic aromatic hydrocarbons, carbon monoxide, nitrogen dioxide, black carbon, and coarse, fine, and ultra fine particulate matter. Meteorology, traffic type and volume, and topography are factors that can alter this distance. **Motor vehicle emissions generally occur within the breathing zone, and near- road populations can be exposed to "fresh" primary emissions as well as combustion pollutants "aged" in the atmosphere.** The EPA found that elevated exposures can occur due to potentially increased concentrations indoors and increased exposures during outdoor activities from many sources, including vehicle exhaust. A review of the literature determined that approximately 100% of gaseous compounds, such as benzene can penetrate indoors, and approximately 80% of diesel particulate matter can penetrate indoors. Studies suggest that ambient temperature variation can also affect particle number gradients near roads substantially. Wind direction also affects traffic-related air pollution mass concentrations inside and outside schools and homes near motorways. Diurnal variations in mixing layer height will also influence both near- road and regional air pollutant concentrations. Decreases in the height of the mixing layer (due to morning inversions, stable atmosphere, etc.) will lead to increased pollutant concentrations at both local and regional scales. Children may represent a subpopulation at increased risk from benzene exposure, (as well as particulate matter, Gauderman et al.) due to factors that could increase their susceptibility. Children have a higher unit body weight exposure because of their heightened activity patterns which can increase their exposures, as well as different ventilation tidal volumes, and frequencies, factors that influence uptake. This could entail a greater risk of leukemia and other toxic effects to children if they are exposed to benzene at similar levels as adults" (Control of Hazardous Air Pollutants from Mobile Sources Chapter EPA February 2007).

3 The FHWA needs to explain, in detail, there rational for dismissing this information as irrelevant to the proposed federal action. The FHWA response below also needs further explanation:

The 2006 guidance was updated on September 30, 2009. The updated guidance is discussed in **Section 2.5.2.2** of the Final EIS. The FHWA will continue to revise and update this guidance as the science on air toxic analysis continues to evolve. The range of 140,000-150,000 AADT was selected as a criterion for considering a quantitative MSAT analysis because through use of USEPA's MOBILE 6.2 emissions model, FHWA staff determined that this range of AADT would be roughly equivalent to the Clean Air Act definition of a major hazardous air pollutant (HAP) source, i.e. 25 tons/year for all HAPS or 10 tons/year for any single HAP.

This decision by FHWA is clearly arbitrary and capricious and sums up their whole interim guidance on MSAT's, and simply changing the date to this guidance is inadequate. According to FHWA ("The update "does not change any project analysis thresholds, recommendations, or guidelines.")

The Clean Air Act definition of a major hazardous air pollutant (HAP) source quoted by the FHWA is used primarily by point sources (Industrial Sources). Congress directed EPA to develop a program to develop further the regulation of HAPs in Section 112 of the 1990 Clean Air Act Amendments (CAAA). While the standards for major sources of HAPs developed per this section are also designated as NESHAPs, they are established according to Maximum Achievable Control Technology (MACT) requirements. MACT is a technology-based standard, as opposed to the original conception of NESHAPs as a risk-based standard. These technology-based NESHAPs are located at 40 CFR 63 and incorporated by reference in 45CSR34.

EPA has set MACT standards for over 100 source categories as specified under Section 112(d) . While these MACT standards typically apply to major sources (those at facilities with greater than 10 ton/yr of a single HAP, or greater than 25 ton/yr of aggregate HAPs), many MACTs also apply to area sources (sources with less than 10/25 ton/yr HAP thresholds); a few MACTs apply only to area sources. EPA has also begun to slowly identify additional area sources of air toxics for regulation per its Integrated Urban Air Toxics Strategy as mandated by Section 112(k) of the CAAA. Many urban communities continue to be exposed to a high amount of hazardous air pollutants (air toxins). **The definition of major source depends upon a facility's potential to emit not its actual emissions.** Also, when a new facility is proposed, a quantitative analysis (using detailed computer models) is conducted from the source to see if any residential, schools etc., are impacted, before a permit is issued. In other words, this analysis gives decision makers valuable information to make informed decisions as to what pollution controls should be used, the stack height and location, to prevent harmful emissions to adjacent properties and residents.

In contrast, the FHWA builds a road facility, in many cases, within close proximity to residential sub-divisions, schools, and communities and only relies on inadequate interim MSAT guidance, knowing that motor vehicle emissions generally occur in the breathing zone.

According to the FHWA, through use of US EPA's MOBILE 6.2 emissions model, (FHWA is aware that the official MOVES model has replaced the MOBILE 6.2 model at the end of 2009) FHWA staff determined that this range of AADT would be roughly equivalent to the Clean Air Act definition of a major hazardous air pollutant (HAP) source, ie.25 tons/year for all HAPS or 10 tons/year for any single HAP, that is, 140000 to 150000 AADT.

The **projected** AADTs for the various DSAs vary by segment and range from 41,400 to 95,600 AADT on the western end of the project and 15,400 to 24,800 AADT on the eastern end of the project, according to the DEIS. In the western end of the project the total single HAP would range from approximately 3.0 and 6.6 tons/year, while all (187) HAPS & diesel PM would range from approximately 7.13 to 16.5 tons/year for this facility alone.

4 How can the FHWA be certain of the computer models that derive their projected AADT's?

As stated in the
updated guidance (page 5), "air toxics analysis is an emerging field and
current scientific techniques, tools, and data are not sufficient to
accurately estimate human health impacts that would result from a
transportation project in a way that would be useful to decision-makers."

Regarding the statement above, Independent research scientists, with work that is peer reviewed, all seem to find that near roadway exposures from Mobile sources is increasingly a problem. While the science may be new, and hard to grasp for the FHWA staff, it is not with other scientists. They are consistently finding tools, compiling data to quantify the human health impacts. This statement above is used by FHWA to circumvent the current NEPA CEQ regulations only.

5 Is the FHWA using science as an excuse not to conduct a quantitative MSAT analysis because it will leave decision makers with fewer options where they can build their road or perhaps just harder to rubber stamp EIS that have pre-determined sites(alternatives) where roads are placed?

6 How can the FHWA, using only a qualitative MSAT analysis know where to use effective MSAT mitigation measures to prevent hazardous emissions where people live and work, or where not to place a road because the emissions will be too high, for the roughly 10 miles of roadway in the western end of this project?

7 Will the FHWA conduct a quantitative MSAT analysis that incorporates the emissions from a new proposed facility in addition to the cumulative emissions from existing roadways?

8 Does the FHWA plan to use any MSAT mitigation for this project? Not sure where to use it? I wonder why?

Does the FWHA monitor the effectiveness of any MSAT mitigation sites, providing there are any, to determine if they are actually working?

Is the FHWA staff aware that the CAA definition of a major (point source) depends on a facility's potential to emit not its actual emissions?

Perhaps in metropolitan statistical areas, vehicle registration data, and transit tractor trailers, should be used to determine the potential to emit for mobile sources, and be required to conduct a quantitative analysis for (hotspot) NAAQS, as well as, MSATs for all road projects.

9 Will the FHWA conduct a quantitative MSAT analysis for this project using Human Exposure Model-3 (HEM-3), AERMOD Version, Assessment System for Population Exposure Nationwide model (ASPEN), Community Multi-scale Air Quality model (CMAQ), EPA Motor Vehicle Emission Simulator (MOVES) model, HAPEM-MS Hazardous Air Pollutant Exposure Model for Mobile Sources; and land use regression models?

These models, as well as others, can effectively conduct a quantitative MSAT analysis at the project level. Of course, proper effective monitoring of pollutants near roadways, for Individuals, and at sensitive receptors, can be used to refine models used to calculate exposures. Actual monitoring can be useful for specific exposure routes, duration and dose as well.

According to the EPA's National-scale Air toxics assessment for three census tracts in the western end of the proposed project are as follows:

	Cancer risk	Avg tot resp HI	Pollutant Contribution
FIPS 37179-020302	48/million	1.7	10% Benzene/ 72% Acrolein
37179-020303	51/million	1.9	11% Benzene/ 75% Acrolein
37179-020401	49/million	1.7	11% Benzene/ 73% Acrolein

10 Can the FHWA quantify the **increased** cancer risks, and average total respiratory HI, for all the census tracts that the proposed new facility will impact?

11 What percentage increase in cancer risk would this facility bring to all the census tracts along the route, especially, the homes in close proximity?

Again, EPA's vehicle and fuel regulations, coupled with fleet turnover is applauded and needed; however, over time, the substantial reductions that will cause region-wide air pollution levels to be significantly lower than today remains to be seen. No Federal or State laws mandate vehicle turnover. The fuel regulations could be eliminated or reduced in the future.

Sincerely,

Ed Eason

Table A-6: Ed Eason

Document: i006 letter dated June 29, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
Note: Many comments in Mr. Eason's June 29, 2010 letter dealt with Air Quality Policy and were not specific to the Monroe Connector/Bypass Final EIS. Only those comments specific to the Final EIS are listed below.			
1	Air Quality	The EPA is set to finalize the 2008 reconsidered 8 hour Ozone NAAQS on August 31, 2011, which is anticipated to range from 0.060 – 0.070 parts per million (ppm). How can the Charlotte Metro area possibly meet this standard in the future with the construction of this facility, and others, proposed in the area?	The current 8-hour NAAQS for ozone is 0.075 ppm. MUMPO currently has an approved Transportation Improvement Program (TIP) covering the years 2012 through 2018 which is a direct subset of the respective conforming 2035 LRTP. The FHWA and FTA approved a regional conformity determination for the MUMPO 2012-2018 TIP on December 19, 2011.[1] The latest conformity determination for the 2035 MUMPO LRTP is dated May 22, 2013, with a FHWA/FTA conformity finding on May 29, 2013.
2	Purpose and Need	Who is to say the economic conditions will not turn the new toll facility into the road less taken, despite any major improvements taken place (most likely never will) to Highway 74. The economic reality is that this is a project that North Carolina cannot afford.	The overall economic climate will vary from year to year and cannot be accurately predicted. Based on available information, including the *Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study Final Report* (Wilbur Smith and Associates, October 2010) (available on the project Web site), and the project's financial plan, NCDOT has determined that the project will be financially feasible.
3	Air Quality	The FHWA needs to explain, in detail, their rationale for dismissing this information as irrelevant to the proposed federal action.	The FHWA position does not consider the information from the EPA as irrelevant; however, as stated in Appendix E of the Final EIS, which was reviewed and determined still valid for the Draft Supplemental Final EIS, FHWA believes "Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable. Because of the limitations in the methodologies for forecasting health impacts…, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis."

[1] The December 19, 2011 conformity determination for the Metrolina Region is titled: Final *Conformity Analysis and Determination Report for the Metrolina Area: Cabarrus-Rowan MPO, Mecklenburg-Union MPO, and Gaston Urban Area MPO 2012-2018 Transportation Improvement Program, 2035 Long Range Transportation Plan Amendments and Projects from the 2012-2018 State Transportation Improvement Program for the Donut Area Counties of Lincoln, Iredell, Gaston, and Union*

Table A-6: Ed Eason

Document: i006 letter dated June 29, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
4	Air Quality	How can the FHWA be certain of the computer models that derive their projected AADT's?	FHWA reviews the travel demand modeling process as part of the MPO certification process (approximately every two years) and indicates their acceptance of the MPO's modeling procedures. FHWA's most recent certification of the CRTPO's (formerly MUMPO) travel demand model occurred on December 6, 2011. The tools utilized today provide the project with the best available information as to traffic volumes twenty years or more into the future.
5	Air Quality	Is the FHWA using science as an excuse not to conduct a quantitative MSAT analysis because it will leave decision makers with fewer options where they can build their road or perhaps just harder to rubber stamp EIS that have pre-determined sites(alternatives) where roads are placed?	See response to Comment #3 in this letter (i006). While there have been several studies regarding the health impacts of MSATs, none have addressed the MSAT health impacts in proximity of roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot-spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.
6	Air Quality	How can the FHWA, using only a qualitative MSAT analysis know where to use effective MSAT mitigation measures to prevent hazardous emissions where people live and work, or where not to place a road because the emissions will be too high, for the roughly 10 miles of roadway in the western end of this project?	See response to Comment #3 in this letter (i006). As a result of the qualitative MSAT analysis, it is expected there would be either minor changes or a slight reduction in MSAT emissions in the immediate area of the project, relative to the No-Build Alternative. In comparing the alternatives, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify them. Based on these findings, no MSAT mitigation is warranted.
7	Air Quality	Will the FHWA conduct a quantitative MSAT analysis that incorporates the emissions from a new proposed facility in addition to the cumulative emissions from existing roadways?	Since publication of the Final EIS, FHWA issued new MSAT Guidance on December 6, 2012 (*Interim Guidance on Mobile Source Air Toxic Analysis in NEPA*). However, this updated guidance does not change any project analysis thresholds, recommendations, or guidelines. There is no change in the impact evaluation conclusions described in the Draft EIS and referenced in the Final EIS and Draft Supplemental Final EIS. Consistent with FHWA Guidance (*Memorandum – Interim Guidance on Air Toxic Analysis in NEPA Documents*, FHWA, December 6, 2012), a quantitative analysis is not required and will not be performed for this project.

Table A-6: Ed Eason

Document: i006 letter dated June 29, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
8	Air Quality	Does the FHWA plan to use any MSAT mitigation for this project? Not sure where to use it? I wonder why?	See response to Comment 6 in this letter (i006).
9	Air Quality	Will the FHWA conduct a quantitative MSAT analysis for this project using Human Exposure Model-3 (HEM-3), AERMOD Version, Assessment System for Population Exposure Nationwide model (ASPEN), Community Multi-scale Air Quality model (CMAQ), EPA Motor Vehicle Emission Simulator (MOVES) model, HAPEM-MS Hazardous Air Pollutant Exposure Model for Mobile Sources; and land use regression models?	See response to Comment 7 in this letter (i006).
10	Air Quality	Can the FHWA quantify the **increased** cancer risks, and average total respiratory HI, for all the census tracts that the proposed new facility will impact?	See response to Comment 5 in this letter (i006). For reasons stated in Appendix E of the Final EIS and the information below, FHWA cannot quantify the cancer risks in the project study area. According to the EPA's NATA website: (http://www.epa.gov/ttn/atw/natamain/) National-Scale Air Toxics Assessment (NATA) assessments do not incorporate refined information about emission sources, but rather, use general information about sources to develop estimates of risks which are more likely to overestimate impacts than underestimates them. NATA provides estimates of the risk of cancer and other serious health effects from breathing (inhaling) air toxics in order to inform both national and more localized efforts to identify and prioritize air toxics, emission source types and locations which are of greatest potential concern in terms of contributing to population risk. NATA results provide answers to questions about emissions, ambient air concentrations, exposures and risks across broad geographic areas (such as counties, states and the Nation) at a moment in time. As such, they help the EPA identify specific air toxics compounds, and specific source sectors such as stationary sources or mobile sources, which generally produce the highest exposures and risks in the country. These assessments are based on assumptions and methods that limit the range of questions that can be answered reliably. The results cannot be used to identify exposures and risks for specific individuals, or even to identify exposures and risks in small geographic regions such as a specific census block, i.e., hotspots. The NATA assessments should not be used for any of the following:

Table A-6: Ed Eason

Document: i006 letter dated June 29, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
			• As a sole means for identifying localized hotspots • As a definitive means to pinpoint specific risk values within a census tract • To characterize or compare risks at local levels such as between neighborhoods • As the sole basis for developing risk reduction plans or regulations • To control specific sources or pollutants • To quantify benefits of reduced air toxic emissions
11	Air Quality	What percentage increase in cancer risk would this facility bring to all the census tracts along the route, especially, the homes in close proximity?	See response to Comment 10 in this letter (i006).

a001

NCDENR

North Carolina Department of Environment and Natural Resources

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

JUL 2010
RECEIVED
Secretary's Office
DOA

MEMORANDUM

TO: Valerie McMillan
State Clearinghouse

FROM: Melba McGee
Project Review Coordinator

RE: 10-0435 FEIS for proposed improvements to the US 74 corridor in Mecklenburg County to US 74 in Union County

DATE: July 16, 2010

The Department of Environment and Natural Resources has reviewed the proposed project.

1 It is requested that the Department of Transportation continue to work with our agencies in order to adequately address any outstanding concerns. Addressing agency comments during the NEPA Merger Process or prior to finalizing the Record of Decision will avoid delays during the permit phase.

Thank you for the opportunity to comment on this project.

Attachments

1601 Mail Service Center, Raleigh, North Carolina 27699-1601
Phone: 919-733-4984 \ FAX: 919-715-3060 Internet: www.enr.state.nc.us

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Table A-7: NC Department of Environment and Natural Resources

Document: a001 letter dated July 16, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	General	The Department of Environment and Natural Resources has reviewed the proposed project. It is requested that the Department of Transportation continue to work with our agencies in order to adequately address any outstanding concerns. Addressing agency comments during the NEPA Merger Process or prior to finalizing the Record of Decision will avoid delays during the permit phase.	NCDOT has continued to work closely with the environmental resource and regulatory agencies during preparation of the Draft Supplemental Final EIS, as summarized in **Section 5.3**, and will continue to work closely with the agencies during the Design-Build phase.

North Carolina Wildlife Resources Commission

TO: Melba McGee, Environmental Coordinator
Department of Environment and Natural Resources

FROM: Marla Chambers, Western NCDOT Permit Coordinator *Marla Chambers*
Habitat Conservation Program, NCWRC

DATE: July 13, 2010

SUBJECT: Review of the Final Environmental Impact Statement for proposed improvements to the US 74 corridor from I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County (Monroe Connector/Bypass). TIP Nos. R-2559 and R-3329. DENR Project No.: 10-0435, originally due 07/06/2010, extended to 07/13/2010.

The North Carolina Turnpike Authority (NCTA) has submitted a Final Environmental Impact Statement (FEIS) for the proposed Monroe Connector/Bypass project, which had previously been analyzed by the North Carolina Department of Transportation (NCDOT) as two separate projects (Monroe Bypass and Monroe Connector). Staff biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the information provided and have attended the Turnpike Environmental Agency Coordination (TEAC) meetings for the project. These comments are provided in accordance with the provisions of the National Environmental Policy Act (42 U.S.C. 4332(2)(c)) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

NCTA proposes to construct a new location toll facility from I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, approximately 20 miles in length. NCWRC has provided several comment letters and other input during the development of this project under both NCDOT and NCTA planning processes. Our comments on the Draft
1 Environmental Impact Statement, dated May 26, 2009, were included in the FEIS. Our most recent project comments, which reviewed the Draft Indirect and Cumulative Effects Water Quality Analysis for the Monroe Connector/Bypass technical report, were submitted May 28, 2010. These comment letters continue to be appropriate and we remain concerned about the

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Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

1 potential negative effects of this project and others on the sensitive aquatic resources in this rapidly developing region.

Water quality in the project study area will have significant effects on the future of both human and wildlife populations. According to the above mentioned technical report, the project study area contains 54 named streams, 22 of which have Water Supply classifications and six are also assigned a Critical Area designation. Eleven of the named streams are on the latest 303(d) lists of impaired waters (draft and final lists): McAlpine Creek, Sixmile Creek, Beaverdam Creek, Crooked Creek, North and South Forks Crooked Creek, Duck Creek, Goose Creek, Little Richardson Creek, Richardson Creek, and Stewarts Creek. This is of particular concern because a number of federal and state listed aquatic species depend on several of these impaired streams for survival or, potentially, their continued existence.

The Carolina heelsplitter (*Lasmigona decorata*), a federal and state Endangered (E) mussel, occurs in Goose, Duck, and Sixmile Creeks within the project area. Only six populations occur in the world, each considered critical to the survival of the species. Other listed species observed in Goose Creek and its tributary, Duck Creek, include Atlantic pigtoe (*Fusconaia masoni*), Federal Species of Concern (FSC) and state E; Carolina creekshell (*Villosa vaughaniana*), FSC and state E; creeper (*Strophitus undulatus*), state Threatened; notched rainbow (*V. constricta*), state Special Concern (SC); and eastern creekshell (*V. delumbis*), state Significantly Rare. Sixmile Creek is also occupied by the Carolina creekshell and eastern creekshell. The Carolina darter (*Etheostoma collis*), a FSC and state SC fish, and the following listed mussel species have been recorded in the South Fork and North Fork of Crooked Creek: Savannah lilliput (*Toxolasma pullus*), FSC and state E; Carolina creekshell; and eastern creekshell. Richardson Creek also has records for the Savannah lilliput, Carolina creekshell, and the eastern creekshell. In addition, the Twelvemile Creek watershed has occurrences of the Carolina creekshell, notched rainbow and eastern creekshell.

We commend NCTA for commitments to minimize direct impacts by adhering to the Design Standards in Sensitive Watersheds for sediment and erosion control along the entire project and the use of bridge crossings at several locations. The bridges not only reduce impacts to sensitive
2 waters, but also improve safety for the public and wildlife by providing areas for wildlife, including large mammals, to cross safely under the road, and by maintaining floodplain functions that help reduce flooding and flood damage. We also appreciate NCTA's response to one of our comments on the DEIS, that indicated they will work with us to protect state-listed species where feasible and practicable.

3 Indirect and cumulative impacts remain our greatest concern for this project and have the potential to be much more significant than the direct impacts. The FEIS summarized the qualitative and quantitative analysis of the Indirect and Cumulative Effects (ICEs) on land use and water quality and provided copies of those reports in the appendices. In general, the effects attributed to the project were characterized as small relative to the overall effects from projected development in the study area. Differences in impervious cover and water quality parameters due to the project were indicated in six of the eighteen watersheds studied, with most of the induced development occurring within a mile of the proposed interchanges.

The watersheds determined to be affected by the project were Crooked Creek, Richardson Creek (Middle and Lower watersheds), Rays Fork, Stewarts Creek, and Salem Creek. The differences in impervious cover between the 2030 Preferred Alternative and the 2030 No-Build scenarios were indicated to be one or two percent of the individual watersheds. Some of these affected watersheds contain listed species, others contain impaired streams, and some have both. As indicated in the FEIS, NCWRC recommends the threshold of concern for impervious surfaces is six percent for watersheds containing Threatened or Endangered mussel species and ten percent for other watersheds. The range of percentages of impervious cover predicted for the Preferred Alternative in the year 2030 was from seven to 37 percent, most (15 of 18) were greater than ten percent. Of those with the Endangered Carolina heelsplitter, the Goose Creek watershed was predicted to have 17 percent imperviousness and the Sixmile Creek watershed was forecast to be 30 percent. This and other project ICE analysis revealed the significance of the cumulative effects on the project area and its aquatic resources.

The quantitative ICE water quality technical report, in particular, revealed cumulative impact data that is of serious concern for the listed species in the study area. For example, the Lower Richardson Creek watershed, which is indicated to be affected by the project, was predicted to have 20.5 percent more annual total fecal coliform and 4.5 percent additional annual total phosphorus. Most alarming was the forecast for Sixmile Creek; although not indicated to be affected by the project, a 70 percent increase in runoff, more than a 40 percent increase in total suspended solids, and an 80 percent increase in annual total fecal coliform were projected for the year 2030.

4 The project ICE analysis appears to show that the project is a contributing factor in the cumulative effects that are likely to have significant negative effects on the health of area waterways and wildlife habitat and the sensitive species that inhabit them. It appears that substantial efforts will be required, beyond those accounted for in the ICE analysis, to provide appropriate protection for listed species, including the federally protected Carolina heelsplitter, with or without this project. Those measures will be critical if the project is built and additional measures may be needed due to project-induced impacts.

5 The FEIS included a section from the Federal Highway Administration (FHWA) Position Paper: Secondary and Cumulative Impact Assessment In the Highway Project Development Process which states "measures that would be appropriate to offset most future developmental impacts in the area of a project often will be beyond the control and funding authority of the highway program. In these situations, the best approach would be to work with local agencies that can influence future growth and promote the benefits of controls that incorporate environmental protection into all planned development." In addition, since past, present and reasonably foreseeable NCDOT projects in the project area certainly contribute to the cumulative impacts, and NCTA is now a division of NCDOT, it is reasonable to recommend these agencies work with the local authorities to implement measures that will greatly reduce or mitigate the negative effects of development on water quality throughout the study area, including the negative effects induced by the project. Strong regulations regarding development and stormwater management, and the enforcement of those regulations will be crucial to the success of mitigation measures and the ultimate protection of listed species.

Thank you for the opportunity to review and comment on this project. If you have any questions regarding these comments, please contact me at (704) 485-8291. We look forward to continuing our participation in the planning process for this project.

cc: Marella Buncick, USFWS
Polly Lespinasse, NCDWQ
Christopher Militscher, USEPA
Angie Rodgers, NCNHP

Table A-8: NC Wildlife Resources Commission

Document: a002 letter dated July 13, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	General	NCWRC has provided several comment letters and other input during the development of this project under both NCDOT and NCTA planning processes. Our comments on the Draft Environmental Impact Statement, dated May 26, 2009, were included in the FEIS. Our most recent project comments, which reviewed the Draft Indirect and Cumulative Effects Water Quality Analysis for the Monroe Connector/Bypass technical report, were submitted May 28, 2010. These comment letters continue to be appropriate and we remain concerned about the potential negative effects of this project and others on the sensitive aquatic resources in this rapidly developing region.	Comment noted. Impacts to natural resources are addressed in **Section 4.4** and **Section 4.5** of the Draft Supplemental Final EIS.
2	Wildlife	We commend NCTA for commitments to minimize direct impacts by adhering to the Design Standards in Sensitive Watersheds for sediment and erosion control along the entire project and the use of bridge crossings at several locations. The bridges not only reduce impacts to sensitive waters, but also improve safety for the public and wildlife by providing areas for wildlife, including large mammals, to cross safely under the road, and by maintaining floodplain functions that help reduce flooding and flood damage. We also appreciate NCTA's response to one of our comments on the DEIS, that indicated they will work with us to protect state-listed species where feasible and practicable.	Thank you for your comment. NCDOT will continue to work closely with the agencies throughout the project development process. As stated in the Project Commitments section of the Draft Supplemental Final EIS, NCDOT will implement *Design Standards in Sensitive Watersheds* for the entire length of the project.
3	Indirect and Cumulative Effects	Indirect and cumulative impacts remain our greatest concern for this project and have the potential to be much more significant than the direct impacts.	The indirect and cumulative impacts assessment has been updated since the Final EIS, as documented in *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) and summarized in **Section 4.5** of the Draft Supplemental Final EIS. While the impacts from the indirect and cumulative effects from the project are modest, localities can help to mitigate the impacts that this growth will have by implementing recommendations from the NCWRC Green Growth Toolbox and other practices, which could reduce cumulative development effects within the study area through such tools as clustered development, Low Impact Design, improved stormwater management, larger riparian buffers and conservation of environmentally sensitive habitats. A discussion of how indirect and cumulative impacts can be minimized or avoided is included in **Section 4.5.6** of the Draft Supplemental Final EIS.

Table A-8: NC Wildlife Resources Commission

Document: a002 letter dated July 13, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
4	Indirect and Cumulative Effects	The project ICE analysis appears to show that the project is a contributing factor in the cumulative effects that are likely to have significant negative effects on the health of area waterways and wildlife habitat and the sensitive species that inhabit them. It appears that substantial efforts will be required, beyond those accounted for in the ICE analysis, to provide appropriate protection for listed species, including the federally protected Carolina heelsplitter, with or without this project. Those measures will be critical if the project is built and additional measures may be needed due to project-induced impacts.	See response to Comment 3 in this letter (a002). Effects on endangered species are summarized in **Section 4.4.5** and **Section 4.5.5.3** of the Draft Supplemental Final EIS. Conservation measures were proposed in the Biological Assessment (*Biological Assessment for the Monroe Connector-Bypass Project*, The Catena Group, May 2010) and accepted by USFWS to further ensure a conservative approach to the analysis of the project's impacts on the Carolina heelsplitter. These measures included funding continued operation of US Geological Survey stream gauge on Goose Creek for 5 years and providing funding to the Carolina Heelsplitter Conservation Bank in the Flat Creek watershed in Lancaster County, South Carolina in the amount of $150,000 to support ongoing research and surveying efforts, as well as protect, manage, and monitor land in the conservation bank. These conservation measures have been implemented. A new Biological Assessment was provided to USFWS in October 2013. The biological conclusions presented in the new Biological Assessment are the same as those presented in the May 2010 Biological Assessment. NCDOT and FHWA are working with USFWS to reach concurrence on the new Biological Assessment. Consultation with USFWS will be complete prior to issuance of the Final Supplemental Final EIS/ROD for the project.
5	Indirect and Cumulative Effects	The FEIS included a section from the Federal Highway Administration (FHWA) Position Paper: Secondary and Cumulative Impact Assessment In the Highway Project Development Process which states "measures that would be appropriate to offset most future developmental impacts in the area of a project often will be beyond the control and funding authority of the highway program. In these situations, the best approach would be to work with local agencies that can influence future growth and promote the benefits of controls that incorporate environmental protection into all planned development." In addition, since past, present and reasonably foreseeable NCDOT projects in the projects area certainly contribute to the cumulative impacts, and NCTA is now a division of NCDOT, it is reasonable to recommend these agencies work with the local authorities to implement measures that will greatly reduce or mitigate the negative effects of development on water quality throughout the study area, including the negative effects induced by the project. Strong regulations regarding development and stormwater management, and the enforcement of those regulations will be crucial to the success of mitigation measures and the ultimate protection of listed species.	See response to Comment 3 in this letter (a002). NCDOT lacks the enforcement authority to require local governments adopt regulations and land use plans that would help protect significant natural resources.

a003

NCDENR

North Carolina Department of Environment and Natural Resources

Division of Water Quality

Beverly Eaves Perdue, Governor | Coleen H. Sullins, Director | Dee Freeman, Secretary

June 28, 2010

MEMORANDUM

To: Melba McGee, Environmental Coordinator, Office of Legislative and Intergovernmental Affairs

From: Polly Lespinasse, Division of Water Quality, Mooresville Regional Office

Subject: **Comments on the Final Environmental Impact Statement Related to the Proposed Monroe Connector/Bypass from near I-485 at US 74 to US 74 Between the Towns of Wingate and Marshville, Mecklenburg and Union Counties, Federal Aid Project No. STP-NHF-74(90), WBS Element 34533.1.TA1, STIP Project Number R-3329/R-2559, DENR Project No. 10-0435, Due Date 07/06/2010**

This office has reviewed the referenced document dated May 2010. The NC Division of Water Quality (NCDWQ) is responsible for the issuance of the Section 401 Water Quality Certification for activities that impact Waters of the U.S., including wetlands. It is our understanding that the project as presented will result in impacts to jurisdictional wetlands, streams, and other surface waters. NCDWQ offers the following comments based on review of the aforementioned document:

Project Specific Comments:

1 1. The document makes several references to the stream mitigation requirements for the project. The document indicates that all perennial streams will require mitigation. In addition, the document states that if an intermittent stream has a stream rating equal to or greater than 26, as per the completed NCDWQ Stream Identification Form, then mitigation will be provided. Effective October 16, 2009, NCDWQ will require mitigation for all jurisdictional streams, either intermittent or perennial. The applicable portion of the *Intermittent Stream Mitigation Policy*, as identified in the Public Notice, published August 14, 2009, is included below:

NCDOT projects reviewed through the Clean Water Act Section 404/ National Environmental Policy Act Merger 01 Process (Merger 01) or Safe Accountable Flexible Efficient Transportation Equity Act; A Legacy for Users (SAFETEA-LU, published by the US Army Corps of Engineers and the Federal Highway Administration, 2003) or its immediate successor, and that have reached agreement with Department of Environment and Natural Resources on avoidance and minimization (Concurrence Point 4A) prior to the effective date of this policy are not subject to the new intermittent stream mitigation policy. Furthermore, if a project is not reviewed by the Merger 01 process or SAFETEA-LU or its immediate successor but has an issued Finding of No Significant Impact and has the written approval of the NC Division of Water Quality prior to the effective date of this policy, then it is not subject to the new Intermittent Stream Mitigation Policy.

Therefore, please be advised, DWQ will require mitigation for all jurisdictional streams (stream rating equal to or greater than 19 as per the completed NCDWQ Stream Identification Form) impacted by this project.

2. North Fork Crooked Creek, South Fork Crooked Creek, and Richardson Creek are Class C; 303(d) Waters of the State. Stewarts Creek is a Class WS-III; 303(d) Waters of the State.

Mooresville Regional Office
Location: 610 East Center Ave., Suite 301 Mooresville, NC 28115
Phone: (704) 663-1699 \ Fax: (704) 663-6040 \ Customer Service: 1-877-623-6748
Internet: http://portal.ncdenr.org/web/wq

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North Fork Crooked Creek, South Fork Crooked Creek, Richardson Creek and Stewarts Creek are on the 303(d) list for impaired use for aquatic life due to impaired biological integrity. North Fork Crooked Creek is on the 303(d) list for impaired use for aquatic life due to turbidity. NCDWQ is very concerned with sediment and erosion impacts that could result from this project. As per the commitment in the Final Environmental Impact Statement, the North Carolina Turnpike Authority (NCTA) shall provide the most protective sediment and erosion control BMPs in accordance with *Design Standards in Sensitive Watersheds* to reduce the risk of nutrient runoff to North Fork Crooked Creek, South Fork Crooked Creek, Richardson Creek and Stewarts Creek. NCDWQ requests that road design plans provide treatment of the storm water runoff through best management practices as detailed in the most recent version of NCDWQ *Stormwater Best Management Practices*. 2

3 3. Due to the proximity of the project to Lake Twitty, which is classified as a Water Supply III (WS-III) Area in the project area, the NCTA shall design, construct, and maintain hazardous spill catch basins as per the commitment in the Final Environmental Impact Statement.

General Comments:

4. The environmental document should provide a detailed and itemized presentation of the proposed impacts to wetlands and streams with corresponding mapping. If mitigation is necessary as required by 15A NCAC 2H.0506(h), it is preferable to present a conceptual (if not finalized) mitigation plan with the environmental documentation. Appropriate mitigation plans will be required prior to issuance of a 401 Water Quality Certification.

5. Environmental impact statement alternatives shall consider design criteria that reduce the impacts to streams and wetlands from storm water runoff. These alternatives shall include road designs that allow for treatment of the storm water runoff through best management practices as detailed in the most recent version of NCDWQ's *Stormwater Best Management Practices Manual*, July 2007, such as grassed swales, buffer areas, preformed scour holes, retention basins, etc.

6. After the selection of the preferred alternative and prior to an issuance of the 401 Water Quality Certification, the NCTA is respectfully reminded that they will need to demonstrate the avoidance and minimization of impacts to wetlands (and streams) to the maximum extent practical. In accordance with the Environmental Management Commission's Rules {15A NCAC 2H.0506(h)}, mitigation will be required for impacts of greater than 1 acre to wetlands. In the event that mitigation is required, the mitigation plan shall be designed to replace appropriate lost functions and values. The NC Ecosystem Enhancement Program may be available for use as wetland mitigation.

7. In accordance with the Environmental Management Commission's Rules {15A NCAC 2H.0506(h)}, mitigation will be required for impacts of greater than 150 linear feet to any single stream. In the event that mitigation is required, the mitigation plan shall be designed to replace appropriate lost functions and values. The NC Ecosystem Enhancement Program may be available for use as stream mitigation.

8. Future documentation, including the 401 Water Quality Certification Application, shall continue to include an itemized listing of the proposed wetland and stream impacts with corresponding mapping.

9. NCDWQ is very concerned with sediment and erosion impacts that could result from this project. NCTA shall address these concerns by describing the potential impacts that may occur to the aquatic environments and any mitigating factors that would reduce the impacts.

10. An analysis of cumulative and secondary impacts anticipated as a result of this project is required. The type and detail of analysis shall conform to the NC Division of Water Quality Policy on the assessment of secondary and cumulative impacts dated April 10, 2004.NCTA is respectfully reminded that all impacts, including but not limited to, bridging, fill, excavation and clearing, and rip rap to jurisdictional wetlands, streams, and riparian buffers need to be included in the final impact calculations. These impacts, in addition to any construction impacts, temporary or otherwise, also need to be included as part of the 401 Water Quality Certification Application.

11. Where streams must be crossed, NCDWQ prefers bridges be used in lieu of culverts. However, we realize that economic considerations often require the use of culverts. Please be advised that culverts should be countersunk to allow unimpeded passage by fish and other aquatic organisms. Moreover, in areas where high quality wetlands or streams are impacted, a bridge may prove preferable. When applicable, NCTA should not install the bridge bents in the creek, to the maximum extent practicable.

12. Whenever possible, NCDWQ prefers spanning structures. Spanning structures usually do not require work within the stream or grubbing of the streambanks and do not require stream channel realignment. The horizontal and vertical clearances provided by bridges shall allow for human and wildlife passage beneath the structure. Fish passage and navigation by canoeists and boaters shall not be blocked. Bridge supports (bents) should not be placed in the stream when possible.

13. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of NCDWQ's *Stormwater Best Management Practices.*

14. Sediment and erosion control measures should not be placed in wetlands or streams.

15. Borrow/waste areas should avoid wetlands to the maximum extent practical. Impacts to wetlands in borrow/waste areas will need to be presented in the 401 Water Quality Certification and could precipitate compensatory mitigation.

16. The 401 Water Quality Certification application will need to specifically address the proposed methods for stormwater management. More specifically, stormwater shall not be permitted to discharge directly into streams or surface waters.

17. Based on the information presented in the document, the magnitude of impacts to wetlands and streams may require an **Individual Permit (IP)** application to the Corps of Engineers and corresponding 401 Water Quality Certification. Please be advised that a 401 Water Quality Certification requires satisfactory protection of water quality to ensure that water quality standards are met and no wetland or stream uses are lost. Final permit authorization will require the submittal of a formal application by the NCTA and written concurrence from NCDWQ. Please be aware that any approval will be contingent on appropriate avoidance and minimization of wetland and stream impacts to the maximum extent practical, the development of an acceptable stormwater management plan, and the inclusion of appropriate mitigation plans where appropriate.

18. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.

19. If temporary access roads or detours are constructed, the site shall be graded to its preconstruction contours and elevations. Disturbed areas shall be seeded or mulched to stabilize the soil and appropriate native woody species shall be planted. When using temporary structures the area shall be cleared but not grubbed. Clearing the area with chain saws, mowers, bush-hogs, or other mechanized equipment and leaving the stumps and root mat intact allows the area to re-vegetate naturally and minimizes soil disturbance.

20. Placement of culverts and other structures in waters, streams, and wetlands shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by NCDWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.

21. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation, floodplain benches, and/or sills may be required where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.

22. If foundation test borings are necessary; it shall be noted in the document. Geotechnical work is approved under General 401 Certification Number 3687/Nationwide Permit No. 6 for Survey Activities.

23. Sediment and erosion control measures sufficient to protect water resources must be implemented and maintained in accordance with the most recent version of North Carolina Sediment and Erosion Control Planning and Design Manual and the most recent version of NCS000250.

24. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.

25. While the use of National Wetland Inventory (NWI) maps, NC Coastal Region Evaluation of Wetland Significance (NC-CREWS) maps and soil survey maps are useful tools, their inherent inaccuracies require that qualified personnel perform onsite wetland delineations prior to permit approval.

26. Heavy equipment should be operated from the bank rather than in stream channels in order to minimize sedimentation and reduce the likelihood of introducing other pollutants into streams. This equipment shall be inspected daily and maintained to prevent contamination of surface waters from leaking fuels, lubricants, hydraulic fluids, or other toxic materials.

27. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.

28. Riparian vegetation (native trees and shrubs) shall be preserved to the maximum extent possible. Riparian vegetation must be reestablished within the construction limits of the project by the end of the growing season following completion of construction.

NCDWQ appreciates the opportunity to provide comments on your project. Should you have any questions or require any additional information, please contact Polly Lespinasse at (704) 663-1699.

Cc: Liz Hair, US Army Corps of Engineers, Asheville Field Office (electronic copy only)
Chris Militscher, Environmental Protection Agency (electronic copy only)
Marla Chambers, NC Wildlife Resources Commission (electronic copy only)
Marella Buncick, US Fish and Wildlife Service, (electronic copy only)
Brian Wrenn, NCDWQ Central Office (electronic copy only)
Sonia Carrillo, NCDWQ Central Office (electronic copy only)
File Copy

Table A-9: NC Department of Environment and Natural Resources – Division of Water Quality

Document: a003 letter dated June 28, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Jurisdictional Resources	The document makes several references to the stream mitigation requirements for the project. The document indicates that all perennial streams will require mitigation. In addition, the document states that if an intermittent stream has a stream rating equal to or greater than 26, as per the completed NCDWQ Stream Identification Form, then mitigation will be provided. Effective October 16, 2009, NCDWQ will require mitigation for all jurisdictional streams, either intermittent or perennial. The applicable portion of the Intermittent Stream Mitigation Policy, as identified in the Public Notice, published August 14, 2009, is included below. NCDOT projects reviewed through the Clean Water Act Section 404/National Environmental Policy Act Merger 01 Process (Merger 01) or Safe Accountable Flexible Efficient Transportation Equity Act; A Legacy for Users (SAFETEA-LU, published by the US Army Corps of Engineers and the Federal Highway Administration, 2003) or its immediate successor, and that have reached agreement with Department of Environmental and Natural Resources on avoidance and minimization (Concurrence Point 4A) prior to the effective date of this policy are not subject to the new intermittent stream mitigation policy. Furthermore, if a project is not reviewed by the Merger 01 process or SAFETEA-LU or its immediate successor but has an issued Finding of No Significant Impact and has the written approval of the NC Division of Water Quality prior to the effective date of this policy, then it is not subject to the new Intermittent Stream Mitigation Policy. Therefore, please be advised, DWQ will require mitigation for all jurisdictional streams (stream rating equal to or greater than 19 as per the completed NCDWQ Stream Identification Form) impacted by this project.	NCDOT and FHWA are aware of the changes to stream mitigation requirements. In June 24, 2010 letters to USACE and NCTA (NCDOT), the Ecosystem Enhancement Program confirmed that they will provide all compensatory stream (intermittent and perennial) and riparian wetland mitigation for this project. Copies of these letters can be found in **Appendix C-1** of the Draft Supplemental Final EIS. The conceptual mitigation plan is incorporated into the Draft Supplemental Final EIS by reference and can be found on the project website: http://www.ncdot.gov/projects/monroeconnector/download/monroe_FEIS_ConceptualMitigation.pdf

Table A-9: NC Department of Environment and Natural Resources – Division of Water Quality

Document: a003 letter dated June 28, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
2	Water Quality	NCDWQ is very concerned with sediment and erosion impacts that could result from this project. As per the commitment in the Final Environmental Impact Statement, the North Carolina Turnpike Authority (NCTA) shall provide the most protective sediment and erosion control BMPs in accordance with Design Standards in Sensitive Watersheds to reduce the risk of nutrient runoff to North Fork Crooked Creek, South Fork Crooked Creek, Richardson Creek and Stewarts Creek. NCDWQ requests that road design plans provide treatment of the storm water runoff though best management practices as detailed in the most recent version of NCDWQ Stormwater Best Management Practices.	NCDOT's NPDES Stormwater Permit NCS000250 requires the use of the *North Carolina Department of Transportation Stormwater Best Management Practices Toolbox* for the selection and design of post-construction linear stormwater control measures on NCDOT projects.
3	Water Quality	Due to the proximity of the project to Lake Twitty, which is classified as a Water Supply III (WS-III) Area in the project area, the NCTA shall design, construct, and maintain hazardous spill catch basins as per the commitment in the Final Environmental Impact Statement.	Final designs will incorporate hazardous spill basins along the project corridor within the designated hazardous spill basin area associated with Lake Twitty. These basins will be designed in accordance with NCDOT's *Best Management Practices for Protection of Surface Waters*, *Guidelines for the Location and Design of Hazardous Spill Basins*, and *Guidelines for Drainage Studies and Hydraulic Design*.

a004

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: UNION
MECKLENBURG

F05: RAILROADS

RECEIVED
JUN 11 2010
HISTORIC PRESERVATION OFFICE

STATE NUMBER: 10-E-4220-0435
DATE RECEIVED: 06/10/2010
AGENCY RESPONSE: 07/07/2010
REVIEW CLOSED: 07/12/2010

MS RENEE GLEDHILL-EARLEY
CLEARINGHOUSE COORDINATOR
DEPT OF CULTURAL RESOURCES
STATE HISTORIC PRESERVATION OFFICE
MSC 4617 - ARCHIVES BUILDING
RALEIGH NC

ER 02-9791

Due 6/18/10 A- ?m N/cat this time 6/17/10

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DENR LEGISLATIVE AFFAIRS
DEPT OF AGRICULTURE
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION

Due 6/24/10 S-

PROJECT INFORMATION

APPLICANT: State of N.C. Turnpike Authority
TYPE: National Environmental Policy Act
Final Environmental Impact Statement

DESC: Improvements in the Monroe Connector/Bypass from I-485 to US 74 in the vicinity of the Town of Marshville in Union Co. TIP Nos. R-3329 & R-2559

CROSS-REFERENCE NUMBER: 02-E-4220-0309 04-E-4220-0332 07-E-4220-0235 09-E-4220-0292

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: [X] NO COMMENT [ ] COMMENTS ATTACHED

SIGNED BY: Renee Gledhill-Earley DATE: 7-7-10

JUL 2010
RECEIVED
Secretary's Office
DOA

JUN 14 2010

Table A-10: NC Department of Cultural Resources

Document: a004 letter dated July 7, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	General	No comments.	None

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

JUL 15 2010

Date: July 12, 2010

Ms. Jennifer Harris, P.E.
North Carolina Turnpike Authority
5400 Glenwood Avenue, Suite 400
Raleigh, North Carolina 27612

SUBJECT: Federal Final Environmental Impact Statement for the Monroe Connector/Bypass, From I-485 at US 74 to US 74 Between the Towns of Wingate and Marshville, Mecklenburg and Union Counties, North Carolina; TIP Project Nos.: R-3329/R-2559; FHW-E40825-NC; CEQ No.: 20100209

Dear Ms. Harris:

The U.S. Environmental Protection Agency Region 4 (EPA) has reviewed the subject document and is commenting in accordance with Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA. The North Carolina Turnpike Authority (NCTA) and the Federal Highway Administration (FHWA) are proposing to construct an approximate 20-mile, multi-lane, median divided bypass and toll facility from I-485 at US 74 to US 74 between the Towns of Wingate and Marshville in Mecklenburg and Union Counties.

The NCTA is utilizing the agency coordination process under SAFETEA-LU Section 6002. EPA provided detailed scoping comments under this process in a letter dated February 14, 2007, and comments on the Draft Environmental Impact Statement (DEIS) on June 15, 2009. In addition to comments on the Final Environmental Impact Statement (FEIS), EPA is also providing written comments on the Draft Indirect and Cumulative Effects (ICE) Quantitative Analysis report dated February 19, 2010. EPA has attached detailed technical review comments (See Attachment A).

EPA's primary environmental concern remains unresolved for impacts to the waters of the U.S., including the need to demonstrate additional avoidance and minimization for direct impacts to jurisdictional streams and wetlands, the need to provide environmental commitments to reduce the indirect and cumulative effects (ICE) to Section 303(d) listed impaired streams and the need to provide a detailed conceptual mitigation plan for jurisdictional impacts. These Clean Water Act issues need to be addressed prior to the issuance of a Record of Decision (ROD). FHWA and NCTA should consider a reduced median width and other avoidance and minimization measures to reduce the construction footprint in jurisdictional areas. FHWA and NCTA should work closely with local governments to insure that ICE resulting from the proposed project does not further degrade Section 303(d) listed streams. EPA recommends that a compensatory mitigation meeting be planned to discuss the conceptual mitigation for unavoidable impacts. EPA continues to have environmental concerns for wildlife habitat fragmentation, farmland losses, socio-economic impacts to existing businesses, and

a005

Mobile Source Air Toxics (MSATs). EPA also believes that additional consideration should be given with respect to MSATs associated with the Preferred Alternative DSA D and identified near- roadway, sensitive receptors. We understand that there is also an unresolved issue that needs to be addressed concerning the Carolina heelsplitter in the Goose Creek watershed per Section 7 of the Endangered Species Act; EPA defers to the U.S. Fish and Wildlife Service on this issue.

Mr. Christopher Militscher of my staff will continue to work with you and FHWA and other agencies on the continued environmental coordination activities for this project. Please feel free to contact Mr. Militscher of my staff at (919) 856-4206 should you have specific questions concerning EPA's comments.

Sincerely,

Heinz J. Mueller, Chief
NEPA Program Office

Cc: J. Sullivan, FHWA
K. Jolly, USACE
B. Wrenn, NCDENR
G. Thorpe, NCDOT

w/Attachment A

a005

Attachment A
FEIS Detailed Review Comments
Monroe Bypass/Connector Toll Facility
Mecklenburg and Union Counties
R-3329/R-2559

<u>Response to EPA DEIS Comments</u>

Responses to EPA's DEIS comments are included in Appendix B1 from pages B1-37 to B1-83. In addition, Section 3 of the FEIS also provides responses to generalized comments on Purpose and Need, the Range of Alternatives, Air Quality, Indirect and Cumulative Effects, and Protected Species.

1 Many of NCTA and FHWA's responses to DEIS comments are a reiteration of its stated positions from the DEIS and during TEAC meetings. For example, Comment #2, Page B1-49 refers to 'likely would be overwhelmed' and 'would not provide for high-speed regional travel'. The responses are generic and are not supported by actual
2 analysis. Another unresolved issue pertains to traffic forecasting where Comment #2 refers to a substantial increase in traffic volumes expected by 2035. However, vehicle miles traveled (VMTs) are expected to slightly decrease. The modeling and projections are not believed by EPA to be accurate or reasonable. The projected VMT decrease is partly defended on the position that people from the north will have a shorter route to the new toll facility. However, people who live south of existing US 74 will have a longer route to use the new toll facility. Population demographics actually show more people living to the south of existing US 74 than north of it. The other rationale for decreased VMTs is the 'slightly shorter route' of the new toll facility versus existing US 74. The ICE report also includes the potential for 1,300 new households in the project study area as well as hundreds of acres converted to commercial uses around new interchanges. This expected development would invariably increase VMTs as well.

3 EPA notes that the information contained in Section 1.1.8 of the FEIS on existing roadway improvements that has occurred in the past ten years. This new information contradicts and corrects the statement made in the DEIS: "Few, if any access management techniques have been applied to this roadway" (Comment #3, B1-49). Obviously from the list provided on pages 1-5 and 1-6, a substantial number of individual improvements to existing US 74 have been made during the last ten years. With all of these improvements, including numerous turn lane additions by NCDOT for retail stores and other commercial facilities, it indicates that local planners were encouraging significant amounts of commercial and retail development along this regionally strategic east-west highway corridor (See also NCTA Response to Comment #8). Local planners apparently did not believe that the US 74 corridor needed to be a regional high-speed facility as proposed by the NCDOT almost 20 years ago nor did they incorporate reasonable access and congestion management techniques in their local planning and zoning for these new commercial and retail facilities. Apparently, the local assumption was that NCDOT and FHWA would build Union County a new Monroe bypass as was initially proposed back in the late 1980's.

4 Regarding the Response to Comment #11, EPA continues to disagree with Quantitative Third Screening that was used for the Detailed Study Alternatives and the use of a 'conceptual right of way' and GIS level data in lieu of actual wetland and stream delineations. The FEIS response to EPA's DEIS comment has not been adequately
5 addressed. Similarly, Responses to Comments #12 and #13 do not address the increases and decreases in residential and business relocations and jurisdictional impacts. For
6 Response to Comment #15, there is no socio-economic analysis to local businesses and retail stores along US 74 that will potentially see far less business once the new toll
7 facility is constructed. Response to Comment #18 does not include recommendations for potential avoidance and minimization by reducing the 70-foot proposed median and 12-foot paved outside shoulders. There is no specific recommendation as to what 'additional opportunities for impact minimization and cost reduction' will be and what opportunity for agency input will be considered during the final design.

8 The Response to Comment #19 concerning compensatory mitigation is not detailed or responsive to the specific issues (See comments below). The conceptual mitigation plan referenced in Response to Comment #20 and included in Section 2.5.4.4 is not detailed. Essentially, NCTA and FHWA state that with the exception of possibly 4 on-site mitigation opportunities, all compensatory mitigation will be provided through the in-lieu fee program of the Ecosystem Enhancement Program (EEP) and they have been regularly apprised of anticipated mitigation requirements. Unfortunately, NCTA and FHWA have been going on the assumption that only some of the intermittent stream impacts will require compensatory mitigation. This is no longer the case, as the North Carolina Division of Water Quality now requires mitigation for all intermittent streams. The conceptual mitigation plan is actually a technical memorandum that is incorporated by reference to the FEIS (This document should have been included in one of the appendices to the FEIS). There is no information provided through the EEP as to what mitigation assets are available or what is being planned for the impacted watershed basins. This deficiency of a detailed mitigation proposal is significant and needs to be resolved prior to the issuance of a ROD. Response to Comment #24 is also not responsive. The resource and permitting agencies have not been given the opportunity to provide a detailed field review of the 4 potential sites. EPA continues to have substantial environmental concerns for the lack of detail concerning compensatory mitigation.

9 NCTA and FHWA's Response to Comment #22 is not responsive and there is no estimate of potential impacts to jurisdictional resources from anticipated borrow pits and from waste disposal. This potentially substantial environmental issue is being deferred to later design work and potentially after the issuance of the Record of Decision (ROD).
10 EPA does not agree with the Response to Comment #23 and the ICE findings. Contrary to the response provided, there are anticipated water quality issues associated with the proposed project, and minimally, to the 303(d) listed Stewarts Creek. Pollutant loadings for the six catchments did not remain 'unchanged' between the 2030 No Build and the 2030 Recommended Preferred Alternative (RPA) scenarios. Table 17 of the ICE shows Total Nitrogen (TN) for lower Richardson's Creek to be 1.52% higher between the 2030 RPA and 2030 No-Build. Total Phosphorus (TP) shown in Table 18 is also increased by

10 2.52% and 4.50% for Stewarts Creek and Richardson's Creek, respectively. Table 19 likewise shows four catchments with increased Total Suspended Solid (TSS) between 1.45% and 2.20% between the 2030 RPA and the 2030 No-Build. Referring to Tables 20 and 21, Total Fecal Coliform for Richardson's Creek is estimated to increase by 20.49% and Mean Fecal Coliform for Ray's Fork is estimated to increase by 46.9% between the 2030 RPA and the 2030 No-Build. The statement that "*water quality in these catchments was found to be unaffected by the Project…*", is inaccurate and not supported by the ICE report findings.

11 The Response to Comment #27 is similar to the discussion provided for Comment #2. EPA does not concur with the analysis on VMTs provided in the FEIS. The land use
12 assumptions as it relates to a lack of access to sewer service in Response to Comment #29 is speculative. The ICE predicts 1,200 acres of low-density residential development, 700 more acres of medium density residential development and approximately 100 acres of industrial/office/institutional development compared to the 2030 No-Build. Considering the 'development sprawl' that has characterized the eastern portion of the project study area for the last 10 years or more, this additional increase in development resulting from the new toll facility is believed by EPA to be very significant. Water supply, wastewater treatment, available 'greenspace', and other natural resources will be further strained in the project study area resulting from the construction of the new toll facility.

13 Responses to the EPA comments on Mobile Source Air Toxics (MSATs) are noted and EPA does not concur that a site specific analysis should not be performed for potential near roadway sensitive receptors such as schools identified from the DEIS. EPA has reviewed the updated information contained in Appendix E. NCTA and FHWA acknowledge there may be some localized MSAT increases and decreases but do not consider the near roadway aspects to sensitive receptors nor the potential for possible mitigation measures (such as noise walls) where schools will be in close proximity to the new toll facility. The same arguments concerning modeling deficiencies, health effects, future vehicle and fuel standards, national MSAT emission 'trends', etc. is repeated from previous NEPA documents and FHWA's 2006 Interim Guidance. The assessment criteria for performing a quantitative MSAT analysis is not specifically supported by any relevant or creditable studies or research. This regional 'airshed' view is not believed to be fully relevant to near roadway sensitive receptors. Higher traffic volumes of 140,000 ADT or more is not related to the proximity of the sensitive receptors to the new facility or the likelihood of exposure, including duration and concentration. There are innumerable toxicological studies that document the 'cumulative and synergistic effects' of exposure to harmful chemicals. The air quality in the Metrolina area is already compromised for ozone and particulate matter. Sensitive populations are already at greater risk from exposure to MSATs. The analysis provided in the FEIS does not address this issue. Much of the emission assumptions for MSATs are based on VMT estimates that are not believed to be accurate. The 3 elementary schools and 1 high school cited on page E-6 continue to be locations where, at a minimum, NCTA and FHWA should commit to localized MSAT monitoring, including baseline information and post-construction. The Responses to Comments #33, #34 and #35 are also not responsive and the same guidance and DEIS positions on MSATs is cited.

a005

14 Regarding Response to Comment #32, EPA will provide specific recommendations on reducing construction emissions at future TEAC meetings. It is confusing as to why NCTA and FHWA were unable to obtain this requested information on low-sulfur diesel fuel sources, air pollution control devices for equipment and other construction issues prior to issuing a FEIS.

15 The Responses to Comments #37 and #38 regarding Farmlands furthers EPA's previous concerns regarding the loss of agriculture in the project study area and the significant impact the proposed project will have on suitable prime and unique farmlands. The 2007 Census of Agriculture information confirms the continued trends of losing farmlands in North Carolina, including those in Mecklenburg and Union Counties. DSA D will convert 964 acres of prime farmland soils and Statewide and important farmland soils to non-agricultural uses. This represents 1.5 square miles of direct impact, exclusive of the indirect and cumulative effects from new development spurred by the project (The ICE predicts 1,200 acres of low-density residential development, 700 more acres of medium density residential development and approximately 100 acres of industrial/office/institutional development compared to the 2030 No-Build). This equates to potentially an additional 3.1 square miles of converting farmland soils and terrestrial
16 forests to non-agricultural uses. The farm displacements comment in Section 1.3.2.4 is speculative opinion and not supported by any actual investigation or inquiry into 'suitable farm replacement property'.

17 Part of the Response to Comment #39 is included in Section 1.3.4.3 regarding impacts to natural communities and wildlife. Under terrestrial wildlife the following statement is included in the FEIS: "*Habitat fragmentation also is expected to occur under the No-Build Alternative due to continued growth in population and development within Union County*". This comment is meant to detract from the actual impacts from the proposed project. A new, 19.7-mile, multi-lane high speed "linear" facility in a suburban and rural setting and the indirect and cumulative effects of induced development is going to have a significant impact on habitat fragmentation. Wildlife mortality and vehicle collisions with large mammals such as deer are expected to be very substantial. The FEIS does not propose any form of mitigation for these serious safety and environmental issues.

EPA acknowledges the NCTA and FHWA's comments concerning air quality, North Carolina State Implementation Plan (NCSIP), and transportation conformity.

<u>Jurisdictional Wetland and Stream Impacts</u>

18 FHWA and NCTA's preferred alternative DSA D has 9,794 linear feet of perennial stream impact, 12, 269 linear feet of intermittent stream impact for a total of 22,063 linear feet of stream impact. However, these impacts are actually from the DEIS. These impacts include 104 total stream crossings. Wetland impacts are estimated at 8.1 acres with 47 total wetland systems being impacted. There are 2.6 acres of pond impacts. Impacts were estimated using functional design construction limits with an additional 40-

18 foot buffer ("in accordance with NCDOT procedures"; Footnote in Table 1-8). Under the NEPA/Section 404 Merger process, preliminary designs are typically utilized and are more accurate than functional designs. Under the Merger process, calculations are based upon construction slope stakes and 25-foot buffers. EPA is uncertain as to the accuracy of the impact estimates as provided by NCTA for the proposed project. This is further illustrated on Pages 2-33 and 2-34 where impacts actually increased following the issuance of the DEIS. Service roads have added an additional 1,489 linear feet of total stream impact which 1,260 linear feet is expected to require compensatory mitigation.

19 Table 2-11 does not match the information contained in Table 1-8. The total length of streams requiring compensatory for the preferred alternative DSA D increased by 685 linear feet to total 13,235 linear feet from the issuance of the DEIS (Table 2-3). Overall, stream impacts after avoidance and minimization proposed by NCTA and FHWA increased by 1,020 linear feet (i.e., 22,063 linear feet for DSA D in DEIS and 23,083 linear feet for DSA D in FEIS). Design refinements identified on Page 2-34 resulted in a decrease of 709 linear of jurisdictional stream impacts, but the overall total stream impacts increased to 23,083 linear feet. Wetland impacts remained the same, pond impacts increased by 0.5 acres, the number of streams impacted increased by 3 to total 107 and the number of wetland systems impacted decreased by 1 to 46 systems.

20 Most of the bridging decisions discussed during the TEAC meetings were based upon avoidance to human resources (Section 2.3 of the FEIS) and not to specifically reducing impacts to jurisdictional systems. Indirectly, there were some <u>reductions to the increases</u> resulting from the inclusion of service roads and their anticipated impacts (Page 2-11 of the FEIS). However, the overall increase in stream impacts from the DEIS to the FEIS for the Preferred Alternative DSA D (and "the likely LEDPA"; Page 3-4) is approximately 4.6%. These stream impact 'reductions' are identified on Pages 2-11 and 2-12, Section 2.3.3 of the FEIS. EPA continues to have substantial environmental concerns that the DEIS did not provide an accurate assessment and analysis of the actual jurisdictional impacts. Other Section 404 avoidance and minimization measures such as steeper side slopes in jurisdictional areas, reduced median widths, reduced paved shoulders, the use of retaining walls, etc., were not addressed and should be considered during TEAC meetings and included in the Record of Decision (ROD).

<u>Compensatory Mitigation and Other Special Conditions</u>

21 The FEIS includes statements that compensatory mitigation is only required for intermittent streams scoring greater than 26 on the DWQ stream delineation forms. EPA understands that NCDWQ is requiring compensatory mitigation for all jurisdictional streams, including intermittent and perennial. The NCDWQ compensatory mitigation requirement for all intermittent streams was made effective in October of 2009. The 'conceptual mitigation plan' identified on Page 2-34 is not detailed. The EEP assets that are currently available or planned for this project are not included in the generalized discussion. The potential mitigation credits for the 4 sites are not listed.

22 The statement under 'Wetland Finding' that wetland impacts resulted in no net gain from the refined design is misleading. Jurisdictional stream impacts increased from the addition of service roads between the DEIS and the FEIS.

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23 The FEIS indicates on Page 2-33 that stream and wetland impacts are expected to decrease from functional designs to preliminary designs as the level of the design increases. The total impact to streams is 23,083 linear feet and the total wetland impact is estimated at 8.1 acres. Surface water or pond impacts are estimated at 3.1 acres. EPA continues to have substantial environmental concerns for water quality based on the magnitude of the impacts to waters of the U.S. North Fork Crooked Creek, South Fork Crooked Creek, Richardson Creek and Stewarts Creek are all on the 303(d) list of impaired waters.

24 The FEIS identifies that, "strict adherence to standard Best Management Practices (BMPs) including those for sedimentation and erosion control and the NCDOT Design Standards in Sensitive Watersheds, will minimize project impacts". A North Carolina State University (NCSU) study conducted for NCDOT potentially refutes this proposition, especially in very erosive Piedmont soils. This 3-year study showed that tons of sediment each year was lost from an NCDOT highway project despite the use of BMPs and that 2 of the 3 years of the study were in severe drought conditions. NCTA and FHWA seem to be anticipating these potential impacts to impaired waters using BMPs as 'a turbidity water quality testing program' for the main stem of Stewarts Creek will also be implemented to evaluate the performance of BMPs (Page 2-32). Testing is proposed upstream and downstream of the construction area as well as before, during and after construction. While EPA generally supports this testing program, the FEIS fails to provide an adequate response plan to potential turbidity problems once they are detected through sampling (testing). The FEIS places full responsibility of 'pollution' and implementation of BMPs on the selected contractor. EPA believes that a turbidity-testing program is also appropriate for other impacted 303(d) listed waters, including Richardson Creek, North Fork Crooked Creek and South Fork Crooked Creek

<u>Indirect and Cumulative Effects Quantitative Analysis</u>

25 Appendix I of Volume 3 includes the Quantitative Indirect and Cumulative Effects (ICE) Analysis on Water Quality. Also, Page 2-49 and 2-50 of the FEIS includes a summary of water modeling. The ICE analysis includes models and calculations based on various land use change assumptions for impervious cover changes. The FEIS report contains the same tables presented in the March 11, 2010, draft ICE report. Model estimates of annual stream flow, runoff and annual pollutant loadings of total nitrogen, total phosphorus, total suspended solids and fecal coliform. A Baseline condition, 2030 No-Build and 2030 Build scenarios were evaluated. EPA does believe that the following statement is germane to the direct action under consideration: "*In reality, substantial reductions in pollutant loadings could be attained as future development takes place if existing BMP regulations are enforced and BMPs are constructed and maintained properly*". Table 5 in the ICE report shows that Union County has no stormwater BMPs.

26 Indirect and cumulative effects including changes in impervious surface are expected to be very significant in several of the watersheds. The North Fork Crooked Creek, South Fork Crooked Creek, Richardson Creek and Stewarts Creek are 303(d) listed. One of the largest predicted ICE changes in pollutant loadings is to Stewarts

26 Creek. Obviously, new development and a lack of enforced BMPs have obviously caused the watershed to be impaired (Page 2-50). NCTA and FHWA propose no mitigation for the ICE resulting from the proposed project and the changes in impervious surfaces, development density and pollutant loadings to Stewarts Creek. An increase of 7% increase in impervious surface in the Stewarts Creek watershed could have increased indirect and cumulative impacts on water quality that do not appear to be addressed in the ICE report or the FEIS. The North Fork Crooked Creek, South Fork Crooked Creek, and Richardson Creek are also 303(d) listed. Several other 303(d) listed streams will also have ICE that result in additional pollutant loadings, including Richardson Creek and Crooked Creek although the rate of change in impervious surface is predicted to be lower. NCTA and FHWA are proposing no mitigation for the ICE to water quality to these impaired waters. FHWA's position on not mitigating for ICE is included on Page 3-22 of the FEIS.

27 The ICE makes several assumptions in predicting future land use in the study area. One of the assumptions is that growth in Union County may be controlled by a moratorium on new sewer connections. There may be a moratorium implemented at the local level, however, the moratorium implemented by NCDWQ has subsequently been lifted. It is also NCDWQ's position that Union County's existing wastewater facilities currently have the capacity to accept additional waste loads. The ICE analysis does not appear to reflect this changed condition and what effects it would have on growth projections through the design year of 2030. Table 1-7 provides active NPDES permits with discharges to streams in the project study area. The permitted flows are included for 6 of the 8 entities listed. Alvac and the City of Monroe are apparently not limited. EPA requests that the average daily flow versus capacity be provided in the ROD. This 'capacity versus use' issue should be further evaluated in the context of the ICE assumptions on development in the project study area. It is also important to note that all of the receiving streams shown in Table 1-7 are 303(d) listed for impairments. EPA has concerns regarding riparian buffers and what controls have actually been adopted, are being implemented and enforced through local governments.

28 EPA continues to have substantial environmental concerns resulting from the indirect and cumulative effects of the recommended preferred alternative (RPA – DSA D) on water resources and the lack of proposed measures to address these impacts. These environmental concerns need to be addressed prior to the issuance of a ROD.

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Response to EPA DEIS Comments	Many of NCTA and FHWA's responses to DEIS comments are a reiteration of its stated positions from the DEIS and during TEAC meetings. For example, Comment #2, Page B1-49 refers to 'likely would be overwhelmed' and 'would not provide for high-speed regional travel'. The responses are generic and are not supported by actual analysis.	An updated assessment of existing travel speeds along existing US 74 was undertaken as part of the Draft Supplemental Final EIS (*US 74 Corridor Travel Time Comparison*, HNTB, October 2013) and is summarized in **Section 1.2.4**. The study shows that even with all the improvements that have been recently made to existing US 74 (described in **Section 2.4**), current data indicates that average travel speeds along US 74 in the project area are limited to less than 50 mph, even during off-peak periods and free-flow conditions with very little to no congestion.
2	Response to EPA DEIS Comments	Another unresolved issue pertains to traffic forecasting where Comment #2 refers to a substantial increase in traffic volumes expected by 2035. However, vehicle miles traveled (VMT's) are expected to slightly decrease. The modeling and projections are not believed by EPA to be accurate or reasonable. The projected VMT decrease is partly defined on the position that people from the north will have a shorter route to the new toll facility. However, people who live south of existing US 74 will have a longer route to use the new toll facility. Population demographics actually show more people living in the south of existing US 74 than north of it. The other rationale for decreased VMT's is the 'slightly shorter route' of the new toll facility versus existing US 74. The ICE report also includes the potential for 1,300 new households in the project study area as well as hundreds of acres converted to commercial uses around new interchanges. This expected development would invariably increase VMT's as well.	The substantial increases in traffic volumes referred to in response to Comment #2 on page B1-49 in the Final EIS refers to a comparison of existing conditions and Year 2035 conditions along existing US 74. It is reasonable to expect substantial increases in traffic volumes to occur on existing US 74 from existing conditions to Year 2035. The Vehicle Miles Traveled (VMT) described in Final EIS Appendix E, Table E-2, are a comparison of Year 2035 No-Build Scenario with Year 2035 Build Scenarios across the entire transportation network, either for Union County or for the region as a whole. They are not a comparison to existing conditions or for just the US 74 corridor. The VMTs were calculated from an approved Metrolina regional travel demand model. There is no significant difference in regional or Union County-wide VMTs between the No-Build Scenario and the Preferred Alternative (DSA D) Build Scenario, with differences of one percent or less, with county-wide VMTs increasing slightly and regional VMTs decreasing slightly. As discussed in **Section 2.5.2** of the Draft Supplemental Final EIS, the latest regional travel demand model (MRM11v1.1) for the 2030 Build Scenario was run with the 2009 socioeconomic data revised to reflect the findings in the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013). As described in the *Monroe Connector/Bypass Traffic Forecast Summary* (HNTB, November 2013), a comparison of the 2030 Build Scenario VMTs generated from the regional model with the 2009 socioeconomic forecasts and with the revised 2009 socioeconomic forecasts showed that there would be approximately 3 percent more VMTs within Union County with the revised 2009 socioeconomic forecasts and an approximate 0 percent change across the entire region. These are considered minor differences that do not require additional analyses.
3	Response to EPA DEIS Comments	EPA notes that the information contained in Section 1.1.8 of the FEIS on existing roadway improvements that has occurred in the past ten years. This new information contradicts and corrects the statement made in the DEIS: "Few, if any access management techniques have been applied to this roadway" (Comment #3, B1-49). Obviously from the list provided on pages 1-5 and 1-6, a substantial number of individual	As described in **Section 2.4** of the Draft Supplemental Final EIS, numerous measures to improve traffic flow on existing US 74 have been implemented in the last several years by NCDOT and by developers of adjacent properties, including improvements at all the intersections recommended for improvement in the *US 74 Corridor Study* (Stantec, July 2007) commissioned by NCDOT Region 10. Many of these improvements are considered access management techniques. However, even with these improvements, current average travel speeds along existing US 74 (see **Section 1.2.4** of the Draft Supplemental Final EIS), are less

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		improvements to existing US 74 have been made during the last ten years. With all of these improvements, including numerous turn lane additions by NCDOT for retail stores and other commercial facilities, it indicates that local planners were encouraging significant amounts of commercial and retail development along this regionally strategic east-west highway corridor (See also NCTA response to Comment #8). Local planners apparently did not believe that the US 74 corridor needed to be a regional high-speed facility as proposed by the NCDOT almost 20 years ago nor did they incorporate reasonable access and congestion management techniques in their local planning and zoning for these new commercial and retail facilities. Apparently, the local assumption was that NCDOT and FHWA would build Union County a new Monroe bypass as was initially proposed back in the late 1980's.	than 50 mph during peak travel periods. These improvements, while providing some short-term benefits, would be overwhelmed by projected 2035 traffic in the corridor, and would not provide long-term benefit nor meet the purpose and need for the Monroe Connector/Bypass project. In the 1970's the NCDOT developed a Thoroughfare Plan for the City of Monroe and its vicinity to serve as a guide to solving existing and anticipated traffic problems in the area. The plan was mutually adopted by NCDOT, the City of Monroe and Union County between 1980 and 1983. This plan highlighted improvements to major and minor roadways and included several new roadways including a northern bypass of US 74 around Monroe. In the 1990's revisions to this plan were considered to include a connector route from the proposed bypass to the Charlotte Outer Loop (I-485). The Environmental Assessment of the original Monroe Bypass was approved in March 1996 and a Finding of No Significant Impact was signed in March 1997. A decision to rescind these documents was not made until January 2006. As many of the changes occurred along US 74, there was no indication at that time that a long delay associated with the project would occur or that an entirely new environmental study would need to be performed. Local governments are typically concerned with development of their local tax base as a priority. Given the long history of this project, it is unsurprising that many localities have allowed intense development of the parcels fronting US 74 with the expectation that the Monroe Connector/Bypass would eventually serve as the through traffic corridor for the area.
4	Alternatives Analysis	Regarding the Response to Comment #11, EPA continues to disagree with Quantitative Third Screening that was used for the Detailed Study Alternative and the use of a 'conceptual right of way' and GIS level data in lieu of actual wetland and stream delineations. The FEIS response to EPA's DEIS comment has not been adequately addressed.	The previous response to USEPA comment #11 in Appendix B of the Final EIS regarding the quantitative screening is still valid. The final methodology for Alternative screening was discussed at the April 18, 2007 Turnpike Environmental Agency Coordination (TEAC) and results of the first and second qualitative screening and 3rd quantitative screening were discussed at the 5/15/07, 9/27/07 and 10/17/07 TEAC meetings. The minutes of these meetings do not reflect USEPA raising any concern with the proposed methodology. USEPA provided NCTA with a letter on 12/4/07 containing their comments to the Draft Alternatives Development and Analysis Report. In these comments, EPA expressed a general comment on the precision of the data used at the preliminary screening level. For example, the screening analysis reported stream impacts to the foot and wetland and pond impacts to the tenth of an acre. EPA stated they believe "this level of accuracy of impacts to natural resource is neither necessary for the purpose of alternative screening nor required for DEIS comparison purposes." EPA suggested FHWA and NCTA "consider reasonable 'rounding' to significant estimates at this stage in planning. Rounding the values would not have changed the relative comparison conducted in the third quantitative screening.

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
5	Alternatives Analysis	Similarly, Responses to Comments #12 and #13 do not address the increases and decreases in residential and business relocations and jurisdictional impacts.	See response to comment #4 in the Environmental Protection Agency Letter (a005). Changes in residential and business relocations and jurisdictional impacts between the quantitative third screening Preliminary Study Alternatives and the Detailed Study Alternatives were related to changes in the designs (which would have been similar for all Preliminary Study Alternatives moving into Detailed Study Alternatives), continued updates to GIS data, and use of surveyed wetlands and streams for calculating impacts from the Detailed Study Alternatives.
6	Economic Analysis	For Response to Comment #15, there is no socio-economic analysis to local businesses and retail stores along US 74 that will potentially see far less business once the new toll facility is constructed.	A socioeconomic analysis is not required. Even with the Monroe Connector/Bypass in place, traffic on existing US 74 is projected to remain high. Diverting through traffic onto the Monroe Connector/Bypass will provide more opportunity for local traffic to access businesses along existing US 74.
7	Jurisdictional Resources	Response to Comment #18 does not include recommendations for potential avoidance and minimization by reducing the 70-foot proposed median and 12-foot paved outside shoulders. There is no specific recommendation as to what 'additional opportunities for impact minimization and cost reduction' will be and what opportunity for agency input will be considered during the final design.	The "Project Details" section of the Design-Build Request for Proposal (RFP) called for the use of a 46-foot median on new location portions of the roadway. The RFP also identified the reduction of the 12-foot (4-foot paved) inside shoulders to 6-foot (4-foot paved) and allows for a maximum cut and fill slope of 2:1 (H:V). Any variations in the functional design and/or construction methods that nullify any decisions reached between the NCDOT and the Environmental Agencies; and/or require additional coordination with the Environmental Agencies shall be the responsibility of the selected Design-Build Team.
8	Jurisdictional Resources	The Response to Comment #19 concerning compensatory mitigation is not detailed or responsive to the specific issues (See comments below). The conceptual mitigation plan referenced in Response to Comment #20 and included in Section 2.5.4.4 is not detailed. Essentially, NCTA and FHWA state that with the exception of possibly 4 on-site mitigation opportunities, all compensatory mitigation will be provided through the in-lieu fee program of Ecosystem Enhancement Program (EEP) and they have been regularly apprised of anticipated mitigation requirements. Unfortunately, NCTA and FHWA have been going on the assumption that only some of the intermittent stream impacts will require compensatory mitigation. This is no longer the case, as the North Carolina Division of Water Quality now requires mitigation for all intermittent streams. The conceptual mitigation plan is actually a technical memorandum that is incorporated by reference to the FEIS (This document should have been included in one of the appendices to the FEIS). There is no information provided	NCDOT and FHWA are aware of the changes to stream mitigation requirements. In a June 24, 2010 letter to USACE and NCTA (NCDOT), the Ecosystem Enhancement Program confirmed that they will provide all compensatory stream (intermittent and perennial) and riparian wetland mitigation for this project. A copy of this letter can be found in **Appendix C** of this Draft Supplemental Final EIS. Mitigation is discussed in **Section 4.4.4** of the Draft Supplemental Final EIS. The conceptual mitigation plan is incorporated into the Draft Supplemental Final EIS by reference and can be found on the project website: http://www.ncdot.gov/projects/monroeconnector/download/monroe_FEIS_ConceptualMitigation.pdf

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		through the EEP as to what mitigation assets are available or what is being planned for the impacted watershed basins. This deficiency of a detailed mitigation proposal is significant and needs to be resolved prior to the issuance of a ROD. Response to Comment #24 is also not responsive. The resource and permitting agencies have not been given the opportunity to provide a detailed field review of the 4 potential sites. EPA continues to have substantial environmental concerns for the lack of detail concerning compensatory mitigation.	
9	Jurisdictional Resources	NCTA and FHWA's response to Comment #22 is not responsive and there is no estimate of potential impacts to jurisdictional resources from anticipated borrow pits and from waste disposal. This potentially substantial environmental issue is being deferred to later design work and potentially after the issuance of the Record of Decisions (ROD).	Until final design plans are completed, the exact amount of borrow and waste materials associated with this project cannot be determined. As previously stated, the Design-Build team will be required to acquire applicable permits relative to borrow pits and comply with requirements for borrow pits, dewatering, and any temporary work conducted in jurisdictional areas. This activity will be required regardless of the selected alternative.
10	Water Quality	EPA does not agree with the Response to Comment #23 and the ICE findings. Contrary to the response provided, there are anticipated water quality issues associated with the proposed project, and minimally, to the 303(d) listed Stewarts Creek. Pollutant loadings for the six catchments did not remain 'unchanged' between the 2030 No-Build and the 2030 Recommended Preferred Alternative (RPA) scenarios. Table 17 of the ICE shows Total Nitrogen (TN) for lower Richardson's Creek to be 1.52% higher between the 2030 RPA and 2030 No-Build. Total Phosphorus (TP) shown in Table 18 is also increased by 2.52% and 4.50% for Stewarts Creek and Richardson's Creek, respectively. Table 19 likewise shows four catchments with increased Total Suspended Solid (TSS) between 1.45% and 2.20% between 2030 RPA and the 2030 No-Build. Referring to Tables 20 and 21, Total Fecal Coliform for Richardson's Creek is estimated to increase by 20.49% and Mean Fecal Coliform for Ray's Fork is estimated to increase by 46.9% between the 2030 RPA and the 2030 No-Build. The statement that "*water quality in these catchments was found to be unaffected by the Project…*" is inaccurate and not supported by the ICE report findings.	The previous response to Draft EIS Comment #23 was clarified in section 2.5.5.2 of the Final EIS. "For the FLUSA as a whole, minor increases in stream flow, runoff, and pollutant loadings are confined to the six catchments intersected by the Preferred Alternative: Crooked, Richardson (Middle), Rays Fork, Stewarts, Richardson (Lower), and Salem Creeks. Of these catchments, Stewarts had the largest change in development density between the No Build and Build scenarios. Stewarts also had the largest amount of new development between 2030 No Build and Build scenarios. However, Richardson Creek (Lower) would experience the largest percent increases in runoff (5.97 percent increase between 2030 No Build and Build scenarios) and pollutant loads because the development would largely take place in an urban portion of the catchment. Water quality in the remainder of the FLUSA (13 catchments) was found to be unaffected by the Preferred Alternative, as the estimated runoff, stream flow and pollutant loadings for the catchments remained unchanged between the 2030 No Build and Build scenarios." It was recognized that there would be some change to six catchments however the remaining catchments in the study area would not be affected. The percent changes in pollutant loading expected between the Build and No Build scenarios was provided in the *Indirect and Cumulative Effects Water Quality Analysis* (PBS&J, April 2010) which is included as Appendix I of the Final EIS. Under the Preferred Alternative, fecal coliform loads are projected to increase in areas of high-density development. The increases correspond to increased urban runoff. The effect in the Richardson Creek (Lower) watershed is especially pronounced because a relatively large amount of urban development is projected in a relatively small watershed. Implementation of

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			structural BMPs, which were not considered in the ICE analysis but are required throughout much of the study area for development in excess of one acre, will greatly reduce the amount of fecal coliform reaching streams and water bodies. As explained in the *Indirect and Cumulative Effects Quantitative Analysis Update* (Baker, November 2013), with regard to percent impervious cover as an indicator for water quality effects and effects to aquatic species, findings show only a one percent difference in percent impervious cover between the 2030 Build and 2030 No-Build scenarios for the study area as a whole. With regard to individual watersheds, findings show no incremental difference from No-Build to Build scenarios for 11 of the 18 watersheds, including Goose Creek and Sixmile Creek. For the remaining seven watersheds, the Build scenario will have a one to three percent greater change in impervious surfaces as compared to the change predicted for the No-Build scenario. Overall, as these results are very similar to the results of the original Quantitative ICE, additional water quality modeling is not necessary as these differences are not large enough to see substantial differences compared to the prior water quality results. It is important to note that riparian buffers were the only BMPs considered in the ICE analysis. Implementation of other BMPs, such as bioretention basins, stormwater wetlands, sand filters, and others listed in the NCDWQ Stormwater Best Practices Manual (2012), requires site-specific information unavailable at this time. However, it can definitively be stated that the post-construction stormwater ordinances of Mecklenburg County, the City of Monroe, and the Towns of Indian Trial and Stallings require developments in excess of one acre to meet minimum stormwater management standards. In all cases, stormwater treatment systems at such developments must be designed for a minimum 85 percent average annual removal of total suspended solids, which also removes sizable percentages of total nitrogen, total phosphorus, and fecal coliform. As such, substantial pollutant load reductions beyond those provided by the riparian buffers simulated in the ICE would be realized if the EPA Phase I and Phase II Stormwater Rules (in effect through 99 percent of the study area) and locally-mandated stromwater treatment requirements are enforced. The North Carolina Department of Environmental and Natural Resources – Division of Water Quality (DWQ) (now called the Division of Water Resources) will be provided this data for their consideration during the Section 401 Water Quality Certification process, and to date they have not raised any concerns with this issue.
11	Traffic Forecasts	The Response to Comment #27 is similar to the discussion provided for Comment #2. EPA does not concur with the analysis on VMTs provides in the FEIS.	See response to Comment #2 in this letter (a005).

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COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
12	Indirect and Cumulative Effects	The land use assumptions as it relates to a lack of access to sewer service in Response to Comment #29 is speculative. The ICE predicts 1,200 acres of low-density residential development, 700 more acres of medium density residential development and approximately 100 acres of industrial/office/institutional development compared to the 2030 No-Build. Considering the 'development sprawl' that has characterized the eastern portion of the project study area for the last 10 years or more, this additional increase in development resulting from the new toll facility is believed by EPA to be very significant. Water supply, wastewater treatment, available 'greenspace', and other natural resources will be further strained in the project study area resulting from the construction of the new toll facility.	As presented in the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), and summarized in **Section 4.5** of the Draft Supplemental Final EIS, the ICE predicts additional development to occur as a result of the project, in addition to the direct addition of roadway acreage from the new highway. Any additional development attributable to the Build Scenario will likely add to demand for water and wastewater services and may require development of previously undeveloped areas.
13	Air Quality	Responses to the EPA comments on Mobile Source Air Toxics (MSATs) are noted and EPA does not concur that a site specific analysis should not be performed for potential near roadway sensitive receptors such as schools indentified from the DEIS. EPA has reviewed the updated information contained in Appendix E. NCTA and FHWA acknowledge there may be some localized MSAT increases and decreases but do not consider the near roadway aspects to sensitive receptors nor the potential for possible mitigation measures (such as noise walls) where schools will be in close proximity to the new toll facility. The same arguments concerning modeling deficiencies, health effects, future vehicle and fuel standards, national MSAT emission 'trends', etc. is repeated from previous NEPA documents and FHWA's 2006 Interim Guidance. The assessment criteria for performing a quantitative MSAT analysis is not specifically supported by any relevant or creditable studies or research. This regional 'airshed' view is not believed to be fully relevant to near roadway sensitive receptors. Higher traffic volumes of 140,000 ADT or more is related to the proximity of the sensitive receptors to the new facility or the likelihood of exposure, including duration and concentration. There are innumerable toxicological studies that document the 'cumulative and synergistic effects' of exposure to harmful chemicals. The air quality in the Metrolina area is already	Air quality information and analyses, including MSATs, were reviewed for the Draft Supplemental Final EIS, as summarized in **Section 4.2.2**. It was determined the MSAT analysis presented in Section 1.3.2.2 and Appendix E of the Final EIS is still valid. As stated in Appendix E of the Final EIS, "Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of the NEPA. Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, FHWA is duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, USEPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this emerging field. While this research is ongoing, FHWA requires each NEPA document to qualitatively address MSATs and their relationship to the specific highway project through a tiered approach. Since publication of the Final EIS, FHWA issued new MSAT Guidance on December 6, 2012 (*Interim Guidance on Mobile Source Air Toxic Analysis in NEPA*), updating their September 30, 2009 Guidance cited in the Final EIS. However, this updated guidance does not change any project analysis thresholds, recommendations, or guidelines. This approach to evaluating MSATs is consistent with and meets the requirements of 40 CFR 1502.22 which requires that "When an agency is evaluating reasonably foreseeable significant

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		compromised for ozone and particulate matter. Sensitive populations are already at greater risk from exposure to MSATs. The analysis provided in the FEIS does not address this issue. Much of the emission assumptions for MSATs are based on VMT estimates that are not believed to be accurate. The 3 elementary schools and 1 high school cited on page E-6 continue to be locations where, at a minimum, NCTA and FHWA should commit to localized MSAT monitoring, including baseline information and post-construction. The Responses to Comments #33, #34 and #35 are also not responsive and the same guidance and DEIS positions on MSATs is cited.	adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking." In FHWA's view, existing information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action. It is FHWA's opinion that responses to Draft EIS comments 33, 34 and 35 are complete and responsive and do not require additional explanation.
14	Air Quality	Regarding Response to Comment #32, EPA will provide specific recommendations on reducing emissions at future TEAC meetings. It is confusing as to why NCTA and FHWA were unable to obtain this requested information on low-sulfur diesel fuel sources, air pollution control devices for equipment and other construction issues prior to issuing a FEIS.	The NCDOT will provide the Design-Build Team any additional information that USEPA can offer specific to the following issues: 1) Availability of low sulfur fuel for construction equipment and information on cost differential; 2) Information on the latest air pollution control devices on construction equipment and whether all equipment needs to be new or be retrofitted; 3) A suggested reasonable amount of time for equipment to idle versus the effect of equipment restarts; and 4) Examples of other forms of dust control that have been used successfully on large construction projects (e.g. foam).
15	Farmlands	The Responses to Comments #37 and #38 regarding Farmlands furthers EPA's previous concerns regarding the loss of agriculture in the project study area and the significant impact the proposed project will have on suitable prime and unique farmlands. The 2007 Census of Agriculture information confirms trends of losing farmlands in North Carolina, including those in Mecklenburg and Union Counties. DSA D will convert 964 acres of prime farmland soils and Statewide and important farmland soils to non-agricultural uses. This represents 1.5 square miles of direct impact, exclusive of the indirect and cumulative effects from new development spurred by the project (The ICE predicts 1,200 acres of low-density residential development, 700 more acres of medium density residential development and approximately 100 acres of industrial/office/institutional development compared to the 2030 No-Build). This equates to potentially an additional 3.1 square miles of converting farmland soils and terrestrial forests to non-agricultural uses.	This project meets the requirements of Farmland Protection Policy Act of 1981 (FPPA), 7 U.S.C. 4201, as amended, and its implementing regulations, 7 CFR Part 658. Potential farmland conversion was coordinated with the United States Department of Agriculture – Natural Resources and Conservation Services (NRCS). As part of the farmland evaluation, NRCS form AD1006 was completed. Sites receiving a total score of 160 points on this form are given increasingly higher levels of consideration for protection (7 CFR 658.4). None of the DSAs studied as part of this project received a score higher than 160 points. Farmland was considered in the evaluation of all the DSAs, and in the selection of the Preferred Alternative. The Preferred Alternative has among the lowest impacts to Prime farmland soils, agricultural land and forests as discussed in **Section 4.2.3** of the Draft Supplemental Final EIS.

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16	Farmland	The farm displacements comment in Section 1.3.2.4 is speculative opinion and not supported by any actual investigation or inquiry into 'suitable farm replacement property'.	The presence of suitable farm replacement was identified through the research associated with the *Relocation Reports for the Monroe Connector/Bypass* (Carolina Land Acquisition, January 2009). Additional information can be found in **Section 4.2.3** of the Draft Supplemental Final EIS.
17	Wildlife	Part of the Response to Comment #39 is included in Section 1.3.4.3 regarding impacts to natural communities and wildlife. Under terrestrial wildlife the following statement is included in the FEIS: "*Habitat fragmentation also is expected to occur under the No-Build Alternative due to continued growth in population and development within Union County*'. This comment is meant to detract from the actual impacts from the proposed project. A new, 19.7-mile, multi-lane speed "linear" facility in a suburban and rural setting and the indirect and cumulative effects of induced development is going to have a significant impact on habitat fragmentation. Wildlife mortality and vehicle collisions with large mammals such as deer are expected to be very substantial. The FEIS does not propose any form of mitigation for these serious safety and environmental issues.	Forested habitat fragmentation was addressed through a patch analysis which measured the amount of edge between forested patches and developed patches in the Baseline and future conditions. This analysis is described in Section 5.7 of the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), and summarized in **Section 4.5.5.5** of the Draft Supplemental Final EIS. Any new location facility will have some impacts on habitat fragmentation. The ICE concluded that induced development would not have a significant effect on forest fragmentation compared to the No-Build scenario. The North Carolina Wildlife Resources Commission specifically noted that the extensive use of bridge crossings should help limit wildlife mortality from road collisions by providing numerous safe crossings under the proposed road.
18	Jurisdictional Resources	FHWA and NCTA's preferred alternative DSA D has 9,794 linear feet of perennial stream impact, 12,269 linear feet of intermittent stream impact for a total of 22,063 linear feet of stream impact. However, these impacts are actually from the DEIS. These impacts include 104 total stream crossings. Wetland impacts are estimated at 8.1 acres with 47 total wetland systems being impacted. There are 2.6 acres of pond impacts. Impacts were estimated using functional design construction limits with an additional 40-foot buffer ("in accordance with NCDOT procedures"; Footnote in Table 1-8). Under the NEPA/Section 404 Merger process, preliminary designs are typically utilized and are more accurate than functional designs. Under the Merger process, calculations are based upon construction slope stakes and 25-foot buffers. EPA is uncertain as to the accuracy of the impact estimates as provided by NCTA for the proposed project. This is further illustrated on Pages 2-33 and 2-34 where impacts actually increased following the issuance of the DEIS. Service roads have	Updated jurisdictional resource impacts for the Preferred Alternative are found in **Section 4.4.4** of the Draft Supplemental Final EIS. As stated in Section 9.4.2 of the Section 6002 Coordination Plan prepared for this project, "*functional design will be used as the basis for comparing the impacts of the alternatives in the DEIS (known as the Detailed Study Alternatives) and will be used for developing the cost estimates presented in the DEIS.*" This matter was previously discussed at the December 15, 2006 TEAC meeting and as documented in the minutes, "*Several of the agencies expressed general support for this approach, noting that in most cases an increased level of design would not affect the decision on a Preferred Alternative and completing preliminary design on multiple alternatives is often an inefficient use of time and funds.*" NCDOT procedure *Wetland Stream and Riparian Buffer Impact Calculations* (September 2006) states that for a Functional Design level of detail, impacts will be computed from slope stake limits plus an additional 40 feet to each side of the slope stake limit. Refined impacts of the preferred alternative based on the final design will be reflected in the final permit application.

Table A-11: US Environmental Protection Agency

Document: a005 letter dated July 12, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		added an additional 1,489 linear feet of total stream impact which 1,260 linear feet is expected to require compensatory mitigation.	
19	Jurisdictional Resources	Table 2-11 does not match the information contained in Table 1-8. The total length of streams requiring compensatory for the preferred alternative DSA D increased by 685 linear feet to total 13,235 linear feet from the issuance of the DEIS (Table 2-3). Overall, stream impacts after avoidance and minimization proposed by NCTA and FHWA increased by 1,020 linear feet (i.e., 22,063 linear feet for DSA D in DEIS and 23,083 linear feet for DSA D in FEIS). Design refinements identified on Page 2-34 resulted in a decrease of 709 linear feet of jurisdictional stream impacts, but the overall total stream impacts increased to 23,083 linear feet. Wetland impacts remained the same, pond impacts increased by 0.5 acres, the number of streams impacted increased by 3 to total 107 and the number of wetland systems impacted decreased by 1 to 46 systems.	The data presented in Tables 1-8 and 2-11 of the Final EIS represent two different scenarios. Table 1-8 reflects impacts associated with the DSAs as presented in the Draft EIS. Table 2-11 reflects impacts of the Preferred Alternative as a result of the addition of service roads, design refinements and updated field work. Jurisdictional impacts are discussed in **Section 4.4.4** of the Draft Supplemental Final EIS.
20	Jurisdictional Resources	Most of the bridging decisions discussed during the TEAC meetings were based upon avoidance to human resources (Section 2.3 of the FEIS) and not to specifically reducing impacts to jurisdictional systems. Indirectly, there were some <u>reductions to the increases</u> resulting from the inclusion of service roads and their anticipated impacts (Page 2-11 of the FEIS). However, the overall increase in stream impacts from the DEIS to the FEIS for the Preferred Alternative DSA D (and "the likely LEDPA"; Page 3-4) is approximately 4.6%. These stream impact 'reductions' are identified on Pages 2-11 and 2-12, Section 2.3.3 of the FEIS. EPA continues to have substantial environmental concerns that the DEIS did not provide an accurate assessment and analysis of the actual jurisdictional impacts. Other Section 404 avoidance and minimization measures such as steeper side slopes in jurisdictional areas, reduced median widths, reduced paved shoulders, the use of retaining walls, etc., were not addressed and should be considered during TEAC meetings and included in	See response to Comments #7and 18 in this letter (a005).

Table A-11: US Environmental Protection Agency

Document: a005 letter dated July 12, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		the Record of Decision (ROD).	
21	Jurisdictional Resources	The FEIS includes statements that compensatory mitigation is only required for intermittent streams scoring greater than 26 on the DWQ stream delineation forms. EPA understands that NCDWQ is requiring compensatory mitigation for all jurisdictional streams, including intermittent and perennial. The NCDWQ compensatory mitigation requirement for all intermittent streams was made effective in October of 2009. The 'conceptual mitigation plan' identified on Page 2-34 is not detailed. The EEP assets that are currently available or planned for this project are not included in the generalized discussion.	See response to Comment #8 in this letter (a005)
22	Jurisdictional Resources	The potential mitigation credits for the 4 sites are not listed. The statement under 'Wetland Finding' that wetland impacts resulted in no net gain from the refined design is misleading. Jurisdictional stream impacts increased from the addition of service roads between the DEIS and the FEIS.	See response to Comment #8 in this letter (a005).
23	Jurisdictional Resources	The FEIS indicates on Page 2-33 that stream and wetland impacts are expected to decrease from functional designs to preliminary designs as the level of the design increases. The total impact to streams is 23,083 linear feet and the total wetland impact is estimated at 8.1 acres. Surface water or pond impacts are estimated at 3.1 acres. EPA continues to have substantial environmental concerns for water quality based on the magnitude of the impacts to waters of the U.S. North Fork Crooked Creek, South Fork Crooked Creek, Richardson Creek and Stewarts Creek are all on the 303(d) list of impaired waters.	As the project moves into final design, it is anticipated that estimated impacts to wetlands and streams would decrease as the buffer required to be included in the calculations is decreased. As discussed in **Section 4.4.4** of the Draft Supplemental Final EIS, prior to the Project's Record of Decision being rescinded, a Section 401/404 Permit application was submitted to the USACE and a permit was granted on April 15, 2011. The permit was revoked by the USACE on April 17, 2013 since NCDOT is reevaluating data as part of the NEPA process (as documented in this Draft Supplemental Final EIS). However, the original permit authorized impacts to 18,658 linear feet of stream impact, 7.66 acres of jurisdictional wetland impacts, and 3.12 acres of pond impacts, which are less than or equal to the impacts indicated in the Final EIS. Also, see response to Comment #10 in this letter (a005).
24	Water Quality	The FEIS identifies that, 'strict adherence to standard Best Management Practices (BMPs) including those for sedimentation and erosions control and the NCDOT Design Standards in Sensitive Watersheds, will minimize project impacts". A North Carolina State University (NCSU) study	The NCSU study cited *"Improving construction site runoff quality with fiber check dams and polyacrylamide"*(Richard A. McLaughlin, Scott E. King and Greg D. Jennings, North Carolina State University, March 2009) does not conclude that the current NCDOT BMPs were not effective, but rather identified additional methods which may perform better for similar costs. As a result of this study, NCDOT is in the process of incorporating natural fiber check dams

Table A-11: **US Environmental Protection Agency**

Document: **a005 letter dated July 12, 2010**

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		conducted for NCDOT potentially refutes this proposition especially in very erosive Piedmont soils. This 3-year study showed that tons of sediment each year was lost from an NCDOT highway project despite the use of BMPs and that 2 of the 3 years of the study were in severe drought conditions. NCTA and FHWA seem to be anticipating these potential impacts to impaired waters using BMPs 'as a turbidity water quality testing program' for the main stem of Stewarts Creek will also be implemented to evaluate the performance of BMPs (Page 2-32). Testing is proposed upstream and downstream of the construction area as well as before, during and after construction. While EPA generally supports this testing program, the FEIS fails to provide an adequate response plan to potential turbidity problems once they are detected through sampling (testing). The FEIS places full responsibility of 'pollution' and implementation of BMPs on the selected contractor. EPA believes that a turbidity-testing program is also appropriate for other impacted 303(d) listed waters, including Richardson Creek, North Fork Crooked Creek and South fork Crooked Creek.	enhanced with polyacrylamide as the new BMP in road construction. http://www.ncsu.edu/project/calscommblogs/news/archives/2009/04/nc_state_study.html The Project Commitments section of the Draft Supplemental Final EIS lists several commitments related to water quality.
25	Indirect and Cumulative Effects	Appendix I of Volume 3 includes the Quantitative Indirect Cumulative Effects (ICE) Analysis on Water Quality. Also, Page 2-49 and 2-50 of the FEIS includes a summary of water modeling. The ICE analysis includes models and calculations based on various land use change assumptions for impervious cover changes. The FEIS report contains the same tables presented in the March 11, 2010, draft ICE report. Model estimates of annual stream flow, runoff and annual pollutant loadings of total nitrogen, total phosphorus, total suspended solids and fecal coliform. A Baseline condition, 2030 No-Build and 2030 Build scenarios were evaluated. EPA does believe that the following statement is germane to the direct action under consideration: "*in reality, substantial reductions in pollutant loadings could be attained as future development takes place if existing BMP regulations are enforced and BMPs are constructed and maintained properly*". Table 5 in the ICE report shows that Union County has no stormwater BMPs.	As included in Table 5 of the *Indirect and Cumulative Effects Water Quality Analysis* (PBS&J, April 2010), which is still valid for this project, the Towns of Stallings, Indian Trail, and Monroe have developed best management practices (BMPs) for projects within their jurisdictions. At a minimum, BMPs developed by NCDOT will be utilized throughout the project.

Table A-11: US Environmental Protection Agency

Document: a005 letter dated July 12, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
26	Indirect and Cumulative Effects	Indirect and cumulative effects including changes in impervious surface are expected to be very significant in several of the watersheds. The North Fork Crooked Creek, South Fork Crooked Creek, Richardson Creek and Stewarts Creek are 303(d) listed. One of the largest predicted ICE changes in pollutant loadings is to Stewarts Creek. Obviously, new development and a lack of enforced BMPs have obviously caused the watershed to be impaired (Page 2-50). NCTA and FHWA propose no mitigation for the ICE resulting from the proposed project and the changes in impervious surfaces, development density and pollutant loading to Stewarts Creek. An increase of 7% increase in impervious surface in the Stewarts Creek watershed could have increased indirect and cumulative impacts on water quality that do not appear to be addressed in the ICE report or the FEIS. The North Fork Crooked Creek, South Fork Crooked Creek, and Richardson Creek are also 303(d) listed. Several other 303(d) listed streams will also have ICE that result in additional pollutant loadings, including Richardson Creek and Crooked Creek although the rate of change in impervious surface is predicted to be lower. NCTA and FHWA are proposing no mitigation for the ICE to water quality to these impaired waters. FHWA's position on not mitigating for ICE is included on Page 3-22 of the EIS.	See response to comment #10 in this letter (a005). The *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) has estimated that the incremental effect of the 2030 Build Scenario will be a one percent increase in impervious surface throughout the study area as compared to the change predicted for the 2030 No-Build Scenario. This will not be a significant impact. As noted, FHWA's legal responsibility for mitigating project impacts can be found in 23 CFR 771.105(d).
27	Indirect and Cumulative Effects	The ICE makes several assumptions in predicting future land use in the study area. One of the assumptions is that growth in Union County may be controlled by a moratorium on new sewer connections. There may be a moratorium implemented at the local level, however, the moratorium implemented by NCDWQ has subsequently been lifted. It is also NCDWQ's position that Union County's existing watershed facilities currently have the capacity to accept additional waste loads. The ICE analysis does not appear to reflect this changed condition and what effects it would have on growth projections through the design year of 2030. Table 1-7 provides active NPDES permits with discharges to streams in the project study area. The permitted flows are included for 6 of the 8 entities listed. Alvac and the City of Monroe are apparently not limited. EPA requests that the	It is noted in the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013) that these water and sewer moratoria were rescinded in 2012. Anticipated areas to be served by water and wastewater utilities were considered in both the No Build and Build Scenarios when allocating forecasted growth and estimating density of development. Areas that are not expected to be served by wastewater would have limited ability to increase density beyond low density residential. Per interviews with local planners, certain communities, such as Unionville and Fairview, have no intention of increasing density of development beyond low density residential even if water and wastewater services are provided. Stream buffer regulations and their incorporation into the indirect and cumulative effects analysis are described in Section 4.1 of the *Indirect and Cumulative Effects Quantitative Analysis Update.* Most stream buffer regulations come from the post-construction ordinances developed by localities in concert with NCDENR. Planners and other officials interviewed were unaware of any violations of these buffers. See Appendix A of the *Indirect and Cumulative*

Table A-11: US Environmental Protection Agency

Document: a005 letter dated July 12, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
		average daily flow versus capacity be provided in the ROD. This 'capacity versus use' issue should be further evaluated in the context of the ICE assumption on development in the project study area. It is also important to note that all of the receiving streams shown in Table 1-7 are 303(d) listed for impairments. EPA has concerns regarding riparian buffers and what controls have actually been adopted, are being implemented and enforced through local governments.	*Effects Quantitative Analysis Update* for responses from local officials regarding stream buffer regulations and their enforcement.
28	Indirect and Cumulative Effects	EPA continues to have substantial environmental concerns resulting from the indirect and cumulative effects of the recommended preferred alternative (RPA – DSA D) on water resources and the lack of proposed measures to address these impacts. These environmental concerns need to be addressed prior to the issuance of a ROD.	Concerns expressed in the EPA's letter (a005) have been addressed in the responses provided to comments 1 through 27. The *Indirect and Cumulative Effects Quantitative Analysis Update* (Michael Baker Engineering, Inc., November 2013), summarized in **Section 4.5** of the Draft Supplemental Final EIS, provides an updated assessment of indirect and cumulative effects of the project. The NCDOT must again obtain a Section 404 permit from the USACE and a Section 401 Water Quality Certification from the NCDWQ prior to project construction. Mitigation needed for these permits will be determined by the USACE and the NCDWQ.

a006

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: UNION
MECKLENBURG

F05: RAILROADS

STATE NUMBER: 10-E-4220-0435
DATE RECEIVED: 06/10/2010
AGENCY RESPONSE: 07/07/2010
REVIEW CLOSED: 07/12/2010

CLEARINGHOUSE COORDINATOR
CC&PS - DIV OF EMERGENCY MANAGEMENT
FLOODPLAIN MANAGEMENT PROGRAM
MSC # 4719
RALEIGH NC

JUL 2010
RECEIVED
Secretary's Office
DOA

RECEIVED
JUN 11 2010
N.C. Floodplain Mapping Program

REVIEW DISTRIBUTION
CC&PS - DIV OF EMERGENCY MANAGEMENT
CENTRALINA COG
DENR LEGISLATIVE AFFAIRS
DEPT OF AGRICULTURE
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION

PROJECT INFORMATION
APPLICANT: State of N.C. Turnpike Authority
TYPE: National Environmental Policy Act
Final Environmental Impact Statement

DESC: Improvements in the Monroe Connector/Bypass from I-485 to US 74 in the vicinity of the Town of Marshville in Union Co. TIP Nos. R-3329 & R-2559

CROSS-REFERENCE NUMBER: 02-E-4220-0309 04-E-4220-0332 07-E-4220-0235 09-E-4220-0292

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: ☐ NO COMMENT ☒ COMMENTS ATTACHE

SIGNED BY: [signature] DATE: 7/9/10

1 PROJECT impacts numerous regulated Special Flood Hazard Areas. Coordination with NCDOT Hydraulics Unit should be made to ensure Compliance with EO 11988 and the FEMA NFIP REGULATIONS - 44 CFR, AND NC EO 123 ARE MET Through the MOA between NCDOT and NCEM OGTM.

Table A-12: NC Department of Crime Control and Public Safety – Floodplain Management Program

Document: a006 letter dated July 9, 2010

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Floodplains	Project impacts numerous regulated Special Flood Hazard Areas. Coordination with NCDOT Hydraulics Unit should be made to ensure compliance with E.O. 11988 and the FEMA NFIP Regulations (44 CFR and NC E.O. 123) are met through the MOA between NCDOT and NCEM OGTM.	As of June 27, 2009, the NCTA is a division of NCDOT and will coordinate closely with the NCDOT Hydraulics Unit.

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APPENDIX A-3

CITIZENS INFORMATIONAL WORKSHOP SUMMARY AND COMMENT FORMS

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NORTH CAROLINA
Turnpike Authority

Monroe Bypass

Community Meetings
June 18 & 19, 2012

Summary

Both meetings consisted of a formal presentation at 6pm, repeated at 7pm if needed, describing the project's legal proceedings, right of way status, and next steps. The presentation lasted about 40 minutes and was followed by a question and answer session. Project team members also answered questions one-on-one with citizens before and after the presentation. A summary of the meetings is provided below:

June 18, 2012

Next Level Church – 4317 Stevens Mill Road, Matthews, NC 28104
102 attendees
1 comment form – support for project

Q1: (Mark Trickey) Explain the dates related to ceasing the right of way acquisition process.
A1: Many meetings were held between NCDOT and FHWA immediately following the court decision. FHWA, which is the lead federal agency, legal and management team, made the final decision that May 3 would be the cutoff date for right of way purchases. If an offer was made as of May 3, the acquisition would continue. All other properties, including those with offers between May 3 and May 21 (date that NCDOT formally announced process was halting), will be considered for acquisition based on hardship conditions on a case-by-case basis.

Q2: (Hank Harris) Property was within days of receiving an offer, so with the delay how much of the process will have to be repeated and will the current negotiated price be affected?
A2: Depending on the length of the delay, the negotiated purchase price should not be affected. Once the project is back online, the NCDOT will begin with the appraisal they started with. If too much time has elapsed, then they will determine if the appraisal is still valid. Replacement housing calculations will have to be redone.

Q3: (Bruce Mark) NCDOT needs to hear the cries of the people who are being impacted by this delay.
A3: NCDOT did not want to stop work on the project and is working to get the project back on track by the first quarter of 2013.

Q: Rumor that properties in foreclosure had been targeted for early acquisition.
A: No preference has been given to properties in foreclosure. Of the 15 offers made to date, 1 was foreclosed and owned by the bank.

Q4: Complaints about maintenance on properties already purchased (vandals, grass, etc.).
A4: NCDOT will be maintaining these properties. If there are any problems, please contact Jane Nelson.

Q5: (Gretchen Carson) What if the petition for re-hearing is denied?
A5: NCDOT is working on parallel paths – a legal path (the petition for rehearing) and a documentation path, in which additional analysis and documentation is being prepared to address concerns raised in the court decision. Either path is expected to be complete by first quarter 2013.

Q6: Request for judges' or the attorney's phone numbers.
A6: David Farren, SELC attorney, in attendance. Mr. Farren commented that the project study is flawed and needs to be redone completely, including consideration of upgrading existing US 74. He also said that the legal path pursued by NCDOT has less than a 1 percent chance of being successful.

June 19, 2012
Union County Agricultural Center – 3230 Presson Road, Monroe, NC 28112
105 attendees
4 comment forms – 3 support for project/complain about delay; 1 suggestion to widen NC 218

Q1: (Karen Thomas) She received a letter in the mail 1-2 weeks ago indicating that work had ceased, but said there were new stakes placed on her property/pasture since then. Then she said she saw surveyors from Mulkey Engineers doing work on her property this week. Why are there people on my property when work has ceased? People already surveyed the property in December.

A1: Surveyors are surveying and documenting right of way purchased in 2002-2003 as part of the original Bypass project. Jane said to please call the R/W office if there are any questions or concerns about anything.

Q2: Savings is tied up and cannot get a 2nd mortgage. Husband died and she tried to refinance. Her son and social security are her only financial lifelines. She cannot drive to the R/W office because she doesn't have the money for gas. Where are the hardship papers and help for her? She has been on an "emotional rollercoaster because of the environmental attorneys".
A2: Property owner would likely be a candidate for a hardship claim and should speak with Jane Nelson directly. Staff also advised those in need of transportation (in order to get to the R/W office) to call for arrangements.

Q3: (Reid Phifer) What is the percent chance that a rehearing will occur?
A3: It is not possible to put a % of success on this, as it is really in the hands of the court. We requested two possible scenarios from the court: 1) Ask the same 3 judges to rehear the case or 2) request an "enbanc" hearing, which would include all 15 judges. It is an uphill battle for both, but that is the legal path the NCDOT is seeking.

Q4: (Steve from Matthews) Does a January 2013 re-start of the project assume a legal victory associated with the rehearing request?

A4: The NCDOT is following two parallel paths: 1) Legal option described previously. If the NCDOT prevails, then the project goes will resume moving forward. 2) Environmental path is also underway and will reassess issues raised about the study. Either path should be complete by the first quarter of 2013.

Q5: (Heather from Monroe) Does the full panel of judges (15) have to unanimously vote in favor for the NCDOT to prevail?
A5: No. Only the majority (8).

Q6: (Karen Thomas) Who is MUMPO? Who are these people? What is the data you're talking about? When was the study done with this data and does it still make sense to rely on the data with the economy the way it is? Continued criticism about wasting taxpayer dollars and how Union County needs teachers, etc. instead. Union County is not going to keep growing now. (She continued to badger staff without allowing them to answer questions…)
A6: MUMPO is made of municipal staff, some of which are elected officials. More information is located on MUMPO's website. More discussion on the concerns can take place one-on-one following the Q&A in order to address other questions from the audience.

Q7: Concern echoed previous question about whether the projected socioeconomic growth is still valid given current economic conditions. Also, suggested no analysis on the Stewarts Creek Watershed was undertaken. Stated overall environmental issues with the project.

Q8: (Rick Traywick) What did you guys miss? Why are we going through this with all the people out doing studies on species, etc.? What stuff was missed?
A8: Numerous studies have been done to determine project impacts, as required. However, the major issue with SELC is that they disagree with the data obtained from MUMPO and how it was used to determine impacts.

Monroe Bypass

Summary of Legal Proceedings, Right of Way and Construction Update & Next Steps

NORTH CAROLINA Turnpike Authority

Community Workshops, June 18 - 19, 2012

1

Agenda

- Welcome and Introductions
- Legal and Environmental Review
- Right of Way Update
- Next Steps and Schedule
- Questions and Answers

2

History of the Case

- Nov. 2, 2010 lawsuit filed by Southern Environmental Law Center ("SELC").
- Nov. 23, 2010, SELC files motion for preliminary injunction to stop project from moving forward during the lawsuit.
- Dec. 30, 2010 Judge James C. Dever, III DENIED SELC's request for a preliminary injunction.

- Oct. 24, 2011, Judge Dever ruled in favor of NCDOT. NCDOT *did not* violate the law.
- Oct. 31, 2011, SELC files appeal to the 4th Circuit Court of Appeals in Richmond, Va.
- March 21, 2012, the 4th Circuit hears the arguments of the parties.

- May 3, 2012, the 4th Circuit renders opinion that NCDOT/FHWA failed to disclose assumptions underlying their decision to build the road and included incorrect information to a public comment.

- June 15, 2012, NCDOT filed a petition for rehearing with the 4th Circuit asking for a rehearing due to facts and law the Court overlooked and misunderstood.

What does the law require?

National Environmental Policy Act ("NEPA").

Government agencies must study the environmental impacts of a project before building the project.

The government must take a "hard look" at the human and natural environmental impacts of a project.

NEPA Studies

Government must study the:

Direct Impacts – What will the road impact in its proposed location?

Indirect Impacts – What impact will the road create in the future?

Cumulative Impacts – What impact will the road <u>and</u> all other planned projects have on the environment?

7

Indirect Impacts

NCDOT tries to predict how many people, households, and jobs will exist in the Project area in future years (up to the year 2030).

(These are called socio-economic projections)

NCDOT tries to predict the future socio-economic conditions with the road and without the road.

("no-build" vs. "build" scenario)

8

Predicting the Future

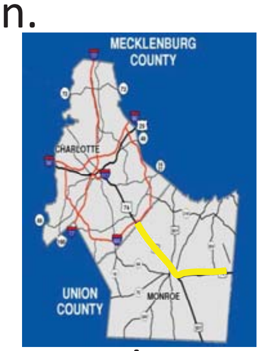
• There is always uncertainty.

• NCDOT follows established guidance on how to study the Indirect Impacts.

•NCDOT stands behind their study and methodology.

Mecklenburg-Union Metropolitan Planning Organization ("MUMPO")

MUMPO is the local organization that develops a long-range transportation plan.



MUMPO uses a tool to develop the plan called a Travel Demand Model.

NCDOT used MUMPO's Model & socio-economic projections in the Indirect Impacts analysis.

NCDOT researched the MUMPO projections before using them

NCDOT went to MUMPO and the localities that created the socio-economic projections and asked:

1. How were the socio-economic projections created?

2. Does the long-term land use plan represent the future with or without the Monroe Connector?

What did NCDOT Determine?

NCDOT found that the MUMPO projections best represent the project area without the project (i.e. the “no-build” scenario).

After comparing the “no-build” to the “build,” NCDOT found that the Monroe Project would induce very little additional growth in the Project area.

Why won't the project induce growth?

Existing growth in Union County.

- The fastest growing county in NC.
- 14th fastest growing county in the US.

However, there are factors that resist growth as well.

- Lack of Water/Sewer availability, moratoriums.
- 200 foot buffers on streams.

SELC Disagrees

SELC says the project was included in the "no-build" projections and therefore NCDOT compared "building the road" with "building the road."

Was the Project in the "no-build" projections?

1 out of 8 variables used to create the model that was used to measure the impacts included a 2,400 mile roadway network that had 20 miles of the Monroe Bypass.

The Project represented less than 1% (.82) of the long-range transportation plan roadway network in that 1 variable.

Judge Dever agreed with NCDOT's conclusion that the less than 1% inclusion did not rise to the level of significance and didn't interfere with the conclusion.

15

Less than 1% is Insignificant

In a "perfect" no-build scenario the project would have 0% inclusion.

NCDOT made the determination that the MUMPO projections best represent the "no-build" scenario despite the project being technically included in the data.

16

Public Comments

During the environmental study, NCDOT receives comments from the public and responds to those comments.

17

U.S. Fish and Wildlife Service

The USFWS is in charge of making sure the Project does not adversely affect any endangered species.

The Carolina Heelsplitter mussel is an endangered species with habitat in the project area.

18

NCDOT VERIFIED ITS ASSUMPTIONS

USFWS requested additional verification regarding the “no-build” scenario.

NCDOT went back to MUMPO and the local planning experts and asked:

Would you agree with our assumption that these forecasts represent the “no-build” scenario? If not, why?

MUMPO and the Local Experts Agreed

MUMPO and the local experts agreed that the socio-economic projections were a reasonable representation of the “no-build” scenario.

Less than 1 % is Insignificant

The District Court judge agreed with NCDOT.

- The Judge said:

NCDOT determined it was reasonable to use the MUMPO projections "with several ample investigations into the propriety of using the data."

4th Circuit Court of Appeal

The 4th Circuit Court of Appeals disagreed with the District Court Judge.

Court of Appeals found that the statement regarding the inclusion of the Project was incorrect and the government should have done a better job of disclosing the information to the public.

NCDOT feels that the Court of Appeals did not consider why the "inclusion" is insignificant.

Next Steps

NCDOT is asking the 4th Circuit Court of Appeals to rehear the case.

Hopefully, the Court will agree to rehear the case.

23

Next Steps

- NCDOT/Turnpike is moving forward with further environmental study and address the concerns raised by the Court.
- We requested our permits be suspended until we address these issue in Court or through our environmental review.
- We hope to address these concerns and restart the project in the early 2013.

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Right of Way and Construction Update

NORTH CAROLINA Turnpike Authority

ROW & Construction Update

Agenda

- Turnpike Authority Right of Way Process
- Initiatives taken for Monroe
- Where we are today
- Hardship Acquisition Requests
- FAQs

Right of Way Process

- Receive final ROW plans
- Initial contact – Acquisition/Relocation
  - ➢ Contractor prioritization
- Order title report & appraisal
  - ➢ Appraisal inspection
  - ➢ Appraisal preparation
  - ➢ Appraisal review & approval (agency)
  - ➢ 60-90 days

Right of Way Process

- Replacement housing calculation (RHP)
  - ➢ Locate three available comparables
  - ➢ DS&S inspections
- RHP review & approval (agency)
- Initiation of Negotiations
  - ➢ Present acquisition offer
  - ➢ Present relocation eligibility – 90-day Letter

Right of Way Process

- Agreement
  - Over $500,000 – NCTA Right of Way Review Board
  - Over $1,000,000 – DOT Secretary's Right of Way Review Board
- Prepare final report package
- Final report review and approval (agency)
- Request closing funds
- Clear title encumbrances
- Closing (subject and replacement)

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Right of Way Process

- Deliver 30-day Notice to Vacate
- Property vacated & inspected
- Disconnect utilities
- Asbestos inspection and abatement
- Remove site improvements
- Payment of relocation claims

30

Right of Way Process

WHY DO WE FILE CONDEMNATION CASES?
(Eminent Domain)

- Opinion of value
- Multiple property owners
- Title encumbrances
- Project schedule

31

Right of Way Process

- Condemnation recommendation & review
- NCTA Right of Way Review Board
- Prepare final report package
- Final report review and approval (agency)
- Request deposit check (appraised value)
- Filing map prepared

32

Right of Way Process

- Final report package submitted to Attorney General's office
- Review file documentation & prepare pleadings
- File condemnation – Clerk of Superior Court
- Court deposit (appraised value)
- Title transferred

33

Right of Way Process

- Deliver 30-day Notice to Vacate
- Property vacated & inspected
- Disconnect utilities
- Asbestos inspection and abatement
- Remove site improvements
- Payment of relocation claims

34

Right of Way Process

- Owner's right to withdraw deposit
- One year to file answer
- Ongoing negotiations
- Mediation
- Jury trial

35

Initiatives taken for Monroe

✓ Established right of way field office

✓ Identified parcels that could be acquired in their entirety
  - 84 "priority" parcels identified
  - Whole acquisition / Uneconomic remnants / Landlocked parcels
  - Voluntary acquisition
  - No condemnation until final ROW plans are available / revise appraisal

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Monroe Bypass Right of Way Office

Located at 5419 Indian Trail Fairview Road,
Indian Trail, NC 28079
Office: 704-893-0131

Website www.monroeconnector-bypass.com

Monroe Initiatives

✓ WEEKLY DESIGN-BUILD TEAM MEETINGS

- Address property owner / community concerns
- Access roads
- Driveways
- Design revisions / right of way impacts

Where we are today

- Telephone contacts with all owners / displacees
- Complete parcels with offers as of May 3rd
- Offers between May 3rd and May 21st – case by case basis (hardship)

39

What constitutes a hardship?

- Illness
- Financial distress
- Job transfer

<u>HARDSHIP REQUEST PROCESS</u>

- Submit a letter explaining hardship
- Provide backup documentation
- Review committee
- Approval by Board of Transportation

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

How do I request hardship acquisition ?

The property owner shall submit a request for hardship acquisition in writing informing the Department of his/her hardship and the location of the property they feel encumbered by the project. The Right of Way Branch requires the property owner to submit information documenting the basis for the hardship acquisition request prior to requesting authorization.

Before any request for hardship acquisition can be approved, there are three conditions that must be met to meet Federal Highway Administration and Department of Transportation guidelines.

1) The Department must determine that a severe hardship exists for the property owner, which makes it unreasonable for the State to wait until the scheduled acquisition date to begin acquisition.

2) The Department must determine that the subject property is needed for the proposed project.

3) The Department must have available sufficient project funds to reimburse the property owner for the property acquired.

Examples of acceptable documentation to qualify for hardship acquisitions may include, where appropriate:

1) Doctor's statement: A doctor's statement clearly and fully describing why an owner or patient should relocate from the property from a medical viewpoint.

2) Financial statement: Where financial difficulties constitute the reason for acquisition, a reliable, accurate and complete discussion is appropriate.

3) Letter from employer: A letter from the employer certifying that the affected owner has been transferred to a specific location. A similar certification regarding loss of employment would likewise constitute adequate documentation.

4) Court records: Copies of documents relating to any legal actions, i.e., pending mortgage foreclosure, probate of estate, etc., which would provide support for the indicated hardship.

5) Income tax return: Verification by Department of Transportation personnel of that part of the return necessary to support the hardship situation will suffice in lieu of copies of the return.

In addition to the health, safety and/or financial hardship, the owner must also document and support an inability to sell the property for fair market value within a typical period of time. A letter from a realtor or listing service may provide this documentation. The price at which the property is offered for sale must be representative of fair market value. If the property has been offered at an unrealistic price, then the requirements of the Federal regulations have not been met.

Please submit your request for hardship acquisition and documentation to:

Jane C. Nelson
NCTA Right of Way Program Manager
1578 Mail Service Center
Raleigh, NC 27699-1578
(919) 707-2716

NORTH CAROLINA Turnpike Authority

Thank you for your time and attention.

Questions?

NORTH CAROLINA
Turnpike Authority

FAQs

- What is the status of the project?
- Will this project actually happen?
- How long will the project be delayed?
- Will property owners be compensated for the delay?

NORTH CAROLINA
Turnpike Authority

FAQs

- Do I still have to move within 90 days?
- Should I make repairs to my property i.e. new roof or kitchen?
- What if I find a home I want to buy?

NORTH CAROLINA
Turnpike Authority

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6/18

NORTH CAROLINA
Turnpike Authority

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Monroe Bypass Status Update
Community Meeting

✓ June 18, 2012 - Next Level Church - 4317 Stevens Mill Road Matthews, NC 28104
_____ June 19, 2012 - Union Co. Agricultural Center - 3230 Presson Road Monroe, NC 28112

Contact Information -Please print legibly-

Name: Zenobia Heggins (c) 704-681-1879

Mailing Address: 5914 Secrest Short Cut Road Monroe, N.C. 28110

[-Please remember to include your zip code-]

Comments

Your opinions about this project are important to us. Please use the space below to include your comments. If you need additional room to write, please take additional comment sheets or include your own letter.

I had high hopes on this project starting this summer. As I discuss with one gentlemen we need this road. ~~a~~ In order to relieve congestion on Secrest Short Cut Rd, Roosevelt Blvd, and Monroe Old.

Let's get this road build.

Please Drop this form into the COMMENT DROP BOX or mail this form by July 3, 2012 to:

Jennifer Harris, PE
North Carolina Turnpike Authority
1578 Mail Service Station
Raleigh, NC 27699-1578

NORTH CAROLINA
Turnpike Authority

Monroe Bypass Status Update
Community Meeting

_____ June 18, 2012 - Next Level Church - 4317 Stevens Mill Road Matthews, NC 28104
_____ June 19, 2012 - Union Co. Agricultural Center - 3230 Presson Road Monroe, NC 28112

Contact Information -Please print legibly-

Name: Linda Thomas

Mailing Address: 12297 US Hwy 74 W, Peachland, NC 28133

[-Please remember to include your zip code-]

Comments

Your opinions about this project are important to us. Please use the space below to include your comments. If you need additional room to write, please take additional comment sheets or include your own letter.

I would like to see this bypass become a reality.
(20+ years in some areas)
It seems that more than sufficient time has been given to decision making. I feel that money has been wasted with studies and legal fees. Property owners are suffering in many ways with not knowing how to plan.
Please reach a decision so that we can move forward.
Thanks!

Please Drop this form into the COMMENT DROP BOX or mail this form by July 3, 2012 to:

Jennifer Harris, PE
North Carolina Turnpike Authority
1578 Mail Service Station
Raleigh, NC 27699-1578

NORTH CAROLINA
Turnpike Authority

Monroe Bypass Status Update
Community Meeting

_____ June 18, 2012 - Next Level Church - 4317 Stevens Mill Road Matthews, NC 28104
_____ June 19, 2012 - Union Co. Agricultural Center - 3230 Presson Road Monroe, NC 28112

Contact Information -Please print legibly-

Name: Jim Little

Mailing Address: 6183 NC Hwy 109 SOUTH WADESBORO NC 28170
[-Please remember to include your zip code-]

Comments

Your opinions about this project are important to us. Please use the space below to include your comments. If you need additional room to write, please take additional comment sheets or include your own letter.

My Suggestion in the beginning was that Hwy 218 Should be Fourlaned.

Please Drop this form into the COMMENT DROP BOX or mail this form by <u>July 3, 2012</u> to:

Jennifer Harris, PE
North Carolina Turnpike Authority
1578 Mail Service Station
Raleigh, NC 27699-1578

NORTH CAROLINA
Turnpike Authority

Monroe Bypass Status Update
Community Meeting

_____ June 18, 2012 - Next Level Church - 4317 Stevens Mill Road Matthews, NC 28104
_____ June 19, 2012 - Union Co. Agricultural Center - 3230 Presson Road Monroe, NC 28112

Contact Information -Please print legibly-

Name: Anthony M SPIERINGS

Mailing Address: 2716 MORGAN Mill Rd

[-Please remember to include your zip code-]

Comments

Your opinions about this project are important to us. Please use the space below to include your comments. If you need additional room to write, please take additional comment sheets or include your own letter.

Get it done

Please Drop this form into the COMMENT DROP BOX or mail this form by July 3, 2012 to:

Jennifer Harris, PE
North Carolina Turnpike Authority
1578 Mail Service Station
Raleigh, NC 27699-1578

NORTH CAROLINA
Turnpike Authority

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Monroe Bypass Status Update
Community Meeting

_____ June 18, 2012 - Next Level Church - 4317 Stevens Mill Road Matthews, NC 28104
__✓__ June 19, 2012 - Union Co. Agricultural Center - 3230 Presson Road Monroe, NC 28112

Contact Information -Please print legibly-

Name: Charles & Carole Helms

Mailing Address: 1225 Old Hwy. 74, Marshville NC 28103

[-Please remember to include your zip code-]

Comments

Your opinions about this project are important to us. Please use the space below to include your comments. If you need additional room to write, please take additional comment sheets or include your own letter.

We sold our property about 12 years Ago with the understanding that money was available For the project - not a toll road - several Families on 74 near Marshville had to move and some have since died - these delays make no sense at all - IF the decision makers had to travel From Marshville every day they would realize how much the road is needed. When the property was sold nothing was said about a Toll road. IF this was near Raleigh this would not have happened. Where is common sense in this? (over)

Please Drop this form into the COMMENT DROP BOX or mail this form by July 3, 2012 to:

Jennifer Harris, PE
North Carolina Turnpike Authority
1578 Mail Service Station
Raleigh, NC 27699-1578

Who is making money on this delay?
Certainly not the tax payer. The older
I get the more I realize just how
incompetent government is.

APPENDIX B

ADDITIONAL INFORMATION ON ALTERNATIVES ANALYSIS

Table B-1 presents a summary of the analysis of US 74 alternatives throughout the project development process.

The maps included in this appendix are reproduced from the Draft EIS and Final EIS. They show the progression of alternatives development from Preliminary Corridor Segments (including alternatives located to the north and south of existing US 74 as well as along existing US 74) to Preliminary Study Alternatives to Detailed Study Alternatives and finally to the Preferred Alternative.

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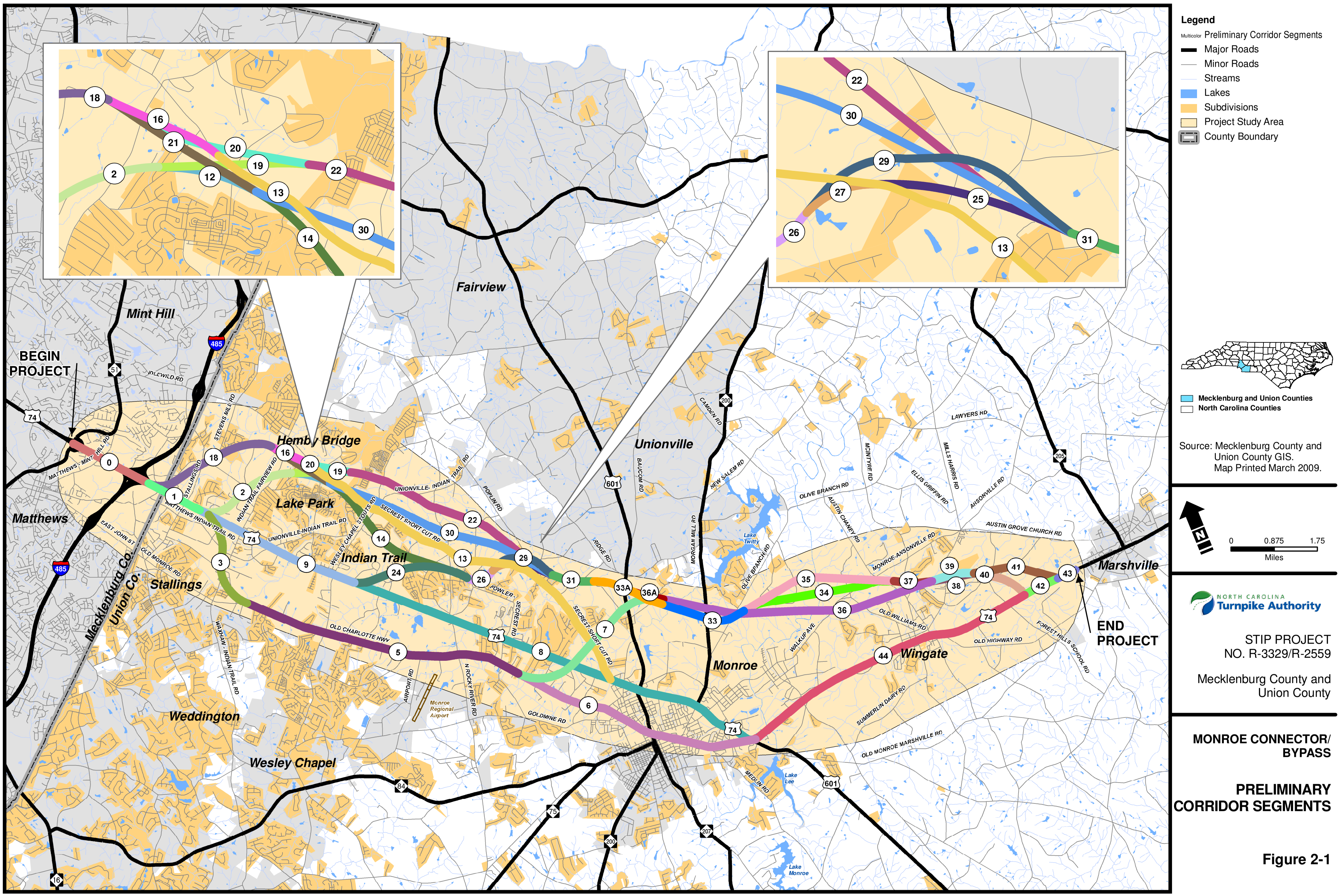
Table B-1. Record and History of US 74 Alternatives in the Monroe Connector/Bypass EIS

IMPROVE EXISTING ALTERNATIVE	DOCUMENTED IN/DATE	ALTERNATIVE DESCRIPTION in DRAFT EIS	1st SCREENING (Qualitative)	2nd SCREENING (Qualitative)	3rd SCREENING (Quantitative)	ADDITIONAL EXAMINATION OF ALTERNATIVE
Transportation System Management (TSM) Alternatives	• *Alternatives Development and Analysis Report* (April 2008, Section 1.2.3, pp. 1-7 – 1-9) • *Draft EIS* (March 2009, Section 2.2.2.3, pp. 2-6 – 2-8; 2-12; 2-13) • *Final EIS* (May 2010, Section 1.2.2.1, pp. 1-7 – 1-9) • *Final EIS* (May 2010, Section 3.3.2, p. 3-9, 3-12 – 3-15)	TSM are activities that maximize efficiency of the present transportation system, including traffic signal timing and intersection improvements. No new location component to this alternative concept.	Screened alternative against elements of the P&N. Conclusion: - Meets only two of three elements of P&N (enhance mobility and capacity and still maintains access to properties along US 74) - Does not provide for high-speed regional travel - Does not provide long-term solutions - Much lower level of improvement in mobility and capacity	This alternative was not carried forward to the 2nd or 3rd screening in the Draft EIS.		**TSM Concept 2** was developed and evaluated by NCDOT in the Final EIS to incorporate the recommendations in the *US 74 Corridor Study* (Stantec, July 2007). Includes the original TSM Alternative and improvements labeled "long-term improvements" (to be implemented by 2015) in the *US 74 Corridor Study*. Conclusion: - Does not provide for high speed (>50 mph) regional travel - Does not provide long-term solutions for the design year of 2035
Improve Existing US 74 as a Standard Arterial Widening	• *Alternatives Development and Analysis Report* (April 2008, Section 1.2.5, p. 1-11) • *Draft EIS* (March 2009, Section 2.2.2.5, pp. 2-9 – 2-10; 2-12; 2-13) • *Final EIS* (May 2010, Section 1.2.2.1, p. 1-8) • *US 74 Corridor Analysis Scenarios* (HNTB, December 2010)	Adding 2- to 4- lanes to create an 8-lane arterial facility. Signalized intersections and driveways would remain. No new location component to this alternative concept.	Screened alternative against elements of the P&N. Conclusion: - Meets only one of three elements of P&N (maintains access to properties along US 74)	This alternative was not carried forward to the 2nd or 3rd screening in the Draft EIS.		After the Final EIS and at the request of the USACE, NCDOT prepared a year 2035 comparative planning level analysis of four Upgrade Existing US 74 corridor scenarios to determine if acceptable corridor levels of service would be provided in the design year 2035 (US 74 Corridor Analysis Scenarios, HNTB, December 2010). One of the scenarios included a Widen to 6-Lane (No Superstreet) scenario that assumed widening the entire corridor to a 6-lane section while maintaining other roadway characteristics. Conclusion: - Analysis concluded that this scenario would not provide acceptable levels of service in the US 74 corridor in 2035.
Improve Existing US 74 as a Superstreet	• *Alternatives Development and Analysis Report* (April 2008, Section 1.2.6, p. 1-12 – 1-13) • *Draft EIS* (March 2009, Section 2.2.2.5, pp. 2-9 – 2-10; 2-12; 2-13) • *Final EIS* (May 2010, Section 1.2.2.1, p. 1-8) • *US 74 Corridor Analysis Scenarios* (HNTB, December 2010)	Involves conversion of existing facility to a superstreet. Configuration adds capacity at intersections by restricting left turns and through movements from cross-streets. In the December 2010 analysis two Superstreet concepts were evaluated: 1) Superstreet Existing, which assumed maintaining existing 4-lane and 6-lane sections and upgrading to high speed principal arterials at 45 and 55 mph posted speeds and 2) Superstreet to 6-Lanes, which assumed widening the entire US 74 corridor to a 6-lane section and upgrading to high-speed principal arterials at 45 and 55 mph. No new location component to this alternative concept.	Screened alternative against elements of the P&N. Conclusion: - Meets two of three elements of P&N (enhance mobility and capacity and still maintains access to properties along US 74) - Does not provide long-term solutions - Much lower level of improvement in mobility and capacity	This alternative was not carried forward to the 2nd or 3rd screening in the Draft EIS.		**TSM Concept 2** incorporated Superstreet design elements. See entry above for TSM Alternatives. After the Final EIS and at the request of the USACE, NCDOT prepared a year 2035 comparative planning level analysis of four Upgrade Existing US 74 corridor scenarios to determine if acceptable corridor levels of service would be provided in the design year 2035 (US 74 Corridor Analysis Scenarios, HNTB, December 2010). Two of the scenarios included the superstreet concept: Superstreet Existing and Superstreet to 6-lanes. Conclusion: - Analysis concluded that these scenarios would not provide acceptable levels of service in the US 74 corridor in 2035. - The Superstreet 6-Lane scenario provided the highest corridor capacity compared to the other scenarios, but most of the corridor would operate with greatly reduced average travel speeds (i.e., would not provide for high speed regional travel).

Table B-1. Record and History of US 74 Alternatives in the Monroe Connector/Bypass EIS

IMPROVE EXISTING ALTERNATIVE	DOCUMENTED IN/DATE	ALTERNATIVE DESCRIPTION in DRAFT EIS	1st SCREENING (Qualitative)	2nd SCREENING (Qualitative)	3rd SCREENING (Quantitative)	ADDITIONAL EXAMINATION OF ALTERNATIVE
Improve Existing US 74 as a Controlled-Access Highway	• *Alternatives Development and Analysis Report* (April 2008, Section 1.2.7, p. 1-13) • *Upgrade Existing US 74 Alternatives Study* (HNTB, March 2009) • *Draft EIS* (March 2009, Section 2.2.2.5, , Section 2.4.4.3) • *Final EIS* (May 2010, Section 1.2.2.1, p. 1-8 – 1-10 • *Final EIS (*May 2010, Section 3.3.2, pp. 3-7 -3-8)	Upgrading existing US 74 from I-485 to between the towns of Wingate and Marshville to controlled-access freeway with a free alternate route, as required, in form of frontage roads. Concept assumed a 6-lane freeway section with 2-lane, one-way frontage roads on either side to provide access to adjacent properties. No new location component to this concept.	Screened alternative against elements of the P&N. Conclusion: - Meets all three elements of P&N - Reasonableness of alternative not clearly determined	Preliminary Corridor Segments (PCS) were developed and evaluated individually to determine if impacts would make the segment impractical or unreasonable to implement. Conclusion: - Reasonableness of alternative not clearly determined - Remaining PCSs used to form end-to-end Preliminary Study Alternatives (PSAs). PSA G included as a preliminary alternative that would improve existing US 74	3rd screening used to identify alternatives that should be carried forward as Detailed Study Alternatives (DSAs) in the Draft EIS. Quantitative comparison/evaluation of 25 PSAs based on 20 impact categories/factors. Factors coordinated with local, regional, state, and federal regulatory and resource agencies. Conclusion regarding PSA G (Improve Existing US 74): - PSA G would have significant human environment impacts, substantial disruption during construction, and more impacts to streams compared to new location PSAs - PSA G would result in impacts to 499 businesses along existing US 74; or about 11 percent of the total businesses in Union County.	In response to agency comments requesting further study of PSA G, NCDOT completed additional quantitative updates to studies of PSA G in the Draft EIS for traffic operations, costs, and impacts for comparison to the DSAs. Updated PSA G would have frontage roads operating at LOS F, would have higher costs and construction time than DSAs, and still have significant impacts to businesses (481). Perennial stream impacts would be less than for the DSAs, but intermittent stream impacts would be greater. Also in response to agency comments, NCDOT developed **Revised PSA G*** and quantitatively evaluated it in the Draft EIS. Revised PSA G modified PSA G to reduce impacts and costs, and improve operations. The revised alternative still resulted in significant (235) business relocations (5.5 percent of Union County businesses) and, compared to the DSAs, 20-23 percent higher costs and much greater construction time. Perennial stream impacts would be less than the DSAs, but intermittent stream impacts would be greater. Conclusion: - Additional evaluation confirmed PSA G and Revised PSA G would not be reasonable or practicable and should not be considered as DSAs.
New Location/Improve Existing Roadways Hybrid	• *Alternatives Development and Analysis Report* (April 2008, Section 1.2.9, p. 1-14) • *Draft EIS* (March 2009, Section 2.2.2.7, pp. 2-11 – 2-26)	Building a portion of the project on new location and improving some combination of existing roadways (US 74 or other roadways) for the remainder of the project. The facility type for both portions would be a controlled-access highway.	Screened alternative against elements of the P&N. Conclusion: - Meets all three elements of P&N - Reasonableness of alternative not clearly determined	Preliminary Corridor Segments (PCS) developed for additional analyses in response to agency comments. PSAs developed for comparison and evaluation to determine whether a PCS was viable and reasonable to carry forward into 3rd quantitative screening. Conclusion: - Various Hybrid PCSs warranted further comparison and evaluation	Quantitative comparison/evaluation based on 20 impact categories/factors. Factors coordinated with local, regional, state, and federal regulatory and resource agencies. 8 of the 25 PSAs were New Location/Improve Existing Roadways Hybrids. Conclusion: - PSAs E,F, E1, F1, E2, F2, E3, and F3 (all 8 hybrids) eliminated due to significant business relocation impacts (207-317) - Comparatively greater impacts to streams, minor road crossings, hazardous material sites, construction costs - Not reasonable based on impacts, and not carried forward as DSAs	No additional evaluation of this alternative.

**Like PSA G, Revised PSA G option included US 74 as a tolled, controlled access 6-lane freeway facility with one-way two-lane frontage roads on either side to allow access to adjacent facilities. Difference was combination of two typical sections, which included 1) narrower curb and gutter sections in areas with higher concentrations of businesses as well as retaining walls to maintain the narrow section at interchanges or cross-streets. 2) wider typical section used in less developed sections, including wider areas at interchanges or crossovers to accommodate ramps. Approximately 7.6 miles of Revised PSA G (or 38 percent of the 19.7-mile long alternative) would be on retaining walls (substantial adverse visual impact).*



NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. R-3329/R-2559

Mecklenburg County and
Union County

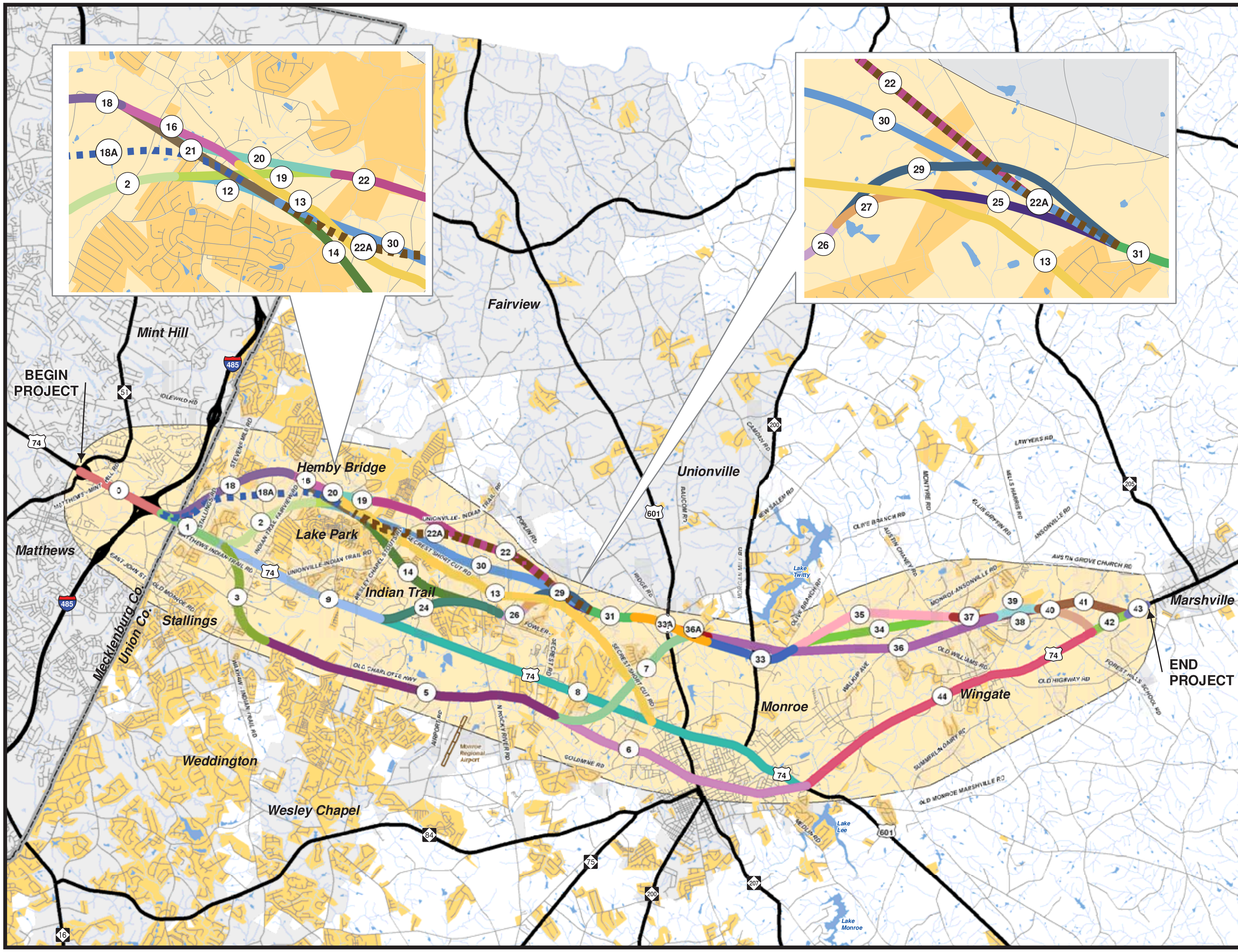
MONROE CONNECTOR/ BYPASS

PRELIMINARY CORRIDOR SEGMENTS

Figure 2-1

from Draft EIS

DEIS_MonExt_Snapshots_11x17_rev2.mxd 12-18-08



Legend

- Multicolor: Preliminary Corridor Segments
- Major Roads
- Minor Roads
- Streams
- Lakes
- Subdivisions
- Project Study Area
- County Boundary

Note: Dashed Segment Lines depict those segments that were modified as a result of early public involvement activities.

Mecklenburg and Union Counties
North Carolina Counties

Source: Mecklenburg County and Union County GIS.
Map Printed March 2009.

0 0.875 1.75
Miles

North Carolina Turnpike Authority

STIP PROJECT
NO. R-3329/R-2559

Mecklenburg County and Union County

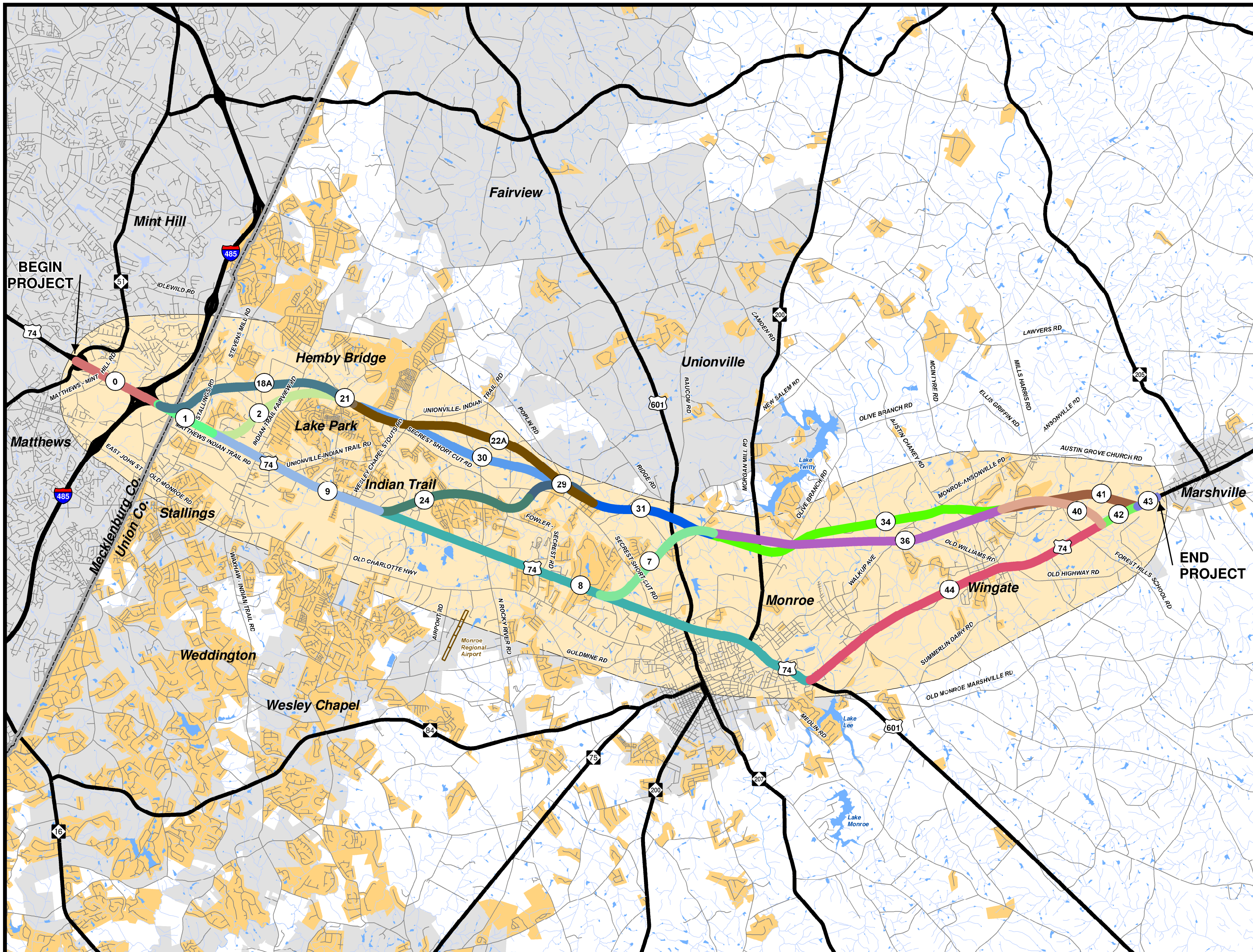
MONROE CONNECTOR/ BYPASS

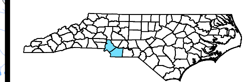
PRELIMINARY CORRIDOR SEGMENTS REVISED

Figure 2-3

from Draft EIS

DEIS_MonExt_Snapshots_Prelim_Corr_Seg3.mxd 3-16-09





Source: Mecklenburg County and Union County GIS. Map Printed March 2009.

N

0 0.875 1.75 Miles

NORTH CAROLINA Turnpike Authority

STIP PROJECT NO. R-3329/R-2559

Mecklenburg County and Union County

MONROE CONNECTOR/ BYPASS

PRELIMINARY CORRIDOR SEGMENTS FOR QUANTITATIVE THIRD SCREENING

Figure 2-5

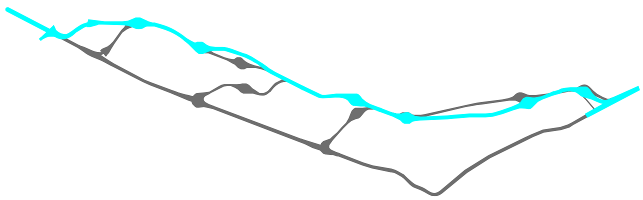
DEIS_MonExt_Snapshots_3rd_rev.mxd 12-18-08

B-5

from Draft EIS

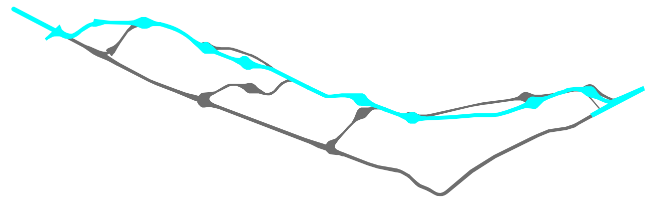
Alternative A

(Segments 0, 18A, 21, 22A, 31, 36, 40, 42 and 43)



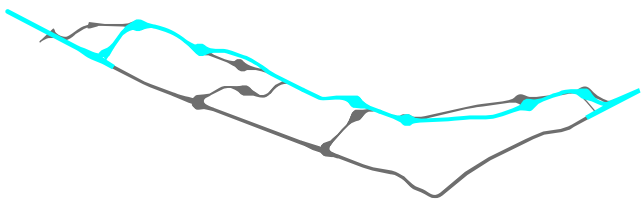
Alternative B

(Segments 0, 18A, 21, 30, 31, 36, 40, 42 and 43)



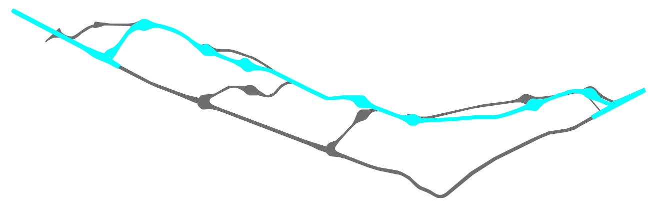
Alternative C

(Segments 0, 1, 2, 21, 22A, 31, 36, 40, 42 and 43)



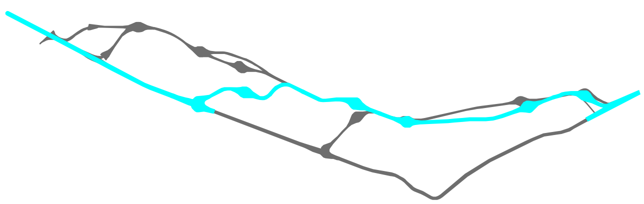
Alternative D

(Segments 0, 1, 2, 21, 30, 31, 36, 40, 42 and 43)



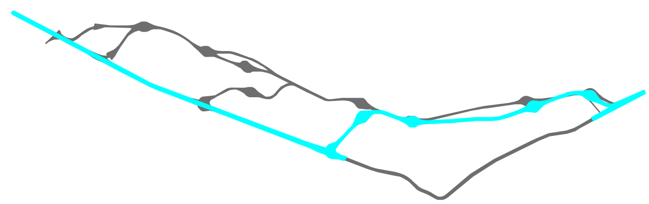
Alternative E

(Segments 0, 1, 1A, 9, 24, 29, 31, 36, 40, 42 and 43)



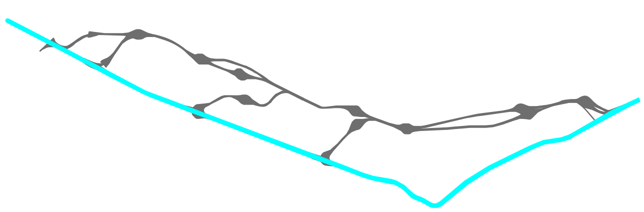
Alternative F

(Segments 0, 1, 1A, 9, 9A, 8, 8A, 7, 36, 40, 42 and 43)



Alternative G

(Segments 0, 1, 1A, 9, 9A, 8, 8A, 44, 42 and 43)



NORTH CAROLINA Turnpike Authority

MONROE CONNECTOR / BYPASS

STIP PROJECT NO. R-3329 / R-2559

Mecklenburg County and Union County

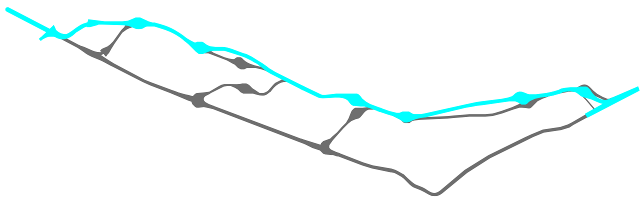
PRELIMINARY STUDY ALTERNATIVES

Figure 2-6a

DEIS_Prelim_Corr_SegREV.ai 02.24.09

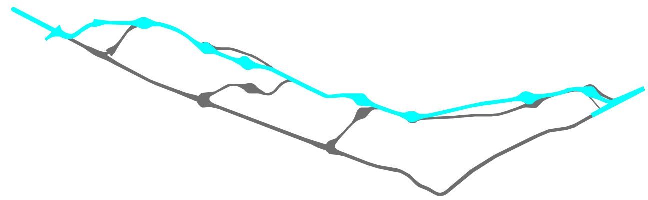
Alternative A1

(Segments 0, 18A, 21, 22A, 31, 34, 40, 42 and 43)



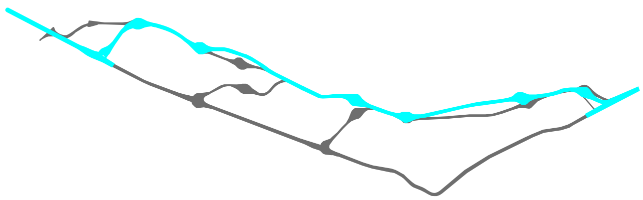
Alternative B1

(Segments 0, 18A, 21, 30, 31, 34, 40, 42 and 43)



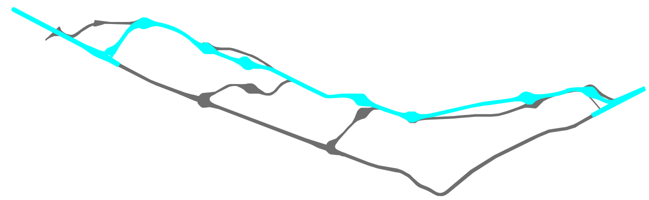
Alternative C1

(Segments 0, 1, 2, 21, 22A, 31, 34, 40, 42 and 43)



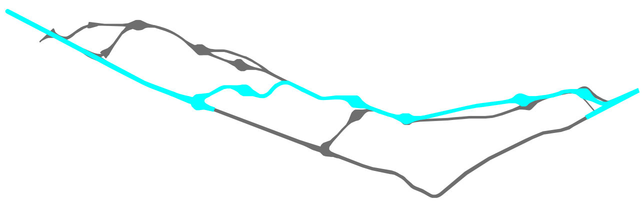
Alternative D1

(Segments 0, 1, 2, 21, 30, 31, 34, 40, 42 and 43)



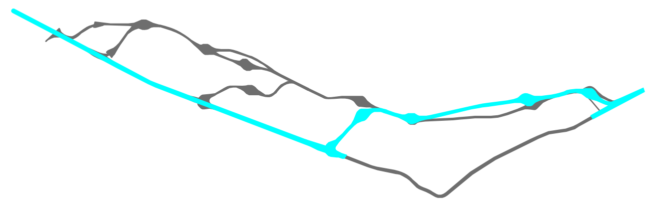
Alternative E1

(Segments 0, 1, 1A, 9, 24, 29, 31, 34, 40, 42 and 43)



Alternative F1

(Segments 0, 1, 1A, 9, 9A, 8, 8A, 7, 34, 40, 42 and 43)



NORTH CAROLINA
Turnpike Authority

MONROE CONNECTOR / BYPASS

STIP PROJECT NO. R-3329 / R-2559
Mecklenburg County and Union County

PRELIMINARY STUDY ALTERNATIVES

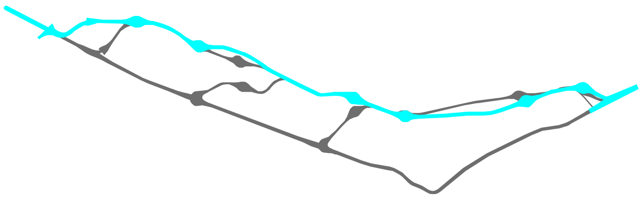
Figure 2-6b

DEIS_Prelim_Corr_SegREV.ai 02.24.09

from Draft EIS

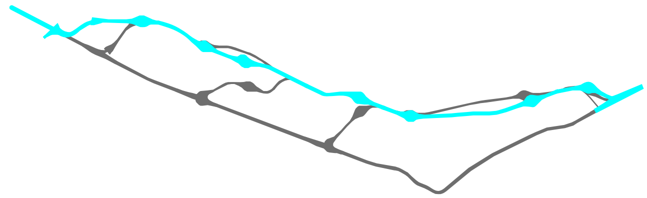
Alternative A2

(Segments 0, 18A, 21, 22A, 31, 36, 41, and 43)



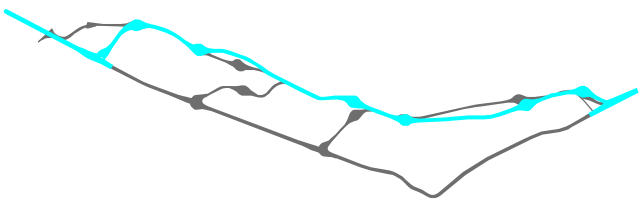
Alternative B2

(Segments 0, 18A, 21, 30, 31, 36, 41 and 43)



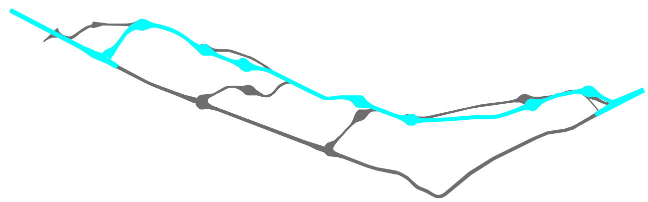
Alternative C2

(Segments 0, 1, 2, 21, 22A, 31, 36, 41 and 43)



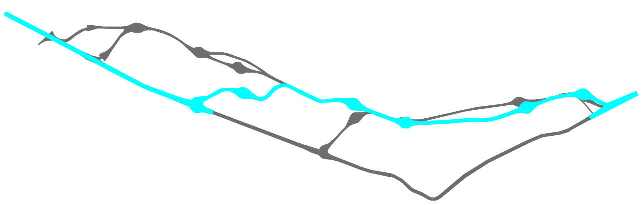
Alternative D2

(Segments 0, 1, 2, 21, 30, 31, 36, 41 and 43)



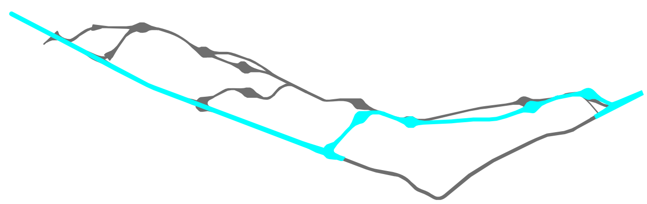
Alternative E2

(Segments 0, 1, 1A, 9, 24, 29, 31, 36, 41 and 43)



Alternative F2

(Segments 0, 1, 1A, 9, 9A, 8, 8A, 7, 36, 41 and 43)



NORTH CAROLINA
Turnpike Authority

MONROE CONNECTOR / BYPASS

STIP PROJECT NO. R-3329 / R-2559
Mecklenburg County and Union County

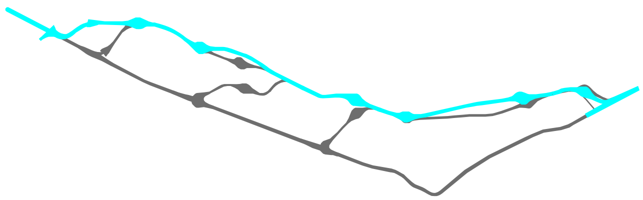
PRELIMINARY STUDY ALTERNATIVES

Figure 2-6c

DEIS_Prelim_Corr_SegREV.ai 02.24.09

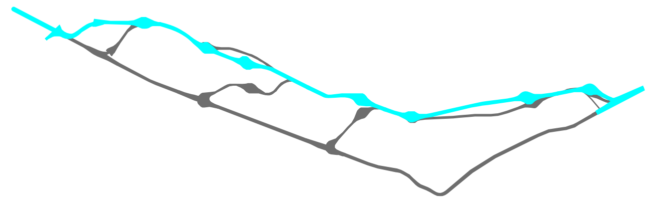
Alternative A3

(Segments 0, 18A, 21, 22A, 31, 34, 40, 42, and 43)



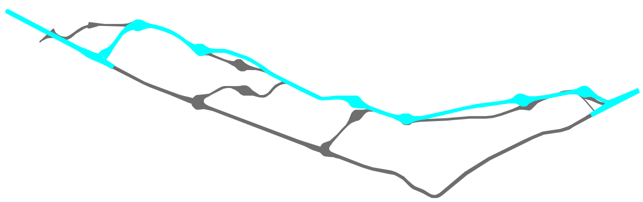
Alternative B3

(Segments 0, 18A, 21, 30, 31, 34, 41 and 43)



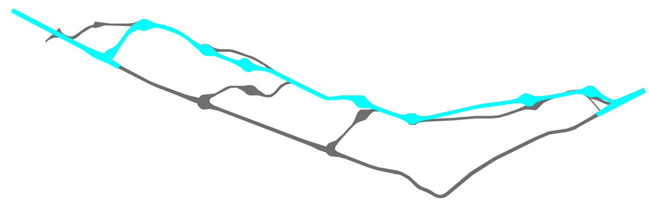
Alternative C3

(Segments 0, 1, 2, 21, 22A, 31, 34, 41 and 43)



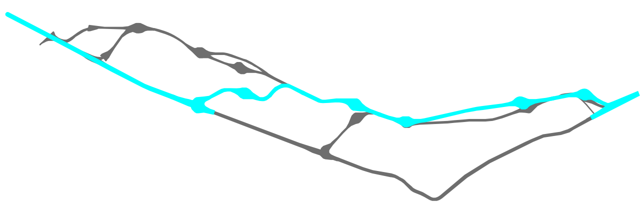
Alternative D3

(Segments 0, 1, 2, 21, 30, 31, 34, 41 and 43)



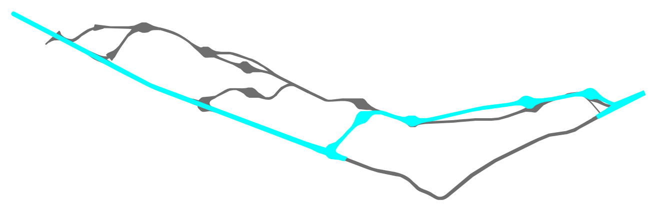
Alternative E3

(Segments 0, 1, 1A, 9, 24, 29, 31, 34, 41 and 43)



Alternative F3

(Segments 0, 1, 1A, 9, 9A, 8, 8A, 7, 34, 41 and 43)



NORTH CAROLINA Turnpike Authority

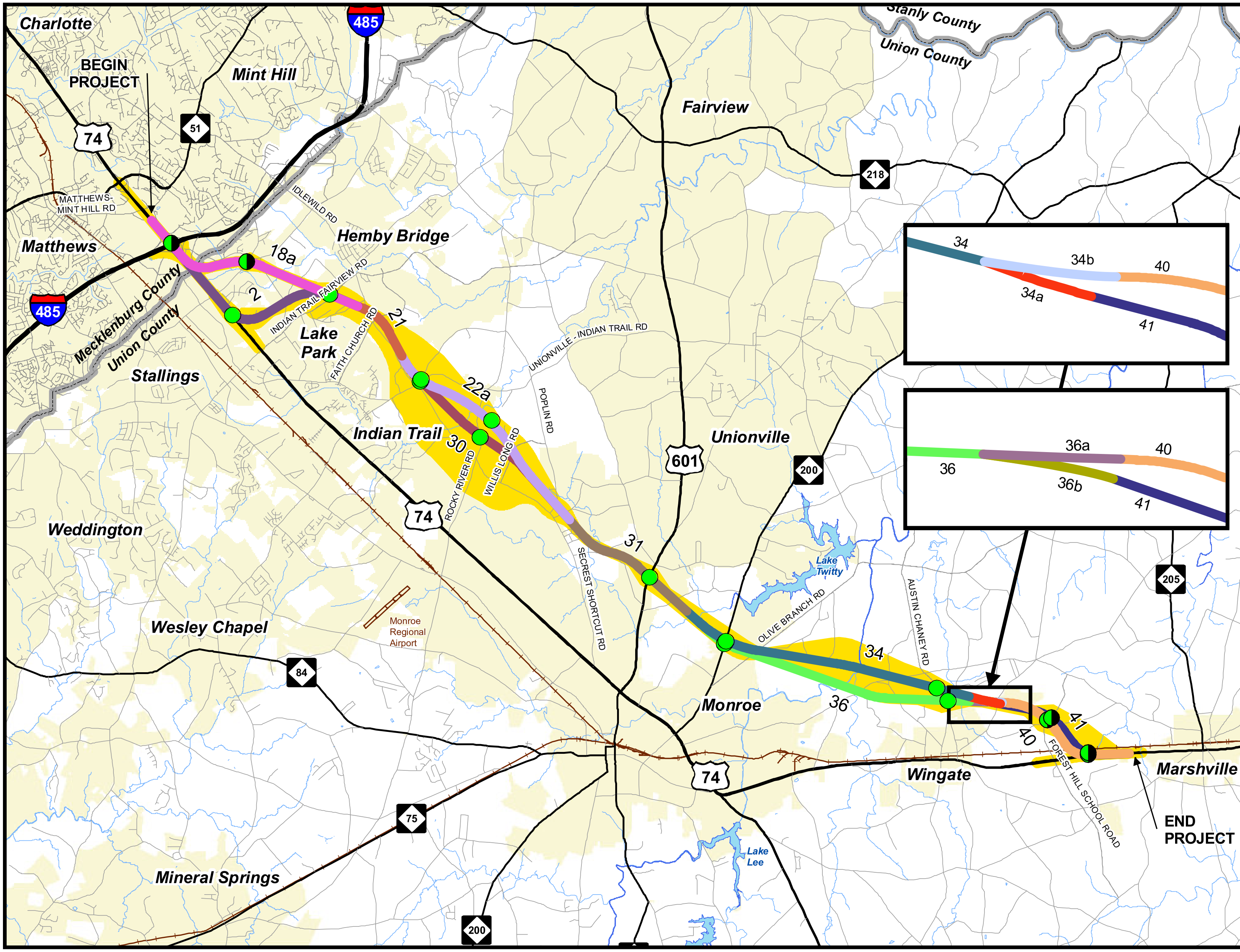
MONROE CONNECTOR / BYPASS

STIP PROJECT NO. R-3329 / R-2559

Mecklenburg County and Union County

PRELIMINARY STUDY ALTERNATIVES

Figure 2-6d



Legend

- Potential Interchange
- Potential Partial Interchange
- Interstate Highway
- US Highway
- NC State Highway
- State Road
- Railroad
- Parcels
- Corridor Study Area
- River / Stream
- Lake
- County Boundary

Detailed Study Alternative

Segment 18A	Segment 34A
Segment 2	Segment 34B
Segment 21	Segment 36
Segment 22A	Segment 36A
Segment 30	Segment 36B
Segment 31	Segment 40
Segment 34	Segment 41

Mecklenburg and Union Counties
North Carolina Counties

Source: Mecklenburg County and Union County GIS. Map Printed March 2009.

N

0 4,250 8,500
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. R-3329/R-2559

Mecklenburg County and Union County

MONROE CONNECTOR/ BYPASS

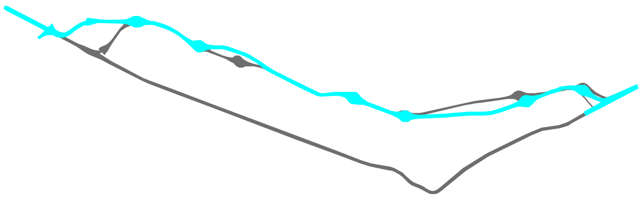
DETAILED STUDY ALTERNATIVES

Figure 2-8a

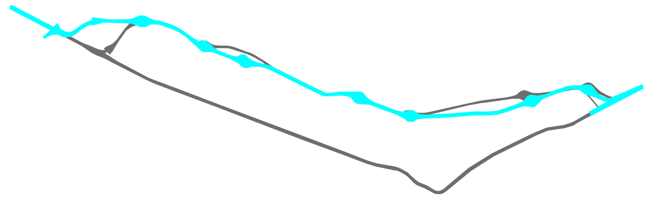
from Draft EIS

CIA_02a-dsa_rev.ai 11-14-08

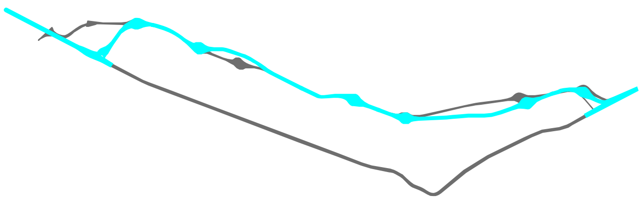
Alternative A
(Segments 18A, 21, 22A, 31, 36, 36A, and 40)



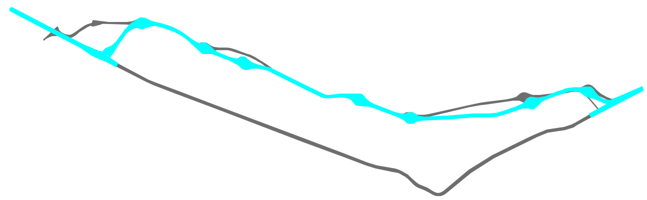
Alternative B
(Segments 18A, 21, 30, 31, 36, 36A, and 40)



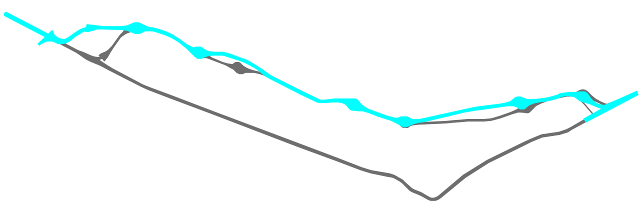
Alternative C
(Segments 2, 21, 22A, 31, 36, 36A, and 40)



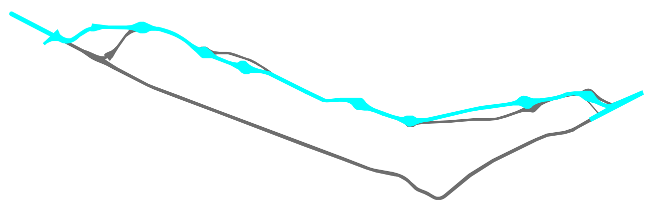
Alternative D
(Segments 2, 21, 30, 31, 36, 36A, and 40)



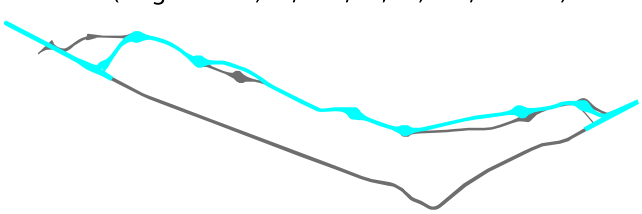
Alternative A1
(Segments 18A, 21, 22A, 31, 34, 34B, and 40)



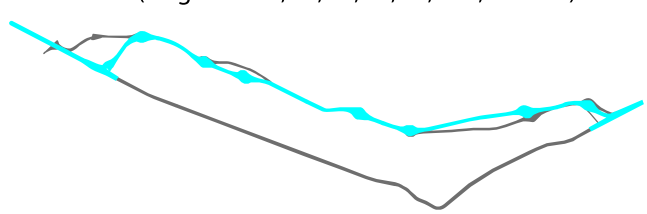
Alternative B1
(Segments 18A, 21, 30, 31, 34, 34B, and 40)



Alternative C1
(Segments 2, 21, 22A, 31, 34, 34B, and 40)



Alternative D1
(Segments 2, 21, 30, 31, 34, 34B, and 40)



NORTH CAROLINA Turnpike Authority

MONROE CONNECTOR / BYPASS

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Mecklenburg County and Union County

DETAILED STUDY ALTERNATIVES

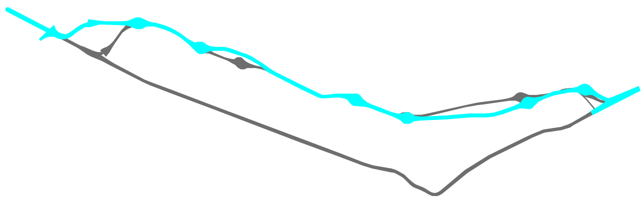
FIGURE 2-8b

DEIS_Prelim_Corr_SegREV.ai 02.24.09

from Draft EIS

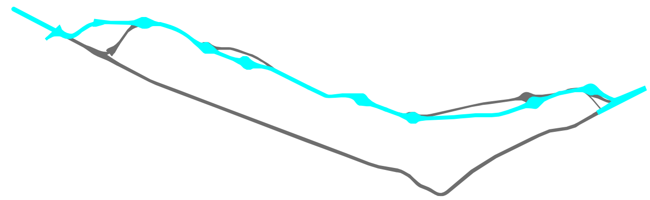
Alternative A2

(Segments 18A, 21, 22A, 31, 36, 36B and 41)



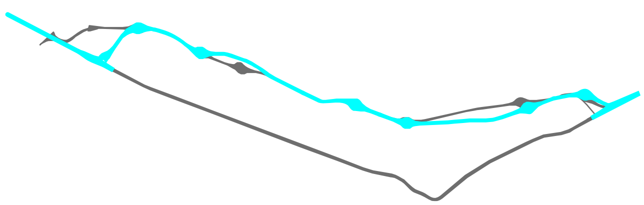
Alternative B2

(Segments 18A, 21, 30, 31, 36, 36B and 41)



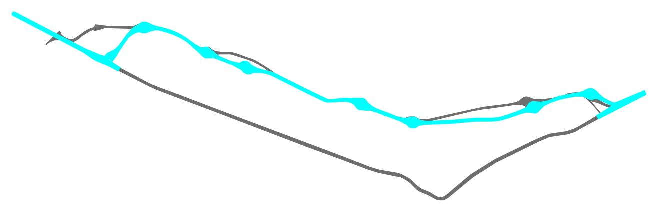
Alternative C2

(Segments 2, 21, 22A, 31, 36, 36B, and 41)



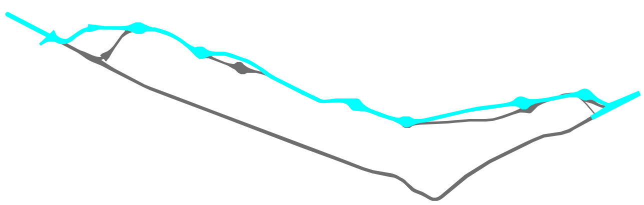
Alternative D2

(Segments 2, 21, 30, 31, 36, 36B, and 41)



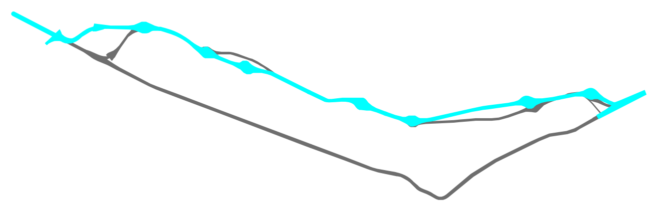
Alternative A3

(Segments 18A, 21, 22A, 31, 34, 34A, and 41)



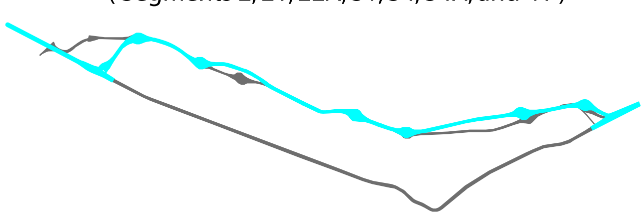
Alternative B3

(Segments 18A, 21, 30, 31, 34, 34A, and 41)



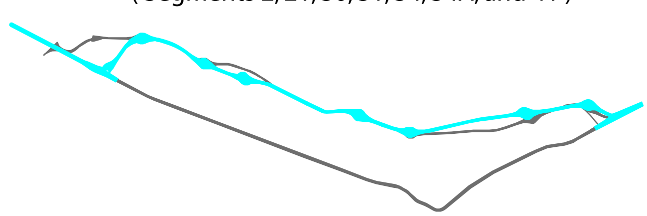
Alternative C3

(Segments 2, 21, 22A, 31, 34, 34A, and 41)



Alternative D3

(Segments 2, 21, 30, 31, 34, 34A, and 41)



NORTH CAROLINA Turnpike Authority

MONROE CONNECTOR / BYPASS

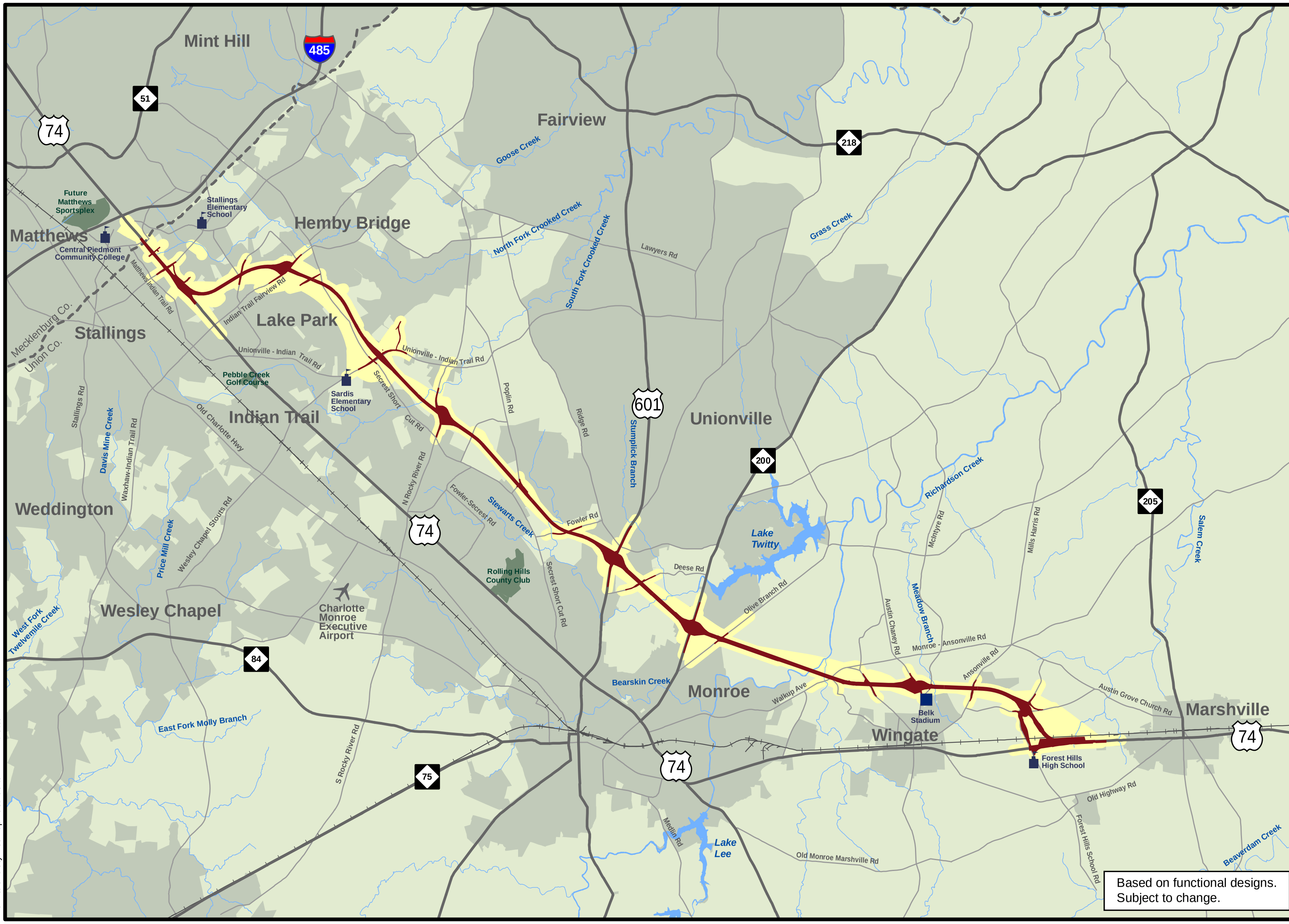
STIP PROJECT NO. R-3329 / R-2559

Mecklenburg County and Union County

DETAILED STUDY ALTERNATIVES

FIGURE 2-8c

DEIS_Prelim_Corr_SegREV.ai 02.24.09



Based on functional designs.
Subject to change.

Legend

- Preferred Alternative Right of Way
- Preferred Alternative Study Corridor
- County Line
- Lakes
- Streams
- Interstates & Highways
- Local Roads
- Railroad

- Mecklenburg and Union Counties
- North Carolina Counties

Source: Mecklenburg County and Union County GIS
Map printed: February 2010

N

0 0.75 1.5
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NORTH CAROLINA
Turnpike Authority

STIP PROJECT
NO. R-3329/R-2559

Mecklenburg County and Union County

MONROE CONNECTOR / BYPASS

PREFERRED ALTERNATIVE DSA D

Figure 2-1

from Final EIS

PrefAltDSADStylizedMapTitleBlock.ai AKH 12.19.09

APPENDIX D
UPDATED CENSUS TABLES

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ATKINS

MEMORANDUM

To: File
From: Jenny Noonkester
CC: Christy Shumate, HNTB
Date: October 9, 2012
Re: Updated Census Tables for Monroe Connector/Bypass (STIP No. R-3329/R-2559)

The purpose of this memo is to provide updated demographic tables for the Monroe Connector/Bypass project based on information from the 2010 Census and the American Community Survey five-year estimates (2006-2010). These tables support the updated community characteristics information presented in the updated environmental document for the project.

TABLE 1. Population

2000 Block Group	2010 Block Group	2000 Population	2010 Population	Difference	Percent Change 2000-2010
Union County		**123,677**	**201,292**	**77,615**	**62.8%**
CT 202.02 BG 1	CT 202.02 BG 1	1,800	1,908	108	6.0%
CT 202.02 BG 2	CT 202.02 BG 2	1,279	1,544	265	20.7%
CT 202.02 BG 3	CT 202.02 BG 3	870	985	115	13.2%
CT 203.02 BG 1	CT 203.05 BG 1 CT 203.05 BG 2 CT 203.06 BG 1 CT 203.06 BG 2 CT 203.06 BG 3	4,377	11,339	6,962	159.1%
CT 203.02 BG 2	CT 203.07 BG 1 CT 203.07 BG 2 CT 203.07 BG 3	2,855	6,693	3,838	134.4%
CT 203.03 BG 2	CT 203.10 BG 1 CT 203.10 BG 2 CT 203.10 BG 3	2,251	5,248	2,997	133.1%
CT 203.03 BG 3	CT 203.11 BG 1 CT 203.11 BG 2 CT 203.11 BG 3	3,246	6,048	2,802	86.3%
CT 203.03 BG 4	CT 203.12 BG 1 CT 203.12 BG 2	3,601	4,279	678	18.8%
CT 203.04 BG 1	CT 203.13 BG 1	1,739	2,222	483	27.8%
CT 203.04 BG 2	CT 203.14 BG 1	1,615	4,703	3,088	191.2%

TABLE 1. Population

2000 Block Group	2010 Block Group	2000 Population	2010 Population	Difference	Percent Change 2000-2010
	CT 203.14 BG 2				
CT 203.04 BG 3	CT 203.15 BG 1 CT 203.15 BG 2	2,676	4,880	2,204	82.4%
CT 203.04 BG 4	CT 203.16 BG 1 CT 203.16 BG 2 CT 203.17 BG 1 CT 203.17 BG 2 CT 203.17 BG 3	2,597	9,710	7,113	273.9%
CT 204.01 BG 1	CT 204.01 BG 1	1,903	3,316	1,413	74.3%
CT 204.01 BG 2	CT 204.01 BG 2	2,226	2,644	418	18.8%
CT 204.02 BG 1	CT 204.04 BG 4	1,415	1,468	53	3.7%
CT 204.02 BG 2	CT 204.04 BG 3	1,104	1,088	(16)	-1.4%
CT 204.02 BG 3	CT 204.04 BG 2	1,541	2,072	531	34.5%
CT 204.02 BG 4	CT 204.03 BG 1 CT 204.03 BG 2 CT 204.03 BG 3	3,463	4,435	972	28.1%
CT 204.02 BG 5	CT 204.04 BG 1	2,118	2,030	(88)	-4.2%
CT 205 BG 1	CT 205.02 BG 1	1,537	1,759	222	14.4%
CT 205 BG 2	CT 205.01 BG 3	1,528	1,271	(257)	-16.8%
CT 205 BG 3	CT 205.01 BG 2	924	1,030	106	11.5%
CT 206 BG 1	CT 206.01 BG 1	2,939	2,703	(236)	-8.0%
CT 206 BG 2	CT 206.01 BG 2	1,556	1,556	-	0.0%
CT 206 BG 3	CT 206.02 BG 2	1,996	2,080	84	4.2%
CT 206 BG 4	CT 206.02 BG 1	2,554	2,608	54	2.1%
CT 206 BG 5	CT 206.01 BG 3	831	892	61	7.3%
CT 207 BG 1	CT 207.01 BG 1	1,398	1,727	329	23.5%
CT 207 BG 2	CT 207.01 BG 2	2,539	3,656	1,117	44.0%
CT 207 BG 3	CT 207.02 BG 1	1,695	1,921	226	13.3%
CT 207 BG 4	CT 207.02 BG 2	1,970	2,105	135	6.9%
CT 208 BG 2	CT 208 BG 2	867	879	12	1.4%
CT 208 BG 4	CT 208 BG 4	1,566	1,558	(8)	-0.5%
Mecklenburg County		**695,454**	**919,628**	**224,174**	**32.2%**
CT 57.09 BG 1	CT 57.09 BG 1 CT 57.09 BG 2	2,633	3,488	855	32.5%
CT 57.12 BG 1	CT 57.12 BG 1	2,041	2,089	48	2.4%
CT 57.12 BG 2	CT 57.12 BG 2	1,297	1,547	250	19.3%
CT 58.12 BG 2	CT 58.12 BG 2 CT 58.12 BG 3	2,362	3,978	1,616	68.4%

TABLE 1. Population

2000 Block Group	2010 Block Group	2000 Population	2010 Population	Difference	Percent Change 2000-2010
CT 58.14 BG 1	CT 58.34 BG 1	2,170	2,730	560	25.8%
CT 58.14 BG 2	CT 58.34 BG 2 CT 58.35 BG 1	3,391	3,914	523	15.4%
DSA Total		**80,470**	**120,103**	**39,633**	**49.3%**
North Carolina		8,049,313	9,535,483	1,486,170	18.5%

Source: US Census Bureau, 2000 Census and 2010 Census, Summary File 1, Table P1 and Table P001 "Total Population"

TABLE 2. Hispanic or Latino Origin

2010 Geography	Total Population	Hispanic		Non-Hispanic	
		#	%	#	%
Union County	**201,292**	**20,967**	**10.4%**	**180,325**	**89.6%**
CT 202.02 BG 1	1,908	56	2.9%	1,852	97.1%
CT 202.02 BG 2	1,544	45	2.9%	1,499	97.1%
CT 202.02 BG 3	985	30	3.0%	955	97.0%
CT 203.05 BG 1	2,157	103	4.8%	2,054	95.2%
CT 203.05 BG 2	2,499	140	5.6%	2,359	94.4%
CT 203.06 BG 1	2,689	318	11.8%	2,371	88.2%
CT 203.06 BG 2	1,377	646	46.9%	731	53.1%
CT 203.06 BG 3	2,617	495	18.9%	2,122	81.1%
CT 203.07 BG 1	2,281	332	14.6%	1,949	85.4%
CT 203.07 BG 2	3,003	318	10.6%	2,685	89.4%
CT 203.07 BG 3	1,409	160	11.4%	1,249	88.6%
CT 203.10 BG 1	1,859	34	1.8%	1,825	98.2%
CT 203.10 BG 2	1,276	78	6.1%	1,198	93.9%
CT 203.10 BG 3	2,113	259	12.3%	1,854	87.7%
CT 203.11 BG 1	967	69	7.1%	898	92.9%
CT 203.11 BG 2	2,515	168	6.7%	2,347	93.3%
CT 203.11 BG 3	2,566	119	4.6%	2,447	95.4%
CT 203.12 BG 1	2,237	259	11.6%	1,978	88.4%
CT 203.12 BG 2	2,042	271	13.3%	1,771	86.7%
CT 203.13 BG 1	2,222	123	5.5%	2,099	94.5%
CT 203.14 BG 1	2,716	260	9.6%	2,456	90.4%
CT 203.14 BG 2	1,987	127	6.4%	1,860	93.6%
CT 203.15 BG 1	2,712	83	3.1%	2,629	96.9%
CT 203.15 BG 2	2,168	108	5.0%	2,060	95.0%
CT 203.16 BG 1	1,784	149	8.4%	1,635	91.6%
CT 203.16 BG 2	2,573	145	5.6%	2,428	94.4%

TABLE 2. Hispanic or Latino Origin

2010 Geography	Total Population	Hispanic		Non-Hispanic	
		#	%	#	%
CT 203.17 BG 1	1,464	175	12.0%	1,289	88.0%
CT 203.17 BG 2	2,643	297	11.2%	2,346	88.8%
CT 203.17 BG 3	1,246	112	9.0%	1,134	91.0%
CT 204.01 BG 1	3,316	156	4.7%	3,160	95.3%
CT 204.01 BG 2	2,644	670	25.3%	1,974	74.7%
CT 204.03 BG 1	1,408	207	14.7%	1,201	85.3%
CT 204.03 BG 2	1,892	291	15.4%	1,601	84.6%
CT 204.03 BG 3	1,135	179	15.8%	956	84.2%
CT 204.04 BG 1	2,030	553	27.2%	1,477	72.8%
CT 204.04 BG 2	2,072	773	37.3%	1,299	62.7%
CT 204.04 BG 3	1,088	672	61.8%	416	38.2%
CT 204.04 BG 4	1,468	478	32.6%	990	67.4%
CT 205.01 BG 2	1,030	302	29.3%	728	70.7%
CT 205.01 BG 3	1,271	441	34.7%	830	65.3%
CT 205.02 BG 1	1,759	540	30.7%	1,219	69.3%
CT 206.01 BG 1	2,703	928	34.3%	1,775	65.7%
CT 206.01 BG 2	1,556	850	54.6%	706	45.4%
CT 206.01 BG 3	892	242	27.1%	650	72.9%
CT 206.02 BG 1	2,608	568	21.8%	2,040	78.2%
CT 206.02 BG 2	2,080	907	43.6%	1,173	56.4%
CT 207.01 BG 1	1,727	373	21.6%	1,354	78.4%
CT 207.01 BG 2	3,656	602	16.5%	3,054	83.5%
CT 207.02 BG 1	1,921	221	11.5%	1,700	88.5%
CT 207.02 BG 2	2,105	128	6.1%	1,977	93.9%
CT 208 BG 2	879	72	8.2%	807	91.8%
CT 208 BG 4	1,558	172	11.0%	1,386	89.0%
Mecklenburg County	**919,628**	**111,944**	**12.2%**	**807,684**	**87.8%**
CT 57.09 BG 1	1,506	117	7.8%	1,389	92.2%
CT 57.09 BG 2	1,982	231	11.7%	1,751	88.3%
CT 57.12 BG 1	2,089	156	7.5%	1,933	92.5%
CT 57.12 BG 2	1,547	60	3.9%	1,487	96.1%
CT 58.12 BG 2	2,590	282	10.9%	2,308	89.1%
CT 58.12 BG 3	1,388	188	13.5%	1,200	86.5%
CT 58.34 BG 1	2,730	150	5.5%	2,580	94.5%
CT 58.34 BG 2	1,282	58	4.5%	1,224	95.5%
CT 58.35 BG 1	2,632	85	3.2%	2,547	96.8%
DSA Total	**120,103**	**17,131**	**14.3%**	**102,972**	**85.7%**

Source: US Census Bureau, Census 2010, Summary File 1, Table P4 "Hispanic or Latino Origin"
NOTE: Shaded cells indicate block groups where the Hispanic or Latino percentage of the total population exceeds the respective county percentage by more than ten percentage points.

TABLE 3. Poverty

2010 Geography	Total Population	Below Poverty		Very Poor: Under 50% of Poverty Level		Near Poor: Between 100% and 150% of Poverty Level	
		#	%	#	%	#	%
Union County	**188,811**	**16,134**	**8.5%**	**5409**	**2.9%**	**14,403**	**7.6%**
CT 202.02 BG 1	1,841	79	4.3%	10	0.5%	115	6.2%
CT 202.02 BG 2	1,627	-	0.0%	0	0.0%	134	8.2%
CT 202.02 BG 3	902	11	1.2%	0	0.0%	119	13.2%
CT 203.05 BG 1	2,189	43	2.0%	5	0.2%	91	4.2%
CT 203.05 BG 2	1,406	8	0.6%	0	0.0%	270	19.2%
CT 203.06 BG 1	2,418	160	6.6%	16	0.7%	108	4.5%
CT 203.06 BG 2	1,269	77	6.1%	77	6.1%	284	22.4%
CT 203.06 BG 3	2,230	75	3.4%	0	0.0%	26	1.2%
CT 203.07 BG 1	1,966	113	5.7%	103	5.2%	283	14.4%
CT 203.07 BG 2	3,064	32	1.0%	22	0.7%	317	10.3%
CT 203.07 BG 3	1,160	100	8.6%	100	8.6%	55	4.7%
CT 203.10 BG 1	1,848	-	0.0%	0	0.0%	56	3.0%
CT 203.10 BG 2	933	31	3.3%	15	1.6%	115	12.3%
CT 203.10 BG 3	2,183	159	7.3%	10	0.5%	0	0.0%
CT 203.11 BG 1	1,223	-	0.0%	0	0.0%	21	1.7%
CT 203.11 BG 2	1,817	25	1.4%	10	0.6%	156	8.6%
CT 203.11 BG 3	2,332	43	1.8%	7	0.3%	66	2.8%
CT 203.12 BG 1	2,053	175	8.5%	162	7.9%	67	3.3%
CT 203.12 BG 2	2,136	152	7.1%	12	0.6%	242	11.3%
CT 203.13 BG 1	2,192	312	14.2%	15	0.7%	12	0.5%
CT 203.14 BG 1	2,829	137	4.8%	4	0.1%	358	12.7%
CT 203.14 BG 2	2,033	162	8.0%	68	3.3%	109	5.4%
CT 203.15 BG 1	1,972	20	1.0%	20	1.0%	52	2.6%
CT 203.15 BG 2	2,120	88	4.2%	22	1.0%	231	10.9%
CT 203.16 BG 1	1,672	311	18.6%	74	4.4%	71	4.2%
CT 203.16 BG 2	2,513	22	0.9%	22	0.9%	180	7.2%
CT 203.17 BG 1	1,481	92	6.2%	12	0.8%	199	13.4%
CT 203.17 BG 2	2,820	30	1.1%	0	0.0%	97	3.4%
CT 203.17 BG 3	764	16	2.1%	0	0.0%	0	0.0%
CT 204.01 BG 1	3,474	723	20.8%	166	4.8%	209	6.0%
CT 204.01 BG 2	2,426	433	17.8%	218	9.0%	297	12.2%
CT 204.03 BG 1	1,622	263	16.2%	242	14.9%	107	6.6%
CT 204.03 BG 2	2,035	178	8.7%	20	1.0%	0	0.0%

TABLE 3. Poverty

2010 Geography	Total Population	Below Poverty		Very Poor: Under 50% of Poverty Level		Near Poor: Between 100% and 150% of Poverty Level	
		#	%	#	%	#	%
CT 204.03 BG 3	1,227	141	11.5%	85	6.9%	232	18.9%
CT 204.04 BG 1	1,842	282	15.3%	22	1.2%	220	11.9%
CT 204.04 BG 2	1,668	583	35.0%	185	11.1%	242	14.5%
CT 204.04 BG 3	1,364	278	20.4%	31	2.3%	690	50.6%
CT 204.04 BG 4	1,247	538	43.1%	0	0.0%	66	5.3%
CT 205.01 BG 2	1,468	119	8.1%	29	2.0%	378	25.7%
CT 205.01 BG 3	791	40	5.1%	40	5.1%	15	1.9%
CT 205.02 BG 1	1,366	448	32.8%	198	14.5%	109	8.0%
CT 206.01 BG 1	3,150	836	26.5%	458	14.5%	256	8.1%
CT 206.01 BG 2	898	230	25.6%	20	2.2%	286	31.8%
CT 206.01 BG 3	775	315	40.6%	0	0.0%	33	4.3%
CT 206.02 BG 1	2,643	299	11.3%	56	2.1%	271	10.3%
CT 206.02 BG 2	2,049	689	33.6%	67	3.3%	158	7.7%
CT 207.01 BG 1	2,220	138	6.2%	50	2.3%	482	21.7%
CT 207.01 BG 2	2,733	376	13.8%	79	2.9%	506	18.5%
CT 207.02 BG 1	1,756	553	31.5%	203	11.6%	215	12.2%
CT 207.02 BG 2	2,093	295	14.1%	202	9.7%	247	11.8%
CT 208 BG 2	778	28	3.6%	28	3.6%	21	2.7%
CT 208 BG 4	1,625	267	16.4%	82	5.0%	104	6.4%
Mecklenburg County	**867,122**	**108,296**	**12.5%**	**47,546**	**5.5%**	**71,364**	**8.2%**
CT 57.09 BG 1	1,680	40	2.4%	13	0.8%	46	2.7%
CT 57.09 BG 2	1,563	232	14.8%	15	1.0%	10	0.6%
CT 57.12 BG 1	2,087	102	4.9%	56	2.7%	18	0.9%
CT 57.12 BG 2	1,961	233	11.9%	0	0.0%	0	0.0%
CT 58.12 BG 2	1,325	94	7.1%	18	1.4%	75	5.7%
CT 58.12 BG 3	1,281	161	12.6%	108	8.4%	16	1.2%
CT 58.34 BG 1	2,740	338	12.3%	118	4.3%	73	2.7%
CT 58.34 BG 2	1,221	92	7.5%	13	1.1%	71	5.8%
CT 58.35 BG 1	2,888	109	3.8%	76	2.6%	10	0.3%
DSA Total	**112,989**	**11,926**	**10.6%**	**3,684**	**3.3%**	**9,297**	**8.2%**

Source: US Census Bureau, American Community Survey 5-Year Estimates (2006-2010), Table 17002 "Ratio of Poverty to Income in the Past 12 Months"

NOTE: Shaded cells indicate block groups where the percentage of the total population in that income category exceeds the respective county percentage by more than ten percentage points.

TABLE 4. Race

2010 Geography	Total Population	White		Black or African American		American Indian & Alaska Native		Asian		Native Hawaiian/ Pacific Islander		Some Other Race		Two or More Races		Total Non-White	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Union County	**201,292**	**158,954**	**79.0%**	**23,558**	**11.7%**	**815**	**0.4%**	**3,271**	**1.6%**	**63**	**0.0%**	**10,760**	**5.3%**	**3,871**	**1.9%**	**42,338**	**21.0%**
CT 202.02 BG 1	1,908	1,815	95.1%	28	1.5%	9	0.5%	10	0.5%	1	0.1%	19	1.0%	26	1.4%	93	4.9%
CT 202.02 BG 2	1,544	1,371	88.8%	133	8.6%	7	0.5%	12	0.8%	1	0.1%	4	0.3%	16	1.0%	173	11.2%
CT 202.02 BG 3	985	940	95.4%	6	0.6%	4	0.4%	3	0.3%	0	0.0%	23	2.3%	9	0.9%	45	4.6%
CT 203.05 BG 1	2,157	1,883	87.3%	147	6.8%	15	0.7%	46	2.1%	0	0.0%	42	1.9%	24	1.1%	274	12.7%
CT 203.05 BG 2	2,499	2,184	87.4%	180	7.2%	12	0.5%	40	1.6%	0	0.0%	26	1.0%	57	2.3%	315	12.6%
CT 203.06 BG 1	2,689	2,086	77.6%	319	11.9%	17	0.6%	58	2.2%	1	0.0%	133	4.9%	75	2.8%	603	22.4%
CT 203.06 BG 2	1,377	839	60.9%	81	5.9%	7	0.5%	27	2.0%	0	0.0%	401	29.1%	22	1.6%	538	39.1%
CT 203.06 BG 3	2,617	1,794	68.6%	455	17.4%	13	0.5%	26	1.0%	1	0.0%	239	9.1%	89	3.4%	823	31.4%
CT 203.07 BG 1	2,281	1,755	76.9%	318	13.9%	7	0.3%	18	0.8%	0	0.0%	127	5.6%	56	2.5%	526	23.1%
CT 203.07 BG 2	3,003	2,449	81.6%	339	11.3%	16	0.5%	57	1.9%	1	0.0%	82	2.7%	59	2.0%	554	18.4%
CT 203.07 BG 3	1,409	1,142	81.1%	153	10.9%	5	0.4%	22	1.6%	1	0.1%	44	3.1%	42	3.0%	267	18.9%
CT 203.10 BG 1	1,859	1,718	92.4%	80	4.3%	4	0.2%	29	1.6%	0	0.0%	15	0.8%	13	0.7%	141	7.6%
CT 203.10 BG 2	1,276	1,069	83.8%	109	8.5%	10	0.8%	28	2.2%	0	0.0%	45	3.5%	15	1.2%	207	16.2%
CT 203.10 BG 3	2,113	1,626	77.0%	320	15.1%	10	0.5%	56	2.7%	1	0.0%	50	2.4%	50	2.4%	487	23.0%
CT 203.11 BG 1	967	839	86.8%	52	5.4%	3	0.3%	30	3.1%	0	0.0%	17	1.8%	26	2.7%	128	13.2%
CT 203.11 BG 2	2,515	2,116	84.1%	174	6.9%	11	0.4%	84	3.3%	0	0.0%	72	2.9%	58	2.3%	399	15.9%
CT 203.11 BG 3	2,566	2,248	87.6%	184	7.2%	15	0.6%	40	1.6%	0	0.0%	31	1.2%	48	1.9%	318	12.4%
CT 203.12 BG 1	2,237	1,862	83.2%	160	7.2%	22	1.0%	11	0.5%	0	0.0%	137	6.1%	45	2.0%	375	16.8%
CT 203.12 BG 2	2,042	1,510	73.9%	277	13.6%	21	1.0%	27	1.3%	0	0.0%	144	7.1%	63	3.1%	532	26.1%
CT 203.13 BG 1	2,222	1,947	87.6%	108	4.9%	19	0.9%	47	2.1%	0	0.0%	52	2.3%	49	2.2%	275	12.4%
CT 203.14 BG 1	2,716	2,187	80.5%	317	11.7%	12	0.4%	83	3.1%	1	0.0%	42	1.5%	74	2.7%	529	19.5%
CT 203.14 BG 2	1,987	1,759	88.5%	90	4.5%	22	1.1%	16	0.8%	3	0.2%	59	3.0%	38	1.9%	228	11.5%
CT 203.15 BG 1	2,712	2,391	88.2%	153	5.6%	5	0.2%	80	2.9%	0	0.0%	33	1.2%	50	1.8%	321	11.8%
CT 203.15 BG 2	2,168	1,933	89.2%	96	4.4%	14	0.6%	45	2.1%	2	0.1%	34	1.6%	44	2.0%	235	10.8%
CT 203.16 BG 1	1,784	1,536	86.1%	139	7.8%	12	0.7%	27	1.5%	0	0.0%	50	2.8%	20	1.1%	248	13.9%
CT 203.16 BG 2	2,573	2,246	87.3%	197	7.7%	7	0.3%	43	1.7%	1	0.0%	42	1.6%	37	1.4%	327	12.7%
CT 203.17 BG 1	1,464	1,042	71.2%	285	19.5%	5	0.3%	24	1.6%	0	0.0%	67	4.6%	41	2.8%	422	28.8%
CT 203.17 BG 2	2,643	2,014	76.2%	411	15.6%	8	0.3%	79	3.0%	0	0.0%	65	2.5%	66	2.5%	629	23.8%
CT 203.17 BG 3	1,246	1,032	82.8%	107	8.6%	5	0.4%	15	1.2%	3	0.2%	40	3.2%	44	3.5%	214	17.2%
CT 204.01 BG 1	3,316	2,759	83.2%	347	10.5%	14	0.4%	79	2.4%	0	0.0%	67	2.0%	50	1.5%	557	16.8%
CT 204.01 BG 2	2,644	1,832	69.3%	344	13.0%	31	1.2%	43	1.6%	2	0.1%	346	13.1%	46	1.7%	812	30.7%
CT 204.03 BG 1	1,408	1,121	79.6%	146	10.4%	12	0.9%	9	0.6%	2	0.1%	92	6.5%	26	1.8%	287	20.4%
CT 204.03 BG 2	1,892	1,394	73.7%	244	12.9%	12	0.6%	16	0.8%	0	0.0%	190	10.0%	36	1.9%	498	26.3%
CT 204.03 BG 3	1,135	834	73.5%	172	15.2%	8	0.7%	8	0.7%	0	0.0%	92	8.1%	21	1.9%	301	26.5%
CT 204.04 BG 1	2,030	1,286	63.3%	330	16.3%	20	1.0%	24	1.2%	0	0.0%	319	15.7%	51	2.5%	744	36.7%
CT 204.04 BG 2	2,072	759	36.6%	667	32.2%	12	0.6%	42	2.0%	0	0.0%	527	25.4%	65	3.1%	1,313	63.4%

TABLE 4. Race

2010 Geography	Total Population	White		Black or African American		American Indian & Alaska Native		Asian		Native Hawaiian/ Pacific Islander		Some Other Race		Two or More Races		Total Non-White	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
CT 204.04 BG 3	1,088	344	31.6%	230	21.1%	10	0.9%	1	0.1%	0	0.0%	468	43.0%	35	3.2%	744	68.4%
CT 204.04 BG 4	1,468	199	13.6%	862	58.7%	10	0.7%	0	0.0%	1	0.1%	373	25.4%	23	1.6%	1,269	86.4%
CT 205.01 BG 2	1,030	350	34.0%	406	39.4%	2	0.2%	9	0.9%	0	0.0%	237	23.0%	26	2.5%	680	66.0%
CT 205.01 BG 3	1,271	530	41.7%	364	28.6%	11	0.9%	5	0.4%	3	0.2%	309	24.3%	49	3.9%	741	58.3%
CT 205.02 BG 1	1,759	686	39.0%	679	38.6%	10	0.6%	3	0.2%	0	0.0%	339	19.3%	42	2.4%	1,073	61.0%
CT 206.01 BG 1	2,703	1,406	52.0%	539	19.9%	3	0.1%	22	0.8%	0	0.0%	650	24.0%	83	3.1%	1,297	48.0%
CT 206.01 BG 2	1,556	374	24.0%	564	36.2%	17	1.1%	0	0.0%	0	0.0%	540	34.7%	61	3.9%	1,182	76.0%
CT 206.01 BG 3	892	395	44.3%	324	36.3%	1	0.1%	10	1.1%	0	0.0%	136	15.2%	26	2.9%	497	55.7%
CT 206.02 BG 1	2,608	1,753	67.2%	457	17.5%	5	0.2%	19	0.7%	0	0.0%	322	12.3%	52	2.0%	855	32.8%
CT 206.02 BG 2	2,080	730	35.1%	712	34.2%	16	0.8%	3	0.1%	0	0.0%	589	28.3%	30	1.4%	1,350	64.9%
CT 207.01 BG 1	1,727	1,005	58.2%	468	27.1%	4	0.2%	6	0.3%	0	0.0%	226	13.1%	18	1.0%	722	41.8%
CT 207.01 BG 2	3,656	2,002	54.8%	1,128	30.9%	14	0.4%	33	0.9%	3	0.1%	400	10.9%	76	2.1%	1,654	45.2%
CT 207.02 BG 1	1,921	940	48.9%	796	41.4%	7	0.4%	5	0.3%	0	0.0%	148	7.7%	25	1.3%	981	51.1%
CT 207.02 BG 2	2,105	1,825	86.7%	158	7.5%	18	0.9%	10	0.5%	0	0.0%	60	2.9%	34	1.6%	280	13.3%
CT 208 BG 2	879	478	54.4%	362	41.2%	2	0.2%	0	0.0%	0	0.0%	31	3.5%	6	0.7%	401	45.6%
CT 208 BG 4	1,558	849	54.5%	601	38.6%	14	0.9%	4	0.3%	0	0.0%	69	4.4%	21	1.3%	709	45.5%
Mecklenburg County	**919,628**	**508,946**	**55.3%**	**282,804**	**30.8%**	**4261**	**0.5%**	**42,352**	**4.6%**	**668**	**0.1%**	**57,113**	**6.2%**	**23,484**	**2.6%**	**410,682**	**44.7%**
CT 57.09 BG 1	1,506	1,218	80.9%	123	8.2%	5	0.3%	70	4.6%	0	0.0%	57	3.8%	33	2.2%	288	19.1%
CT 57.09 BG 2	1,982	1,476	74.5%	253	12.8%	5	0.3%	86	4.3%	1	0.1%	101	5.1%	60	3.0%	506	25.5%
CT 57.12 BG 1	2,089	1,807	86.5%	146	7.0%	5	0.2%	24	1.1%	2	0.1%	62	3.0%	43	2.1%	282	13.5%
CT 57.12 BG 2	1,547	1,353	87.5%	98	6.3%	8	0.5%	32	2.1%	0	0.0%	38	2.5%	18	1.2%	194	12.5%
CT 58.12 BG 2	2,590	1,663	64.2%	578	22.3%	15	0.6%	155	6.0%	0	0.0%	115	4.4%	64	2.5%	927	35.8%
CT 58.12 BG 3	1,388	592	42.7%	566	40.8%	11	0.8%	36	2.6%	4	0.3%	118	8.5%	61	4.4%	796	57.3%
CT 58.34 BG 1	2,730	2,051	75.1%	352	12.9%	4	0.1%	176	6.4%	5	0.2%	71	2.6%	71	2.6%	679	24.9%
CT 58.34 BG 2	1,282	987	77.0%	151	11.8%	3	0.2%	115	9.0%	1	0.1%	12	0.9%	13	1.0%	295	23.0%
CT 58.35 BG 1	2,632	2,376	90.3%	108	4.1%	28	1.1%	63	2.4%	0	0.0%	11	0.4%	46	1.7%	256	9.7%
DSA Total	**120,103**	**86,707**	**72.2%**	**18,693**	**15.6%**	**654**	**0.5%**	**2,191**	**1.8%**	**41**	**0.0%**	**9,250**	**7.7%**	**2,567**	**2.1%**	**33,396**	**27.8%**

Source: US Census Bureau, Census 2010, Summary File 1, Table P3 “Race”

NOTE: Shaded cells indicate block groups where the percentage of the total population made up of a particular race exceeds the respective county percentage by more than ten percentage points.

TABLE 5. Populations with Limited English Proficiency

Geography	Total Adult Population	Adult Population that Speaks English less than Very Well							
		Spanish		Other Indo-European		Asian/Pacific		Other	
		#	%	#	%	#	%	#	%
CT 202.02 BG 1	1,476	45	3.0%	0	0.0%	0	0.0%	0	0.0%
CT 202.02 BG 2	956	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 202.02 BG 3	794	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 203.05 BG 1	1,555	2	0.1%	87	5.6%	3	0.2%	0	0.0%
CT 203.05 BG 2	1,003	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 203.06 BG 1	1,673	27	1.6%	33	2.0%	0	0.0%	14	0.8%
CT 203.06 BG 2	842	62	7.4%	0	0.0%	27	3.2%	0	0.0%
CT 203.06 BG 3	1,432	105	7.3%	0	0.0%	0	0.0%	0	0.0%
CT 203.07 BG 1	1,315	99	7.5%	0	0.0%	0	0.0%	0	0.0%
CT 203.07 BG 2	2,031	28	1.4%	10	0.5%	0	0.0%	0	0.0%
CT 203.07 BG 3	801	48	6.0%	20	2.5%	13	1.6%	0	0.0%
CT 203.10 BG 1	1,325	0	0.0%	29	2.2%	0	0.0%	0	0.0%
CT 203.10 BG 2	670	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 203.10 BG 3	1,325	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 203.11 BG 1	889	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 203.11 BG 2	1,338	59	4.4%	0	0.0%	21	1.6%	0	0.0%
CT 203.11 BG 3	1,559	4	0.3%	18	1.2%	5	0.3%	0	0.0%
CT 203.12 BG 1	1,639	127	7.7%	0	0.0%	10	0.6%	0	0.0%
CT 203.12 BG 2	1,357	15	1.1%	15	1.1%	20	1.5%	0	0.0%
CT 203.13 BG 1	1,476	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 203.14 BG 1	2,052	19	0.9%	49	2.4%	0	0.0%	0	0.0%
CT 203.14 BG 2	1,422	90	6.3%	53	3.7%	0	0.0%	0	0.0%
CT 203.15 BG 1	1,234	10	0.8%	0	0.0%	0	0.0%	0	0.0%
CT 203.15 BG 2	1,605	89	5.5%	0	0.0%	0	0.0%	0	0.0%
CT 203.16 BG 1	1,197	88	7.4%	48	4.0%	0	0.0%	0	0.0%
CT 203.16 BG 2	1,589	29	1.8%	0	0.0%	0	0.0%	0	0.0%
CT 203.17 BG 1	939	48	5.1%	66	7.0%	0	0.0%	0	0.0%
CT 203.17 BG 2	1,762	80	4.5%	0	0.0%	0	0.0%	0	0.0%
CT 203.17 BG 3	561	0	0.0%	39	7.0%	0	0.0%	0	0.0%
CT 204.01 BG 1	2,554	114	4.5%	0	0.0%	7	0.3%	0	0.0%
CT 204.01 BG 2	1,903	302	15.9%	0	0.0%	6	0.3%	0	0.0%
CT 204.03 BG 1	1,218	124	10.2%	0	0.0%	0	0.0%	0	0.0%
CT 204.03 BG 2	1,456	0	0.0%	20	1.4%	0	0.0%	0	0.0%
CT 204.03 BG 3	873	34	3.9%	0	0.0%	43	4.9%	0	0.0%
CT 204.04 BG 1	1,484	241	16.2%	0	0.0%	0	0.0%	0	0.0%
CT 204.04 BG 2	1,324	193	14.6%	32	2.4%	17	1.3%	0	0.0%
CT 204.04 BG 3	812	403	49.6%	44	5.4%	0	0.0%	0	0.0%
CT 204.04 BG 4	708	203	28.7%	0	0.0%	0	0.0%	0	0.0%
CT 205.01 BG 2	1,021	424	41.5%	0	0.0%	0	0.0%	0	0.0%
CT 205.01 BG 3	679	104	15.3%	0	0.0%	0	0.0%	0	0.0%
CT 205.02 BG 1	982	61	6.2%	0	0.0%	0	0.0%	0	0.0%
CT 206.01 BG 1	2,469	869	35.2%	24	1.0%	0	0.0%	0	0.0%
CT 206.01 BG 2	735	130	17.7%	0	0.0%	0	0.0%	0	0.0%
CT 206.01 BG 3	590	96	16.3%	0	0.0%	0	0.0%	0	0.0%
CT 206.02 BG 1	2,315	368	15.9%	0	0.0%	0	0.0%	0	0.0%
CT 206.02 BG 2	1,419	184	13.0%	0	0.0%	0	0.0%	0	0.0%
CT 207.01 BG 1	1,361	66	4.8%	0	0.0%	0	0.0%	0	0.0%
CT 207.01 BG 2	2,285	173	7.6%	30	1.3%	0	0.0%	0	0.0%
CT 207.02 BG 1	1,677	82	4.9%	0	0.0%	0	0.0%	0	0.0%
CT 207.02 BG 2	1,491	62	4.2%	0	0.0%	0	0.0%	0	0.0%
CT 208 BG 2	820	62	7.6%	0	0.0%	0	0.0%	0	0.0%
CT 208 BG 4	1,255	118	9.4%	0	0.0%	0	0.0%	0	0.0%
CT 57.09 BG 1	1,378	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT 57.09 BG 2	1,140	28	2.5%	12	1.1%	0	0.0%	0	0.0%
CT 57.12 BG 1	1,604	9	0.6%	0	0.0%	0	0.0%	0	0.0%
CT 57.12 BG 2	1,450	3	0.2%	8	0.6%	102	7.0%	0	0.0%
CT 58.12 BG 2	1,196	0	0.0%	28	2.3%	10	0.8%	0	0.0%
CT 58.12 BG 3	1,067	37	3.5%	0	0.0%	0	0.0%	0	0.0%
CT 58.34 BG 1	1,822	0	0.0%	36	2.0%	39	2.1%	0	0.0%
CT 58.34 BG 2	924	36	3.9%	0	0.0%	31	3.4%	0	0.0%
CT 58.35 BG 1	2,042	0	0.0%	0	0.0%	0	0.0%	8	0.4%
DSA Total	**81,871**	**5,600**	**6.8%**	**701**	**0.9%**	**354**	**0.4%**	**22**	**0.0%**

Source: American Community Survey 5-Year Estimates (2006-2010), Table B16004
NOTE: The DSA includes a Spanish-speaking LEP population that exceeds the US Department of Justice's Safe Harbor threshold of 1,000 people or 5% of the total adult population that speak English less than very well. In addition, the shaded block groups in the table indicate Block Groups with more than 50 LEP persons in language groups other than Spanish.

APPENDIX E

UPDATED ICE TECHNICAL REPORT

ORGANIZATION OF APPENDIX E

E-1. Updated ICE Technical Report

E-2. Supporting Documentation Referenced in the ICE Technical Report

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APPENDIX E-1
UPDATED ICE TECHNICAL REPORT

NOTE: This appendix includes only the main body of the report. The maps and appendices for the *Indirect and Cumulative Effects Quantitative Analysis Update* (Michel Baker Engineering, Inc., November 2013) are provided on a CD inside the back cover of Volume 2 of this Draft Supplemental Final EIS, and are also available on the project Web site (www.ncdot.gov/projects/monroeconnector).

Appendices noted above as being included on a CD are included in the PDF file:

Monroe C_B DSFEIS11_08_13 Vol 2 App E support docs.pdf

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Monroe Connector/Bypass
(R-3329/R-2559)

Indirect and Cumulative Effects
Quantitative Analysis Update

Prepared for the North Carolina Turnpike Authority

NORTH CAROLINA
Turnpike Authority

A Division of North Carolina Department of Transportation

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EXECUTIVE SUMMARY

E.1 Why Was This Report Developed?

The North Carolina Department of Transportation (NCDOT) and the Federal Highway Administration (FHWA) developed this report to update the indirect and cumulative effects analysis for the Monroe Connector/Bypass (the project). The FHWA rescinded its Record of Decision (ROD) for the project on July 3, 2012. This action was in response to the decision of the United States Court of Appeals for the Fourth Circuit to vacate the United States District Court decision in *NC Wildlife Federation v NCDOT* and remand the decision for further review and analysis by the agencies.[1]

Since that time, the NCDOT and the FHWA have conducted additional research, investigation and analysis on the potential indirect and cumulative effects on land use and water quality in the project area. The NCDOT and the FHWA published this report to update the quantitative indirect and cumulative effects analysis for Land Use (Quantitative ICE) and to determine whether a quantitative indirect and cumulative effects water quality analysis (WQA) included in the Final Environmental Impact Statement (FEIS) as Appendix H remains appropriate.

What Did We Do to Update the Quantitative ICE?

The scope of the work for the update of the quantitative ICE generally included the following activities.

1. We reviewed conditions and trends in the study area and updated the baseline land use data (Sections 1.0 and 2.0)
2. We reviewed the regional travel demand model socioeconomic projections, developed for the Mecklenburg-Union Metropolitan Planning Organization (MUMPO), including how other studies have used the projections, and determined the most appropriate data set for the ICE analysis of future land use (Section 3.0)
3. We developed the future No-Build and Build land use scenarios and thoroughly explained the methods used to estimate induced growth (Section 4.0)
4. We reported revised induced growth results and conclusions based on the updated land use scenarios (Section 5.0)
5. We review measures that localities and others could adopt to minimize any impacts of future development, whether induced or not, on sensitive environmental resources (Section 6.0).

This report summarizes the conclusions reached in the evaluation of ICE and describes the data collected, methodologies used and analysis conducted for the ICE for the project. This document also re-evaluates and considers data, analytical research relevant to the project area, and new information relevant to the analysis of the indirect and cumulative effect on land use, water quality, and federally designated threatened and endangered species and their critical habitat in the surrounding area. Since the Carolina heelsplitter (federally protected freshwater mussel) lives in two watersheds in the study area, water quality is a major focus area of this analysis. Thus, we report results for both the overall study area and at the watershed level.

How Did We Update the Study Area Land Use Data?

In reviewing conditions in the study area, the study team analyzed the following:

[1] NC Wildlife Federation v NCDOT, US Court of Appeals for the 4th Circuit, May 3, 2012, p 15

- We conducted new interviews with local planners
- We incorporated the 2010 Census and reviewed and analyzed growth trends and conditions in the study area
- We identified and incorporated new, reasonably foreseeable proposed or approved development activity
- We reviewed new planning documents (such as new land use plans and new capital improvement plans) and identified differences in future growth plans and related infrastructure.

The additional research found some changes in existing land uses and some updates to future expectations of land use change and development. Overall, the evidence strongly indicates that Union County has a history of relatively fast growth and continues to exhibit factors that would continue to encourage growth rates that exceed the regional average regardless of whether the proposed project is completed.

E.2 How Was Existing Land Use Modeled for this Study?

Existing land use was modeled using a combination of parcel-level GIS data from Mecklenburg and Union Counties, raster (image) format GIS data describing undeveloped land cover and a cross check against aerial imagery (as described in Section 2). These sources were combined to model the land uses in the study area in a land cover raster image. Given the age of various data sources available, the most recent date to which the existing land use could be reasonably updated is 2010.

E.3 How Did We Estimate Future Growth?

Several different agencies and organizations forecast or project growth in North Carolina to the county level. Federal law requires every MPO to estimate the long-term travel needs of their respective regions in their Metropolitan Transportation Plans (MTP). Most MPOs must also assess the air quality impacts of their MTPs for compliance with the Clean Air Act. Thus, MPOs develop future demographic projections (including employment and households) for small geographic units called traffic analysis zones (TAZs). These projections typically consider projections from other state and federal agencies and private organizations. As noted above, the Quantitative ICE analysis requires a data source that enables future projection of land use at a detailed geographic level. Since the MPOs projection process and future projections have been determined to be acceptable for complying with the Clean Air Act and other federal regulations, which includes a public review process, we consider them the best available and reasonable source for estimating future growth in the context of this ICE analysis. Furthermore, as described below, we conducted an in-depth review of the MPO projection process, the data origins and assumptions, and as necessary, tested assumptions regarding the Monroe Connector/Bypass in order to fully understand the appropriate use of the data.

E.4 How Were the MPO Socioeconomic Projections Developed?

MUMPO developed its latest projections in 2009 for use in its most recent (2035) Long-Range Transportation Plan (LRTP). These projections were developed using a spreadsheet workbook based model called a Land Use Allocation Model (LUSAM). The LUSAM model relied, in turn, on previous projections developed in 2005, by MUMPO and its regional partners at other surrounding MPOs and Rural Planning Organizations (RPOs). Those projections supported the 2030 LRTP.

The 2005 Projections (which were used in the 2030 LRTP) were developed through a process with three main components, a Top-Down projection, a Bottom-Up projection and input from an advisory group on the final projections. The development of the TAZ-level projections relied first on the Top-Down process to project future growth at the regional level and then allocate the regional growth to the county level. Dr. Thomas Hammer conducted the Top-Down analysis and his report, *Demographic and Economic Forecasts for the Charlotte Region* (Appendix H), documents his methodology and results. Dr. Hammer used a highly detailed, employment and earnings based model to estimate regional growth and then allocated that growth to counties based on detailed statistical relationships based on his research into 227 other counties in 29 other metropolitan areas across the eastern US.

A subsequent Bottom-Up process allocated the county-level growth to the TAZ level within each county. Different parts of the Metrolina region used different approaches to the Bottom-Up process, but for the MUMPO area, which included most of Union County, a process prepared by Paul Smith of UNC-Charlotte provided the initial allocation. Mr. Smith's report *Mecklenburg-Union Metropolitan Planning Organization Population Projections and Employment Allocations, 2000-2030* (Appendix I) documents his methodology and results. Mr. Smith's process focused on the household (and by default population) allocation and the allocation of population-chasing employment. Population-chasing employment is that employment associated with retail and services that tend to follow population growth. Non-population-chasing employment was distributed solely based on the input of staff and expert panel participants. Mr. Smith's allocation process started with the county-level control totals developed in the Top-Down process, existing baseline data (2000), and the influence of the of land development factors chosen and ranked by expert panels. Within Union County, there were eight land development factors used to assess the attractiveness and capacity of each TAZ in the county to draw future growth. As was the case with the Top-Down projections, the Bottom-Up steps used input from local planners and jurisdictional representatives to review and refine the projections prior to adoption.

Review of Metrolina Socioeconomic Projection Versions

We reviewed and analyzed the Metrolina Regional Travel Demand Model (MRM) Socioeconomic Projections and assessed them for use in the ICE analysis. The review included an assessment of the following factors.

1. We reviewed the various socioeconomic projection versions developed by the MPO and the assumptions upon which they rely.
2. We analyzed the specific methodology used with the Travel Time to Employment factor in the allocation of growth within Union County.
3. We re-evaluated the Travel Time to Employment factor where the Monroe Bypass/Connector was removed from the analysis.
4. We assessed other studies that have used or analyzed the MPO projections and the conclusions they have drawn about those projections and from those projections.

From 2003 to 2009, the Charlotte Department of Transportation (CDOT), the official custodian of the MRM, in cooperation with the Mecklenburg Union MPO (MUMPO) and other MPOs and Rural Planning Organizations (RPOs) in the region, developed various socioeconomic projections to input into the MRM in support of the MPO LRTP development. Table ES-1 summarizes these various projections and shows a timeline of the development of these projections.

We used the 2009 Projections for this Quantitative ICE analysis because MUMPO used this data set with its most recent transportation planning approvals and the June 2013 update of its LRTP. Although MUMPO is currently working on a new set of socioeconomic projections to support its 2040 LRTP, those projections are not anticipated to be complete or fully approved nor accepted for transportation conformity purposes until May, 2014 and therefore would be inappropriate to use in this analysis.

Table ES-1: MRM Socioeconomic Projections Versions

Projections Name	TAZ File Name	Projections Completed	Use for LRTP Conformity Determination	Associated Model Version	Base and Horizon Years
2009 Projections	SE_*Year*_091028	October 2009	MUMPO 2035 LRTP	MRM 09 v1.0 MRM 11 v1.0 MRM 11 v1.1	Base: 2005 Horizon: 2015, 2025, 2035
2008 Interim Projections	SE_*Year*_081119_ MUMPO_interim	November 2008		None	Base: 2005 Horizon: 2015, 2025, 2035
2008 Projections	SE_*Year*_081024	October 2008	RFATS 2035 LRTP	MRM 08 v1.0	Base: 2005 Horizon: 2015, 2025, 2035
2005 Projections	SE_*Year*_taz2934	May 2005	MUMPO 2030 LRTP	MRM 05 v1.0 MRM 06 v1.0 MRM 06 v1.1	Base: 2000 Horizon:2010, 2020, 2030

The 2009 Projections used a spreadsheet workbook modeling process (called the Land Use Allocation Model or LUSAM) that included a number of variables. A detailed analysis of those factors showed that none of the factors used to develop the projections were affected by the proposed project. In particular, the study team worked with CDOT and Paul Smith to reanalyze the Travel Time to Employment Factor used in the Bottom Up allocation process of the 2005 Projections which were used for the 2030 LRTP and which substantially provided the basis for the 2009 Projections. When Mr. Smith ran his original land use allocation models in 2004, his roadway network for his Travel Time to Employment Factor included the proposed project. When Mr. Smith reran his allocation models in July 2012, without the proposed project in his roadway network for that factor, the results were exactly the same as the original results.

Did the Monroe Connector/Bypass Influence the MPO Projections?

A detailed assessment of the MRM socioeconomic projections (see Section 3.2) reveals the following regarding the influence of the Monroe Connector/Bypass on the 2009 Projections:

- The proposed project did not affect the Travel Time to Core Employment factor in the LUSAM process, as this factor had zero weight for all districts for all LUSAM runs.[2]
- The proposed project did not affect the Planners' Judgment factor in the LUSAM process, as this factor had zero weight for all districts in Union County for all LUSAM runs.
- The proposed project was included in the Travel Time to Employment factor used by Paul Smith in developing the 2005 Projections, but a reassessment of that factor without the proposed project (as discussed in Section 3.2) shows that the project had no influence on the projection results.

[2] See Section 3.2 and Appendix A (CDOT Staff Communications) for detail on the LUSAM process and the reasoning for giving the Travel Time to Core Employment a weight of zero.

- The proposed project did not affect Dr. Hammer's projections of households and employment that were used in the 2005 Projections for county level control totals and were used in the 2008 Interim and 2009 Projections for developing the district level targets.
- There is no evidence or indication that any other factor in the LUSAM process or the other projection processes was influenced by the proposed project, and communications with CDOT and Union County planning staff indicate that the proposed project was not a consideration in development of the projections.
- A review of the distribution of projected households and employment relative to the proposed project location shows no signs that the proposed project influenced the projections.

Our analysis shows that the various models used to develop the MRM socioeconomic projections are insensitive to the presence or absence of the proposed project. We determined the methodology used by CDOT and MUMPO to develop the socioeconomic projections is effectively insensitive to any potential induced land use effects associated with the Monroe Bypass/Connector. Dr. Hammer states that he made specific adjustments to his projections for two large roadway projects (NC 16 in Lincoln County and the Garden Parkway but not the Monroe Connector/Bypass) in the Top-Down process that was used to develop total population and employment estimates. As the sensitivity analysis of Paul Smith's Travel Time to Employment Factor showed, the proposed project made no difference in the Bottom-Up allocation process. If our ICE analysis were to follow the exact same methodology used by MUMPO to calculate induced growth impacts of the Monroe Connector/Bypass then the result would be to find no induced growth, since the methodology would be blind to the accessibility impacts of the project. Therefore, we used other methodologies to estimate potential induced growth and induced land use changes associated with the proposed project as described in Section 4.

Are There Other Information Sources that Agree with the Assessment of the MPO Forecasts?

The North Carolina Turnpike Authority (NCTA) hired Wilbur Smith Associates (WSA) to conduct a preliminary and then final comprehensive traffic and revenue study for the proposed project. WSA, in consultation with NCTA, hired the Kenan Institute of Private Enterprise at the University of North Carolina's Kenan-Flagler Business School (Kenan Institute) in 2009 to develop a set of TAZ-level socioeconomic projections specifically for the project's Comprehensive Traffic and Revenue Study. The Kenan Institute reviewed the 2008 Interim Projections and made two adjustments to MUMPO's socioeconomic estimates. "The first was to make region-wide adjustments consistent with the national growth expectations (the 2008 economic adjustment). The second was to reallocate growth in Union County in line with development factors and constraints".[3]

Looking within the project corridor, the Kenan Institute accepted the allocation of growth by the MPO in Mecklenburg County. However, it reallocated the projected population growth within Union County away from the line of high growth in the southwest quadrant of the county to the Connector/Bypass corridor because of the project. The Kenan Institute also reallocated a portion of the expansion in several high growth TAZs in the northeastern quadrant of the county towards the corridor. The Kenan Institute made these adjustments based on results of interviews with local planners, analysis of growth trends in the area,

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[3] Appendix K p 29

and analysis of water and sewer demand and capacity in the area. Our analysis of the Kenan Institute adjustments to MUMPO's projections showed that the Kenan Institute reallocated about 1,800 households or about 3 percent of Union County growth towards the project corridor. Further analysis of the Kenan Institute adjustments to 2008 Interim Projections showed that the reallocation of growth was similar to the growth patterns in the DEIS Qualitative ICE.

How Did the Quantitative ICE Use the MPO Projections?

The preceding analysis of the MPO socioeconomic projections leads to the conclusion that, if we used MUMPO's land use models to evaluate future changes between the No-Build and Build scenarios, we would find no difference between the two. The conclusions of the Qualitative ICE and research into local expectations suggest that it is unlikely that there would be absolutely no difference in land use development conditions in the study area between a No-Build and Build Scenario. Therefore, we conducted an induced growth analysis to account for the potential environmental impacts of these potential land use changes. In our analysis of potential induced land use changes, we used the MPO socioeconomic projections as control totals along with local land use plans and other regulations, to develop a scenario without the project (hereafter referred to as the No-Build Scenario). We estimated the potential induced growth and induced land use changes associated with the proposed project and added that estimated induced growth to the No-Build land use scenario to create a new scenario that represents future conditions with the project and its growth-inducing impacts (i.e. the Build Scenario). This methodology was originally developed in consultation with the resource agencies and did not reallocate growth within the FLUSA, and is thus considered conservative in nature in that it might overestimate cumulative impacts since we did not reallocate growth between the No-Build and Build scenarios.

A reallocation approach might have resulted in shifting growth eastward in the study area by taking expected growth from the areas of northwestern and central Union County and shifting it eastward toward Wingate. This approach might have been reasonable as areas of eastern Union County will be relatively more accessible under a Build Scenario due to reduced travel times and therefore some growth that would have occurred in northwestern or central Union County under a No-Build Scenario would instead occur in eastern Union County. To err on the side of overestimating cumulative impacts, an additive approach was used where growth was added, over and above the No-Build Scenario, to create the Build Scenario without reallocation.

E.5 How Was Induced Growth Estimated?

We developed the No-Build Scenario using local zoning and land use plans to determine the total build-out capacity of the study area and then using the MPO projections as a control total (total population and total employment for the study area) for determining how much of that capacity would actually develop by 2030 (See Section 4.1 for details).

We developed the Build Scenario using a combination of the four analytical techniques.

1. We used a scenario writing approach to identify areas most likely to see induced growth based on planning information and interviews.
2. We conducted a build-out analysis to see which areas had the most capacity for induced growth.
3. We completed an accessibility analysis to see which areas would most benefit from the proposed project and thus be most likely to see induced growth.
4. We used a Hartgen Analysis to estimate potential commercial growth at interchange areas.

We combined these methods to estimate the likely induced development within the FLUSA and this induced development was then added to the No-Build Scenario to create a Build Scenario (See Section 4.2 for details). The accessibility analysis used to help determine land use effects associated with the project was based on the assumption of a "free" high-speed roadway. Since NCDOT intends to implement the project as a toll road or "priced" facility, it is possible that our results will represent a high range or conservative estimate of effects. A logical conclusion is that a toll captures some of the value that drivers' gain in shorter travel times and therefore the accessibility improvements of new, tolled facilities are less likely to encourage induced land use changes than a free facility might. Nevertheless, there is insufficient research on induced land use changes associated with tolled facilities to estimate how much tolling would reduce potential induced land use changes. Therefore, we have not adjusted our estimates to account for that factor.

In the research conducted for this ICE, two noteworthy proposals surfaced that the study team specifically considered for how those proposals might need to be addressed in the future land use scenarios. The study team investigated the proposed industrial park in eastern Union County, called Legacy Park. Based on interviews with Union County officials, CSX staff and researchers familiar with the proposal, the study team determined that the proposal was not reasonably foreseeable at this time and did not include any portion of the proposal in any future land use scenario (see Section 4.2 for details). Additionally, the study team reviewed the draft US 74 Revitalization Study and its recommendations for their potential impact to future land use scenarios. Since the study is still draft and has not been adopted and since the land use and other recommendations would result in minimal changes to the land use scenario results, the study team determined it was not reasonably foreseeable to incorporate the draft plan recommendations into any future land use scenario.

E.6 What Are the Results of the Updated ICE Analysis?

The following section outlines the updated results from the three updated scenarios, the 2010 Existing (Baseline), the 2030 No-Build, and the 2030 Build scenario. As with any attempt to project the future, the accuracy of these results for future years is problematic as the typical error range for long-range forecasting of households and employment is upward of 25 percent (see Section 3.5 for details). Thus, one should interpret the future year results as the best estimate within a wide range of potential error. Table ES-2 shows the results of all updated land use scenarios. Map 3 illustrates the updates to the 2010 Baseline Land Use. Map 16 illustrates the results of the updated No-Build Scenario. Map 17 illustrates the results of the updated Build Scenario.

Table ES-2: Updated Land Use Scenario Results

Land Use	Updated Baseline (2010)		Updated 2030 No-Build			Updated 2030 Build		
	Total Area (acres)	% of Total Area	Total Area (acres)	% of Total Area	Change in % from Baseline	Total Area (acres)	% of Total Area	Change in % from No-Build
Total Residential	71,500	35%	97,900	48%	13%	99,700	49%	1%
Low Density	*55,600*	*28%*	*79,500*	*40%*	*12%*	*80,600*	*40%*	*0%*
Medium Density	*12,900*	*6%*	*14,900*	*7%*	*1%*	*15,600*	*8%*	*1%*
High Density	*3,100*	*2%*	*3,500*	*2%*	*0%*	*3,500*	*2%*	*0%*
Commercial	3,900	2%	5,600	3%	1%	5,900	3%	0%
Industrial/Office/Institutional	7,100	4%	8,700	4%	1%	8,800	4%	0%
Transportation	12,700	6%	12,800	6%	0%	13,900	7%	1%
Total Developed	**95,200**	**47%**	**125,000**	**62%**	15%	**128,200**	**63%**	**2%**
Total Agricultural	**52,900**	**26%**	**37,500**	**19%**	-8%	**35,500**	**18%**	**-1%**
Total Forested	**51,900**	**26%**	**37,700**	**19%**	-7%	**36,500**	**18%**	**-1%**
Total Other	**1,900**	**1%**	**1,800**	**1%**	0%	1,800	1%	**0%**
TOTAL	**202,000**	**100%**	**202,000**	**100%**	0%	**202,000**	**100%**	**0%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

We calculated impervious surface based on the National Resource Conservation Service (NRCS) (formally the Soil Conservation Service) TR-55 Manual guidance for impervious surface levels by land use category. We compared the impervious surface results to the results of the prior Quantitative ICE analysis to determine whether additional water quality modeling might be needed. Given how similar the updated results are, there appears to be little need for additional water quality modeling. The results for the Baseline, No-Build and Build Scenarios compared to the prior results are shown in Tables ES-3.

Table ES-3: Percent Impervious Cover Results from 2010 Report Compared to 2013 Report

Watershed Name	Impervious Cover Results from 2010 Report				Impervious Cover Results from 2013 Report				Difference in Change in Build from No-Build between 2010 Report and 2013 Report
	2007 Baseline	2030 No-Build	2030 Build	Change in Build from No-Build	2010 Baseline Updated	2030 No Build Updated	2030 Build Updated	Change in Build from No-Build	
Study Area	18%	22%	22%	0%	18%	22%	23%	1%	1%
Beaverdam Creek	6%	7%	7%	0%	6%	7%	7%	0%	0%
Richardson Creek (Upper)	14%	18%	18%	0%	14%	18%	18%	0%	0%
Rays Fork	12%	16%	17%	1%	12%	16%	17%	1%	0%
Bearskin Creek	24%	31%	31%	0%	24%	31%	31%	0%	0%
Richardson Creek (Middle)	23%	27%	29%	2%	23%	27%	30%	3%	1%
Gourdvine Creek	6%	8%	8%	0%	6%	8%	8%	0%	0%
Salem Creek	9%	13%	14%	1%	9%	13%	16%	3%	2%
Sixmile Creek	25%	30%	30%	0%	26%	31%	31%	0%	0%
Twelvemile Creek	22%	25%	25%	0%	22%	25%	25%	0%	0%
Richardson Creek (Lower)	10%	15%	16%	1%	10%	15%	17%	2%	1%
Stewarts Creek	15%	20%	22%	2%	15%	21%	23%	2%	0%
Fourmile Creek	32%	34%	34%	0%	32%	35%	35%	0%	0%
Crooked Creek	21%	25%	27%	2%	22%	26%	28%	2%	0%
Goose Creek	13%	17%	17%	0%	13%	18%	18%	0%	0%
Irvins Creek	35%	37%	37%	0%	35%	38%	38%	0%	0%
McAlpine Creek	36%	37%	37%	0%	36%	38%	38%	0%	0%
Bakers Branch	6%	8%	8%	0%	5%	8%	8%	0%	0%
Wide Mouth Branch	10%	12%	12%	0%	10%	12%	12%	0%	0%

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

E.7 What Are the Impacts Associated with the Results of the Analysis?

Indirect Impacts to Land Use and Impervious Surface

Land Use Impacts

All changes in land use within the entire study area from the Baseline to the Build are within two percent (i.e., between negative one percent and one percent) of the change that is predicted for the 2030 No-Build. Additional development (including direct and indirect effects) estimated to occur under the 2030 Build Scenario totals approximately 3,400 acres more, about 2 percent more than the total development expected under the 2030 No-Build. The indirect land use effects are modest, totaling about 2,300 acres of additional development, an increase of less than 2 percent over the No-Build and an increase in development of about 1 percent of the total land area within the study area. Incremental effects to agricultural and forested lands are a reduction of 2,000 and 1,200 acres respectively as a result of the additional developed land. The 2030 No-Build shows a 29 percent reduction in agricultural land compared to the 2010 Baseline, whereas the 2030 Build shows a 33 percent reduction. The 2030 No-

Build shows a 27 percent reduction in forested land compared to the 2010 Baseline, whereas the 2030 Build shows a 30 percent reduction. For both forested and agricultural land uses, the decrease equals a change of less than one percent of total land. Overall, while there are sizeable reductions in agricultural and forested lands, the indirect impacts are small and the cumulative impacts are minimal as the small additional loss does not create a substantial overall impact. It is likely that some portion of the household increase would shift within the study area and the remainder would shift from elsewhere in the greater metropolitan area. However, in an effort to estimate the environmental impacts for each watershed without underestimating them, no portion of this induced household growth has been subtracted from elsewhere in the study area.

Impervious Surface Impacts

Findings show the incremental effect of the 2030 Build Scenario will be a one percent increase in impervious surface throughout the study area as compared to the change predicted for the 2030 No-Build Scenario. This results in approximately 2,000 additional acres of impervious surface. With the 2030 Build Scenario, increases in percent impervious surface as compared to the change predicted for the 2030 No-Build are found in six of the 18 watersheds. These increases are between one and three percent. There is no difference in impervious surface resulting from direct or indirect effects in the Goose Creek or Sixmile Creek watersheds between the 2030 No-Build and 2030 Build scenarios.

Cumulative Impacts to Water Quality

As stated above, there are small differences in impervious surfaces associated with six of the 18 watersheds in the FLUSA. It is not anticipated that these, minor changes would alter the results of the previous water quality Quantitative ICE, as they are within the standard error of such analyses. For this reason, additional water quality modeling is not required.

Cumulative Impacts to Endangered Species

No measureable differences in impervious surface were found between the 2030 No-Build and 2030 Build within the Goose Creek or Sixmile Creek watersheds. Therefore, no indirect effects are anticipated on the species associated with the Monroe Connector/Bypass project. As there are no indirect effects anticipated, the project does not contribute an incremental effect that would yield potential cumulative effects. Potential direct effects are not anticipated, and are addressed in the Biological Assessment (BA) for the species. For the 2030 Build, findings indicate a four percent greater decrease of land exhibiting habitat characteristics that might support the Schweinitz's sunflower as compared to the change predicted for the 2030 No-Build based on results of this study. These reductions are likely an overestimate as the land categories included do not constitute actual habitat for the species and there will remain substantial areas available for species habitat under both No-Build and Build Scenarios. Therefore, no ICEs to the sunflower are expected. The BA provides more detail on direct and potential indirect and cumulative impacts.

Cumulative Impacts to Land Use and Farmland

The 2030 Build is predicted to have one percent additional conversion of land to development as compared to the conversion predicted with the No-Build scenario. The composition of the development is different between the Build and the No-Build scenarios. With the 2030 Build, there is more Low Density and Medium Density Residential, Commercial, and Industrial/Office/Institutional growth. The 2030 Build is predicted to convert 2,100 additional acres of agricultural land to low density residential or other developed uses. This represents one percent greater conversion than that predicted with the No-Build scenario for farmlands in the study area. While the raw decrease in farmland acreage seems sizeable, the vast majority of farmland loss will occur with or without the project. Therefore, the modest additional loss caused by the project does not constitute a cumulative effect.

Cumulative Impacts to Wildlife Habitat

Total Habitat Impacts

The 2030 Build is predicted to convert approximately three percent more undeveloped vegetated land in the study area as compared to that predicted for the No-Build scenario. These conversions are mostly concentrated in Salem Creek and Richardson Creek – Lower, with some lesser amounts scattered among Richardson Creek – Middle, Stewarts Creek and Crooked Creek. The incremental losses represent a maximum of 9 to 12 percent additional loss relative to the Baseline conditions for the three most affected watersheds.

Forest Fragmentation Impacts

The forest fragmentation analysis indicates that indirect impacts will be modest but that cumulative effects may be more substantial. Nevertheless, most of the cumulative effects are likely to occur with or without the proposed project.

Indirect and Cumulative Impacts to Traffic

Traffic levels with and without the induced land use impacts of the Monroe Connector were calculated to test the order-of-magnitude impact of induced land use on travel and congestion. Overall, these forecasted traffic levels indicate that the growth-induced impacts of the proposed project will add to the total volume of traffic in Union County and to the total vehicle miles traveled and vehicle hours traveled within the county, but the overall regional change in VMT is just one percent. Roads that connect to the Monroe Connector/Bypass will likely see some increases in traffic. Overall, however, the increases in traffic are modest and would not likely create substantial congestion issues within the design year of the project. In addition, under the Build Scenario, 2030 traffic on US 74 would decrease by approximately 20 percent relative to the No-Build Scenario with the induced growth and travel taken into account.

Consistency with Local Plans

Overall, the projected induced growth is consistent with local plans as most jurisdictions in the eastern portions of the FLUSA, which are likely to see the greatest induced growth, have recently developed planning documents or economic plans that anticipate the proposed project.

E.8 How Can Indirect and Cumulative Impacts Be Minimized or Avoided?

Cumulative effects occur because of decisions made not just by NCTA and FHWA, but also by other local, state and federal entities as well as private institutions and citizens. Separating, quantifying and minimizing and possibly avoiding the environmental effects from individual contributors continues to prove challenging and would require collaboration and coordination among the local governments within the study area along with the efforts of FHWA and NCDOT and other agencies.

First, one should note that the assumptions used in the methodology of this report and the reports summarized herein were generally designed to overestimate impacts to sensitive resources and water quality. Thus, the actual impacts in the future may be less than estimated here, as current and future regulations may prove more effective in reducing impacts from development than past regulations.

Nevertheless, cities, counties, towns and developers could do more to limit development impacts to water quality and other sensitive environmental resources. In an effort to promote the use of “nature friendly” growth management strategies, the North Carolina Wildlife Resources Commission (NCWRC) developed the Green Growth Toolbox.[4] The handbook for the toolbox document provides a background on green growth practices, offers tips on green planning, sample land use zoning ordinances, and provides examples of green growth projects. As discussed in Section 6, practices included in the Toolbox could reduce overall cumulative effects for development throughout North Carolina. The “Green Growth Toolbox” and LID techniques offer valuable tools for local governments and NCDOT to use for reducing cumulative effects to resources within the study area.

[4] NCWRC, 2012. http://www.ncwildlife.org/Conserving/Programs/GreenGrowthToolbox.aspx

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GLOSSARY

Term/Acronym	Definition
AADT	Annual average daily traffic Total volume of a road or highway for a given year divided by 365. This is used by planners to determine the activity at specific points along the roadway.
Air Quality Conformity	Under the Clean Air Act of 1970 (as amended), states or tribes in areas that do not meet National Ambient Air Quality Standards (NAAQS) must ensure that their federally funded transportation and infrastructure projects meet established plans to improve area air quality.
Annualized Percent Change	Growth in an area over any number of years calculated as a compounded annual growth rate.
BA	Biological Assessment A document that describes the potential effects of a project on federally or state listed species. The biological assessment is used by the U.S. Fish and Wildlife Service to make an effects determination under Section 7 or Section 10 of the Endangered Species Act.
Bottom Up Process	Type of analysis that focuses on smaller components first, rather than the big picture.
Build Out	Estimate of the total amount or growth and development that an area would support given a set of environmental and regulatory constraints such as zoning restrictions and stream buffer regulations.
Build Scenario	Scenario that represents future conditions with the proposed project and its potential impacts .
CAFO	Confined animal feeding operations
Carolina heelsplitter	A species of fresh water mussel (scientific name: *Lasmigona decorata*) found only in North Carolina and South Carolina. The Carolina heelsplitter is found within the Goose Creek and Six Mile Creek watersheds in the Monroe Connector/Bypass study area.
CDOT	Charlotte Department of Transportation

Term/Acronym	Definition
CEQ	Council of Environmental Quality The CEQ was established by the National Environmental Policy Act of 1969 (as amended, 40 CFR Parts 1500-1508). This office is part of the Executive Branch of government and works closely with agencies and other White House offices in the development of environmental policies and initiatives.
CFR	Code of Federal Regulations
COG	Council of Governments
Cohort Component projections	A demographic projection method that focuses on fertility, mortality and net migration to estimate total population by year.
Confidence Interval	Interval estimate of a population parameter used to indicate the reliability of an estimate. The confidence interval is a statistical range in which the correct answer is most likely to be located. Estimates with a higher degree of uncertainty (such of estimates of changes over time) have a wider confidence interval and indicates that more data should be collected for greater certainty.
Conservative Estimate	An estimate developed to provide a "worst case" scenario. When developing estimates of potential environmental effects of a transportation project, conservative estimates will maximize land development caused by the new road or highway. For revenue projections of toll highways, conservative estimates would minimize potential toll revenue.
Control Totals	The total number of populations, employment, and households. For planning purposes, control totals are the anticipated totals for a region (generally County-level or larger). Using these totals, growth is allocated within the region using other methods.
CRMPO	Cabarrus Rowan Metropolitan Planning Organization The metropolitan planning organization responsible for transportation planning in Cabarrus and Rowan Counties in North Carolina.
CSO	Combined Sewer Overflow Discharge from a combined sewer system that is caused by snowmelt and stormwater runoff.

Term/Acronym	Definition
Cumulative Effects	Cumulative impacts are the impacts on the environment caused by an action, such as a transportation/infrastructure project or land use development. The impact is added to other past, present, and future actions regardless of who undertakes the potential action. While individually these impacts may be minor, when occurring together these impacts may be significant over time.
CWA 303(d) List	Clean Water Act Section 303(d) Under the Clean Water Act Section (1972, as amended) states are required to develop a list every two years of waters that do not meet water quality objectives, provide the cause(s) of contamination, and develop a plan or schedule to address the contamination.
DEIS	Draft Environmental Impact Statement Draft report of environmental effects of a proposed action on an area of land required by the National Environmental Policy Act for major federal actions.
Demand Side Model	A demand side model examines growth in a region based on the need for goods and services rather than from a supply side model that looks at the availability of resources such as land available for development
Developable Land	Areas of land that are currently undeveloped and identified as suitable for future development.
DSA	Detailed Study Alternative An analysis of each design alternative based on cost, environmental factors, and quality of design.
DU	Dwelling Units
NCDWQ	North Carolina Division of Water Quality
EIS	Environmental Impact Statement Document used for decision making. required by the National Environmental Policy Act for certain actions, including transportation infrastructure, that may have a significant impact on the environment.

Term/Acronym	Definition
Endangered Species Act	The Endangered Species Act (ESA) of 1973 (as amended) seeks to protect the habitats upon which species listed as federally threatened or endangered depend. By protecting these sensitive habitats, the ESA seeks to preserve the diverse environmental heritage of the US for future generations.
Extrapolate	Mathematical estimation that extends current trends into the future.
FEIS	Final Environmental Impact Statement Final report of environmental effects of a proposed action on an area of land required by the National Environmental Policy Act for major federal actions.
FHWA	Federal Highway Administration
FLUSA	Future Land Use Study Area Designated area surrounding the project that could be affected if the project is completed and analyzed.
Forest Fragmentation	A form of habitat fragmentation in which forested land is developed in such a way that leaves small patches of forests. Fragmented habitats increase the stress on species and the potential for human/wildlife interactions (animals struck by vehicles, etc.)
GIS	Geographic Information Systems Integrates, stores, edits, analyzes, shares, and displays geospatial data for informing decision making
GUAMPO	Gaston Urban Area Metropolitan Planning Organization The organization that responsible for the transportation planning process in the greater Gaston County, North Carolina region.
Hartgen Analysis	Analysis of potential commercial development at rural interchange locations that reviews traffic volumes, distance to the nearest towns, and access to sewer and water services based on research by Dr. David T. Hartgen in Beltways, Traffic and Sprawl: The Empirical Evidence, 1990- 1997 (Charlotte, NC: Center for Transportation Studies, University of North Carolina at Charlotte)

Term/Acronym	Definition
IMP	Integrated Management Practices Best practices designated by the Environmental Protection Agency to design, implement, and evaluate their stormwater management efforts.
Impervious Surface	Structures (usually artificial) that are covered by impenetrable materials such as concrete, brick, asphalt and stone. Impervious surfaces include parking lots, rooftops, roads and sidewalks. Increases in impervious surface have been linked to decreases in the overall quality of surface waters.
Indirect Effects	Effects which are caused by the project or action and occur later in time or farther in distance, but are still reasonably foreseeable. Indirect effects include land use changes, population density or growth rate, or environmental effects.
Induced Land Use Change	Changes in land use development caused by the construction of a road or other infrastructure project.
Inverse Distance Weighted Method	Analysis of distance within a scattered set of points. It assigns a greater weight to points closest to the location and the weight diminishes as a function of distance.
LID	Low Impact Development Infrastructure and urban design approach to manage stormwater runoff limiting the environmental effects and protect water quality.
LNRPO	Lake Norman Rural Planning Organization The rural planning organization responsible for Iredell, Lincoln and Cleveland Counties along with the non-urban portions of Gaston County in North Carolina.
LRTP	Long Range Transportation Plan A metropolitan planning organization's plan to assess future population growth in a metropolitan region and how to meet the growing population's mobility needs. The plan lists transportation projects that will serve the growing population and anticipated available revenue.
LUSAM	Land Use Allocation Model Analysis that measures land use changes by assigning future employment and population growth based on the current land use in a region.

Term/Acronym	Definition
MPO	Metropolitan Planning Organization A federally mandated and federally funded transportation policy-making organization in the United States that is made up of representatives from local government and governmental transportation authorities.
MRM	Metrolina Regional Model Estimation, based on socioeconomic projections, of traffic in the MUMPO region that will use transportation infrastructure in the future.
MRM05v1	2005 Metrolina Regional Model, Version 1
MRM09v1	2009 Metrolina Regional Model, Version 1
MRM11v1	2011 Metrolina Regional Model, Version 1
MRM11v1.1	2011 Metrolina Regional Model, Version 1.1
MTP	Metropolitan Transportation Plan A federal mandated document that assesses the transportation system of a region and identifies problem or shortfalls of the region's transportation system. The plan seeks to address the problems and shortfalls of the transportation system and meet demands of future growth.
MUMPO	Mecklenburg-Union Metropolitan Planning Organization responsible for the transportation development within the Charlotte, North Carolina region.
NC Data Center	A group of agencies cooperating with the US Bureau of the Census to provide the public with data about the state of North Carolina and its component geographic areas.
NCDENR	North Carolina Department of Environmental and Natural Resources
NCDOT	North Carolina Department of Transportation
NCGAP	North Carolina Gap Analysis Project State level representative of the National Gap Analysis Program sponsored by the United States Geological Survey. The GAP Analysis collects data to assess the conservation status of native terrestrial vertebrate species.
NCTA	North Carolina Turnpike Authority
NCWRC	North Carolina Wildlife Resource Commission

Term/Acronym	Definition
NEPA	National Environmental Policy Act (42 U.S.C. § 4321 United States environmental law that established national environmental policy and set up requirements for federal agencies to document environmental impacts.
No-Build Scenario	Scenario without the project or its growth-inducing impacts.
Parcel Data	Data based on County parcels. Counties will typically include information on the type(s) of development allowed and number of dwellings. This information is used to assign potential development for future land use.
Project Design Year	Time span during which a particular road, highway or bridge must adequately serve traffic needs.
Quantitative ICE	Quantitative Indirect and Cumulative Effects Assessment A report required by the National Environmental Policy Act that lists the effects of the project on the water quality and land use in the study area.
Raster Data	An image comprised of pixels that typically displays continuous data such as, land use, elevation, and weather.
RFATS	Rock Hill - Fort Mill Area Transportation Study Metropolitan Planning Organization for eastern York County, South Carolina
River Basin/Watershed	A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place
ROD	Record of Decision Document issued by the Federal Highway Administration concerning a proposed highway project. The Record of Decision authorizes the respective state transportation agency to proceed with design, land acquisition, and construction based on the availability of funds.
RPO	Rural Planning Organization A voluntary association of local governments that plans rural transportation systems and advise each state's department of transportation on rural policy.
RRRPO	Rocky River Rural Planning Organization Rural planning organization serving Anson, Stanly and Union Counties in North Carolina.

Term/Acronym	Definition
SCALDS	Social Cost of Alternative Land Development Scenarios Analysis of the estimates monetary and non-monetary costs associated with land development in a region. Estimated costs include land use development, infrastructure development, air pollution, energy consumption and estimated passenger miles traveled.
NRCS	National Resource Conservation Service
SEPA	North Carolina State Environmental Policy Act A North Carolina legislative act that to review and report the environmental effects of all activities that involve an action by a State or with public money.
Socioeconomic Data	Social and economic data parameters such as, but not limited to, education, race, income, age and employment used to analyze populations.
STIP	State Transportation Improvement Program A state's comprehensive improvement plan for spending both state and federal funds on transportation projects
Stream Buffer	A vegetated area near a stream, that is usually forested, which helps shade and partially protect a stream from the impact of adjacent land use.
T&R Study	Traffic and Revenue Study A study conducted to measure the feasibility of pursuing toll financing for construction of a roadway.
TAZ	Traffic Analysis Zone Unit of geography most commonly used in conventional transportation planning models. A full definition, including how a TAZ is used in transportation planning, is provided on page 23 of this document.
TDM	Travel Demand Model Estimation, based on socioeconomic projections, of traffic that will use transportation infrastructure in the future.

Term/Acronym	Definition
TMDL	Total Maximum Daily Load - Under the Clean Water Act Section (1972, as amended) states are required to develop TMDL for waters that do not meet their designated uses (such as recreational use, drinking water, or aquatic life). A TMDL calculates the amount of a contaminant that water can carry and still meet its water quality standard. This amount of contamination is then allocated to sources of pollution throughout the watershed.
Top Down Process	A method of analysis that looks at the big picture first, then smaller components.
Traditional Neighborhood Design	Urban design approach which develops residential neighborhoods with principles including, but not limited to, include building developments with a range of housing types, a well-connected street system, integrated public spaces and some mix of uses.
TSS	Total Suspended Solids are solid materials that are suspended in water and will not pass through a filter. Suspended solids are present in sanitary wastewater and many types of industrial wastewater, as well as soil erosion from urban runoff, construction sites, and agricultural sites.
US Census Data	A population survey conducted every ten years that gathers information on location, households, income, race and education.
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Services
UZA	Urbanized Area An area of higher population density surrounding a city.
VHT	Vehicle Hours Traveled The total vehicle hours expended traveling on the roadway network in a specific area during a specific time period.
VMT	Vehicle Miles Traveled The total number of vehicle miles travelled within a specific geographic area over a given period of time.

Term/Acronym	Definition
Water Quality Quantitative ICE	Water Quality Indirect and Cumulative Effects Assessment A report that lists the effects of a project on the water quality in the study area.
WQA	Water Quality Analysis The testing or analysis of the condition of the water, including chemical, physical and biological characteristics to measure safety for humans and wildlife.
WSA	Wilbur Smith Associates
WWTP	Waste Water Treatment Plant

1.0 INTRODUCTION

1.1 What Is the Proposed Project?

The North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), proposes to construct a project known as the Monroe Connector/Bypass, which would be a controlled-access toll road extending from US 74 near I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, a distance of approximately 20 miles. Map 1 shows the proposed project and surrounding area. The proposed action is included in the NCDOT 2009–2015 State Transportation Improvement Program (STIP) as Project R-3329 (Monroe Connector) and Project R-2559 (Monroe Bypass) as a toll facility.

1.2 Why Is an Updated Quantitative Indirect and Cumulative Effects Analysis Needed?

NCTA previously analyzed indirect and cumulative effects of the Detailed Study Alternatives for the proposed action through a Qualitative Indirect and Cumulative Effects Assessment (Qualitative ICE) completed for the Draft Environmental Impact Statement (DEIS Chapter 7) and incorporated into the Final Environmental Impact Statement (FEIS Appendix G). This analysis was expanded and extended for the Preferred Alternative through a Quantitative Indirect and Cumulative Effects Analysis for Land Use (Quantitative ICE) and Quantitative Indirect and Cumulative Effects Water Quality Analysis (WQA) completed for the Final Environmental Impact Statement (FEIS Appendices H & I). These reports were summarized in Section 2.5.5 of the FEIS and together these reports comprise the FEIS ICE analysis and conclusions. In August 2010, FHWA issued a Record of Decision (ROD) selecting Detailed Study Alternative D (DSA D) as the Selected Alternative for the proposed action based on the analysis of the DEIS and FEIS showing that this alternative had lower overall impacts to the natural environment and residential areas compared to other alternatives.

In November 2010, The North Carolina Wildlife Federation, Clean Air Carolina and Yadkin Riverkeepers (Plaintiffs) filed suit to overturn the ROD. The U.S. District Court for the Eastern District of North Carolina decided the case in October 2011, finding for FHWA and NCTA that the FEIS was sufficient. Plaintiffs appealed the decision to the U.S. Court of Appeals for the Fourth Circuit and the appellate court vacated the District Court decision on May 3, 2012. The FHWA rescinded its ROD for the project on July 3, 2012 in response to the appeals court decision.

The FHWA and NCDOT conducted additional work, analysis and developed this report to address the U.S. Court of Appeals for the Fourth Circuit decision. The purpose of this report is to update the FEIS summary of the quantitative ICE effects documented in the FEIS Appendix H and to inform the public about the underlying assumptions of the models and how they were used to inform decisions for the project and the analysis. The findings of this report will be summarized and included in a draft supplemental FEIS. Furthermore, this document will

1. review the scope of this ICE analysis and conditions and trends in the study area (Section 1.0)
2. discuss the methods for developing an existing land use scenario (Section 2.0)
3. review the Metrolina Regional Model socioeconomic projections, including how other studies have used the projections, and evaluate the most appropriate use of those projections within the framework of this ICE analysis (Section 3.0)

4. explain the methods used to estimate induced growth and develop the future land use scenarios (Section 4.0)
5. report revised induced growth results and conclusions based on the updated land use scenarios (Section 5.0)
6. review measures that localities and others could adopt to minimize any impacts of future development, whether induced or not, on sensitive environmental resources (Section 6.0).

This report summarizes the conclusions reached in the evaluation of ICE and describes the data collected, methodologies used and analysis conducted for the ICE for the project. This document also re-evaluates and considers data, analytical research relevant to the project area, and new information relevant to the analysis of the indirect and cumulative effect on land use, water quality, and federally designated threatened and endangered species and their critical habitat in the surrounding area.

1.3 What Are Indirect and Cumulative Effects?

Indirect effects are addressed under CEQ regulations, 40 CFR 1508.8 and are defined as effects "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."

Cumulative effects are addressed under two CEQ regulations, 40 CFR 1508.7 and 40 CFR 1508.25(a)(2). As stated in 40 CFR 1508.7, a "[c]umulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

50 CFR §402.02 provides a somewhat different definition of cumulative effect to Federally listed threatened and endangered species, specifically. However, for the purposes of this analysis, Federal actions were included with the future changes that may affect protected species. This was determined to be the best approach for this study because 1) it provides a conservative (i.e., high) estimate of changes to land use, and 2) quantifying projected future Federal actions is particularly difficult. Many of the private, local, or state actions predicted in this analysis may become Federal actions in the future through permitting procedures (e.g., Clean Water Act Section 404 permit approvals by the US Army Corps of Engineers [USACE]). For this study, each reasonably foreseeable future non-Federal action was considered a contributor to the potential cumulative effect on protected species, regardless of whether it may be a Federal action in the future.

1.4 How Is an ICE Analysis Done?

The National Environmental Policy Act of 1969, as amended (NEPA), the North Carolina State Environmental Policy Act (SEPA), and the United States Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508) identify assessment of indirect and cumulative effects as a necessary component of environmental impact assessment for major Federal actions. The ICE analysis to evaluate potential land use changes and environmental effects associated with the Monroe Connector/Bypass project followed a process contained in guidance released in 2001 by the NCDOT, in consultation with the North Carolina Department of the

Environment and Natural Resources (NCDENR), the North Carolina State Attorney General's Office and the Association of Municipalities entitled *Guidance for Assessing Indirect and Cumulative Impacts for Transportation Projects in North Carolina, Volume I: Guidance Policy Report and Volume II: Practitioners' Handbook.* [5] In this guidance document, the agencies agreed to the following steps that should be taken to thoroughly assess indirect and cumulative impacts.

Step 1: Definition of the Future Land Use Study Area (FLUSA)
Step 2: Identification of the FLUSA's Direction and Goals
Step 3: Inventory of Notable Features
Step 4: Identification of Important Impact Causing Activities
Step 5: Identification and Analysis of Potential Indirect/Cumulative Effects
Step 6: Analyze Indirect/Cumulative Effects
Step 7: Evaluate Analysis Results
Step 8: Assess the Consequences and Develop Appropriate Mitigation and Enhancement Strategies.

The first five steps are undertaken for a qualitative ICE study. The last three steps are undertaken if a quantitative study is required. The ICE analysis previously conducted for the Monroe Connector/Bypass project included a qualitative analysis for inclusion and publication in the DEIS and a quantitative analysis for inclusion and publication in the FEIS.

FHWA and NCTA presented the results of the analysis of the first five steps in a Qualitative ICE, which was included in the DEIS and the FEIS as Appendix G. Based on a review of data and information available since that report was completed, the results and conclusions in the FEIS Appendix G would not be significantly different or introduce new significant impacts or information, which were not previously considered.

Subsequently, a Quantitative ICE was developed following steps six through eight and was presented in FEIS Appendix H. Because of new data, information and the results of the Fourth Circuit of the United States Court of Appeals, FHWA and NCTA have reanalyzed steps six through eight in this updated Quantitative ICE. The scope of this Quantitative ICE includes analysis of the potential of increased indirect and cumulative effects on water resources, threatened and endangered species, and in response to agency and public comment on the DEIS. The decision to use watersheds as boundaries to quantitatively analyze effects, instead of the zones presented in the Qualitative ICE, was made due to the water quality concerns expressed by resource agencies. Watershed boundaries were also used for analysis for compliance with Section 7 of the Endangered Species Act. Land use changes within watersheds were analyzed first and those results were used to estimate changes in water quality and impacts on the Carolina heelsplitter mussel. Map 2 shows each watershed within the project study area.

The Quantitative ICE analysis addresses the potential land use changes associated with the proposed project by developing three land use scenarios associated with the following conditions:

- **Existing (or Baseline) Land Use Scenario**: A scenario that reflects the land use conditions as they existed in 2010 to provide a basis for comparison for cumulative impacts assessment.

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[5] NCDOT and NCDENR. *Guidance for Assessing Indirect and Cumulative Impacts for Transportation Projects in North Carolina, Volume I: Guidance Policy Report and Volume II: Practitioners' Handbook.* November 2001.

- **No-Build Land Use Scenario**: A scenario that reflects the best estimate of land use development conditions in 2030 if the proposed project is not built based on the assumptions and methods used in this report.
- **Build Land Use Scenario**: A scenario that reflects the best estimate of land use development conditions in 2030 if the proposed project is built based on the assumptions and methods used in this report.

1.5 What Is the Study Area for the ICE Analysis?

The NCDOT ICE Guidance indicates that the development effects of a new or improved roadway facility are most often found within one mile of an interchange, and approximately two to five miles along major intersecting roadways to the interchange. Using the ICE Guidance, it was determined for the purposes of the Draft EIS that the potential for ICE exists within about five miles of the various project alignments, which for the purpose of the study were evaluated as a single Build Alternative. This approximate five-mile radius is depicted in the Draft EIS, Figure 7-1, and is referred to in the Draft EIS and the Qualitative ICE Assessment as the Future Land Use Study Area (FLUSA).

For the more detailed purposes of this report, the Draft EIS FLUSA was expanded to include all of the Goose Creek watershed (14-digit Hydrologic Unit 03040105030020) as well as the headwaters of some of the area streams in the FLUSA. The Goose Creek watershed is located at its closest point approximately one mile north of the proposed project in northwestern Union County. Although some of the FLUSA watersheds overlap Anson County, the FLUSA was not expanded into Anson County because it lies outside the five-mile radius and does not contain special resources noted in comments on the Draft EIS. This expanded FLUSA is the area within which the Build Alternatives have the potential to affect the resources that are the subject of this report (water quality, threatened and endangered species, and land use). The expanded FLUSA is depicted in Map 1. The watersheds within the Study Area are shown in Map 2 and areas of each watershed within the study area are listed in Table 1; the Goose Creek watershed is the relatively large watershed along the northern border.

Table 1: Study Area Watersheds

Watershed Name	Area (Square Miles)
Beaverdam Creek	18.2
Richardson Creek (Upper)	10.6
Rays Fork	14.7
Bearskin Creek	15.2
Richardson Creek (Middle)	9.3
Gourdvine Creek	1.2
Salem Creek	21.7
Sixmile Creek	2.6
Twelvemile Creek	20.4
Richardson Creek (Lower)	23.3
Stewarts Creek	35.3
Fourmile Creek	12.1
Crooked Creek	38.3
Goose Creek	42.3
Irvins Creek	14.8
McAlpine Creek	21.2
Bakers Branch	3.6
Wide Mouth Branch	10.8

1.6 What Are the Land Use Conditions and Trends in the Study Area?

To understand existing land use conditions and estimate future land use conditions, a review and assessment of land use conditions, land use regulations, growth trends, growth factors and other factors was completed. Much of this analysis was already completed in the original Quantitative ICE analysis. Additional background research for this Quantitative ICE updated included:

- Updated interviews with local planners
- The 2010 Census and growth trends and conditions in the study area
- Additional development activity
- New planning documents (such as new land use plans and new capital improvement plans).

Interviews

In 2008, the study team interviewed planners with local jurisdictions within the FLUSA, such as the Council of Governments (COG) and city, county and town planning department representatives, as part of the Qualitative ICE Assessment. In August 2009, the study team interviewed the same organizations as part of the FEIS Quantitative ICE, with follow-up questions as necessary. In September 2012, the study team interviewed representatives of the same organizations again to determine if any new information was available to inform the update of the ICE analysis as these organizations are the most knowledgeable about current and future growth trends and land use patterns in the study area. Table 2 lists the organizations that were the focus of these recent interviews, the individual respondents, and the dates of contact. The study team was unable to schedule an interview with the mayor of Hemby Bridge. Additionally, the project team was unable to meet with staff from the Village of Lake Park, but their most recent Unified Development Ordinance was obtained. Beyond those staff and officials who were officially interviewed as documented in Table 2, the study team also coordinated with other staff and officials at NCDOT, MUMPO, the Charlotte Department of Transportation (CDOT), the Rocky River Rural Planning Organization (RRRPO) and many others, as documented in the administrative record, throughout the research, analysis and documentation phases of this report.

Each interview began with an introduction of the study and its purpose. A map of the study area was provided to facilitate communication, as were past interview summaries as applicable. The purpose of the interviews was to identify changes to future land use scenarios since the 2009 interviews for the Quantitative ICE and gather any new or updated databases or GIS data that would be useful to the analysis. The following data was requested:

- Approved developments
- Updated zoning
- Information on current stream buffer or other environmental protection areas
- Water and sewer utility information
- Water and sewer priority areas
- Future land use projections
- Existing land use
- Approved population and employment projections and anticipated variations from projections with each land use scenario.

Table 2: List of Interviews Completed in 2012

Organization	Respondent	Date of Interview
Town of Wingate	Patrick Niland – Town Manager	September 6, 2012
Centralina COG	Diane Dil – Centralina Planner I	September 12, 2012
Town of Matthews	Kathi Ingrish – Planning Director	September 10, 2012
Town of Unionville	Sonya Gaddy – Land Use Administrator	September 11, 2012
Union County Planning	Amy Helms – Water and Land Resources Division Manager Scott Huneycutt – Engineering Division Manager Richard "Dick" Black – Planning Director	September 12 & 19, 2012
Town of Marshville	Amanda Reid – Town Manager	September 12, 2012
Town of Indian Trail	Shelley DeHart – Director of Planning and Neighborhood Services Adam McLamb, Civil Engineer	September 14, 2012
Town of Mint Hill	John Hoard - Planner	September 14, 2012
Town of Weddington	Jordan Cook - Town Planner and Zoning Administrator	September 25, 2012
Town of Wesley Chapel	Josh Langen – Planning and Zoning Administrator	September 12, 2012
Charlotte – Mecklenburg Planning	Debra Campbell – Director, Charlotte-Mecklenburg Planning Department	September 14, 2012
City of Monroe	Doug Britt – Senior Planner	September 11, 2012
Town of Fairview	Ed Humphries – Land Use Administrator	September 11, 2012
Town of Stallings	Brian Matthews – Town Manager Lynne Hair – Town Planner	September 14, 2012
Union County Partnership for Progress*	Gretchen Carson – Planner Melanie O'Connell Underwood – Interim Director	September 27, 2012
Union County Planning*	Richard "Dick" Black – Planning Director	January 21, 2013
CSX Corporation*	Vance E. Bennett Jim Van Derzee	November 29-30, 2012
Monroe-Union County Economic Development	R. Christopher Platé – Executive Director Gretchen Carson – Project Manager	October 2, 2013

*-Contacted after the initial round of interviews to obtain information on the Proposed Legacy Park Development

Prior to the discussion, staff provided a list of the questions to the respondents. Appendix A contains complete minutes from all of the interviews. The following 11 questions were asked during interviews with local planners (the interviews conducted concerning Legacy Park included different questions, which are documented in the appendix):

1. *The August 2009 interview covered land use and economic development trends, growth management and natural resource protection – in general, have any of these dynamics affecting future land use changed since the previous interview?*
2. *Have any changes to future land use plans, transportation plans or other plans, policies or projections been made that incorporate information from the 2010 Census?*
3. *Have new or amended land use regulations been developed since August of 2009? Please see the list we have provided of documents we collected and reviewed during the previous environmental*

documentation effort. Are there any updates to those plans or regulations? If there have been any changes, please provide specific web link or a copy of the document.

4. *Has the local regulation of natural resources (including stream buffers) changed since August 2009? If so, how?*
5. *What can you tell us about any proposed or approved developments that have come to light since the August 2009 interviews? What information is available about any of these planned or approved developments that are not built yet? Can you provide any details and locations for these projects?*
6. *Have long-term growth expectations changed since the previous interview and if so how?*
7. *Has the city/town/county updated its Comprehensive Plan or Land Use plan since August 2009?*
    - *If so, does this updated plan reflect conditions in the future with or without the Monroe Connector/Bypass?*
8. *We are reviewing and considering the predictions of future growth (2030 forecast year) included in the previous EIS. Are there any other factors that have changed since August 2009 that might affect the level of future growth and the location of that growth in your community?*
    - *Do these changes reflect the future with the Monroe Connector/Bypass, without the Monroe Connector/Bypass, or is there no difference on that basis?*
9. *Have there been any changes in capacity of utility infrastructure or expectations about the future capacity since the last round of interviews? Do any of those changes affect growth expectations?*
10. *Are you or other planners or development review staff familiar with the North Carolina Wildlife Resources Commission "Green Growth Toolbox"? (http://216.27.39.101/greengrowth/)*
    - *Have you attempted to implement any of the practices, ordinances or other policies recommended by the toolbox?*
    - *Have you attempted to incorporate any other low-impact design type policies into zoning, subdivision or other land development ordinances?*
    - *How would you rate the likelihood of incorporating any low-impact design principles in future regulations or plans?*

Supplemental questions were asked pertaining to the specific interviewee's location or expertise. Face-to-face interviews were conducted to the extent practical. The interviews generally took between 30 and 60 minutes to complete. Notable information included:

- Often, zoning maps provided the best representation of current land use, while land use plans provided the best representation of future land use. Much of this information was available as GIS data.
- Some land use plans were in the process of being updated and were not yet available for this study. For example, Indian Trail was in the process of updating their Comprehensive Land Use Plan. Marshville indicated that the next update of their land use plan would include the Monroe Bypass/Connector. The City of Monroe was developing the US 74 Corridor revitalization Plan, which included the Monroe Bypass/Connector in its assumptions. Older land use plans tended not to include the Monroe Connector/Bypass, while the updated plans usually included the project.
- Based on the 2010 Census, the MUMPO Urbanized Area is expanding to include Marshville.
- Mecklenburg County now administers the Goose Creek Management Plan[6]

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[6] This is a plan to guide restoration, retrofit and preservation efforts aimed at achieving specific goals for improving water quality conditions in the Goose Creek Watershed in Mecklenburg County such that these waters meet or

- Goose Creek Water Quality Recovery Program Plan for the Fecal Coliform TMDL (Total Maximum Daily Load) was revised in 2010. This is a plan to reduce fecal coliform impairments based on the TMDL report completed in 2005.
- Areas in the eastern portion of the study area were more likely to indicate that their future plans included the Monroe Connector/Bypass and that the implementation of certain aspects of their plans was contingent on the development of the facility.
- Water and Sewer moratoria were rescinded in Union County in 2012.

Plans and Ordinances

Specific documents or information obtained during the interview process are summarized in Table 3.

In addition, CDOT staff were interviewed on June 19, 2012 to discuss the TAZ projections and any updates to their data since they were developed in 2008. Further communications were conducted with CDOT staff as this report was prepared. Summaries of that interview and follow up communications are provided in Appendix A along with the interviews listed in Table 3.

Table 3: Zoning or Other Local Data Collected During Interviews*

Jurisdiction/Area	Document	Year
Goose Creek Watershed	Goose Creek Water Quality Recovery Program Plan for the Fecal Coliform TMDL	2010
City of Monroe	Zoning Ordinance	Modified 2010
	List of Current Developments	Modified 2009
Village of Lake Park	Unified Development Ordinance	Draft 2012
Town of Unionville	Zoning Map	Updated 2011
	Future Land Use Map	2005
	Zoning Amendments	Modified 2012
Town of Fairview	Future Land Use Map	Modified 2010
	Land Use Ordinance	Updated 2009
Town of Stallings	**Unified Development Ordinance**	Adopted 2012
	Post Construction Ordinance	Adopted 2010
Town of Mint Hill	Unified Development Ordinance	Adopted 2011
	Lawyers Road & I-485 Small Area Plan	Adopted 2011
	Pedestrian Master Plan	Adopted 2011
Town of Marshville	Urbanized Area Expansion	Updated 2010
	Comprehensive Pedestrian Plan	Adopted 2010
	Comprehensive Transportation Plan	Updated 2010

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exceed their State designated uses and are no longer rated as impaired on 303(d) lists. *Goose Creek Watershed Management Plan*. Charlotte-Mecklenburg Storm Water Services. October 31, 2009. http://charmeck.org/stormwater/Projects/Documents/GooseCreekWatershedManagementPlan.pdf

Jurisdiction/Area	Document	Year
Town of Wingate	Land Use Ordinance	Updated 2010
	Wingate 2020 Plan (Comprehensive Plan and Concept Plan)	Adopted 2010
	Wingate Mixed Use Center Plan	Draft 2012
Town of Weddington	Local Area Regional Transportation Plan	Updated 2009
	Land Use Map	Modified 2012
	Zoning Map	Modified 2011
	Land Use Plan	Modified 2011
Village of Wesley Chapel	Flood Damage Prevention Ordinance	Updated 2009
	Subdivision Ordinance	Updated 2011
	Western Union County Local Area Regional Transportation Plan	Prepared 2009
	Zoning Ordinance	Updated 2012
Town of Matthews	Zoning Code	Modified 2010
	Unified Development Ordinance	Draft 2012
	Downtown Master Plan	Draft 2012
	Town of Matthews Land Use Plan	Draft 2012
	Demographic/Economic Update	Prepared 2012
Charlotte-Mecklenburg	Growth Framework	Adopted 2010
	FY 2013-2017 Capital Improvements, including 10-Year Needs for Water and Sewer Projects	Updated 2012
	Water Quality Buffer Implementation Guidelines	Updated October 2011
	Floodplain Ordinance	Adopted 2012
Union County	Water Allocation Policy	Updated 2012
	Sewer Policy	Updated 2012
	Union County Water and Sewer Extension Ordinance	Updated 2012
	Carolina Thread Trail Master Plan	Adopted 2011
	Union County Land Use Ordinance	Adopted 2008
	Union County Thoroughfare Plan	Updated 2008
	Union County 2025 Comprehensive Plan	Adopted October 2010
	Comprehensive Water and Wastewater Master Plan	December 2011
	US 74 Corridor Revitalization Study	Underway

*Bolded documents include the Monroe Connector/Bypass

Growth Trends and Factors

A review of critical growth factors and trends indicates that Union County maintains a number of advantages relative to other suburban jurisdictions in the region. These growth trends and factors are discussed in detail in Appendix B. First, Union County has more land available for development than Mecklenburg, Gaston or Cabarrus counties. Union County has the highest median income of all surrounding counties, it has affordable housing relative to its median income level, and it has one of the best school districts in the region based on SAT scores and graduation rates. In terms of commute times, the interesting trend is that despite having one of the highest average commute times over the last decade, Union County has grown faster than any other county in the region. This finding suggests that factors other than accessibility to jobs are encouraging households to choose to locate in Union County. For the past decade, Union County has exhibited strong growth, and the factors driving those trends are poised to continue attracting growth to Union County regardless of whether the Monroe Connector/Bypass is constructed.

These findings are further supported by the analysis of the Operations Research and Education Laboratory of the Institute for Transportation Research and Education at North Carolina State University's February 28, 2007 *Land Use Study Final Report 2006-2007* (Appendix C). In its research on behalf of the Union County Public Schools, it described the leading factor of growth in Union County as its location within the Charlotte-Mecklenburg region. The Operations Research and Education Laboratory of the Institute for Transportation Research and Education determined the western area of Union County continues to experience a substantial population increase as a result of its desirable location. Marvin, Waxhaw, Weddington, Wesley Chapel and other western Union County suburbs continue to experience high demand for single-family homes. The report also listed the following other factors contributing to growth in Union County.

- Low taxes
- Good quality schools
- Comparatively reasonable land prices.

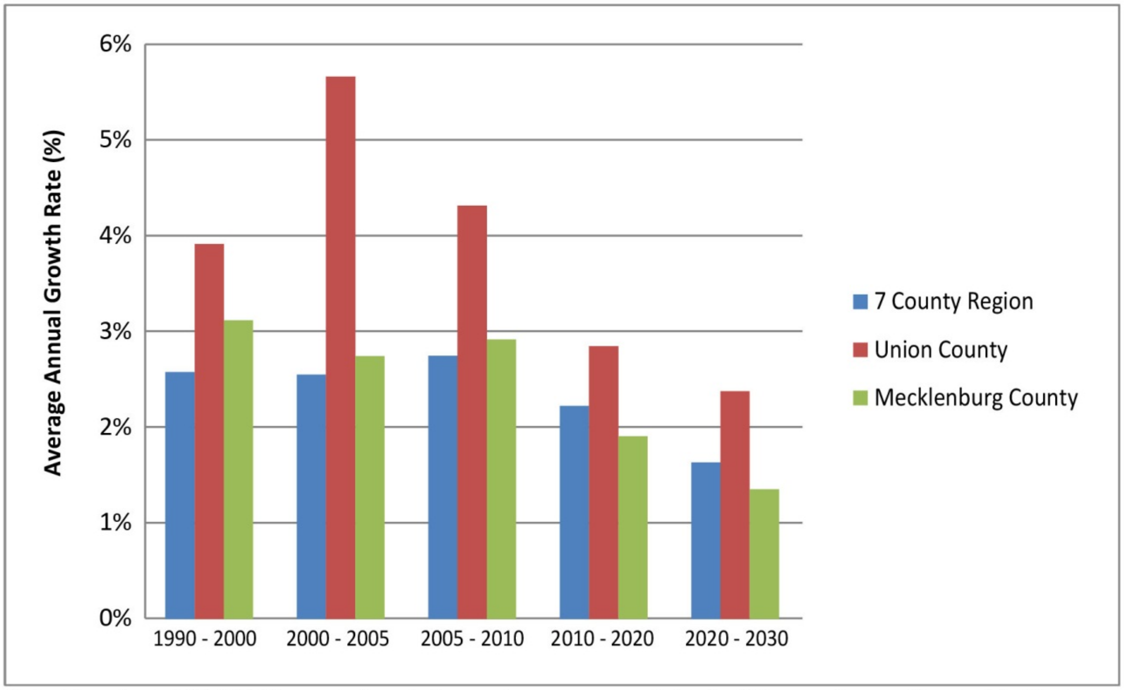
The report described the availability and cost of undeveloped land as a factor of future growth in the western part of the county. It concluded that a reduction in raw land would push development toward the eastern part of the county. The report described the eastern expansion of growth towards Monroe as constrained by a lack of easy access to Charlotte and Mecklenburg County.

Lastly, a review of current growth trends and projected growth trends suggests that while growth has slowed in Union County since 2005, it has still grown at a pace above the regional average. While the MPO projections still foresees a growth rate above the regional average into the future, the projected growth rate is expected to decline dramatically. To reach the projected 337,317 estimate of population by 2030, growth in Union County would have to slow to an average annualized growth rate of 2.6 percent, based on the 2010 Census count. Figure 1[7] shows the differences in average annual growth rates across the five different periods (1990 to 2000, 2000 to 2005, 2005 to 2010, 2010 to projected 2020 and projected 2020 to projected 2030). The difference between 2000-2005, 2005-2010, 2010-2020 and 2020-

[7] Figure 1 compares growth rates to a 7 county region as the TAZ level forecasts for whole counties are only available for Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union and York Counties.

2030 average annual growth rates reflects a typical "s-curve" of decreasing growth rates over time as a population base expands.

Figure 1: Average Annualized Growth Rates Comparison



Note: The adopted MUMPO forecasts for whole counties are only available for Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union and York Counties.
Sources: US Census 2000 and 2010, MUMPO 2009 Socioeconomic Forecasts

Specific Updates from Prior Quantitative ICE Analysis

Based on the interviews and review of documents provided by local jurisdictions, this section outlines the new information that prompted modifications to the future land use scenarios, compared to the prior Quantitative ICE analysis.

Charlotte/Mecklenburg County: There were no major changes to growth expectations or land use plans. Local planners did note one subdivision and zoning update of a 24-acre parcel on land that previously was identified as Industrial or Undeveloped in the future scenarios of the last Quantitative ICE analysis. The area is now expected to develop as High Density Residential in the future under any scenario.

Matthews: There were no major changes in growth expectations or land use plans. Local planners did note one zoning change and one planned land use change affecting about 275 acres of land. These changes affected land that was previously identified as Low Density Residential Development or Undeveloped in the future scenarios of the last Quantitative ICE analysis. These areas were now expected to develop as Commercial, High Density Residential or Low Density Residential Development in the future under any scenario.

Mint Hill: There were no major changes in growth expectations but some changes to land use plans as a small area land use plan has been developed for the area around Lawyers Road and I-485 (see Figure 2).[8] The entire small area plan covers over 1,200 acres of land. In the prior Quantitative ICE analysis, most of this area was already designated as developed, as either Commercial or Low Density Residential. With the new information, some of the land previously identified as Low Density Residential is now identified as Medium Density Residential, Commercial, Institutional or Undeveloped (in the case of those areas identified as Open Space in the Small Area Plan). These updated development plans are expected to occur under any scenario.

Stallings: There were no major changes in growth expectations, land use plans or zoning that would necessitate adjustments to the ICE land use scenarios.

Indian Trail: There were no major changes in growth expectations or land use plans. One zoning change involves a 28-acre development. In the prior Quantitative ICE analysis, this area had been identified as a Low Density Residential Area. This area is now being zoned as Commercial and is expected to develop as Commercial under any scenario.

Wesley Chapel: There were no major changes in growth expectations, land use plans or zoning that would necessitate adjustments to the ICE land use scenarios.

Fairview: The town has adopted a new land use plan with some important changes. Specifically the town has added some commercial nodes at major intersections and is working with the County on expanding water and sewer availability at the US 601 and NC 218 intersection. The new land use plan calls for a commercial district at this intersection as well as at NC 218 and Mill Grove Road (SR-1525) and at US 601 and Lawyers Road (SR-1612). The new land use plan also calls for a new Industrial node along Price Tucker Road (SR-1603) and at NC 218 and Old Dutch Road (SR-1542). All of these new nodes are expected to develop with or without the Monroe Connector/Bypass. In the prior Quantitative ICE analysis, these areas were expected to be Low Density Residential and Undeveloped areas. These areas are now expected to develop as Commercial and Industrial areas under any scenario.

Unionville: Town officials noted that their land use plan includes some commercial clusters at US 601 and Ridge Road (SR-1504) (near the proposed 601 interchange), US 601 and Unionville-Indian Trail Road (SR-1367), US 601 and Lawyers Road (SR-1612), which were not fully incorporated into the previous Quantitative ICE analysis. Most of these clusters are expected to develop under any scenario; however, the cluster near the proposed US 601 interchange with the Monroe Connector/Bypass would likely see greater development build-out if the Monroe Connector/Bypass were built. In the prior Quantitative ICE analysis, these areas were designated as Low Density Residential and Undeveloped but are now expected to develop as Commercial with more Commercial development expected if the proposed project is built.

Monroe: There were no major changes in growth expectations or land use plans that would necessitate adjustments to the ICE. Local planners noted that there were zoning changes affecting parcels totaling about 80 acres that were previously identified as Low Density Residential in the previous Quantitative ICE analysis but that would now be expected to develop as Institutional and Commercial under any scenario.

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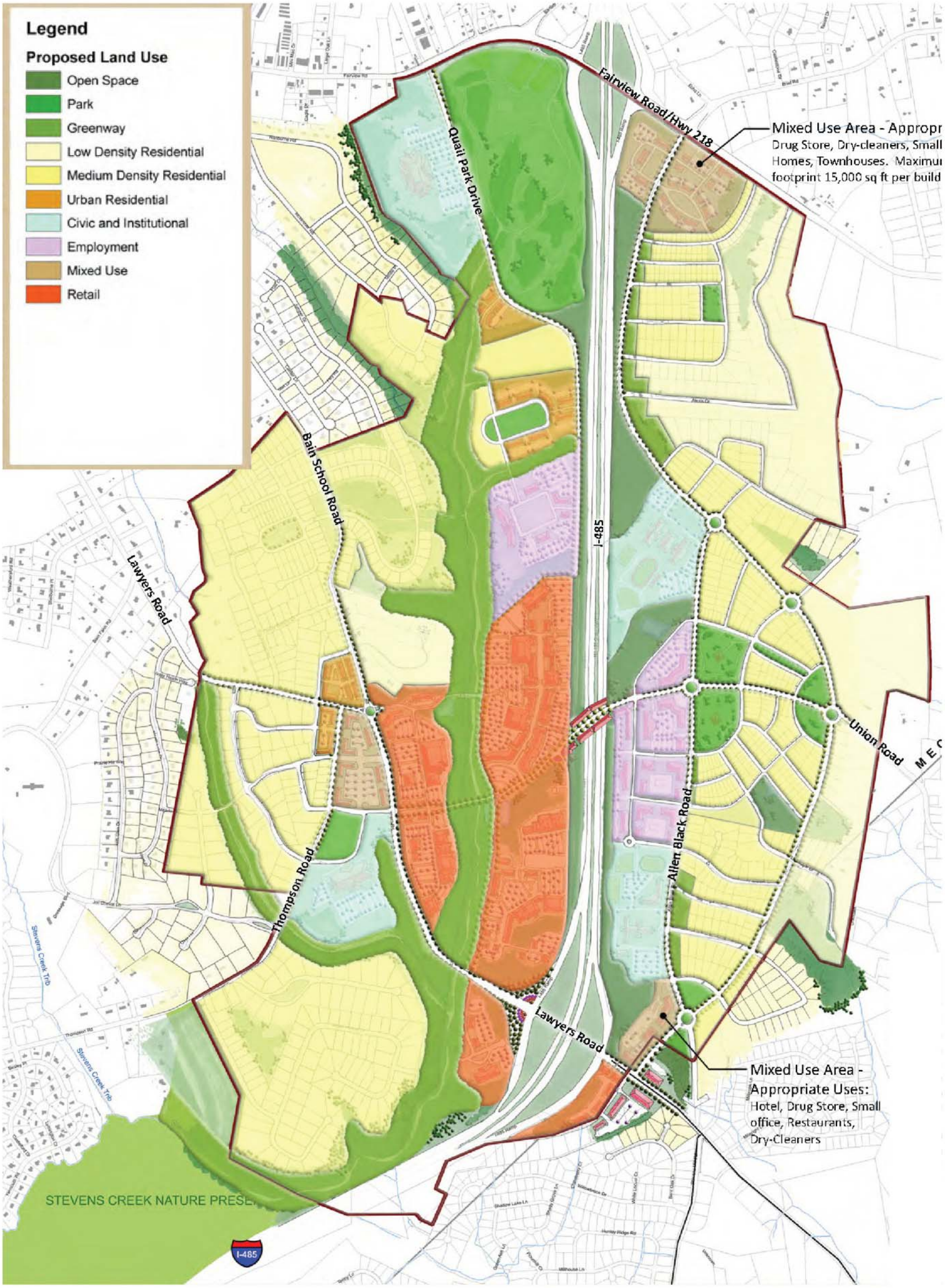
[8] *Lawyers Road & I-485 Small Area Plan*, Future Land Use Map

Figure 2: Lawyers Road and I-485 Small Area Land Use Plan, Town of Mint Hill



Union County: The County has adopted a new land use plan that provides more detailed information on growth expectations in the eastern end of the county if the proposed project is built (see Figure 3)[9]. Specifically, the county plan shows larger swaths of Medium Density Residential development at the eastern end of the Monroe Connector/Bypass corridor in response to the expectation of the proposed project. Their definition of "medium density", however, generally falls within the Low Density Residential category (2 units per acre or fewer) used in this Quantitative ICE analysis. This is the same section of the corridor where the previous Quantitative ICE analysis showed the greatest additional development. The new plan suggests planners, planning commissioners and elected officials expect the development to extend a bit farther than the previous plan anticipated.

To address these higher growth expectations, the study team analyzed the expected development in the TAZ level projections for this area. An additional 10 years of household growth was assumed to occur in this swath of the county north of Wingate and Marshville if the proposed project were built. The resulting land use adjustments affect land that was previously identified as Undeveloped; this area would now be expected to develop as Low Density Residential if the proposed project were built.

Wingate: There were no major changes in expectations, land use or zoning requiring adjustments to the ICE. The previously Quantitative ICE analysis used the town zoning to determine the most appropriate allocation and density of development under a No-Build Scenario. For the Build Scenario in the prior Quantitative ICE analysis, the study team incorporated many of the proposed zoning changes noted in the Strategic Plan for Economic Development, Town of Marshville, Town of Wingate (2008) as this plan assumes construction of the Monroe Connector/Bypass. These assumptions appear to remain reasonable and valid based on discussions with local planners.

Marshville: There were no major changes in growth expectations, land use plans or zoning that would necessitate adjustments to the ICE land use scenarios (see Wingate discussion above).

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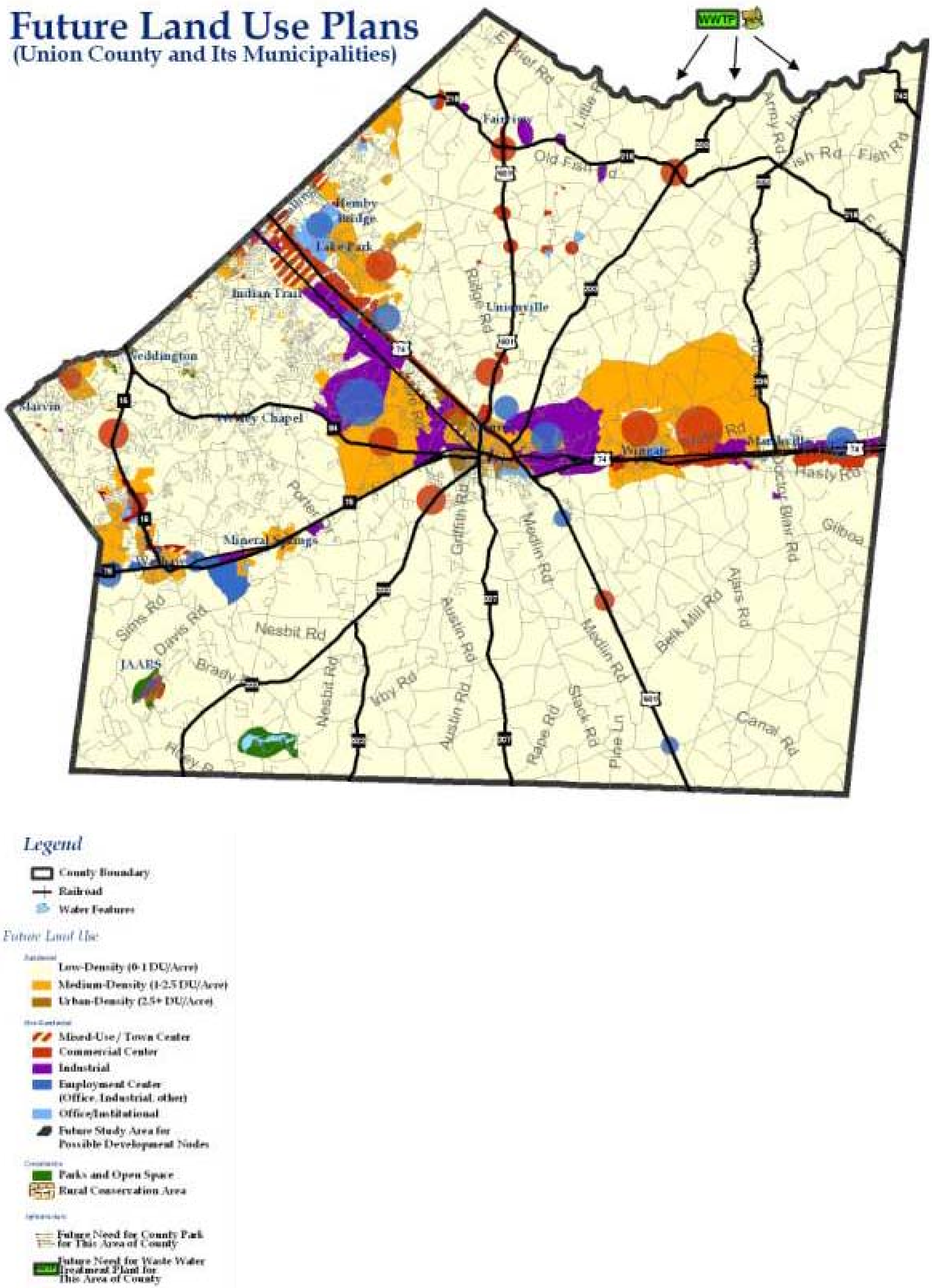
[9] *Union County 2025 Comprehensive Plan*, p 33

Figure 3: Union County Future Land Use Plan



2.0 EXISTING LAND USE

2.1 How Was Existing Land Use Modeled?

Existing land use was developed using parcel-based data from both Mecklenburg and Union counties combined with zoning layers from all the local jurisdictions and the NCGAP[10] land cover dataset, which is based on 1992 aerial photography. The existing land cover is largely a combination of these three data sets, with developed land based on current parcel data and the NCGAP data filling in the land cover types where parcels are undeveloped. Each parcel was classified as developed or undeveloped. Undeveloped properties included vacant land and farms. For parcels in the developed category, each was assigned one of five land use categories based on its zoning category and land use attributes from the parcel assessment records. The five categories were:

1. Low Density Residential
2. Medium Density Residential
3. High Density Residential
4. Commercial
5. Industrial/Office/Institutional.

Spot checks for the assessment were conducted by comparing recent aerial photography (2010) of the Study Area with the assessed land use. In addition to the zoning and parcel land use attributes, Union County provided a list of parcels that had applied for tax deferral based on agricultural use. This list was used to categorize farm properties as undeveloped. Aerial photography was used to identify farm properties in Mecklenburg County and also to check for other farms in Union County that were not included in the farm deferral list provided by the County.

Once each parcel was assigned to one of these five development categories or the undeveloped category, the parcel polygon feature class was converted to a raster image. A raster is a rectangular grid where each cell or pixel within the grid represents one unit of area and contains a value (which in this analysis represents land use). For this analysis, all rasters were formatted with a 30x30 meter cell size to match the NCGAP land cover dataset. Each raster cell is a 30x30 meter square, or about one quarter of an acre. For undeveloped properties, the NCGAP raster dataset was used to fill in the natural and farm land covers within those areas. Since parcels do not cover all land in the Study Area, a provision had to be made to account for areas outside parcel boundaries. Since nearly all land not included within a parcel boundary is a road right-of-way, these areas were categorized as transportation uses. Figure 4 illustrates how the existing land use raster was developed. It shows for an example area how the parcels were categorized and converted to a raster and then the undeveloped areas were filled in with the NCGAP land cover.

The resulting land cover is a raster image consisting of over 900,000 individual cells, each cell categorized into one of 26 land use categories. The 26 land cover categories consist of: 5 developed

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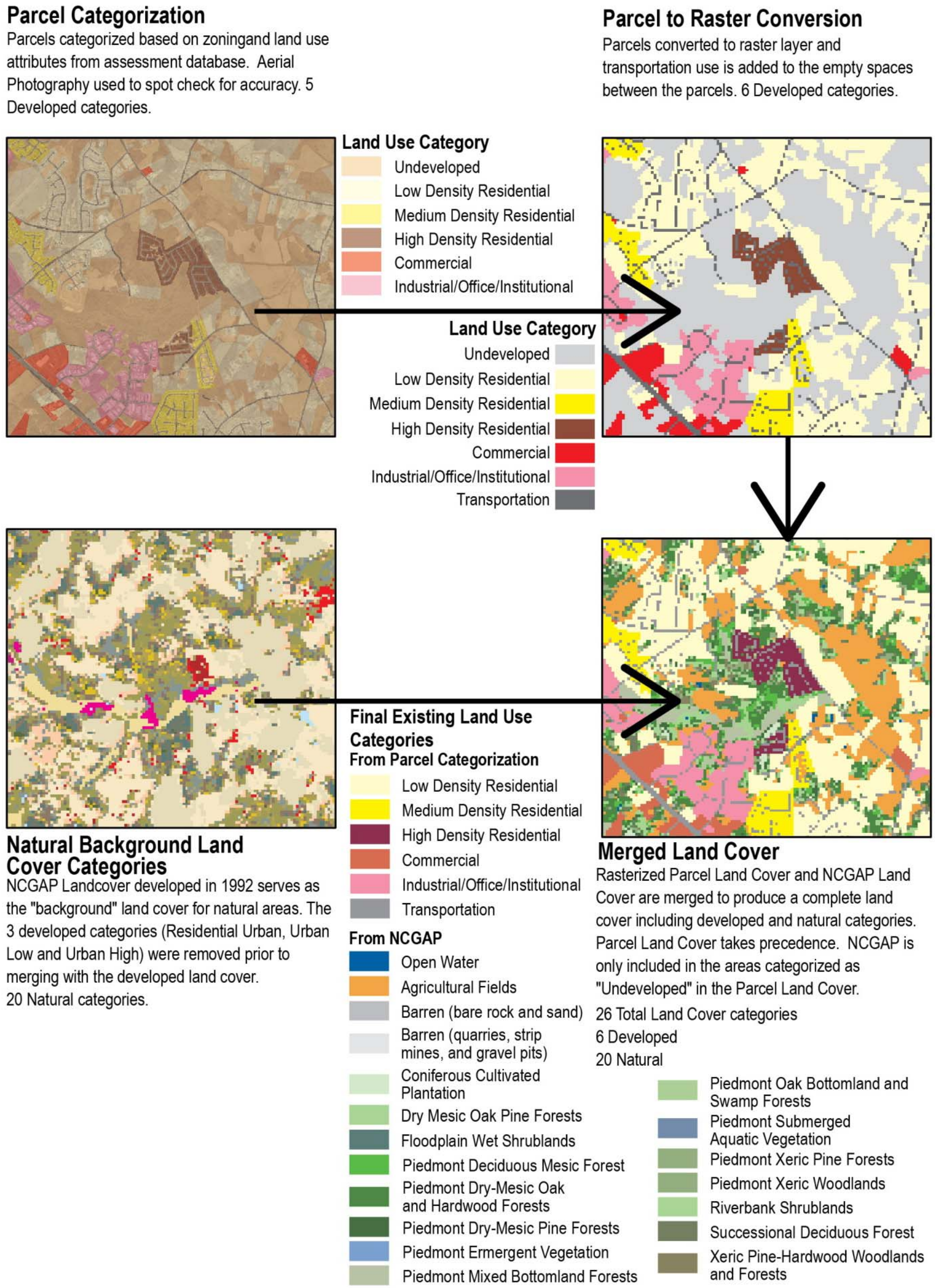
[10] The Gap Analysis Program is a national program with the mission of developing key datasets needed to assess biological diversity across the nation. The North Carolina Gap Analysis Project (NCGAP) was a state affiliate based at the North Carolina Cooperative Fish and Wildlife Research Unit and charged with developing those data for the state. A map of North Carolina's land cover was developed using Landsat TM satellite imagery acquired in 1991 and 1992.

categories, 1 transportation category, 2 farm categories, 16 vegetation categories from the NCGAP land cover, and 2 barren categories from the NCGAP land cover. Existing land use, or Baseline condition, is presented in Map 3. To simplify the display of the land cover, many categories have been aggregated into larger categories in Maps 3, 16 and 18. These aggregated categories are:

- Agricultural Fields: includes both the Agricultural Fields and the Agricultural Pasture/Hay and Natural Herbaceous.
- Barren: includes both Barren (bare rock and sand) and Barren (quarries, strip mines, and gravel pits).
- Forested: includes Coniferous Cultivated Plantation (natural / planted), Successional Deciduous Forests, Piedmont Xeric Pine Forests, Piedmont Dry-Mesic Pine Forests, Piedmont Xeric Woodlands, Piedmont/ Mountains Dry-Mesic Oak and Hardwood Forests, Piedmont Mesic Forest, Xeric Pine-Hardwood Woodlands and Forests.
- Other Natural: includes Piedmont/Mountain Submerged Aquatic Vegetation, Piedmont/Mountain Emergent Vegetation, Riverbank Shrublands, Floodplain Wet Shrublands.

Figure 4: Land Use Categorization Process



3.0 REVIEW OF SOCIOECONOMIC PROJECTIONS

To assess potential impacts from induced development, two future land use scenarios are needed: a No-Build that reflects the future without the proposed project and a Build that reflects the future with the proposed project. Research on induced growth impacts of transportation investments indicates that typically induced development impacts fully arise within eight years of the opening of new roads or new capacity.[11] Therefore, if the proposed project is expected to be open to traffic before 2020, a 2030 horizon year would be an appropriate and reasonable analysis year. Since the prior Quantitative ICE analyzed 2030 conditions, it would also be appropriate to maintain that analysis year to make comparisons easier.

Since the Quantitative ICE analysis is looking at land use changes at the watershed level, the next question is how to estimate future growth under either scenario at that level of detail. Many entities, such as state level demographic agencies, private forecasters such as Woods and Poole, and even universities, produce projections of population and employment at the county, regional or state level, and these projections could be used to estimate growth in the study area. However, none of these sources provide detail on where that growth may occur below the level of individual counties. Metropolitan Planning Organizations (MPOs) develop similar projections of population and employment and, due to their federally mandated planning efforts, their projections typically include much smaller geographic divisions. MPO projections, therefore, represent the best available resource for population and employment projections at the necessary geographic and temporal scales to reasonably estimate quantitative land use impacts of transportation projects.

3.1 What Is an MPO?

MPOs have been required under federal law since the early 1970s. Federal regulations requires any Census Bureau defined urbanized area (UZA) of at least 50,000 people to have an MPO to develop regional transportation plans and programs through a continuing, cooperative and comprehensive (3-C) transportation planning process (23 U.S.C. 134 and 135). An MPO is required to develop a number of planning documents to guide the planning and funding of transportation improvements across the metropolitan region. To address the long-range transportation needs of a region, MPOs are required under federal regulations to estimate and accommodate the mobility needs for persons and goods in their Metropolitan Transportation Plans (MTP). This requirement, therefore, necessitates estimating the long-range travel needs of their respective regions. As such, most MPOs use some form of travel demand modeling to estimate the long-range travel needs for their regions and help in addressing other policy concerns such as transportation conformity (through emissions estimates), estimation of freight movement and of non-motorized trips. Most MPOs, including those in the Charlotte region, use a standard four-step travel demand model while a few MPOs have begun using more advanced modeling techniques such as activity-based models.

What Is the Metrolina Regional Travel Demand Model and How Does It Relate to the MPO Projections?

The main reason that MPOs prepare regional socioeconomic projections is to operate a regional travel demand model (TDM). The TDM is used to project future travel demand for use in transportation planning activities. In the Metrolina region, the TDM is called the Metrolina Regional Model (MRM).

[11] Cervero, Robert. "Road Expansion, Urban Growth and Induced Travel: A Path Analysis." *Journal of the American Planning Association*. Vol. 69, No. 2. Spring 2003, p 158.

This model is used for the four major tasks that MPOs must complete as part of their federally mandated planning responsibilities:

1. Identifying existing transportation conditions and deficiencies on the major segments of the transportation network within the region
2. Identifying future transportation conditions and deficiencies on the major segments of the transportation network within the region
3. Prioritizing projects for inclusion in LRTPs and a plan of implementation for inclusion in the Transportation Improvement Plan
4. Demonstrating conformity to the National Ambient Air Quality Standards established by the U.S. Environmental Protection Agency (EPA), under the Clean Air Act, for the EPA designated non-attainment area(s) within the region (also known as the air quality conformity process).

Based on the *Metrolina Regional Travel Demand Model Memorandum of Agreement* (Appendix D), the Charlotte Department of Transportation (CDOT) is the custodian for the MRM and all its constituent parts (network files, socioeconomic data and projections, programming scripts, trip tables and any other files necessary to run the model). The MRM is the main tool used by state, regional and local planning agencies to assess regional travel patterns. The MRM covers the following areas, also shown in Map 4:

- Cabarrus-Rowan Metropolitan Planning Organization (CRMPO): Cabarrus and Rowan Counties
- Gaston Urban Area Metropolitan Planning Organization (GUAMPO): Most of Gaston County
- Mecklenburg-Union Metropolitan Planning Organization (MUMPO): All of Mecklenburg and most of Union County
- Part of the Lake Norman Rural Planning Organization (LNRPO): Iredell, Lincoln and Cleveland Counties and the remainder of Gaston County
- Part of the Rocky River Rural Planning Organization (RRRPO): Stanly and Anson Counties and the remainder of Union County
- All of York County and part of Lancaster County, South Carolina, including all areas within the Rock Hill-Fort Mill Area Transportation Study (RFATS, the MPO for eastern York County).

As custodian of the model, CDOT leads the model team and leads the model development and maintenance process, including all its constituent parts such as socioeconomic projections. Most CDOT staff members who oversee the model are also staff to MUMPO.

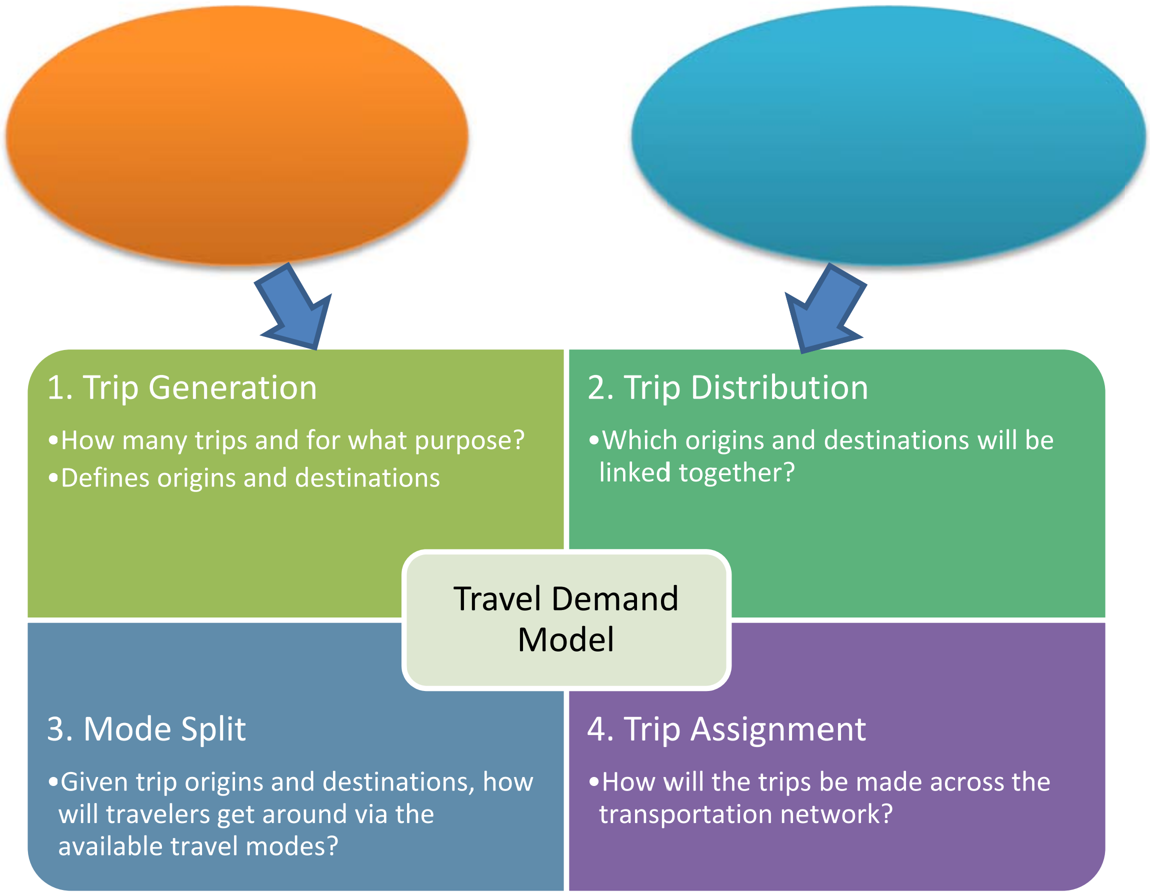
In addition to the above tasks, the MPO and others may use the travel demand model or its component parts to complete other planning or analytical tasks related to land use, transportation or environmental planning within the region. Often, in completing the necessary environmental studies, DOTs or others will use MPO socioeconomic projections and travel demand models for traffic forecasting or land use analysis as the MPO projections and travel demand models are often the only readily available source or tools available to complete the necessary analyses. As shown in Figure 5, the regional travel demand model is a “Four-Step Model” that uses the projections of population, households and employment as one key input file.

In most MPOs that use a Four-Step Model, the MPO develops the socioeconomic projections through some combination of projecting of historical trends, build-out capacity and other methods as appropriate for the specific region. To properly develop traffic forecasts, these socioeconomic projections must be provided at small geographic scales, thus the projections are allocated from a regional level, to a county level and finally to smaller geographic areas called Traffic Analysis Zones (TAZs). The TAZ projections typically include data for a base year (with data based on Census counts and other survey resources) and future horizon years based on the MPO forecasting process. The data for each year typically includes, for each TAZ,

- the number of households
- number of persons within households
- number of persons within group quarters (i.e. dorms, prisons or other non-household living arrangements)
- median income for households
- the number of students (sometime divided into sub-categories by age group)
- number of employees (typically divided into multiple sub-categories by type of employment).

The regional travel model uses this data in Step 1 of 4 to predict how many trips and what type of trips are generated in each TAZ. The MRM TAZs for the Future Land Use Study Area (or FLUSA, the study area defined for the purposes of the ICE report) are shown in Map 5 to provide a sense of scale for these important geographic subdivisions. Also shown in Map 5 is the distinction between TAZs within the jurisdiction of MUMPO and those TAZs under the jurisdiction of another MPO or RPO. Of the 383 TAZs partially or fully within the FLUSA, 349 are within the jurisdiction of MUMPO, while the remaining 34 are under the jurisdiction of the Rocky River Rural Planning Organization (RRRPO). Each planning organization is the final authority of the socioeconomic projections at the TAZ level for the TAZs under its jurisdictions. As discussed in Section 3.2, the socioeconomic projections developed for the Metrolina region have been developed through an extensive and highly cooperative regional projection process.

Figure 5: Four-Step Travel Demand Model and Inputs



TAZs are delineated by the MPO working from Census data on population and employment and criteria set by the FHWA. These criteria recommend minimum populations of 600 persons or workers but they generally recommend approximately 1,200 persons or workers per TAZ. Additionally, FHWA recommends or requires that TAZs meet the following criteria[12]:

- Compactness: TAZs should be compact in nature.
- Nesting and boundaries: TAZs must nest within a county and must not cross county or state boundaries. Where possible, TAZs should follow city or town boundaries.
- Maximize contiguity: TAZs should be contiguous across each county without any missing slivers.
- Include all water and land: TAZs must include all area within the territory of a county; water bodies must be part of a TAZ.
- Unique and identifiable: TAZs must have unique identifiers and each MPO must have a unique identifier.

A TDM generates trip "productions" based on household location and characteristics, and trip "attractions" based on the employment data, which represent not only job destinations but also shopping

[12] FHWA CTPP Data Products. March 2010. "*TAZ Delineation Business Rules*."
http://www.fhwa.dot.gov/planning/census_issues/ctpp/data_products/tazddbrules.cfm

and other activities that attract household trips. The overall number of productions and attractions are balanced, providing a set of trip origins and destinations, which is then taken into Step 2 of the Travel Demand Model for Trip Distribution – the linking of the origins and destinations into trips. At this point, the model begins to use a separate input file that represents the network of available roadways in the region, including data about the capacity, speeds, and other characteristics of each road or highway.

Other modes of transportation such as public transit are also taken into account in Step 3 of the model, which estimates the division of all trips across the available travel modes. The final "loading" of trips onto the network happens in an iterative process in Step 4 of the model, in which trips are distributed across all of the roads in the network and the impacts of congestion on travel patterns are incorporated.

What is both important and relevant to the ICE analysis process is the fact that the socioeconomic projections (the projection of where population and employment will be in the future) are a distinct input to the travel demand model from the transportation network. Consequently, the extent to which the socioeconomic projections represent the land use impacts of any given project cannot be answered by solely looking at the transportation network used in the travel demand model or its outputs. Instead, it requires examining the process and data used by the MPO in developing the population and employment projections. The assumptions behind the MRM socioeconomic projections are discussed below.

3.2 How Did the MPO and CDOT Develop the Projections?

It is important to note that regional socioeconomic models and projections are somewhat fluid in their development. Factors and variables may be created in the development stage that are either applied narrowly or omitted due to data limitations or other aspects of the extremely complex process of creating future land use projections at regional, county, and TAZ levels. This is one factor that caused confusion in the past quantitative ICE analysis and which could persist in spite of the additional information provided here. As such, it is necessary not only to conduct a very careful review of how the models were designed, but more importantly, how they were ultimately used in developing socioeconomic projections. This is necessary in order to understand fundamental questions regarding the role of the Monroe Connector/Bypass in the ultimate socioeconomic projections. For this reason, the following discussion reviews not just the model processes, but also reviews the model results and includes information from CDOT, who created and applied the many of these models. These reviews are needed to understand the true meaning and bases of the regional projections and to develop a full understanding of the projections and their appropriate use in other analyses.

Review of Projection Versions

As custodian of the MRM, CDOT and MUMPO staff oversaw the various regional socioeconomic projection processes and updates that have occurred over the last decade. As the discussions below shows, the projection process is a continuous and evolving process, so it is important to document exactly which datasets are used for any different purposes and different planning efforts.

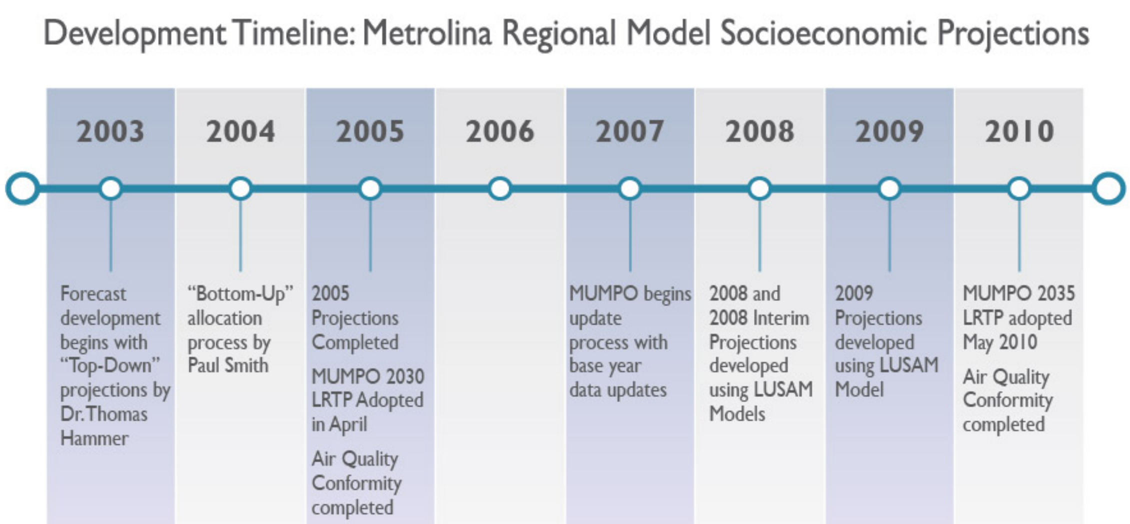
The current MRM 2011 v 1.1 uses projections finalized in 2009 and is used as the basis for air quality conformity approvals for the 2035 Long-Range Transportation Plan (LRTP) adopted May 3, 2010. These current projections (hereafter called the 2009 Projections) were the latest update to projections that were first developed beginning in 2003. Table 4 summarizes the various socioeconomic projections, the associated file naming conventions, the month and year the projections were completed, associated MRM versions and the base and horizon years for each socioeconomic projection dataset. Figure 6 shows the timeline of when the projections were developed relative to the adoption of each MUMPO LRTP. The Projection Names shown in the table and figure are not an official name but are used in this document for ease of reference. Each socioeconomic projection dataset includes projections for ten-year increments, with five-year increments interpolated between horizon years. Thus for the 2009 Projections (which were used in the 2035 LRTP), the horizon years were 2015, 2025 and 2035, but interpolated projections were also available for 2020 and 2030. Similarly, for the 2005 Projections (which were used in the 2030 LRTP), the horizon years were 2010, 2020 and 2030, but interpolated projections were also available for 2015 and 2025.

In the 2003-2004 timeframe, MUMPO and its regional partners at other MPOs and Rural Planning Organizations (RPOs) prepared the TAZ-level 2030 projections of population, households and employment in support of the development of the 2030 LRTP. The projections originally developed for this purpose were completed in 2005 and became the projections used in the official Metrolina Travel Demand Model 2005 version 1 (MRM05v1) and all versions of the model through MRM06v1.1.

Table 4: MRM Socioeconomic Projection Versions

Projection Name	TAZ File Name	Projections Completed	Use for LRTP Conformity Determination	Associated Model Version	Base and Horizon Years
2009 Projections	SE_*Year*_091028	October 2009	MUMPO 2035 LRTP	MRM 09 v1.0 MRM 11 v1.0 MRM 11 v1.1	Base: 2005 Horizon: 2015, 2025, 2035
2008 Interim Projections	SE_*Year*_081119_ MUMPO_interim	November 2008	None	None	Base: 2005 Horizon: 2015, 2025, 2035
2008 Projections	SE_*Year*_081024	October 2008	RFATS 2035 LRTP	MRM 08 v1.0	Base: 2005 Horizon: 2015, 2025, 2035
2005 Projections	SE_*Year*_taz2934	April 2005	MUMPO 2030 LRTP	MRM 05 v1.0 MRM 06 v1.0 MRM 06 v1.1	Base: 2000 Horizon:2010, 2020, 2030

Figure 6: Timeline of MRM Projection Development



Subsequent to the adoption of the 2030 LRTP, MUMPO conducted an update process for their projections in 2008-2009 and extended their projections to 2035. These updates used the 2005 Projections as a critical input as described below. All of these updates used a spreadsheet model system called a Land Use Allocation Model (LUSAM) to develop the 2008 and 2009 Projections. The details of this process are described in later sections.

The first of these updates was completed and incorporated into MRM 08 v1.0, which was the official model used to support the 2035 LRTP for the Rock Hill-Fort Mill Transportation Study Area. CDOT continued to update the regional projections based on new information and developed interim projections in 2008 for use in the Northeast Transit Corridor planning process. These projections are known as the 2008 Interim Projections. These projections were further updated and finalized in 2009 and eventually incorporated into the 2035 LRTP adopted May 3, 2010 and modeled using Metrolina Travel Demand Model 2009 version 1 (MRM09v1). Subsequent Metrolina Travel Demand Model versions (MRM11v1, MRM11v1.1) also use these same projections.

The FEIS Quantitative ICE (developed in 2009 and completed in 2010) used the 2008 Interim Projections, as they were the most up-to-date projections available at the time of that analysis. Given that CDOT has updated its projections since that report, it would be most appropriate to use the 2009 Projections. The following sections describe the 2009 Projections and the various inputs and processes used to develop those projections, as well as describing the prior process for developing projections. The purpose of this review is to fully disclose and explain what, if any, impact the Monroe Connector/Bypass had on the 2009 Projections to determine the most appropriate way to use those projections in the update of the ICE analysis.

2008 and 2009 Projections (LUSAM Process)

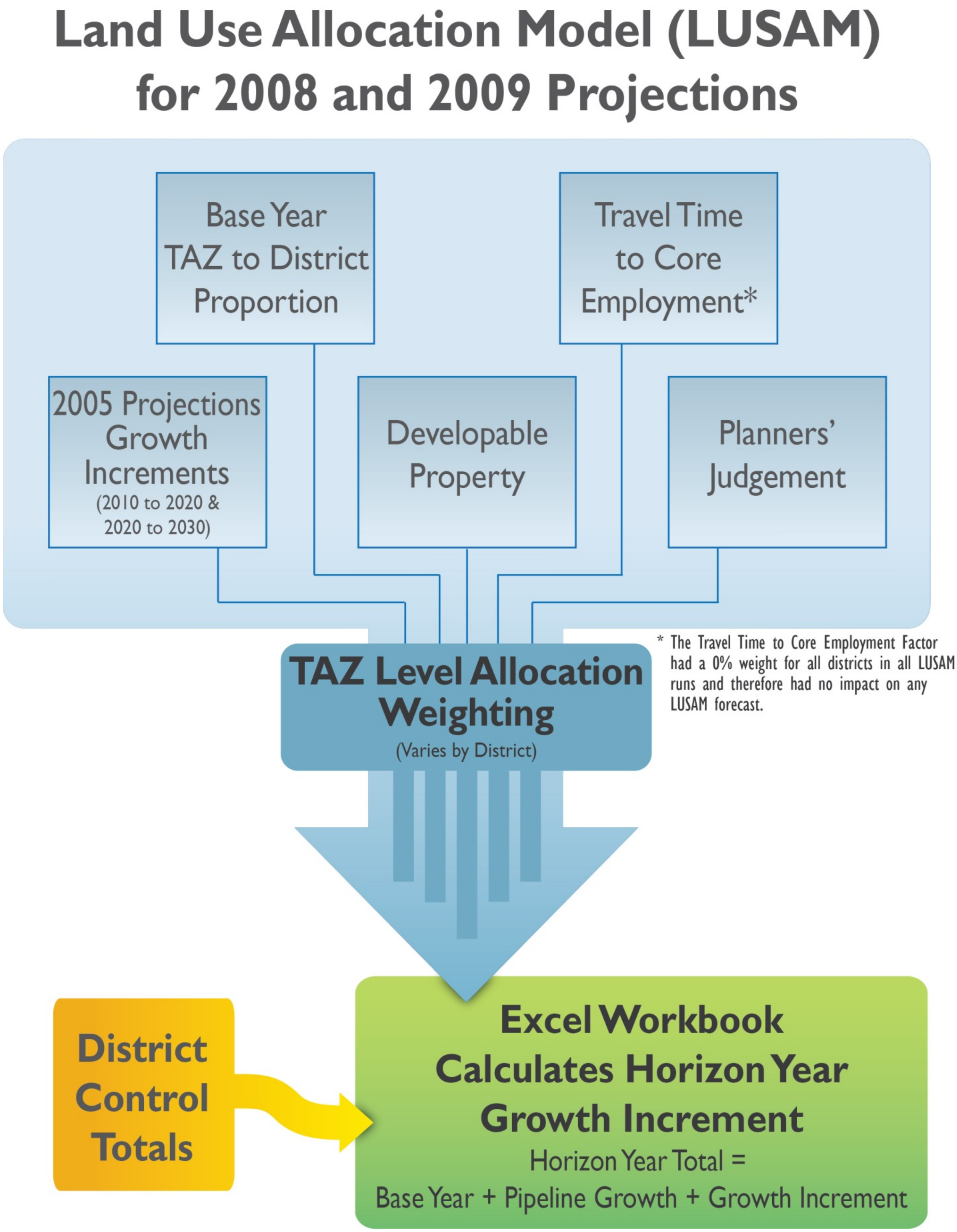
In 2008, CDOT, MUMPO and other regional MPOs began development of their 2035 LRTPs and in doing so, needed to update population and employment projections for 2015 and 2025 and develop a TAZ level projection for 2035. The initial step was to develop the socioeconomic base year of 2005 by reviewing recent development activity and updating TAZ level data on households, population and employment estimates as of 2005. Next, CDOT staff developed a spreadsheet model system called a Land Use Allocation Model (LUSAM) to consider multiple factors as part of the projection process. CDOT documented how the model worked in an internal draft document titled *Metrolina Regional Travel Demand Model LUSAM: Land Use Allocation Model Technical Documentation* dated December 4, 2007 (Appendix E).

The LUSAM model uses a number of inputs to generate the future projections of households and employment for each TAZ and uses a district level approach to determining the factors considered in the distribution of the households and employment to each TAZ. The LUSAM model requires TAZs to be grouped into districts with up to 32 districts defined in the model. This simplifies the process of entering model weights, targets and factors. The model outputs its horizon year projections in an iterative process, such that each horizon year projection builds upon the next. Each iteration requires the input of base year values. For the first iteration, which produced the 2015 projections, the 2005 base year was used as the base year in all LUSAM model runs. For later LUSAM model iterations, the prior model output was used. Thus, for the 2025 horizon year, the 2015 output would be input as the base year and for the 2035 horizon year, the 2025 output would be input as the base year. The LUSAM model uses a district level targeting approach, where target household, population and employment values are set for each horizon year and the model attempts to adjust the projections such that the totals for the TAZs within each district would equal the district target. LUSAM aggregates the base TAZ data into the same districts as the targets. The difference between the target and base is allocated by percentages to the TAZs within the district and a new TAZ land use dataset is created. These targets were developed independent of the LUSAM model and the inputs to those are discussed later.

Figure 7 provides a visual representation of the LUSAM model process. The model would use up to five weighted factors to determine how to allocate the district level target of growth to each TAZ within the district. The growth increment would then be added to the base year plus the pipeline growth (the number of households or jobs under construction or approved for construction) to yield to total for the horizon year. The five factors available in the LUSAM workbook are described below; however, as applied in the projection process, not all factors were used:

- **2005 Projections Growth Increment:** The change (growth) over time from an earlier projection (e.g. – projections for a new 2015 dataset would use the same growth allocation as an earlier projection between 2010 and 2020). In practice, the 2005 Projections growth increments for 2010 to 2020 and 2020 to 2030 were used as the input for this factor. Thus, the 2008 Interim and 2009 Projections relied on the growth increments in the 2005 Projections.
- **Base Year Proportion:** The same proportion of TAZ to District as in the base TAZ file (e.g. if TAZ "1" has 100 retail employees of the 1000 retail employees in the district – it would receive 10 percent of all new retail employees)
- **Developable Property:** This is based on an estimate of households or jobs per acre (and total acres). Relative development density is a primary input to this category. It differs across categories and across geographies, for example, employment density by acre is considerably higher in the center city than in suburbs.
- **Travel Time to Core Employment:** The estimated travel time to downtown Charlotte under peak highway congestion conditions. This factor was inverted as shorter travel times are preferred over longer. In the LUSAM Models for the 2008 Interim and 2009 Projections the weight applied to this factor was zero. Therefore, this factor was never used (See Appendix F and G).
- **Planners' Judgment:** A direct 1-5 scale rating that could be applied to specific TAZs to reflect highly popular or unpopular TAZs for residential or non-residential development.

Figure 7: Visualization of LUSAM Workbook Process



The LUSAM model also incorporated "Pipeline" data by TAZ. The number of households or jobs under construction or planned could be added to a specific TAZ. Similarly, known decreases, such as that for a factory being closed, could be subtracted from a particular TAZ. Pipeline data would be added or subtracted to the base prior to allocation from districts.

The LUSAM model allowed for a weighting of the factors by each district. Thus, one district could have its entire weight based on the previous projections while another could have its entire allocation weight based on planners' judgment. The basic allocation equation is essentially the same for all categories and households are used in the example below.

$$
\begin{aligned}
&HH\_future_{taz} \\
&= HH\_base_{taz} + HH\_pipeline_{taz} \\
&+ (HH\_target_{dist} - (HHbase_{dist}\_HH\_pipeline_{dist}) * \\
&(Wgt1 * (\Delta HH\_y2 - y1_{taz} / \sum \Delta HH\_y2 - y1) \\
&+ Wgt2 * (HH\_base_{taz} / \sum HH\_base) \\
&+ Wgt3 * (Vacant\_res_{taz} / \sum Vacant\_res) \\
&+ Wgt4 * (TravTime_{taz} / \sum TravTime) \\
&+ Wgt5 * (PlannersJudgment / \sum PlannersJudgment))
\end{aligned}
$$

Where:

HH_future_{taz}	Future (projection) year TAZ households
HH_base_{taz}	base year TAZ households
$HH\_pipeline_{taz}$	Pipeline households added to TAZ between base year & future year
$\Delta HH\_y2\text{-}y1_{taz}$	Change in no. of HH in TAZ between y1 and y2 in "old" projection set
$\sum \Delta HH\_y2\text{-}y1$	Change in no. of HH in district (sum of all TAZ) between y1 and y2 in old projection set
HH_base_{taz}	No. of base households in district
$\sum HH\_base$	Sum of base households for district
$Vacant\_res_{taz}$	Vacant residential acres for TAZ
$\sum Vacant\_res$	Sum of vacant residential acres for district
$TravTime_{taz}$	Reciprocal of travel time to core employment for TAZ
$\sum TravTime$	Sum of reciprocal of travel time to core employment for district
$PlannersJudgment_{taz}$	Planners Judgment value (1-5) for TAZ
$\sum PlannersJudgment$	Sum of Planners Judgment values for district
Wgt1 … Wgt5	Weights (0 – 1 for each factor, weights must sum to 1.0)

The 2008 Projections were the first projections developed using the LUSAM methodology. These projections were developed and used for the Rock Hill-Fort Mill Area Transportation Study 2035 LRTP air quality conformity analysis. The 2008 Projections were not used for any planning purposes within the MUMPO or RRRPO regions. Also, these projections were not used in development of the 2008 Interim or 2009 Projections, either. Therefore, they were not analyzed as part of this report.

The 2008 Interim Projections were the projections provided to NCTA for use in the FEIS Quantitative ICE analysis. The LUSAM input and output sheets for the 2008 Interim Projections are provided in Appendix F. The model inputs show that for the 2008 Interim Projections the major focus of adjustment was on Mecklenburg County, with the remainder of the region largely relying on the growth projections from the 2005 Projections to guide the LUSAM adjustments. Of the factors in the model, the Travel Time to Core Employment is not used at all for any district for any horizon year. For all areas outside Mecklenburg County, the previous projections (2005 Projections, which were used in the 2030 LRTP) were the main factor in the household and population projections. For employment projections outside Mecklenburg County, the previous projections had the highest weighting but some weight (10-25 percent) was placed on the estimate of available land and densities. Within Mecklenburg County, projections of households and population were based on a mixture of the previous projections, available land and density and planners' judgment, with the exact weighting varying from district to district within the county.

The 2009 Projections are the most recently completed projections that have been fully adopted and used in regional air quality conformity analysis. These projections are very similar to the 2008 Interim Projections and, in fact, LUSAM runs were only used in Mecklenburg County to adjust between the 2008 Interim Projections and the 2009 Projections. The LUSAM input and output sheets for the 2008 Interim Projections are provided in Appendix G. Only minor adjustments were made in Union County and only to employment. Within Mecklenburg County, projections of households and population were based on a mixture of the previous projections, available land and density and planners' judgment, with the exact weighting varying from district to district within the county.

To illustrate how the LUSAM workbook produces the projections, Figure 8 shows the LUSAM process with district targets and changes for household projections for all TAZs in the Marshville District for the 2015 horizon year from the 2009 and 2008 Interim Projections LUSAM Model run. The example is somewhat simplified as there are no pipeline household adjustments and 100 percent of the weight is on the Old Projection factor. Pipeline households would be any planned or under construction households in a TAZ. The process begins with the base year households, which are the number of households in each TAZ in 2005. The model then adds the pipeline households to the base year households. Next, the model works to distribute the households from the district level targets to the TAZ level using the weighted factors. In the example of Marshville, the full weight is placed on the distribution from the Old Projections (the 2005 Projections used in the 2030 LRTP). Thus, in the example shown below, TAZ 9333 captures 16.1 percent of the district household growth in the Old Projections. Thus, it receives that same percentage of the district household growth from the new, targeted growth (16.1% x 344 = 55 households). Thus, the household projection for 2015 for TAZ 9333 is 531 households.

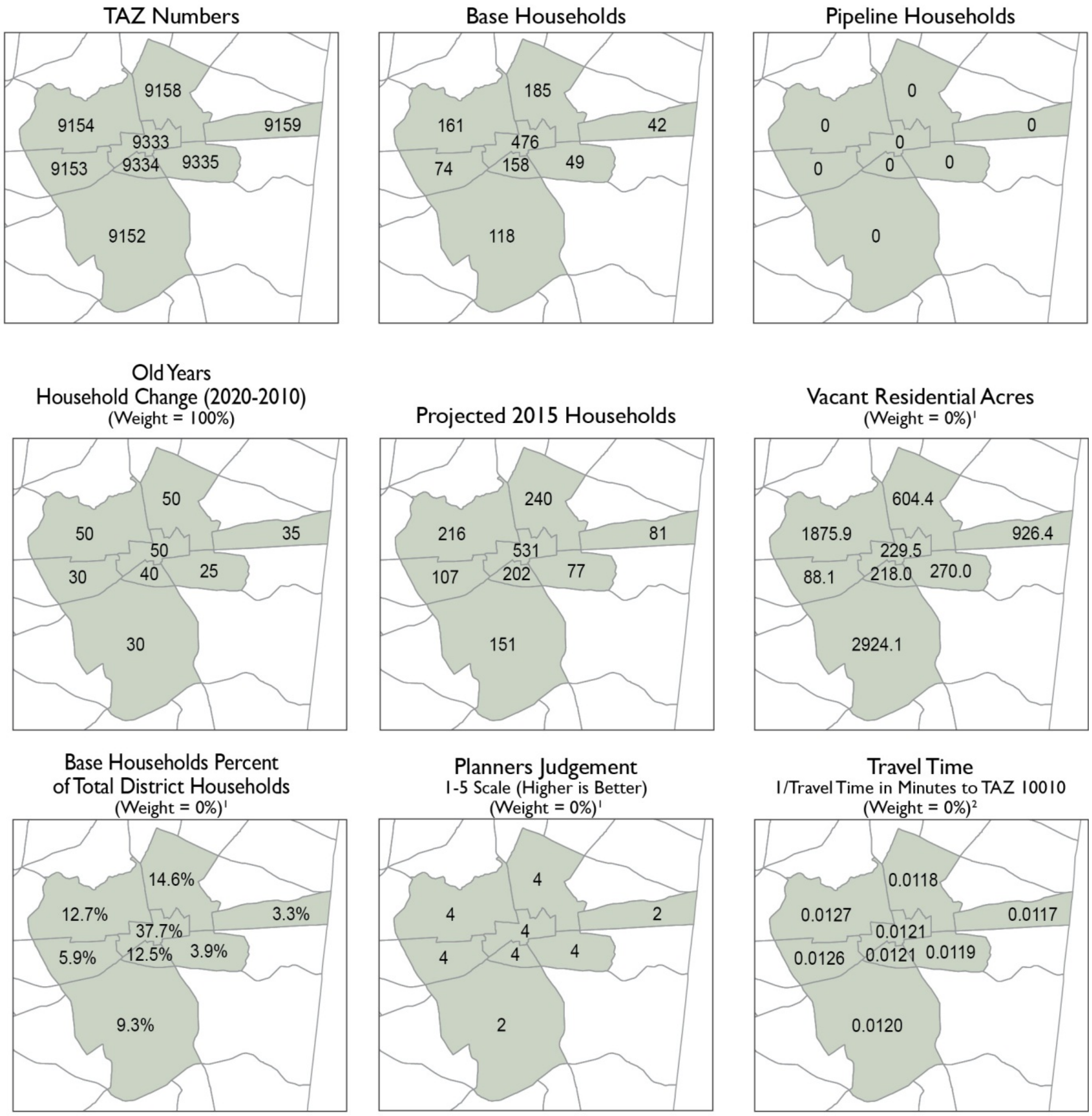
Based on these inputs and the LUSAM process, the Monroe Connector/Bypass could only have affected the LUSAM model through four possible inputs:

- The Planners' Judgment Factor
- The Travel Time to Core Employment Factor
- The Old Projections Growth Increments Factor (2005 Projections)
- District Level Targets.

As discussed above, however, the Travel Time to Core Employment Factor was not used (its weight was zero percent) for any LUSAM runs. Furthermore, the Planners' Judgment Factor was not used at all in Union County for any LUSAM run. Thus, based on the weighting of factors, the Monroe Connector/Bypass could not have influenced the projections through these two factors.

Thus, to fully assess whether the 2008 Interim or 2009 Projections were affected by the Monroe Connector/Bypass, one must fully understand the 2005 Projections (since the allocation of those projections guided the allocation of the newer projections) and the District Level Targets.

Figure 8: LUSAM Example, Marshville, 2009 and 2008 Interim Projections, 2015 Horizon Year



Marshville District		Marshville District Old Projections	
2005 Base HHs	1,263	2010 Projected HHs	1,415
2015 Target HHs	1,607	2020 Projected HHs	1,725
Difference	344	Difference	310

<u>TAZ 9333 Example Calculation</u>

$$2005\ \text{Base HHs} + \text{Pipline HHs} + ((\text{OldYears}_{TAZ}/\text{OldYears}_{Dist}) \times \text{HH\_Target}_{Dist}) = 2015\ \text{HH Projection}$$

$$476 + 0 + ((50 / 310) \times 344) = 531\ \text{HHs}$$

[1] These factors were not used at all in Union County for the 2008 Interim or 2009 Projections. These variables were used in Mecklenburg County projections with the weights varied by district.

[2] While the LUSAM includes values for the Travel Time to Core Employment factor, the factor was not used for any projection. The weight applied to it in all cases was 0%. It is shown here for the purposes of full transparceny. For full details please see Appendicies B, C and D.

Development of the 2005 Projections (Used in the 2030 LRTP)

The 2005 Projections (which were used in the 2030 LRTP) were developed through a process with three main components, a Top-Down projection, a Bottom-Up projection and input from an advisory group on the final projections. Each component in the process had a key role, as shown in Table 5. The development of the TAZ-level projections relied first on the Top-Down process to project future growth at the regional level and then allocate the regional growth to the county level. A subsequent Bottom-Up process allocated the county-level growth to the TAZ level within each county. Different parts of the Metrolina region used different approaches to the Bottom-Up process, but for the MUMPO area, which included most of Union County, a process prepared by Paul Smith of UNC-Charlotte provided the initial allocation. As was the case with the Top-Down projections, the Bottom-Up steps used input from local planners and jurisdictional representatives to review and refine the projections prior to adoption.

Table 5: Roles, Factors and Accessibility Considerations of the MRM Socioeconomic Projection Process Components

	Roles	Projection Factors	Accessibility Considerations
Macroeconomic (Top-Down) Projections **Completed by Dr. Thomas Hammer**	Projects regional household, population and employment totals and sets county level control totals	**Regional Projection** National population and employment trends linked by economic sector to regional trends	None
		County Level Allocation Past economic and demographic trends Economic and demographic conditions (as of 2003) Influence of income on growth Proximity Land availability Past land use and infrastructure policies	Explicitly includes two major road projects: • NC 16 Freeway to Lincoln County • Garden Parkway Only considers proximity in linear terms (county centroid to county centroid); no use of roadway networks
Household and Employment Allocation: (Bottom-Up) Process **Completed by Paul Smith, UNC-Charlotte**	Distributes growth from county-level to the Traffic Area Zones level	Developable Residential Land Redevelopable Residential Land Recent Population Change Travel Time to nearest Employment Center Water Availability Sewer Availability Expert Panel (High Growth Areas) Growth Policy Factor	Considers travel time from each TAZ to the NEAREST employment center, NOT regional employment centers Uses the TDM network, including the Monroe Connector/Bypass, but only in travel time to nearest employment calculations for final period (2020-2030).
Advisory/ Expert Input	County representatives agree on final county totals based on Top-Down process Local planners refine the Bottom-Up allocation based on adopted plans and local land use expertise; serves as a reality check on the allocation	Discretionary	Reflects local advisors' expectations (in 2003-2004) of whether new roads would be built Reflects the assumptions in adopted land use plans at the time regarding the anticipated road network

Regional Socioeconomic Projection and County Level Allocation (Top-Down Process)

The process to develop regional socioeconomic projections and allocate them to the county level (known as the Top-Down process) was a rigorous, research-based approach to developing a regional and county level projection of households and employment. Led by Dr. Thomas Hammer and documented in his report to the region titled *Demographic and Economic Forecasts for the Charlotte Region* (hereafter referred to as the "Hammer Report" and incorporated into this report as Appendix H), Dr. Hammer developed a long-range regional growth projection based on economic factors in the Charlotte region.

Dr. Hammer described his model as a demand-side model where the model determined economic employment (earnings) from a breakdown of different employment groups based on their link to national employment trends. The model also assumed by 2030, population demographic changes would constrain regional earnings. His report described large transportation projects and public policy land use or development controls as supply-side factors that do not necessarily contribute to the growth demand, but act as limits or constraints to where growth might occur at smaller scale projections.[13] Therefore, Dr. Hammer's projections were not sensitive to large transportation projects such as the construction of the Monroe Connector/Bypass. Therefore, his methods and approach would not be appropriate to model potential indirect and cumulative effects and thus other methods were used as described in Section 4.

Dr. Hammer's process started with descriptions of the national economy and regional economy to quantitatively link the economies based on worker earnings, referred to as employment. His modeling broke the regional economy into a 42-industry classification scheme to quantitatively link to the national economy. The procedure separated employment in each regional industry into a "basic" component and a "population-serving" component to quantitatively link the regional industry employment trends to national industry employment trends. Separate quantitative analysis was performed to create a linkage between the basic component of employment between the regional and national trends and the "population-serving" component of employment between the regional and national trends. The two separate quantitative linkages were combined to develop overall industry profiles for the region. Demographic projections were obtained by finding a regional population profile for each future year that yielded a labor force consistent with expected employment level.[14] The process yielded region-wide employment and demographic totals that became control totals to help determine where in the region the overall growth would occur.

The region-wide employment and household totals were allocated among the counties and districts with the aid of 35 equations to identify factors used in the determination of county level growth shares of the regional industry growth total. These equations included three for demographic variables of upper, middle and low-income housing, and 32 equations for employment by sector. These equations were calibrated on the experience of 227 counties in 29 separate U.S. metropolitan areas chosen for their comparability to the Charlotte region. The modeling allocation process also included factors such as available land in each county and location proximity between employment and households. The location proximity was incorporated by weighting an inverse function of distance to the county for which a variable was being measured to another county. However, the model omitted such supply side factors of large-scale transportation projects, new land use policies and provision of infrastructure, and natural land constraints

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[13] Appendix H, p 10
[14] Appendix H, p 7

on development. Table 6 summarizes Dr. Hammer's description of the capacity of his projection and allocation model to capture growth influences.

Table 6: Capacity of Allocation Model to Capture Growth Influences

	Demand Side	Supply Side
Growth Factors Covered	• Past economic & demographic trends • Existing economic & demographic conditions • Economic-demographic linkages • Influence of income on growth patterns • Location	• Land area and land availability (as estimated on the basis of development magnitudes) • Past land use and infrastructure policies (to the extent they register in past growth)
Growth Factors Omitted	• Refinements o Some measures could be improved such as distance and area descriptors	• New or altered public policies governing land use and the provision of infrastructure • Large-scale transportation projects • Natural land constraints on development (if not strongly reflected in past growth)

Appendix H p 14

Dr. Hammer provided ranges of population and employment projections to account for variability and error in the model. He specifically noted, ". . . the upper and lower limits that express the ranges are specifically intended to express 90 percent or 95 percent confidence intervals. They cover only the year 2030, but could be extended to other years using the same proportions of past 2002 growth involved in their derivation"[15]. He obtained the upper and lower limits of growth by adding and subtracting amounts from the "most-likely" projection shown in Table 7.

> *The additions or subtractions at each geographic level equal a common percentage times the difference between the most likely values for 2030 and the actual values for 2002. Thus, the greater the expected growth, the wider the error margin, on the logic that unforeseen supply-side influences will operate mainly by reallocating growth rather than affecting urban development already present.*[16]

Dr. Hammer noted that different percentage margins are appropriate at different geographic levels, since the potential for error increases as area size decreases. He stated that "[s]mall margins are appropriate for the region as a whole because supply-side factors exert little influence at that scale." He calculated regional margins for population and employment by adding and subtracting 10 percent of the most likely 2002-2030 growth. He further noted that "[a]t the county level and district levels, the calculations involve larger downside margins than upside margins, on the argument that land use policies and environmental factors can have larger effect in diverting growth than in attracting development over and above location based demands." He obtained the county ranges from the 2030 most-likely projection, by applying a 25 percent deduction of the 2002-2030 most-likely growth and a 15 percent addition to the 2002-2030 most-likely growth.[17] Table 7 shows Dr. Hammer's 2030 population projection ranges.

[15] Appendix H, p 66
[16] Appendix H, p 66
[17] Appendix H, p 66

Table 7: Dr. Hammer's Population Projection for the Charlotte Region

County	2030 Population		
	Lower	Most-Likely	Upper Limit
Anson County	36,967	40,847	43,175
Cabarrus County	247,142	283,115	304,699
Cleveland County	125,373	134,563	140,077
Gaston County	235,228	249,261	295,071
Iredell County	227,287	259,906	279,477
Lincoln County	113,206	128,857	138,247
Mecklenburg County	1,051,400	1,157,311	1,220,858
Rowan County	183,747	200,639	210,774
Stanly County	80,171	87,366	91,682
Union County	268,543	312,147	338,309
Cherokee County	83,228	93,168	99,132
Chester County, SC	52,278	58,306	61,923
Lancaster County, SC	91,781	101,680	107,619
Union County, SC	38,480	41,466	43,258
York County, SC	272,096	305,228	334,080

Appendix H p 67

Regional Projection and County Allocation (Top-Down Process) and the Monroe Connector/Bypass

Correspondence from interested parties suggests that Dr. Hammer's regional projections implicitly included the Monroe Connector/Bypass and therefore the regional projections should be used as the basis for a Build scenario or should be recalculated for the purposes of the Quantitative ICE.[18] Specifically, one comment suggests that Dr. Hammer's analysis assumed that there would be sufficient infrastructure available to accommodate any future growth and that this assumption implies that the Monroe Connector/Bypass is therefore assumed in the socioeconomic projections. As detailed above, supply side constraints were not a factor in Dr. Hammer's projections.[19] The following quotes from Dr. Hammer's report show that his process did not assume construction of the Monroe Bypass/Connector in projecting socioeconomic projections for the region or in allocation to the county level.

> *The strengths of the model approach include its objectivity and ability to capture a wide variety of relationships and spatial interactions. Its weaknesses derive from the severe limits on types of variables that can be feasibly collected for large sample model calibration. Because whole classes of variables must be omitted, the factors driving the model (other than regional totals) are limited to earlier values of the target variables themselves – i.e. to demographic and economic descriptors – plus functions of distance,*

[18] Letter from Southern Environmental Law Center to Jennifer Harris, NCTA, November 30, 2012, p 19.
[19] Appendix H, p 11

> *land area and density. The most important omissions are factors that typically must be measured at a fine-grain level of detail (and often are hard to quantify in a relevant fashion) such as land use controls, natural land characteristics and availability of infrastructure. Since these factors mostly affect the supply of land suitable for development, and since the factors that allocation models do cover are most predictors of development demand, the limitations of such constructs can be summarized by calling them demand-side models*[20].
>
> *Two circumstances allow demand-side models to capture some supply-side influences. First such models can express the general role of land availability using crude measures that consider total land area (minus large-scale deductions like the military installations, wetlands and parks) and existing development density. Second because the model equations operate partly by extrapolation and are pegged to replicate past conditions in the subject areas, they implicitly cover all supply-side factors to the extent that future impacts of these factors equal past impacts.*[21]
>
> *But what models of the given type cannot do is capture the influence of exceptionally large infrastructure projects or shifts to more or less stringent development controls. They basically assume that the tendency of public actions to restrict or encourage growth will resemble the conditions prevailing in the calibration period (at the present meaning the 1990s).*[22]

Other comments from correspondence suggest that the "proximity factor" used by Dr. Hammer implicitly assumes an improved transportation network.[23] Dr. Hammer's proximity factor cannot include the transportation network. Since Dr. Hammer used the growth rates that occurred in the county between 1990 and 2000 to calibrate his model equations and there has been no controlled access freeways built in Union County in the last two decades, his projections, therefore, could not have assumed construction of a limited access roadway like the Monroe Connector/Bypass. Further, 2000-2010 growth that occurred in the region moved Union County's population rank among regional counties from sixth in 2000 to fourth in 2010. This growth occurred without a freeway. Thus, a freeway (even less so a toll-road), is not a factor contributing to the extremely high growth occurring in Union County. Rather Dr. Hammer describes major infrastructure projects as an influence that will operate by mainly reallocating growth rather than affecting the urban development that is already present.[24] As discussed in Section 3.3, this conclusion is not exclusive to the analytical work performed by Dr. Hammer.

Correspondence from interested parties also suggests that the county level population projections and employment projections should be re-calculated to exclude the Monroe Connector/Bypass.[25] Again, Dr. Hammer's model to allocate the region growth to County population and employment projections was not

[20] Appendix H, p 10
[21] Appendix H, p 10-11
[22] Appendix H, p 11
[23] Letter from Southern Environmental Law Center to Jennifer Harris, NCTA, November 30, 2012, p 19.
[24] Appendix H, p 66
[25] Letter from Southern Environmental Law Center to Jennifer Harris, NCTA, November 30, 2012, p 19.

sensitive to a large-scale transportation project like the Monroe Connector/Bypass as he described in his report.[26]

> *In North Carolina, county-level forecasts from a calibrated allocation model should ordinarily be reliable – to the extent any forecast is reliable – with little or no adjustment for omitted supply-side influences. But supply-side factors gain potential importance at progressively smaller geographic scales, so the question is how far below the county level a model application should extend.*

Later in the report, Dr. Hammer notes how he adjusted outputs from the model to account for a particular major highway project that he believed would influence growth in a particular county.

> *The present approach is designed to avoid any need for ad hoc adjustment of results (other than systematic reconciliation with bottom-up, supply-side forecasts, if these are available). However, one after the fact adjustment has occurred here to improve the validity of the numbers in an area relevant for a particular planning project. The failure of the top-down forecasting procedure to acknowledge the impacts of special infrastructure development was judged a critical weakness in eastern Lincoln County, where the upgrading of Route 16 to a freeway will clearly yield growth increments over and above those predicted by demand-side model. This situation has been addressed by advancing the population forecast for one sub-district of Lincoln County from 2035 to 2025 and advancing the forecasts for two other Lincoln sub-districts from 2029 to 2025[27].*

Finally, explaining the ranges of population and employment projections shown in his tables, Dr. Hammer noted how he adjusted model results for the upper limit of the projections for East Gaston, Southwest Gaston, North York districts for the proposed toll road over the Catawba River.

> *The second factor is the possibility that a toll expressway will be constructed across the Catawba River to link southern Gaston County with western Mecklenburg. Such a facility would have substantial development impacts on East Gaston, Southwest Gaston, North York and the two counties in aggregate. These potential impacts are incorporated into the upper-limit population and employment values as explained in the footnotes to tables 11 and 12. Adjustments of this nature are not provided for the Route 16 freeway in Lincoln County because the impacts of this facility have already been incorporated into the forecasts, as discussed near the end of Section I. There are also not adjustments for completion of the I-485 beltway around Charlotte because it is not clear whether or how the beltway will alter district-level development patterns relative to what has already been predicted.[28]*

It should be noted that no changes were made to the "most likely" or "lower-limit" scenarios for Gaston and Mecklenburg Counties based on the proposed toll facility. In summary, Dr. Hammer's analytical approach estimated regional and county growth within the Metrolina Regional Travel Demand model

[26] Appendix H, p 11
[27] Appendix H, p 12-13
[28] Appendix H, p 69

area. This projection was designed to establish regional and county level household, population and employment control totals and as such was not influenced by projects that primarily impact accessibility within one county such as the Monroe Connector/Bypass. This means Dr. Hammer's regional and county projections would not have changed with or without the construction of the project.

MUMPO 2030 LRTP Household, Population and Employment Allocation Process (Bottom-Up Process)

In 2004, CDOT hired Paul Smith and his team from the UNC-Charlotte Center for Applied GIS to create a model to allocate households, population and employment from the county level to the TAZ level. The methodology of the process is described in Mr. Smith's report *Mecklenburg-Union Metropolitan Planning Organization Population Projections and Employment Allocations, 2000-2030* (Appendix I). Mr. Smith's process focused on the household (and by default population) allocation and the allocation of population-chasing employment. Population-chasing employment is that employment associated with retail and services that tend to follow population growth. Non-population-chasing employment was distributed solely based on the input of staff and expert panel participants. Mr. Smith's allocation process started with the county-level control totals developed in the Top-Down process, existing baseline data (2000), and the influence of the of land development factors chosen and ranked by expert panels. Within Union County there were eight land development factors used to assess the attractiveness and capacity of each TAZ in the county to draw future growth. These variables are listed in Table 8.

Table 8: Union County Land Development Factors

Factor	Weight by Year of Allocation		
	2010	2020	2030
Developable Land	3	3	3
Travel Time to Employment	3	3	3
Water	2	2	2
Sewer	2	2	2
Redevelopable Land	2	3	3
Population Change	3	1	Not used
Expert Panel	2	2	2
Growth Policy	1	1	1

Mr. Smith used a raster cell based analysis system where Union County was split into a set of 500 feet by 500 feet grid cells and the value for each land development factor was calculated for each grid cell. Each land development factor would also be normalized to a 0 to 1 scale and weighted so that all scores could be combined into a composite score. The composite grid scores were calculated for each cell and then averaged across each TAZ to calculate land attractiveness scores for each TAZ. The TAZ land attractiveness scores were used to derive the available residential acreage to be consumed during each allocation period. The 2005 Projections (which were used in the 2030 LRTP) were developed for 2010, 2020 and 2030. Thus for each allocation period (2000-2010, 2010-2020, 2020-2030) land development factors were calculated and normalized then weighted and the composite score calculated for each cell. Finally, for each TAZ, an average of the composite scores for all cells within each TAZ was calculated. Higher scores reflected higher attractiveness and would result in higher acreage consumed, until a TAZ reached its calculated maximum capacity. Allowable development densities per TAZ multiplied by the derived residential acres to be consumed were used to calculate the number of households in each TAZ. Historical household size was used to generate TAZ population at each allocation period. Existing development and available land acted as limits on further growth. Thus, while the available developable land served as a land development factor, it also served as a constraint in the model to ensure that growth in a TAZ was predicted within its capacity to accept development. Once the developable land within a TAZ was consumed, future development would be assigned to TAZs with lower composite scores in subsequent iterations. The land development factors and corresponding weights that were used in the Union County portion of the model are shown in Table 8.

The modeled predictions were subject to feedback and adjustment from the panel of experts. These experts reviewed and adjusted projections as documented in *Land Use and Socioeconomic Data and Projections for the Greater Charlotte* Region (Appendix J). No specific changes to household, population or employment projections are documented in Appendix J but the overall process of expert panel input is reviewed. Expert panel review is a common and recommended method in long-range projection to improve the acceptance of projections by political entities and data users.[29] Within Union County, however, no changes were made to the household and population projections as developed by Paul Smith at the TAZ level for the horizon years of 2010, 2020 and 2030. These projections were included as the socioeconomic projections for the adopted MUMPO 2030 LRTP.

Consultation with CDOT staff indicates that there was no influence from the Monroe Connector/Bypass on growth expectations associated with these projections (Appendix A). The travel time to employment factor did include the Monroe Connector/Bypass in the road network used to calculate travel times for the final period, but the assessment of CDOT staff was that the methodology used to calculate that factor would have minimized any impact of the Monroe Connector/Bypass on the 2005 Projections (which were used in the 2030 LRTP).[30] Furthermore, a review of Mr. Smith's results shows no indications of population or employment growth clusters along the project corridor. If the 2005 Projections had included growth expectations associated with the Monroe Connector/Bypass, one would expect to see higher than average population and employment growth and density in TAZs along the project corridor. There are no indications of such clusters of growth along the project corridor in Mr. Smith's results (Appendix I pp 42-67).

Review of the Travel Time to Employment Factor within the Bottom-Up Process

Since May 2012, NCTA has worked with CDOT staff and Paul Smith to reanalyze the travel time factor to determine if the factor affected the 2005 Projections (which were used in the 2030 LRTP) in a way that would indicate those projections include the induced growth effects of the proposed project. Specifically, NCTA engaged Paul Smith and CDOT staff in a reevaluation of the factor beginning in June 2012 and Paul Smith completed his analysis and reported his results to NCTA in September 2012.

The travel time to employment factor for Mr. Smith's model used an estimate of travel time to the nearest employment center. Mr. Smith defined an employment center as any location with 5,000 jobs within a ½-

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[29] Smith, Stanely K., Tayman, Jeff, Swanson, David A. *State and Local Population Projections: Methodology and Analysis.* Kluwere Academic/Plenum Publishers, New York, 2001. p 358

[30] Mr. Smith included the proposed project in his model as his travel time analysis for major roadways relied on speed data from the regional travel demand model in use at the time. The travel demand model in use at the time included the proposed project in its future year roadway network. See Appendix A (June 19th, 2012 discussion with CDOT Staff and follow up) for detail.

mile area. Travel time was calculated using a composite approach, combining travel speed information from the Metrolina Region Travel Demand Model (MRM), a GIS shapefile of existing roads and assumed walking speed of 2.5 miles per hour. [31] The MRM was used to estimate travel speeds for all roads within the MRM network. For the 2010 and 2020 horizon years, the 2010 model network was used and for the 2030 horizon year the 2025 model network was used. Using the speed assumptions above, travel times to the nearest employment center were then calculated for each horizon year (2010, 2020 and 2030). These travel times were then normalized to a 0 to 1 scale and averaged across each TAZ to determine the score for each TAZ.

The Monroe Connector/Bypass was included in the 2025 MRM network and thus the speed of that facility influenced the travel time to employment factor for the 2020 to 2030 period. Map 6 shows the original travel times calculated using this methodology. These travel times formed the basis of the original Travel Time to Employment Factor used in the Bottom-Up allocation process. As illustrated in the map and detailed in the discussion that follows, the Monroe Connector/Bypass does have a minor influence on the travel time used as an input to the Bottom-Up allocation process as indicated by the area of travel times of less than 10 minutes around the proposed project from Unionville-Indian Trail Road to Rocky River Road. The map also shows that many employment centers were used as destination points for the analysis in Mecklenburg and Union Counties. The closest employment centers within the FLUSA are at the following locations:

- US 74 and Rama Road in Charlotte
- Monroe Road and Sardis Road in Matthews
- US 74 at NC 51 in Matthews
- US 74 just west of Seacrest Short Cut Road in Monroe
- Downtown Monroe
- US 74 at Sutherland Ave in Monroe
- Along Secrest Avenue, north of US 74 in Monroe.

The methodology to calculate the travel time to employment for the Bottom-Up allocation calculated travel times to the *nearest* employment center, not to major destinations such as downtown Charlotte. The average distance from an employment center for the MUMPO study area Mr. Smith analyzed was only 3.8 miles, while the greatest distance was 14 miles. Thus, the methodology was a relatively localized analysis of travel time. Freeway type facilities, such as the proposed 20-mile long Monroe Connector/Bypass, tend to serve longer trip lengths. As such, the travel time to employment center analysis methodology would largely miss the travel time savings that would accrue to longer trips like those most likely to occur on the Monroe Connector/Bypass. Lastly, the location of the employment centers Mr. Smith used relative to the Monroe Bypass/Connector would tend to minimize the travel time savings the project could provide. A number of employment centers are located in and around downtown Monroe, as seen in Map 6, and since the proposed project bypasses the downtown Monroe area, Mr. Smith's travel time analysis would largely not account for travel time savings associated with the project in central and eastern Union County.

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[31] FHWA guidance on signal design recommends using 3 to 5 feet per second (2 to 2.7 mph) walking speeds in developing pedestrian clearance times for signal timings. FHWA. *Traffic Signal Timing Manual.* Chapter 5, Section 5.3.3. http://ops.fhwa.dot.gov/publications/fhwahop08024/chapter5.htm

Revising the Travel Time to Employment Factor without the Monroe Connector/Bypass

Since May 2012, NCTA worked with CDOT staff and Paul Smith to rerun the MRM model and the Bottom-Up allocation process with a revised MRM network that did not include the Monroe Connector/Bypass. NCTA requested the analysis to compare the results to the original 2005 Projections to determine whether removal of the proposed project would affect the results. CDOT staff obtained the 2025 MRM model used to calculate the travel speeds for the original travel time to employment factor analysis and revised the network by removing the Monroe Connector/Bypass. They subsequently reran the travel demand model with the revised network to get new speed data for the transportation network that did not include the Monroe Connector/Bypass. Mr. Smith then incorporated this new speed data into his other speed assumptions and recalculated the travel times used to develop the travel time to employment factor score for each TAZ. He then recalculated the composite attractiveness scores and subsequently reapplied his allocation model with the new composite attractiveness scores to determine if there would be any differences in population or employment allocations with the new travel time results.

When Mr. Smith removed the Monroe Connector/Bypass from his analysis, it resulted in minor changes to the travel times and composite attractiveness index. Out of 256 TAZs in the MUMPO analysis area of Union County, most had little to no change in travel time to employment centers when the Monroe Connector/Bypass was removed from the network:

- 150 TAZs (59 percent) had no change in their travel time
- 85 TAZs (33 percent) had a travel time increase of less than 1 minute
- 21 TAZs (8 percent) experienced a travel time increase of 1 minute or more
- The maximum change for a TAZ was 5.7 minutes, and the average change throughout Union County was 16 seconds.

The areas with increased travel time are shown in Map 7. The areas with the greatest increase in travel time are in western Union County, centered around the proposed corridor between Stallings and Monroe. The impact of this travel time change is highly localized around the western end of the Monroe Connector/Bypass. As described above, the model uses travel time to employment as one of several weighted factors in the calculation of composite grid attractiveness scores, which are averaged across a TAZ to derive the percentage of available acreage to be consumed by TAZ for each period. Mr. Smith used the recalculated travel time to employment factor to recalculate the grid attractive scores and TAZ scores for the 2020 to 2030 period. When the composite attractiveness scores were recalculated to include the revised travel time results above and then further averaged for each TAZ, the results showed that most TAZs had little to no change in attractiveness score. Of those that did change, the result was a reduction in attractiveness scores, as increased travel time would result in lower attractiveness to development. Out of 256 TAZs in the MUMPO portion of the study area:

- 150 TAZs (59 percent) had no change in composite attractiveness score
- 92 TAZs (36 percent) had a reduction of less than 1 percent
- 14 TAZs (5 percent) had a reduction of 1 percent or more change in composite score
- The greatest Composite Score reduction is 3.9 percent, and the average Composite Score reduction is 0.21 percent.

Changes in composite attractiveness scores by TAZ, calculated by Mr. Smith, are shown in Map 8. The geographic distribution of the changes roughly parallels those in the travel time map.

Next, Mr. Smith reapplied the allocation model to determine specifically if the change in travel times and composite scores would result in a different allocation of households and employment. The allocation model uses the composite scores to determine the percentage of available land in each TAZ that would be consumed by growth. The higher the composite score the higher the percentage of available land that would be consumed. The model would then multiply the percentage consumed by the actual available land in each TAZ to determine the acreage of land consumed within each TAZ. Then the acreage would be multiplied by the development density for each TAZ (calculated from tax and zoning records) to determine the actual number of households to be added to each TAZ for each period. Thus any change in composite score could potentially change the percentage of land consumed and thus the number of households added to any given TAZ.

When Mr. Smith reran the allocation model with the new composite scores, the results showed that the land use projections were identical to those produced in his original report; in other words the results did not change. For the 106 TAZs where the change in travel time led to a reduction in their composite attractiveness index, the allocation model in the original allocation (i.e. before the Monroe Connector/Bypass was removed) had calculated that those TAZs would use 100 percent of available land by 2030. For those same TAZs, when the new allocation model was run (i.e. after the Monroe Connector/Bypass was removed) the lower attractiveness scores did not reduce their attractiveness in the allocation model enough to cause the allocation model to request less than 100 percent of the developable land within each of those TAZs by 2030. These 106 TAZs already had relatively high composite scores as they were in areas with sewer and water availability, where growth policy was favorable and where Expert Panel members expected growth already. The relatively small reduction in composite attractiveness that resulted from the changes in travel time did not reduce the score for these TAZs enough to reduce the percentage of land the model would consume. In addition, many of these TAZs had little available land to fill in the 2020 to 2030 period. This result is logical given that the areas where travel time and composite scores changed have experienced extensive growth since 1990 and thus are likely to reach build out sooner than most other areas of the County.

These results show clearly that removal of the Monroe Connector/Bypass from the travel time to employment factor had no effect on the results of the 2005 Projections. Therefore, it is clear that the Bottom-Up portion of the 2005 Projections was insensitive to the presence or absence of the proposed project. Since this factor was the only factor that explicitly included the project in either the Top Down or Bottom Up, it is clear that the 2005 Projections are insensitive to the presence or absence of the proposed project. As such, it is reasonable to conclude, that the proposed project had no influence on the "Old Projections" factor used in the LUSAM process for the 2008 and 2009 Projections.

District Level Targets

The only remaining area that the Monroe Connector/Bypass could have influenced the LUSAM process would be through the district level targets. The household, population and employment targets used in the LUSAM models were developed based on the following inputs:

- Interpolation and extrapolation of the previous projections (2005 Projections, which were used in the 2030 LRTP)
- NC State Data Center Demographic Projections (Summer 2007)
- Hammer Report Five-Year Projections.

As previously documented, neither the Hammer Report nor the 2005 Projections (which were used in the 2030 LRTP) were influenced by the Monroe Connector/Bypass growth expectations. The NC State Data Center develops its projections based on trend growth over the previous two decades drawing from both Census counts and estimates. The projections are then developed using the most appropriate smoothing model that best fits the trend line data.[32] Since these projections rely entirely on trend data, there is no influence in these projections from proposed transportation improvements. Therefore, it is reasonable to conclude that the district level targets were unaffected by any influence from growth associated with the Monroe Connector/Bypass.

Review of Projection Results

An examination of density levels along the project corridor is illustrative regarding the relationship (or lack thereof) between the proposed project and the MPO projections of households, population and employment. Map 9 shows the household density by TAZ in 2030 from the 2009 Interim Projections. The household density levels in TAZs along the proposed project corridor in the 2030 projections are similar to the household densities of surrounding TAZs. If the projections were representative of a Build Scenario then one would expect to see higher household density levels along the project corridor, particularly at interchange locations. Map 10 shows the employment density by TAZ in 2030 from the 2009 Interim Projections. The employment density levels in TAZs along the proposed project corridor in the 2030 projections are similar to the densities of surrounding TAZs. If the projections were representative of a Build Scenario then one would expect to see higher employment density levels along the project corridor, particularly at interchange locations. Overall, the density pattern in the 2009 Projections shows no signs of influence from the Monroe Connector/Bypass. Furthermore, CDOT staff indicated that growth impacts of the proposed road were not a consideration in the projection process.

3.3 How Have Other Studies Used the MRM Socioeconomic Projections

The NCTA hired other consultants and researchers to perform work on traffic and revenue studies to obtain investment ratings for Toll Revenue Bonds. The work performed consisted of a Preliminary Traffic and Revenue Study, an Independent Economist Evaluation of the Socio-economic Estimates Underlying the Study of the Feasibility of the Proposed Monroe Connector/Bypass, and a Comprehensive Traffic and Revenue Study. This section will provide a summary of the work and the relevance to the research performed and used in the Quantitative ICE analyses.

WSA, Proposed Monroe Connector Preliminary Traffic and Revenue Study, Final Report, October 11, 2006

The NCTA hired Wilbur Smith Associates (WSA) to conduct a preliminary traffic and revenue study for the proposed Monroe Connector. The purpose of the study was to determine the feasibility of pursuing toll financing for construction of the Monroe Connector and/or Monroe Bypass. WSA assumed that the proposed project would provide significant time savings for travelers moving between I-485 south of Charlotte and Monroe or points south and east based on their analysis of travel conditions on US 74 in 2006 and travel demand model analysis of travel speeds in their study area. It should be noted that WSA completed this preliminary study in 2006 before analysis for the EIS had begun. WSA used the 2005

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[32] Smoothing models use historical data on past population or employment conditions and apply exponential functions that best fit those past trends to then forecast future conditions.

Projections socioeconomic data set (which were used in the 2030 LRTP) as it was the most recent projection available at the time of their study.

WSA collected traffic counts in the project corridor and used the information to re-calibrate the Metrolina Regional TDM model and provide traffic scenarios for No-Build, Build (Toll Free) and Build (Tolled) scenarios. They also updated the network within the model to account for proposed transportation improvements. WSA also collected information regarding regional and corridor income characteristics to aid in the development of estimated values of time for potential users of the toll facility. WSA stated that this is a critical parameter used to assess a motorist's willingness to pay for tolls and use the facility.

WSA concluded that the Monroe Connector/Bypass would help reduce congestion in the study area even with the planned widening of US 74. Its preliminary traffic and revenue study concluded that pursuing project financing with tolling was feasible and would be best served by combining the Monroe Connector and Bypass in a proposed toll financed project.

WSA's analysis relied upon the socioeconomic projections incorporated in the Metrolina Regional TDM. They concluded that the population projections contained in the Metrolina Regional TDM at that time were directly related to the growth rate of traffic predicated by the model. In their report, WSA indicated that the Monroe Connector/Bypass is included in the model and influences the growth projections therein. However, WSA did not perform a Build versus No-Build analysis for purposes of determining the project influence on the socioeconomic conditions in its study area. Furthermore, WSA provided no basis for the assumption that the Monroe Connector/Bypass influenced the growth projections in the model nor did they provide any documentation to justify the assumption. WSA's report clarified that its work was performed without the benefit of an independent economic review of the socioeconomic projections. WSA also acknowledged that such work would typically be required to support project financing.

In summary, this report was a preliminary traffic and revenue study and conducted prior to the DEIS Qualitative ICE and FEIS Quantitative ICE analyses. Furthermore, as shown through the analysis by Mr. Paul Smith discussed in section 4.4, the Monroe Connector/Bypass did not influence the 2005 Projections (which were used in the 2030 LRTP). Additionally, as discussed in the following sections, in their final *Comprehensive Traffic and Revenue Study* (October 2010), WSA did not assume the Monroe Connector/Bypass influenced growth projections in the base model, but instead, used an independent economist to develop TAZ projections specific for the final traffic and revenue study

Kenan Institute of Private Enterprise, Technical Memorandum, Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, Initial Report of Independent Economist, September 28, 2009

In subsequent work on the traffic and revenue studies, the WSA team, in consultation with NCTA, hired the Kenan Institute of Private Enterprise at the University of North Carolina's Kenan-Flagler Business School (Kenan Institute) in 2009 to develop a set of TAZ projections specifically for the Monroe Connector/Bypass Traffic and Revenue Study. The Kenan Institute developed their projections based on Dr. Hammer's 2003 projections for regional and county growth, a review of the MUMPO Bottom-Up process to allocate county and district growth from Dr. Hammer's projections to TAZs; a review of recent economic, employment and population trends and estimates produced by other organizations; a regional scan of the project area; and, interviews with planners, developers and business/economic experts within the region. The Kenan Institute Report, entitled *Initial Report of Independent Economist* (Appendix K), was used in the development of WSA's *Comprehensive Traffic and Revenue Study*, October 22, 2010.

The main objective of the Kenan Institute Report was to determine the socioeconomic conditions that would be prevalent in its project study area with the construction of the Monroe Connector/Bypass toll road. As part of its work, the Kenan Institute conducted an independent economic review of the 2008 Interim Projections, which were the most up to date TAZ level projections available at the time of their study. The Kenan Institute's corridor study area for evaluation and analysis is shown in Map 11.

Map 11 also includes the Qualitative and Quantitative ICE analysis areas. One key observation is the Kenan Institute's study area is much smaller than the either the Qualitative or Quantitative ICE study areas. The Quantitative ICE study boundary was established to evaluate effects on the natural environment in consultation with resource agencies and is focused on impacts to watersheds and protected species. The Kenan Institute's study area appears to have been established based on the project's travel time savings during peak travel times. The Kenan Institute study area is 132,436 acres compared to the Quantitative ICE study area of 202,000 acres or 66 percent of the Quantitative ICE study area. This observation also highlights that the area of influence of change in socioeconomic projections is much less than the project area, the county and the region as a whole. In other words, the Kenan Institute analysis and resulting study area provide further evidence that the Monroe Connector/Bypass would have little to no effect on regional or county level growth.

The Kenan Institute reviewed the 2008 Interim Projections and determined that for the purposes of forecasting traffic for Toll Revenue Bond issuance, adjustments would be required to develop socioeconomic projections that were reasonable but did not overestimate traffic forecasts. The Kenan Institute made two adjustments to the socioeconomic estimates. "The first was to make region-wide adjustments consistent with the national growth expectations. The second was to reallocate growth in Union County in line with development factors and constraints."[33]

The Kenan Institute's analysis determined that the growth in the 2008 Interim Projections needed to be adjusted to account for the extended recession, which it determined was not accounted for in the projections. Based on its research, the Kenan Institute lowered the TAZ level projections by 8.7 percent to account for the national economic correction, which suggests that as growth resumes, the gross domestic product is expected to be 91.3 percent as high as it would have been at the same time in the absence of the national crisis.[34]. Table 9 shows the original 2008 Interim Projections of household and population, the Kenan Institute adjustments for the national economic correction, and their project specific adjustments.

Table 9: Household and Population Projections for the Corridor Study Area (132,436 acres)

Year	MRM 2008 Interim Projections		Kenan Adjustments for "National Correction"		Kenan Adjustments due to Project	
	Households	Population	Households	Population	Households	Population
2005	42,595	120,054	42,595	120,054	42,595	120,054
2010	49,393	140,267	45,164	128,258	45,346	128,732
2015	56,454	161,371	51,556	147,364	51,968	148,486
2020	62,479	178,152	57,056	162,689	57,974	165,207
2025	68,407	194,812	62,469	177,902	63,869	181,775
2030	74,497	211,973	68,029	193,573	69,843	198,613

[33] Appendix K, p 29
[34] Appendix K, p 24

Looking within the project corridor, the Kenan Institute accepted the allocation of growth by the MPO in Mecklenburg County. However, it reallocated the projected population growth within Union County away from the line of high growth in the southwest quadrant of the county to the Connector/Bypass corridor because of the project. A portion of the expansion in several high growth TAZs in the northeastern quadrant of the county was also reallocated towards the corridor. The Kenan Institute made these adjustments based on results of interviews with local planners, analysis of growth trends in the area, and analysis of water and sewer demand and capacity in the area. The Kenan Institute report notes that many of the regional planners could not recall critical details of the regional and TAZ level socioeconomic projection and allocation modeling and reasoning behind specific projections. They also concluded from the interviews that a few biases may have entered into the Union County small area projections. Dr. Appold specifically noted the line of growth in southwest Union County along and south of NC 75 that did not appear to be appropriate given limitations on growth in that area.[35]. However, that the Kenan Institute found it necessary to reallocate growth to account for the influence of the Monroe Connector/Bypass is consistent with the contention that the existing projections did not represent a Build Condition for the Monroe Connector/Bypass.

Table 10 provides a comparison between the MRM 2008 Interim Projections in the corridor to the overall adjustments made by the Kenan Institute.

The set of projections in the second column of Table 10, shown under the heading Kenan National Correction Adjusted, was calculated by multiplying the MPO projection for 2030 by 8.68 percent (the same reduction that the Kenan Institute used to adjust the projection for all TAZs). This calculation allowed a comparison of the Kenan Institute adjustments within the corridor due to the project (third column set of projections) with projections adjusted due to the national correction. Thus, the last column set in the table shows how the project would increase growth by zones in the corridor of the Kenan Institute study area. It is important to note that the Kenan Institute did not conduct a "Build versus No-Build" analysis, but only created a scenario of a 2030 projections of population and households with the project.

Although the growth rate difference in the entire corridor is rather small (3 percent), the tables show the substantial difference in the allocation of growth between the western corridor zones to the eastern corridor zones. This re-allocation of growth by zone is very similar to the growth patterns in the DEIS Qualitative ICE and FEIS Quantitative ICE. Therefore, the Kenan Institute reallocation of adjusted regional growth in Union County supports the Quantitative ICE conclusions regarding the project's influence on accelerated growth in central and eastern Union County.

[35] Appendix K, p 24-25

Table 10: Change in Household and Population Projections within the Corridor Study Area

	MRM 2008 Interim Projections[1]		Kenan "National Correction" Adjusted		Kenan Project Adjusted[1]		Change in Kenan Projection due to project in 2030 (%)	
Year	Households	Population	Households	Population	Households	Population	Households	Population
Corridor								
2005	42,595	120,054	42,595	120,054	42,595	120,054		
2030	74,497	211,973	68,029	193,573	69,843	198,613	3%	3%
Zone 1								
2005	14,118	38,774	14,118	38,774	14,118	38,774		
2030	19,307	55,413	17,631	50,603	17,730	50,871	1%	1%
Zone 2								
2005	11,017	30,859	11,017	30,859	11,017	30,859		
2030	16,676	47,280	15,228	43,176	15,474	43,842	2%	2%
Zone 3								
2005	7,617	20,404	7,617	20,404	7,617	20,404		
2030	11,369	30,980	10,382	28,291	11,074	30,225	7%	7%
Zone 4								
2005	6,164	19,084	6,164	19,084	6,164	19,084		
2030	17,827	51,435	16,279	46,970	16,455	47,580	1%	1%
Zone 5								
2005	3,679	10,933	3,679	10,933	3,679	10,933		
2030	9,318	26,865	8,509	24,533	9,110	26,095	7%	6%

[1] Appendix K Table 11

One may argue that the Kenan Institute concluded that the growth in the corridor area would reallocate outside Union County without the project. However, the Kenan Institute acknowledged that it did not conduct a no-build versus build analysis. It also acknowledged that its analysis relied upon the regional growth allocation to the counties, which did not consider supply-side factors such as large infrastructure projects. Lastly, the Kenan Institute's study area of 132,436 acres is much smaller than the area of Union County. Therefore, any conclusion the Kenan Institute report made regarding a No-Build Scenario was not reached with the same degree of analytical work performed in developing the adjusted projections.

A final point regarding the reports prepared by the Kenan Institute for the project is the complimentary narratives regarding Dr. Hammer's methodologies, models and projections of region and county population and employment described in his report, *Demographic and Economic Forecasts for the Charlotte Region*, 2003.

> *Our basic assessment of the MPO socio-economic projections is twofold. First, although the region-wide projections were prepared with an unusual degree of competency and care, they may have been over-adapted to new information during the boom years which followed.*[36]
>
> *The large area projections performed by Thomas Hammer and summarized above appear to be thoughtfully and carefully constructed.*[37]
>
> *Recognizing that no projection is completely accurate (error bounds are discussed in the full report), our judgment is that Thomas Hammer, the consultant hired by MUMPO to estimate county and sub-county population and employment for selected years, has the most credible methodology of any known population and employment projection. His estimation process relies on Census data, the quantified detailed experiences of similar metropolitan regions, and extensive feedback from knowledgeable regional (Charlotte) informants. We feel that his estimates, modified with the best available information about development subsequent to his work, form the best possible basis for NCTA decision-making.*[38]

WSAs, Final Report, Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, October 22, 2010

WSA's Comprehensive Traffic and Revenue Study (T&R Study), begun in 2009, was a follow up to the preliminary study performed in 2006. This research was conducted parallel to but separate from the NEPA analyses conducted for the FEIS and ROD. The report was not completed until after issuance of the ROD and it was not relied upon in the previous EIS process. The T&R Study used the Kenan Institute's socioeconomic projections of population, household and employment described above as inputs to the Metrolina Regional TDM. WSA also conducted an Origin-Destination Study in the project study area to identify current travel patterns and trip characteristics. They also supplemented NCDOT traffic counts with further counts during March 2009. WSA also updated the proposed transportation projects into the transportation network. Finally, based on traffic counts, WSA adjusted the model during a calibration process to achieve model predictions better aligned with current traffic observations.

WSA's T&R Study Report also compared population projections from the 2005 Projections (which were used in the 2030 LRTP), the 2008 Interim Projections, and the projections developed by the Kenan Institute in 2009 within the corridor. WSA found that the three different population projections for the corridor in the year 2030 closely correlate. For example, in 2009, the Kenan Institute estimated the 2030 population in their study area to be 198,613. This projection clearly included the effects of the project. However, the information WSA extracted from the 2005 Projections estimated the 2030 population in their study area to be 210,900. The information WSA extracted from the 2008 Interim Projections estimated the 2030 population in their study area to be 211,973. As previously discussed, none of the

[36] Appendix K, p 4
[37] Appendix K, p 23
[38] Appendix K, p 3

MRM socioeconomic projection versions included growth effects from the project. All of these projection results are within seven percent and suggest a high degree of similarity among different projection versions. Since the Kenan Institute's charge in developing their projections was to err on the side of not overestimating traffic so as to provide a conservative estimate for financing purposes, it would not necessarily be appropriate to use those adjusted projections as a basis for environmental impacts analysis. Finally, WSA's T&R Study did not construct a No-Build versus Build scenario to analyze the effects of the project on the study area. However, they did break down the project zones to more precisely describe where increased growth was likely to occur. This work is similar to the work conducted in the FEIS Quantitative ICE analysis and the implications from their analyses regarding the areas most likely to see additional growth due to the project are similar to the conclusions of the DEIS Qualitative ICE and FEIS Quantitative ICE.

3.4 How Do the MRM Socioeconomic Projections Compare to Other Projections?

The ICE Guidance recommends using adopted regional projections authored by MPOs where available.[39] FHWA guidance also recommends use of MPO projections and model forecasts when properly vetted.[40] Yet it would be best to compare those projections to others before using them. Therefore, it is instructive to compare the MPO projections to other population projections for the area. Projections from other sources show a wide range of future growth trends for Union County. Two of the most commonly cited privately developed projections are from Woods & Poole and Global Insights. Both firms use cohort-component projections, a demographic projection method that focuses on fertility, mortality and net migration to estimate total population by year. The Global Insight model incorporates the predictions of a regional macroeconomic model, thereby incorporating some economically driven assumptions of jobs growth into the process. The North Carolina State Data Center also generates population projections using a time series trends projection process. Table 11 summarizes five different projections of population to 2030 from four different sources:

1. MRM 2009 Projections (developed between 2004 and 2009)
2. Global Insights Projections (developed in 2009)
3. Woods & Poole Projections (developed in 2009)
4. NC State Data Center Projections (developed in 2009)
5. NC State Data Center Projections (developed May 2011).

As all of the projections operate from either demographic trend projection or economic modeling projections; they do not incorporate expectations of transportation infrastructure development except to the extent that past infrastructure development has affected past trends. One key to understanding the differences in these projections is to compare the actual change in each five-year increment. The demographically driven approaches used by Woods & Poole and the NC State Data Center produce very similar changes in each five-year increment of their projections, whereas the Global Insights and MPO projections, which are more economically driven models, show significant differences in each five-year increment of changes.

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[39] NCDOT & NCDENR, 2001a, p III-16

[40] FHWA. *Interim Guidance on the Application of Travel and Land Use Forecasting in NEPA*. March 2010. p 12.

As to the actual projection of future population in Union County, the highest projection is from the NC Data Center in 2009, which projected a 2030 population of 400,683. The NC Data Center's projection from 2011, however, predicts a 2030 population of 271,289, the lowest of all the projections. The Global Insights projection from 2009 predicts a 2030 population of 393,407, while Woods & Poole from 2009 predicts a 2030 population of 283,433. The MRM 2009 Projections fall generally in the middle of all these projections, predicting a 2030 population of 337,314 for Union County. Most interesting is how closely the MPO projections predicted the 2010 populations (based on actual 2010 Census counts) of Mecklenburg and Union Counties. In the case of Mecklenburg County, the MPO projection for 2010 population of 931,666 (Table 11) is only 1.3 percent higher than the actual 2010 Census count of 919,628. In the case of Union County, the projected population in 2010 of 200,450 is only 0.4 percent lower than the actual 2010 Census count of 201,292. This compares favorably to other projections completed prior to 2010. The Global Insights projections from 2009 overestimated population in Mecklenburg and Union Counties by four percent and nine percent respectively. The Woods & Poole projection from 2009 underestimated population for Mecklenburg and Union Counties by 0.3 percent and two percent respectively. The NC State Data Center projections from 2009 underestimated Mecklenburg County population by one percent and overestimated Union County population by four percent. Given that these other projections were all completed about one year prior to the horizon year in question (the 2010 Census counts) whereas the MRM Socioeconomic projections were largely completed two years prior (and the underlying work dates back to 2004), the MRM socioeconomic projections for Mecklenburg and Union Counties compare favorably.

Table 11: Comparison of Population Projections

Global Insights (2009)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	806,834			161,765			1,314,553		
2010	956,823	149,989	3.5%	219,690	57,925	6.3%	1,570,976	256,423	3.6%
2015	1,065,308	108,485	2.2%	263,298	43,608	3.7%	1,749,656	178,680	2.2%
2020	1,171,442	106,134	1.9%	303,978	40,680	2.9%	1,920,865	171,209	1.9%
2025	1,275,768	104,326	1.7%	349,186	45,208	2.8%	2,097,412	176,547	1.8%
2030	1,382,406	106,638	1.6%	393,407	44,221	2.4%	2,280,808	183,396	1.7%
Woods & Poole (2009)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	802,400			160,876			1,307,329		
2010	916,747	114,347	2.7%	197,554	36,678	4.2%	1,497,063	189,734	2.8%
2015	1,000,055	83,308	1.8%	218,988	21,434	2.1%	1,630,535	133,472	1.7%
2020	1,084,264	84,209	1.6%	240,490	21,502	1.9%	1,765,570	135,035	1.6%
2025	1,168,900	84,636	1.5%	261,995	21,505	1.7%	1,901,371	135,801	1.5%
2030	1,253,544	84,644	1.4%	283,433	21,438	1.6%	2,037,236	135,865	1.4%
MRM 2009 Projections									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	837,862			168,728			1,369,445		
2010	931,666	93,804	2.15%	200,450	31,722	3.51%	1,544,779	175,334	2.44%
2015	1,025,004	93,338	1.93%	231,986	31,536	2.97%	1,719,218	174,439	2.16%
2020	1,111,254	86,250	1.63%	266,612	34,626	2.82%	1,891,996	172,778	1.93%
2025	1,196,999	85,745	1.50%	301,053	34,441	2.46%	2,063,849	171,853	1.75%
2030	1,271,300	74,301	1.21%	337,314	36,261	2.30%	2,221,345	157,496	1.48%
NC State Data Center (2009)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	796,529			159,726			1,298,879		
2010	911,252	114,723	2.7%	210,069	50,343	5.6%	1,518,920	220,041	3.2%
2015	996,414	85,162	1.8%	257,378	47,309	4.2%	1,706,871	187,951	2.4%
2020	1,081,577	85,163	1.7%	304,688	47,310	3.4%	1,894,854	187,983	2.1%
2025	1,166,740	85,163	1.5%	351,996	47,308	2.9%	2,082,842	187,988	1.9%
2030	1,253,198	86,458	1.4%	400,683	48,687	2.6%	2,274,700	191,858	1.8%

NC State Data Center (2011)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	802,998			160,260			1,305,092		
2010	923,144	120,146	2.8%	202,200	41,940	4.8%	1,510,094	205,002	3.0%
2015	1,009,658	86,514	1.8%	219,522	17,322	1.7%	1,634,793	124,699	1.6%
2020	1,095,857	86,199	1.7%	236,778	17,256	1.5%	1,758,306	123,513	1.5%
2025	1,182,056	86,199	1.5%	254,034	17,256	1.4%	1,881,818	123,512	1.4%
2030	1,268,257	86,201	1.4%	271,289	17,255	1.3%	2,005,336	123,518	1.3%

* The Regional projections here are for a four county region of Cabarrus, Gaston, Mecklenburg and Union Counties. This is due to data limitations from the various sources.

3.5 How Accurate are the MPO Projections?

Projecting socioeconomic conditions, and any projection of the future, is an uncertain process fraught with the potential for error. Available evidence on socioeconomic projection indicates that "forecast errors are generally larger for small places [such as an individual TAZ] than for large places; are generally larger for places that have very high [such as Union County] or negative growth rates than they are for places that have moderate, positive growth rates; generally increase with the length of the projection horizon; and vary from one launch year to another."[41] Errors for long-range socioeconomic projection can also be quite high, especially for smaller geographies. For county level projections of 25 years, the typical mean algebraic percentage errors are about 30 percent while for census tracts (which are typically larger than TAZs) errors are typically 45 percent for the same period.[42] Thus, despite the best efforts of researchers and forecasters, the error rates for long-range projections are still quite high and thus any projection or estimate of induced and cumulative effects must be considered the best estimate within a wide range of error. The accuracy of projected growth under any future scenario could be affected by many variables. These include individual owner or developer actions, the timing of or changes in utility provision, changes in local or state regulations on land use and, most importantly, changes in national or regional economic conditions. While the potential for error is high, the techniques used by the MPO are the best available and provide the best available data for projecting population and employment conditions in the future.

3.6 Conclusions

What Influence Did the Monroe Connector/Bypass Have on the MPO Projections?

As discussed above, an assessment of the MRM socioeconomic projections reveals the following regarding the influence of the Monroe Connector/Bypass on the projections:

- The proposed project did not affect the Travel Time to Core Employment factor in the LUSAM process as this factor had zero weight for all districts for all LUSAM runs.

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[41] Smith, Stanely K., Tayman, Jeff, Swanson, David A. *State and Local Population Projections: Methodology and Analysis.* Kluwere Academic/Plenum Publishers, New York, 2001. p 292

[42] Smith, Tayman, Swanson, p 340

- The proposed project did not affect the Planners' Judgment factor in the LUSAM process as this factor had zero weight for all districts in Union County for all LUSAM runs.
- The proposed project was included in the Travel Time to Employment factor used by Paul Smith in developing the 2005 Projections, but a reassessment of that factor without the proposed project shows that the project had no influence on the projection results.
- The proposed project did not affect Dr. Hammer's projections of households and employment that were used in the 2005 Projections for county level control totals and were used in the 2008 Interim and 2009 Projections for developing the district level targets.
- There is no evidence or indication that any other factor in the LUSAM process or the other projection processes was influenced by the proposed project and communications with CDOT staff indicate that the proposed project was not a consideration in development of the projections.
- A review of the results of the projections shows no signs that the proposed project influenced the projections.

Based on this review, the overall evidence suggests that the MRM socioeconomic projections are insensitive to the presence or absence of the proposed project in the land use models used to develop the projections. The methodology used by CDOT and MUMPO to develop the projections is effectively insensitive to the Monroe Bypass/Connector. In the methodology used by Dr. Hammer, specific adjustment had to be made to account for the expected growth-induced by large roadway projects in the Top-Down process. As the sensitivity analysis of Paul Smith's Travel Time to Employment Factor showed, the proposed project made no difference in the Bottom-Up allocation process. Thus, the methodology used does not incorporate the full accessibility impacts of major roadway projects. Consequently, if the ICE analysis were to follow the exact same methodology as the MRM socioeconomic projections to calculate induced growth impacts of the Monroe Connector/Bypass, then the result would be to find no induced growth. However, the qualitative ICE analysis and all other studies point to localized land use impacts occurring with the Build Alternative, particularly in eastern Union County. Therefore, it would be inappropriate to use the MPO socioeconomic projection and allocation methods to attempt to estimate induced growth or induced land use changes associated with the Monroe Bypass/Connector. As described in Section 4, the study team has chosen other methodologies to estimate induced growth and induced land use changes associated with the proposed project.

How Did the Quantitative ICE Use the MPO Projections?

Based on the above review of the assumptions and variables used in the Top-Down and Bottom-Up processes, the inputs and variables used in the LUSAM models, a review of the actual results of the various projection versions, and a re-evaluation of the 2005 Projections without the project, we concluded that the MUMPO models did not incorporate the induced land use effects of the Monroe Connector/Bypass. Furthermore, comparisons to other projections for Union County, the MPO projections appear to be reasonable and in the middle of the range of available projections. Since the MPO projections are also the only source that provides growth projections at a small geographic scale, which is critical to a Quantitative ICE analysis, the MPO projections appear to be the best resource to developing a starting point for future land use conditions in the study area.

A review of the actual distribution of growth in the projections indicates that there is no pattern of development along the proposed project corridor that would suggest that the proposed project was considered in the projection development. Furthermore, a review of how other entities have used the MRM Projections for Traffic and Revenue analyses shows that minor adjustments were made to the MRM socioeconomic projections to account for the presence of the Monroe Connector/Bypass. These adjustments generally consisted of increases in household and employment in eastern portions of the study area. These conclusions suggest that additional analysis is needed to estimate the induced land use effects of the project. As described in Section 4, this Quantitative ICE analysis used the MPO projections as control totals, along with various other information, to develop a scenario without the project or its growth inducing impacts (i.e., the No-Build Scenario). The study team then estimated the induced growth potential of the project and added that estimated induced growth to the No-Build land use scenario to create a new scenario that represents future conditions with the project and its growth inducing impacts (i.e. the Build Scenario).

The prior Quantitative ICE analysis (2010) examined two build scenarios, one with an interchange at US 601 (the RPA) and one without an interchange at US 601. The prior analysis found very little difference in land use change between the RPA and the alternative without the US 601 interchange. Therefore, only one build scenario was used in this analysis.

4.0 INDUCED GROWTH ASSESSMENT AND FUTURE LAND USE SCENARIOS

To assess the induced growth potential of the proposed project and compare, quantitatively, the land use conditions with and without the proposed project, two land use scenarios were developed. The Build Scenario would represent the best estimate of land development conditions with the proposed project and its growth inducing impacts. The No-Build Scenario would represent the best estimate of land use conditions without the proposed project or its growth inducing impacts. As noted above, a reference point for the future growth of the study area was needed from which to base the two scenarios and that reference point was the MPO socioeconomic projections. The sections below describe specifically how each scenario was created and how the projections were used in the development of those scenarios.

4.1 How Did the ICE Analysis Project Land Use without the Proposed Project?

To estimate the land use conditions in 2030 without the proposed project or its growth-inducing impacts, the study team used three main inputs:

- Stream buffer regulations
- Land use plans or zoning ordinances (as appropriate per the research phase)
- MPO socioeconomic projections of growth.

All undeveloped parcels were isolated from the process to develop the Existing Land Use Scenario and these parcels were considered available for development unless specifically excluded by regulations. These parcels were then compared to the areas designated for stream buffers and the zoning and land use plans for the various communities to determine the potential use and density for each parcel. Then, based on the growth estimates in the TAZ level projection, the total amount of development was estimated for 2030. The specific steps and methods are detailed below.

Lands Excluded from Development

Prior to allocating growth, stream buffers were excluded from the subset of developable parcels because development within these areas is prohibited by local and/or state regulations. Buffers were developed based on the Post Construction Ordinance regulations and NCDENR's *Site Specific Water Quality Management Plan for the Goose Creek Watershed* (NCDENR, 2009). These regulations vary somewhat between jurisdictions but generally require the following buffers: 30 feet on streams draining areas less than 50 acres; 35 feet on streams draining more than 50 acres and less than 300 acres; 50 feet on streams draining areas more than 300 acres less than 640 acres; and 100 feet plus the floodplain on streams draining more than 640 acres. Special rules apply in the Goose Creek watershed where undisturbed riparian buffers within 200 feet of waterbodies within the 100-year floodplain and within 100 feet of waterbodies that are not within the 100-year floodplain are now required.[43] Buffers were developed on all

[43] North Carolina Department of Environment and Natural Resources (NCDENR). 2009. *Site Specific Water Quality Management Plan for the Goose Creek Watershed*.

streams in the National Hydrographic Dataset available for the area.[44] While it is possible to obtain an exemption to these restrictions, it is assumed that mitigation requirements would offset any impacts.

Residential Development Allocation

Once the total land available for development was determined, the next step was to estimate the level of development needed to accommodate future household growth. The study team used the projected household growth from the MPO 2009 Projections. For each TAZ, the total undeveloped (vacant or agricultural) area was determined based on the parcel categorization completed for the Existing Land Use Scenario (see Section 2.1). For the future scenario, each undeveloped parcel was re-categorized into one of the five development categories based on the future land use plans and zoning of the local jurisdictions. For residential properties, the land use categories equated to the following densities:

- Low Density Residential – two dwelling units (DU) per acre or fewer
- Medium Density Residential – greater than two DU per acre but fewer than five
- High Density Residential – five or more DU per acre.

Household growth by TAZ based on the MUMPO's projections is depicted in Map 12. The allocation for residential growth followed a four-step process, as detailed below.

<u>Step 1 - Identification of TAZ Build-Out Capacity:</u> The total acreage of currently undeveloped land that is zoned or planned for future residential development based on local land use plans was calculated for each TAZ to determine the total build-out capacity of that TAZ. Based on local future land use plans, each parcel was assigned a residential land use category, and the total number of possible dwelling units was determined.

<u>Step 2: - Identification of Projections by TAZ:</u> The build-out capacity values calculated in Step 1 were then compared to the household growth in the MUMPO TAZ projections.

<u>Step 3 - Density Adjustments for Over-Capacity TAZs:</u> Where projected growth based on MUMPO's TAZ projection exceeded capacity (determined in Step 1 above), spot checking was done to determine where infill development could be expected to increase density, and parcels were reclassified to a higher residential density appropriately to allow the projected growth to "fit" within the TAZ area.

<u>Step 4 - Distribution of Growth for Under-Capacity TAZs:</u> Where projected growth was equal to or less than capacity, a "percentage of capacity factor" was calculated by dividing the projected growth by the capacity. This factor was used to determine the reduction of the potential build-out area necessary to represent the projected level of growth.

Rather than selecting some parcels to build-out and others to remain undeveloped, the methodology spreads the growth across a proportionate amount of every potential parcel. This provides a more fragmented land use projection than that which might actually occur; therefore, it is a conservative estimate (i.e., overestimate), in terms of coverage, of the areas that may have future development. Given that TAZ boundaries are smaller than watershed boundaries, distributing growth to control totals within the TAZs does not appear to potentially skew the indirect or cumulative effects results for watersheds.

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[44] U.S. Geological Survey Water Resources Division and U.S. Department of Agricultural Natural Resources Conservation Service (USGS & USDA). 1999. National Hydrography Dataset, Watershed Boundaries Dataset.

It should be noted that only a portion of each developable parcel was converted to development for the future land use scenario, as described below, so that the total acres of development in each TAZ was maintained according to the projections. For example, if a TAZ had 1,000 acres of currently undeveloped parcels categorized for low density residential growth in the future (two DU per acre), the TAZ would have capacity for 2,000 households. If the TAZ was expected, based on the MPO projections, to add 1,000 households in the future, the TAZ would be filling only 50 percent of its capacity. Thus, a 50 percent reduction factor would be applied to all currently undeveloped parcels in that TAZ categorized for future low density residential development. Therefore, each of those parcels in that TAZ would be reduced in size by 50 percent to reflect the expectation that growth under the 2030 No-Build scenario will only fill 50 percent of the total capacity of low density residential development in that TAZ, and the remaining 50 percent was classified as undeveloped. These undeveloped areas retained the previously assigned NCGAP land cover category (as listed in Section 2.1).

Non-Residential Development Allocation

A similar process was completed for future non-residential development. All currently undeveloped parcels with non-residential zoning or future land use designations were summarized at the TAZ level to calculate the difference between projected growth and capacity.

The MPO TAZ projections include projections for the number of new employees by economic sector for each TAZ. Those sectors were aggregated into Office, Retail or Industrial/Warehouse/Distribution employment growth. Total employment growth by TAZ is depicted in Map 13. Projected new employees were used to calculate new acres of employment-related development using the Social Cost of Alternative Land Development Scenarios (SCALDS) model values provided in the NCDOT's ICE Guidance for assessing future land use (NCDOT & NCDENR, 2001b, p. A-14). These model values are presented in Table 12.

Table 12: Non-Residential Land Use by Employment

Employment Type	Employees/Acre
Office	52.32
Retail	21.78
Industrial/Warehousing/ Distribution	16.33

As with the residential land use analysis, the resulting values from the conversion of employees to acres of land developed were compared to the total capacity for each land use in each TAZ. Reduction factors were calculated in similar fashion to the residential process. These reduction factors were then applied to the non-residential parcels. As with residential development, the growth was spread across a portion of all developable parcels rather than selecting which parcels would develop and which would not within each TAZ.

Once both residential and non-residential development had been accounted for in the parcel and TAZ analysis, the "reduced" parcels categorized by land use were converted to 30x30-meter raster and overlaid on the existing land cover raster to create a new 2030 No-Build scenario raster image.

4.2 How Was Project-Induced Growth Estimated?

As National Cooperative Highway Research Program (NCHRP) Report 423A notes:

> *When a transportation project or policy makes it easier to access certain locations, these places can become attractive to more or different types of development. However, improving accessibility does not guarantee that land use changes will follow. The type, amount, and timing of land use changes will also depend upon the state of the regional economy, the current levels of accessibility, the types of development permitted by land use regulations, the availability of services such as sewer and water, the desirability of the area for development, and other factors.*[45]

This statement suggests that induced growth impacts of major road projects will be dependent upon five major factors:

- The state of the regional economy
- Current levels of accessibility
- The types of development permitted by land use regulation
- The availability services such as sewer and water
- The desirability of an area for development.

Thus, in some cases, induced growth impacts of specific projects may be negligible. The Monroe Connector/Bypass would certainly improve travel times to eastern Union County; however, most of the county is already highly accessible with a well-connected roadway network and no major barriers limiting access from Union County to the major employment centers in Mecklenburg County. Various studies have shown that accessibility improvements of highway projects have had diminishing impacts on land values since the 1950s. This is logical—as the national and regional highway systems have been more fully built out, the addition of any single additional link in the network provides a diminishing return to the overall accessibility of any given area. Boarnet and Haughwout note that:

> *As more highways are built, and the metropolitan highway network matures, the incremental effect on accessibility from new or improved highways decreases, thus accounting for a smaller change in land prices due to any access premium.*
>
> *New evidence suggests that metropolitan highway projects still influence land use in the way that theory predicts. The important difference between the new evidence and earlier studies is that the geographic scale of the land use effect appears to be somewhat smaller. A new highway or improvement might importantly reduce travel times in the immediate vicinity of a project, even if the resulting changes in metropolitan-wide transportation accessibility are small. Hence the land use effects of modern highway projects likely operate over a very fine geographic scale, rather close to the project.*[46]

Therefore, other factors that might affect land use change, such as utility availability and planned and zoned land uses were also analyzed to estimate the potential induced impacts of the project. The methods

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[45] NCHRP Report 423A. *Land Use Impacts of Transportation: A Guidebook.* Washington DC: National Academy Press, 1999.

[46] Boarnet, Marlon G. and Haughwout, Andrew F. *Do Highways Matter? Evidence and Policy Implications of Highways' Influence on Metropolitan* Development. The University of California Transportation Center, Berkley, CA. August 2000. http://escholarship.org/uc/item/5rn9w6bz. p. 9

used to estimate the induced growth potential of the proposed project can be summarized as a combination of the following analytical techniques:

- a scenario writing approach to identify areas most likely to see induced growth based on planning information and interviews
- a build-out analysis to see which areas had the most capacity for induced growth
- an accessibility analysis to see which areas would most benefit from the proposed project and thus most likely to see induced growth
- a Hartgen Analysis to estimate potential commercial growth at interchange areas.

This combination of approaches was deemed most appropriate as the local land use regulatory restrictions varied dramatically across the FLUSA and a more direct gravity model approach would likely overstate growth in some areas and understate it in others by missing the regulatory restrictions. The accessibility analysis did not consider that the cost of a toll would offset the value of the time saved using the road and therefore that portion of the analysis may actually overstate the potential for induced growth.

Build Land Use Scenario

This Quantitative ICE examines potential effects of the alternative DSA D, which was the Recommended, Preferred Alternative (RPA) for the Monroe Connector/Bypass in the Final Environmental Impact Statement (FEIS). NCTA found no reason to change the conclusions previously reached by NCTA and its agency partners as to the RPA when evaluating changes in the study area since the publication of the ROD and therefore this ICE report analyzes only the RPA in the Build Land Use Scenario.

Improvements in Accessibility/Travel Time

An analysis of accessibility was completed to determine the areas most likely to see development increases attributable to the Monroe Connector/Bypass. The main areas of employment in the region are in Mecklenburg County; therefore, improving accessibility (as measured by travel time) to I-485 and the major employment centers in Mecklenburg County would be the main reason for changes in development patterns. This assertion is supported by the Qualitative ICE Assessment and the ICE discussion in the Draft EIS. To identify the areas with substantially improved accessibility, an estimate of the improvement in travel time to the US 74/I-485 interchange attributable to the proposed project was calculated for the FLUSA.

Map 14 shows the changes in driving time under the Build scenario compared to the No-Build scenario. This analysis was completed using the Network Analyst extension of ArcGIS and a general roadway network with posted speed limit attributes. The travel time from all intersections within the Study Area to the I-485/US 74 interchange was calculated in both the No-Build and Build scenarios. The scenarios are compared on the basis of traffic operating at posted speed limits. The difference in travel time to each intersection was calculated, and the result was converted to a raster surface using the Inverse Distance Weighted method. The resulting map shows the estimated travel time improvement that the Monroe Connector/Bypass will provide to the study area, given the assumptions noted above. The results are not intended to represent the exact travel time savings that the project would provide to the study area. It is mostly an illustrative tool for determining which areas will see the greatest and least accessibility improvements because of the proposed project. The analysis shows improvement in accessibility, especially east of Monroe and around Wingate due to the proposed project. There are also improvements for some sections of Unionville along NC 200 (Morgan Mill Road).

Scenario Writing and Build Out Analyses

Other factors considered in the allocation of growth in the project area with the Monroe Connector/Bypass included the availability of water and sewer, and the inclination of local jurisdictions to new development. Availability of sewer service in the future was determined by using Future Public Sewer System coverage from the NC Center for Geographic Analysis. Map 15 shows the estimates of existing and future availability of sewer service in the FLUSA. Existing sewer service is relatively limited north of the proposed project, particularly east of Rocky River Road. In the future, sewer service is expected to be extended into Fairview and northern parts of Unionville, but these areas are relatively far from the proposed project and do not coincide with areas that see travel time savings from the proposed project. East of Morgan Mill Road, sewer service exists around each interchange and in the future sewer service is expected to be expanded especially north and south of Wingate. These areas to coincide with areas that would benefit substantially from the travel time savings of the proposed project. These areas would logically be the most likely to see some induced land use changes associated with the proposed project.

The inclination of local jurisdictions toward new development is also critical to the likelihood of induced land use changes and induced growth. Based on the interviews and review of planning documents, the localities in the western portions of the study area, particularly Indian Trail and Stallings, are less interested in fostering significant growth within their jurisdictions. Unionville, while not opposed to new development, is not interested in increasing densities and would prefer to maintain its rural character, though they are planning for a commercial node at the US 601 interchange with the proposed project.

Other jurisdictions, however, are more interested in fostering growth and development associated with the proposed project. Union County, as noted above, has a new land use plan that specifically recommends residential development north of Wingate and east of Monroe that is expected to occur with the proposed project. Additionally, Wingate and Marshville have plans to encourage development around the interchange areas within their jurisdictions. These observations were suggested in the Qualitative ICE Assessment and Draft EIS, and are supported by the GIS analysis and interviews conducted for the quantitative ICE analysis. Based on this improved accessibility, as well as the availability of sewer service, the areas east of Monroe and north of Wingate, in the eastern portions of the Study Area, are most likely to see increased growth as a result of the project.

Hartgen Analysis of Interchanges

In addition to the accessibility analysis described above, a "Hartgen analysis" was completed for each interchange area to gauge potential for development, using methods researched by Dr. David Hartgen.[47] A Hartgen analysis reviews the traffic volumes, distance to nearest towns, and access to sewer and water services to gauge the potential for induced development at interchanges in rural areas. The results of that analysis indicated that all interchanges except the Forest Hills School Road interchange have at least moderate potential for commercial development. Thus, the Build scenario analysis indicates that more dense growth would be expected where accessibility will improve and other needed infrastructure will be available in the future. Results of this analysis are shown in Appendix L.

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[47] NCDOT & NCDENR, 2001a, p. IV-27

Project-Induced Growth Allocation

The preceding analysis identified the general locations and types of development that the proposed project would induce in a Build Scenario. The amount of additional development was determined based on the availability of land in the vicinity of proposed interchanges, the density allowed by zoning and land use plans for the jurisdictions and the capacity for additional development. Capacity for additional development is limited primarily by the access to sewer services. Thus, those areas around the interchanges that are not expected to receive sewer service in the future were not considered for higher density uses. Most new commercial development was allocated in the immediate vicinity of interchanges or at major crossroads nearby. Additional residential development or increases in residential density were allocated in areas near (within roughly two to three miles) but not immediately adjacent to interchanges. The resulting adjustments in parcel-level land use from the 2030 No-Build scenario was then converted to a 30x30 meter raster land cover and overlaid on the 2030 No-Build raster.

Finally, one method often considered in induced growth analysis is the possible reallocation of growth within a study area. As accessibility improves in the eastern parts of Union County, the expanded opportunities for development may result in less development in the western portions of the FLUSA in a Build Scenario, relative to a No-Build Scenario, as new development may prefer less costly land and more growth friendly jurisdictions. Other ICE analyses have sometimes taken a reallocation approach to the issue of induced growth. In this case, the study team has specifically chosen not to reallocate growth, but instead to add the estimated induced growth over and above that growth expected under a No-Build Scenario. With this assumption, the ICE analysis is taking a more conservative approach to assuming higher possible cumulative effects across the entire study area.

Project-Induced Growth Estimates

Induced land use changes in the area of US 74 at the western terminus of the project were expected to be limited. Under the No-Build Scenario, 84 percent of the land within one mile of the interchange is already developed and many of the remaining undeveloped areas are within or near regulated riparian buffers and would therefore be more difficult to develop. Thus, most of the land in the vicinity of this interchange is already developed or planned for development and there would be little opportunity for additional development under the Build Scenario. Additionally, the proposed project does not provide substantial time savings to major regional employment centers from this area and would therefore be unlikely to spur development in this area.

At Indian Trail-Fairview Road, approximately 50 acres of additional industrial development was expected with the Build scenario. This is consistent with the Indian Trail's zoning and land use plans for the interchange area to become a major industrial park.

At Unionville-Indian Trail Road, Indian Trail land use plans projected a village center as the focal point of the interchange area. Land use plans called for additional commercial space to take advantage of the interchange and medium density residential using Traditional Neighborhood Design (TND) principles. TND principles include building developments with a range of housing types, a well-connected street system, integrated public spaces and some mix of uses. Land use changes under the Build scenario were a shift from residential to commercial for about 50 acres and increases in residential density affecting about 100 acres.

At Rocky River Road, an addition of approximately 50 acres of commercial land use was expected, with about half being converted from a different use compared to the No-Build, consistent with City of

Monroe's Rocky River Land Use Corridor Plans (November 2008) for additional commercial development in this area should the proposed project be built.

At US 601, an additional 100 acres of commercial development, with about half being converted from residential use compared to the No-Build, was expected and was consistent with the City of Monroe zoning and plans for areas near this interchange. About 100 acres of residential land use were expected to increase in density. While this was not consistent with existing zoning for the area, it was projected that additional residential density would follow commercial development in the vicinity of this interchange.

At Morgan Mill Road, additional commercial development of less than 50 acres was expected just south of the interchange, mostly converted from residential compared to the No-Build scenario. In addition, about 50 acres of increased residential density was expected in the Build scenario. Also, less than 50 acres of industrial land use, converted from residential as compared to the No-Build, was expected, which was consistent with existing land use and zoning.

At Austin Chaney Road, additional industrial/office development of about 100 acres, plus additional commercial development of about 50 acres was expected. Most of these additions would replace residential development as compared to the No-Build scenario. Additional or increased residential density of about 150 acres was also expected. These were generally consistent with the *Strategic Plan for Economic Development, Town of Marshville, Town of Wingate* (2008) indicating that this interchange area should be a focal point for non-residential development in eastern Union County. In addition, approximately 1,000 additional acres of Low Density Residential development is expected in the areas north of Wingate and east of Monroe. This is generally consistent with the expected land use changes identified in the updated Union County Comprehensive Plan.

At Forest Hills School Road, only new residential development was expected as the results of Hartgen Analysis indicated poor conditions for commercial development. About 100 acres of additional or higher density residential development was expected around this interchange.

Legacy Park Proposal

The resource agencies and others have questioned whether the Quantitative ICE should consider the effects associated with the proposed Legacy Park development in eastern Union County and include them in one or both of the future land use scenarios. The proposed Legacy Park is a potential industrial park and intermodal shipment terminal advocated by the former economic development agency for Union County (Union County Partnership for Progress) and mentioned in several regional reports, including the NCDOT Seven Portals Study. The potential development was proposed to be sited north and east of Marshville, along and north of the CSX railroad. Estimates from the Union County Partnership for Progress of the full build-out of the proposed industrial park and rail terminal included up to 5,000 acres of development and up to 20,000 jobs on site.

The Qualitative ICE and the previous Quantitative ICE addressed this development as not being reasonably foreseeable as there were no definite project plans or financing behind the project. Research by the Kenan Institute at the same time as the Quantitative ICE indicated that the proposal did not have any funding commitment and needed to surmount a significant number of hurdles before becoming a reality.[48] These hurdles include:

- a feasibility study to determine potential site constraints,
- infrastructure including water and sewer,
- a company interested in developing such a facility at a distance from the core of the Charlotte region,
- funding for feasibility studies, infrastructure development and other pre-development activities.

Further research by the study team since the FEIS has reinforced the conclusion that Legacy Park is currently not a reasonably foreseeable development, particularly in the timeframe of the ICE analysis (see interview summaries in Appendix A). There are a few factors that do indicate planning for the project is continuing. For example, the most recent Union County Water and Wastewater Master Plan (2011) does include provisions for ensuring sufficient capacity to provide service if Legacy Park is built, but the plan includes no actions items or financing recommendations for providing the specific water or sewer lines to directly serve the site. Three localities (Anson County, Marshville and Wingate) have adopted resolutions supporting the proposal, but these localities do not have jurisdiction over most of the proposed site.

The vast majority of evidence at this time suggests the proposal is highly speculative and unlikely to develop in a foreseeable timeframe, if ever. In an interview with the project's main sponsor, staff from the Union County Partnership for Progress indicated that planning for the project is "dead" and that they felt the project was highly speculative and unlikely to develop. Their most optimistic estimate was that if the Monroe Connector/Bypass were built there might be a 25 percent chance of some industrial development at the proposed site.

In an interview with the Planning Director for Union County, Richard Black noted that the site of the proposed development was marked for rural residential development in the most recent Union County Land Use Plan. The first draft of that plan did include industrial planned land use at the site of the proposal, but the planned land use was changed as Planning Commissioners and others felt the Legacy Park proposal was too speculative and highly unlikely to occur. Furthermore, the current zoning for most of the site is rural residential. Mr. Black also noted that his impression was that the proposal hinged on the participation of CSX Transportation and, in particular, the development of an intermodal (rail-truck) terminal at the site to spur connected industrial development.

The project team corresponded with CSX staff who noted that the site was topographically well suited to development and situated in a manner that would make it easy to develop rail-served industrial development or an intermodal terminal. They noted that they have previously marketed the site to a number of customers but that none had showed interest. As to the development of an intermodal terminal, CSX staff noted that they did not see the level of market demand necessary to proceed with a feasibility study at this time.

The project team communicated with Dr. Stephen J. Appold, Assistant Professor at the Kenan Institute at UNC-Chapel Hill. Dr. Appold has been involved with CDOT and the Metrolina Region on new Top-Down projections and has worked on logistics studies for the State Logistics Task Force. Dr. Appold

[48] Appendix K, p 34-35

noted that the anchor tenant for Legacy Park has expressed interest but made no commitment. He noted that the location of Legacy Park is distant from the main traffic flows in the region and that even if the Monroe Connector/Bypass were constructed as a non-toll facility, it would not be clear that Legacy Park would develop as a logistics node. Additionally, Dr. Appold noted that while many proposed developments may cite large potential "build out" projections, such projections are often inflated and that many proposals never reach their build out and some may never attract any tenants or users at all.[49]

Finally, the project team communicated with Christopher Platé and his staff at Monroe-Union County Economic Development. Mr. Platé and his staff indicated that while there was interest is seeing some industrial development in the area where Legacy Park had been planned, the ideas on the table as of 2013 were for a much smaller industrial park of up to 200 acres. While the economic development staff was taking steps to secure property options and to encourage utility infrastructure planning, the much smaller proposal was still considered speculative.

The totality of information points toward the likelihood that Legacy Park is a highly speculative proposal that is unlikely to see development within the time horizon of the ICE analysis (2030) with or without the Monroe Connector/Bypass. Therefore, no development associated with Legacy Park has been incorporated into any future land use scenarios for this analysis. However, NCDOT and FHWA will continue to monitor the Legacy Park proposal and other proposed development projects throughout the NEPA process.

US 74 Revitalization Study

Beginning in 2011, Union County, and the Towns of Stallings, Indian Trail and Monroe worked together to begin development of the US 74 Revitalization Study. The study completed a draft plan in 2013 and those draft recommendations are currently under review and consideration. The study team reviewed the draft US 74 Revitalization Study and its recommendations for their potential impact to future land use scenarios. Since the study is still draft and has not been adopted and since the land use and other recommendations would result in minimal changes to the land use scenario results, the study team determined it was not reasonably foreseeable to incorporate the draft plan recommendations into any future land use scenario.

[49] Letter from Dr. Stephen J. Appold to Jamal Alavi, NCDOT, May 29, 2013, p 3-4.

5.0 UPDATED LAND USE RESULTS

5.1 What Are the Land Use Results?

The following section outlines the updated results from the three updated scenarios, the 2010 Existing (Baseline), the 2030 No-Build, and the 2030 Build scenario. The results of the Updated 2010 Baseline Scenario are shown in Table 13. The Update 2010 Baseline Land Use is illustrated in Map 3.

Table 13: Updated 2010 Baseline Land Use

Land Use	Total Area (acres)	% of Total Area
Total Residential	71,500	35%
Low Density Residential	*55,600*	*28%*
Medium Density Residential	*12,900*	*6%*
High Density Residential	*3,100*	*2%*
Commercial	3,900	2%
Industrial/Office/Institutional	7,100	4%
Transportation	12,700	6%
Total Developed	**95,200**	**47%**
Agricultural Fields	20,100	10%
Agricultural Pasture/Hay and Natural Herbaceous	32,800	16%
Total Agricultural	**52,900**	**26%**
Coniferous Cultivated Plantation	1,100	1%
Successional Deciduous Forest	4,100	2%
Piedmont Xeric Pine Forests	1,000	0%
Piedmont Dry-Mesic Pine Forests	4,600	2%
Piedmont Xeric Woodlands	4,000	2%
Piedmont Dry-Mesic Oak and Hardwood Forests	16,200	8%
Piedmont Deciduous Mesic Forest	5,700	3%
Xeric Pine-Hardwood Woodlands and Forests	1,800	1%
Dry Mesic Oak Pine Forests	9,500	5%
Piedmont Mixed Bottomland Forests	1,800	1%
Piedmont Oak Bottomland and Swamp Forests	2,000	1%
Total Forested	**51,900**	**26%**
Barren (quarries, strip mines, and gravel pits)	100	0%
Barren (bare rock and sand)	100	0%
Piedmont Submerged Aquatic Vegetation	0	0%
Piedmont Emergent Vegetation	0	0%
Riverbank Shrublands	200	0%
Floodplain Wet Shrublands	0	0%
Open Water	1,500	1%
Total Other	**1,900**	**1%**
TOTAL	**202,000**	**100%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

The results of the Updated No-Build Scenario compared to the Baseline are shown in Table 14. These results are analyzed in the indirect and cumulative impacts review below. Map 16 illustrates the No-Build Scenario land use conditions and Map 17 shows the changes from the Existing (Baseline) land use conditions to the the No-Build land use scenario conditions.

Table 14: Updated 2030 No-Build Land Use

Land Use	Total Area (acres)	% of Total Area	Difference in Percentage from Baseline
Total Residential	97,900	48%	13%
Low Density Residential	*79,500*	*40%*	*12%*
Medium Density Residential	*14,900*	*7%*	*1%*
High Density Residential	*3,500*	*2%*	*0%*
Commercial	5,600	3%	1%
Industrial/Office/Institutional	8,700	4%	1%
Transportation	12,800	6%	0%
Total Developed	**125,000**	**62%**	**15%**
Agricultural Fields	14,600	7%	-3%
Agricultural Pasture/Hay and Natural Herbaceous	22,900	11%	-5%
Total Agricultural	**37,500**	**19%**	**-8%**
Coniferous Cultivated Plantation	600	0%	0%
Successional Deciduous Forest	3,000	1%	-1%
Piedmont Xeric Pine Forests	600	0%	0%
Piedmont Dry-Mesic Pine Forests	3,100	2%	-1%
Piedmont Xeric Woodlands	2,700	1%	-1%
Piedmont Dry-Mesic Oak and Hardwood Forests	11,800	6%	-2%
Piedmont Deciduous Mesic Forest	4,500	2%	-1%
Xeric Pine-Hardwood Woodlands and Forests	1,200	1%	0%
Dry Mesic Oak Pine Forests	7,000	3%	-1%
Piedmont Mixed Bottomland Forests	1,600	1%	0%
Piedmont Oak Bottomland and Swamp Forests	1,500	1%	0%
Total Forested	**37,700**	**19%**	**-7%**
Barren (quarries, strip mines, and gravel pits)	0	0%	0%
Barren (bare rock and sand)	100	0%	0%
Piedmont Submerged Aquatic Vegetation	0	0%	0%
Piedmont Emergent Vegetation	0	0%	0%
Riverbank Shrublands	100	0%	0%
Floodplain Wet Shrublands	0	0%	0%
Open Water	1,500	1%	0%
Total Other	**1,800**	**1%**	**0%**
TOTAL	**202,000**	**100%**	**0%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

The results of the updated Build Scenario are shown in Table 15. These results are analyzed in the indirect and cumulative impacts review below. Map 18 shows the 2030 Build Scenario land use conditions and Map 19 compares the Build Scenario land use conditions to the No-Build Scenario land use conditions.

Table 15: Updated 2030 Build Land Use

Land Use	Total Area (acres)	% of Total Area	Difference in Percentage from 2030 No-Build
Total Residential	99,700	49%	1%
Low Density Residential	*80,600*	*40%*	*0%*
Medium Density Residential	*15,600*	*8%*	*1%*
High Density Residential	*3,500*	*2%*	*0%*
Commercial	5,900	3%	0%
Industrial/Office/Institutional	8,800	4%	0%
Transportation	13,900	7%	1%
Total Developed	**128,200**	**63%**	**2%**
Agricultural Fields	13,800	7%	0%
Agricultural Pasture/Hay and Natural Herbaceous	21,600	11%	-1%
Total Agricultural	**35,500**	**18%**	**-1%**
Coniferous Cultivated Plantation	600	0%	0%
Successional Deciduous Forest	2,900	1%	0%
Piedmont Xeric Pine Forests	600	0%	0%
Piedmont Dry-Mesic Pine Forests	3,000	1%	0%
Piedmont Xeric Woodlands	2,600	1%	0%
Piedmont Dry-Mesic Oak and Hardwood Forests	11,500	6%	0%
Piedmont Deciduous Mesic Forest	4,300	2%	0%
Xeric Pine-Hardwood Woodlands and Forests	1,200	1%	0%
Dry Mesic Oak Pine Forests	6,800	3%	0%
Piedmont Mixed Bottomland Forests	1,600	1%	0%
Piedmont Oak Bottomland and Swamp Forests	1,500	1%	0%
Total Forested	**36,500**	**18%**	**-1%**
Barren (quarries, strip mines, and gravel pits)	0	0%	0%
Barren (bare rock and sand)	100	0%	0%
Piedmont Submerged Aquatic Vegetation	0	0%	0%
Piedmont Emergent Vegetation	0	0%	0%
Riverbank Shrublands	100	0%	0%
Floodplain Wet Shrublands	0	0%	0%
Open Water	1,500	1%	0%
Total Other	1,800	1%	**0%**
TOTAL	**202,000**	**100%**	**0%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

5.2 How Was Impervious Surface Estimated?

In order to determine the amount of impervious surface in the FLUSA and by watershed under all the land use scenarios, each land use category was assigned an assumed level of impervious surface. This step of the analysis followed guidance in the Soil Conservation Service (SCS) TR-55 Manual. The SCS TR-55 Manual is widely used for drainage studies and runoff calculations. Land use categories with their associated percentage of impervious coverage applied in this quantitative ICE analysis are presented in Table 16.

Table 16: Percent Impervious Surface for Each Land Use Category

Land Use Category	% Impervious using SCS TR-55 Manual
Commercial	85%
Industrial/Office/Institutional	70%
High Density Residential	38%
Medium Density Residential	25%
Low Density Residential	20%
Transportation	100%
Agricultural and Natural	0%

Source: SCS, 1986

These percentages were applied to the land use acreages, and results are summarized here. Since the FEIS Quantitative ICE analyses included a Water Quality Analysis based on the results of the prior Quantitative ICE for Land Use, the results of the impervious surface analysis will be compared to the prior results from the FEIS Appendix H to determine if the changes are substantial enough to necessitate rerunning the water quality modeling. Table 17 shows the changes in impervious surface between the original 2007 Baseline and the updated 2010 Baseline results. The updated Existing 2010 Land Use shows that most watersheds have seen little to no change in impervious surface percentage since 2007. Two watersheds, Crooked Creek and Sixmile Creek have seen an increase in their impervious percentages of one percentage point. Bakers Branch Creek had a reduction in its impervious percentages of less than one percentage point due to some slight adjustments in land use classification.

Table 17: Updated 2010 Baseline Imperviousness Compared to Previous 2007 Baseline Imperviousness

Watershed Name	Original Impervious Cover	Updated Impervious Cover	Difference in Percentages
Beaverdam Creek	6%	6%	No Change
Richardson Creek (Upper)	14%	14%	No Change
Rays Fork	12%	12%	No Change
Bearskin Creek	24%	24%	No Change
Richardson Creek (Middle)	23%	23%	No Change
Gourdvine Creek	6%	6%	No Change
Salem Creek	9%	9%	No Change
Sixmile Creek	25%	26%	1%↑
Twelvemile Creek	22%	22%	No Change
Richardson Creek (Lower)	10%	10%	No Change
Stewarts Creek	15%	15%	No Change
Fourmile Creek	32%	32%	No Change
Crooked Creek	21%	22%	1%↑
Goose Creek	13%	13%	No Change
Irvins Creek	35%	35%	No Change
McAlpine Creek	36%	36%	No Change
Bakers Branch	6%	5%	1%↓
Wide Mouth Branch	10%	10%	No Change

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Table 18: Updated 2030 No-Build Imperviousness Compared to Previous No-Build Imperviousness

Watershed Name	Original Impervious Cover	Updated Impervious Cover	Difference in Percentages
Beaverdam Creek	7%	7%	No Change
Richardson Creek (Upper)	18%	18%	<1%↑
Rays Fork	16%	16%	<1%↑
Bearskin Creek	31%	31%	<1%↑
Richardson Creek (Middle)	27%	27%	No Change
Gourdvine Creek	8%	8%	No Change
Salem Creek	13%	13%	<1%↑
Sixmile Creek	30%	31%	1%↑
Twelvemile Creek	25%	25%	No Change
Richardson Creek (Lower)	15%	15%	<1%↑
Stewarts Creek	20%	21%	<1%↑
Fourmile Creek	34%	35%	1%↑
Crooked Creek	25%	26%	1%↑
Goose Creek	17%	18%	1%↑
Irvins Creek	37%	38%	1%↑
McAlpine Creek	37%	38%	1%↑
Bakers Branch	8%	8%	No Change
Wide Mouth Branch	12%	12%	<1%↑

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Table 18 shows the changes in impervious surface between the original No-Build and the updated No-Build results. Five watersheds have no change from the previous results. Seven watersheds have an increase in imperviousness of less than one percentage point. Only six watersheds (Sixmile Creek, Fourmile Creek, Crooked Creek, Goose Creek, Irvins Creek and McAlpine Creek) show an increase of at least one full percent point but none of those sees more than a one percent increase. Therefore, the overall results are similar to the previous results.

Table 19: Updated 2030 Build Imperviousness Compared to Previous 2030 Build Imperviousness

Watershed Name	Original Impervious Cover	Updated Impervious Cover	Difference in Percentages
Beaverdam Creek	7%	7%	No Change
Richardson Creek (Upper)	18%	18%	No Change
Rays Fork	17%	17%	<1%↑
Bearskin Creek	31%	31%	<1%↑
Richardson Creek (Middle)	29%	30%	1%↑
Gourdvine Creek	8%	8%	No Change
Salem Creek	14%	16%	2%↑
Sixmile Creek	30%	31%	1%↑
Twelvemile Creek	25%	25%	No Change
Richardson Creek (Lower)	16%	17%	1%↑
Stewarts Creek	22%	23%	1%↑
Fourmile Creek	34%	35%	1%↑
Crooked Creek	27%	28%	1%↑
Goose Creek	17%	18%	1%↑
Irvins Creek	37%	38%	1%↑
McAlpine Creek	37%	38%	1%↑
Bakers Branch	8%	8%	No Change
Wide Mouth Branch	12%	12%	No Change

Notes: Results have been rounded to the nearest whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Table 19 shows the changes in impervious surface between the original Build and the Updated Build results. Six watersheds show no discernible change, while two have increases of less than one percent. Nine watersheds see increases of one percent over the previous results. Only one watershed, Salem Creek, sees an increase of more than one percent. The increase in Salem Creek is mostly attributable to increases in Low Density Residential Development attributable to new information from Union County described in Section 1. Overall the results are similar to the previous results. This suggests that additional water quality modeling would find the same results as the prior water quality modeling, given the standard errors associated with both land use projections and water quality modeling. The indirect and cumulative effects of these impervious surface results are discussed further in Section 5.4.

5.3 What Were the Indirect Land Use Impacts?

Table 20 shows the indirect land use differences between the Updated No-Build and Updated Build scenarios.

Table 20: Indirect Land Use Comparison

Land Use Category	2030 Updated No-Build		2030 Updated Build		
	Total Area (acres)	% of Total Area	Total Area (acres)	% of Total Area	Difference from 2030 No-Build
Total Residential	97,900	48%	99,700	49%	1%↑
Low Density Residential	*79,500*	*40%*	*80,600*	*40%*	*<1%↑*
Medium Density Residential	*14,900*	*7%*	*15,600*	*8%*	*1%↑*
High Density Residential	*3,500*	*2%*	*3,500*	*2%*	*0%*
Commercial	5,600	3%	5,900	3%	*0%*
Industrial/Office/Institutional	8,700	4%	8,800	4%	*0%*
Transportation	12,800	6%	13,900	7%	1%↑
Total Developed	**125,000**	**62%**	**128,200**	**63%**	**<2%↑**
Total Agricultural	**37,500**	**19%**	**35,500**	**18%**	**1%↓**
Total Forested	**37,700**	**19%**	**36,500**	**18%**	**1%↓**
Total Other	**1,800**	**1%**	**1,800**	**1%**	**0%**
TOTAL	**202,000**	**100%**	**202,000**	**100%**	**0%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Differences in land use between the 2030 Build and 2030 No-Build scenarios are small relative to the overall level of growth in development expected between the Baseline and No-Build. Total additional developed land associated with the Build is approximately 3,200 acres, less than two percent of all land in the study area. Approximately 1,100 acres of this difference, however, is directly attributable to the footprint of the roadway. Therefore, the indirect land use impacts attributable to growth-induced by the project are approximately 2,100 acres. Agricultural and forested lands decrease by about 2,000 and 1,200 acres, respectively, as a result of the additional developed land. These additional changes represent a one percent decrease, respectively, as compared to the 2030 No-Build condition.

While the aggregate numbers describing the change in developed land indicate that transportation (i.e., the proposed project itself) accounts for about one-third of the difference in land use from the No-Build Alternative, there are also important differences in the developed land use categories. There is an increase of about 1,100 acres in low density residential land use and an increase of about 700 acres in medium density residential. In total, these differences are estimated to produce the net increase of about 4,900 households in the study area with the Build Scenario. In addition, commercial and industrial land use categories increase by 300 and 100 acres, respectively.

As shown in Table 21, increases in impervious surface as a result of the 2030 Build Scenario are relatively small for the overall study area and for most watersheds. Increases in impervious surface percentages between the No-Build and Build are found in six of the 18 watersheds in the study area (Rays Fork, Richardson Creek - Middle, Salem Creek, Richardson Creek - Lower, Stewarts Creek, and Crooked Creek). Five of these watersheds see an increase in impervious surface of only one or two percent. Salem Creek sees an increase of three percent. The Build Scenario has no measurable difference in effect on the amount of impervious surface in the remaining 12 watersheds, including the Goose Creek and Sixmile Creek watersheds, which are known to support the endangered Carolina heelsplitter.

Looking at cumulative changes, the overall study area would see a four percent increase in impervious surface under the No-Build but a five percent under the Build. Each watershed is expected to experience an increase in impervious surface in the No-Build scenario and some will see slightly higher impervious surface levels under the Build scenario, with the highest increase being a seven percent increase in Bearskin Creek. Watersheds with the highest impervious surface levels will likely see modest increases; although Irvins Creek and McAlpine Creek have baseline conditions of 35 percent and 36 percent impervious surface, these levels only increase by three percent and one percent, respectively, with any of the future conditions (No-Build or Build). With the Build scenario, no watershed would see a greater than three percent increase in impervious surface as compared to the No-Build scenario.

For individual watersheds, comparisons between the 2030 No-Build and Build find no difference for 12 of the 18 watersheds, including Goose Creek and Sixmile Creek. For the remaining six watersheds, a one to two percent difference between the 2030 Build and the 2030 No-Build scenarios was found for five watersheds and a three percent increase was found for Salem Creek. It is possible that in the watersheds where there are differences from the No-Build, the incremental Build effect could also have a cumulative effect when considered in combination with the incremental effects of other reasonably foreseeable future projects. These potential effects are discussed further in Section 5.4

5.4 What Were the Indirect Impervious Surface and Cumulative Water Quality Impacts?

Indirect Impervious Surface Impacts

Impervious surface was calculated as described above. The changes in impervious surface from Baseline to No-Build and No-Build to Build in the updated analysis are show in Table 21. In all cases, the total impervious area was calculated from the raw land use results and then rounded to the nearest percent.

Table 21: Percent Impervious Surface by Watershed and Alternative

Watershed Name	2010 Baseline Impervious Cover	2030 No-Build Impervious Cover	Change from Baseline to 2030 No-Build[1]	2030 Build Impervious Cover	Change from 2030 No-Build to 2030 Build[1]
Study Area	18%	22%	4%	23%	1%
Beaverdam Creek	6%	7%	2%	7%	No Change
Richardson Creek (Upper)	14%	18%	4%	18%	No Change
Rays Fork	12%	16%	4%	17%	1%
Bearskin Creek	24%	31%	7%	31%	No Change
Richardson Creek (Middle)	23%	27%	5%	30%	2%
Gourdvine Creek	6%	8%	2%	8%	No Change
Salem Creek	9%	13%	4%	16%	3%
Sixmile Creek	26%	31%	5%	31%	No Change
Twelvemile Creek	22%	25%	3%	25%	No Change
Richardson Creek (Lower)	10%	15%	5%	17%	2%
Stewarts Creek	15%	21%	5%	23%	2%
Fourmile Creek	32%	35%	3%	35%	No Change
Crooked Creek	21%	26%	5%	28%	2%
Goose Creek	13%	18%	5%	18%	No Change
Irvins Creek	35%	38%	3%	38%	No Change
McAlpine Creek	36%	38%	1%	38%	No Change
Bakers Branch	5%	8%	3%	8%	No Change
Wide Mouth Branch	10%	12%	2%	12%	No Change

[1] Changes were calculated prior to rounding and therefore do not match exactly the difference shown in the table results.

Overall, the study area impervious surface increases one percent from the No-Build to the Build, whereas the previous scenarios showed a change that was indistinguishable at the overall study area level. By watershed, results are generally similar to the previous results with the following exceptions:

- Richardson Creek (Lower) shows a two percent change, whereas previously it showed a one percent change.
- Salem Creek shows a three percent change, where previously it showed a one percent change.

Most of these changes are relatively modest compared to the larger overall change anticipated between the Baseline and No-Build scenarios. Six of the 18 watersheds have an increase in percent impervious from the No-Build to the Build Scenario. Of these, Rays Fork shows a one percent increase, Richardson Creek – Middle, Richardson Creek – Lower, Stewarts Creek and Crooked Creek all have two percent increases and Salem Creek has a three percent increase.

Cumulative Water Quality Impacts

Of the watersheds in the area, nine include streams that are impaired in some capacity according to water quality ratings documented by the NC Department of Environment and Natural Resources (NCDENR), Division of Water Quality (NCDWQ). These watersheds and their impaired waters are documented in Table 22. Some watersheds, such as McAlpine Creek, have high levels of impervious surface and have impaired waters. Others, such as Irvins Creek and Fourmile Creek have high levels of impervious surface but no impaired waters. Beaverdam Creek has low levels of impervious surface but has impaired waters. Potential effects on each watershed with anticipated percent impervious changes under a Build Scenario are discussed below.

Table 22: 2012 Clean Water Act §303(d) Impaired Streams by Watershed

Watershed Name	Impaired Stream or Water Body	Impaired Reasons (Year)
Beaverdam Creek	Beaverdam Creek (Source to Lanes Creek)	Category 5 Copper (2008)
		Category 5 Low Dissolved Oxygen (2008)
Richardson Creek (Upper)	Lake Monroe	Category 5 Chlorophyll a (2008)
	Lake Lee	Category 5 Chlorophyll a (2008)
		Category 5 High pH (2008)
Richardson Creek (Middle)	Richardson Creek (Lake Lee to Mill Creek)	Category 5 Fair Bioclassification (1998)
Sixmile Creek	Sixmile Creek (Source to NC/SC Line)	Category 5 Fair Bioclassification (2006)
Richardson Creek (Lower)	Richardson Creek (Mill Creek to Watson Creek)	Category 5 Copper (2008)
Stewarts Creek	Lake Twitty	Category 5 Low Dissolved Oxygen (2012)
		Category 5 Copper (2008)
		Category 5 Chlorophyll a (2008)
	Stewarts Creek (Source to Stumplick Branch)	Category 5 Fair Bioclassification (2008)
Crooked Creek	Crooked Creek (Source to Rocky River)	Category 5 Turbidity (2010)
		Category 5 Fair Bioclassification (2012)
	North Fork Crooked Creek (Source to Crooked Creek)	Category 5 Turbidity (2004)
		Category 4s Poor Bioclassification
	South Fork Crooked Creek (Source to SR 1515)	Category 5 Poor Bioclassification (1998)
	South Fork Crooked Creek (SR 1515 to Crooked Creek)	Category 5 Fair Bioclassification (1998)
Goose Creek	Duck Creek (Source to Goose Creek)	Category 4b Fair Bioclassification (2008)
	Goose Creek (Source to SR 1524)	Category 4b Turbidity
	Goose Creek (SR 1524 to Rocky River)	Category 4b Fair Bioclassification (1998)
		Category 4t Fecal Coliform Violation
McAlpine Creek	McAlpine Creek (Source to NC 51)	Category 5 Fair Bioclassification (1998)
		Category 5 Fecal Coliform Violation (1998)

Source: 2012 NCDENR 2012 North Carolina 303(d) Integrated Report

The **Rays Fork Creek** watershed includes four waterbodies with water quality ratings documented by NCDWQ. None of these streams is listed as impaired at this time. The impervious surface level for this watershed is expected to increase from 12 percent to 16 percent from the Baseline to the No-Build condition. Under the Build Scenario, the level of impervious surface would increase to 17 percent. Given the small difference in induced impacts (one percent) the induced water quality impacts would likely be very small in this watershed. Cumulative impacts would also likely be minimal. The Rays Fork watershed is not listed in the 2003 or 2008 Yadkin-Pee Dee River Basinwide Water Quality Plans and therefore does not appear to be a watershed facing major water quality issues. Currently, eight of 18 watersheds have impervious surface areas of 17 percent or higher. Of these, four (McAlpine Creek, Sixmile Creek, Crooked Creek and Richardson Creek – Middle) have streams with impaired waters while four (Twelvemile Creek, Bearskin Creek, Fourmile Creek and Irvins Creek) do not have impaired waters.

The **Richardson Creek - Middle** watershed includes one waterbody segment listed as impaired at this time by NCDWQ. Richardson Creek is listed as a Category 5 impaired stream due to a fair bioclassification in 1998. The impervious surface level for this watershed is expected to increase from 23 percent to 27 percent from the Baseline to the No-Build condition. Under the Build Scenario the level of impervious surface would increase to 30 percent, although the calculated difference is only two percent, due to rounding. Given the small difference in induced impacts (two percent) the induced water quality impacts would likely be small in this watershed. Cumulative impacts would also likely be small. Currently, three of 18 watersheds have impervious surface areas of 30 percent or higher. Of these, only one (McAlpine Creek) has streams with impaired waters while the other two (Fourmile Creek and Irvins Creek) do not have impaired waters.

The **Richardson Creek - Lower** watershed includes one waterbody segment listed as impaired at this time by NCDWQ. The impervious surface level for this watershed is expected to increase from 10 percent to 15 percent from the Baseline to the No-Build condition. Under the Build Scenario the level of impervious surface would increase to 17 percent. Given the small difference in induced impacts (two percent) the induced water quality impacts would likely be small in this watershed. Cumulative impacts would also likely be small. Currently, eight of 18 watersheds have impervious surface areas of 16 percent or higher. Of these, four (McAlpine Creek, Sixmile Creek, Crooked Creek and Richardson Creek – Middle) have streams with impaired waters while four (Twelvemile Creek, Bearskin Creek, Fourmile Creek and Irvins Creek) do not have impaired waters.

The **Richardson Creek watershed (in whole)** is discussed in the 2003 and 2008 Yadkin-Pee Dee River Basinwide Water Quality Plans for Aquatic Life and Secondary Recreation Impairment. The 2003 report noted that the stream had low levels of dissolved oxygen and high levels of nutrients (nitrate/nitrite nitrogen and total phosphorous). The City of Monroe Waste Water Treatment Plant (WWTP) is located along Richardson Creek and is listed as a cause of stream impacts. The 2003 report notes that that the benthic community was improving, suggesting water quality improvements. The 2008 report noted turbidity and nutrient issues mostly associated with agricultural and pasture activity in the watershed. The report also noted the numerous confined animal feeding operations (CAFOs) within the watershed. Given these reports, many of the underlying reasons for the water quality issues in Richardson Creek are not directly related to new development and therefore the projected incremental and cumulative land use changes are unlikely to exacerbate the water quality issues in these watersheds.

The **Salem Creek** watershed includes five waterbodies assessed by the NCDWQ, none of which is listed as impaired in the 2012 assessment database. The impervious surface level for this watershed is expected to increase from nine percent to 13 percent from the Baseline to the No-Build condition. Under the Build Scenario, the level of impervious surface would increase to 16 percent. While the three percent incremental difference from the No-Build to Build scenarios is the largest of all watersheds modeled, the induced and cumulative water quality impacts would likely be very small in this watershed. Currently, eight of 18 watersheds have impervious surface areas of 16 percent or higher. Of these, four (McAlpine Creek, Sixmile Creek, Crooked Creek and Richardson Creek – Middle) have streams with impaired waters while four (Twelvemile Creek, Bearskin Creek, Fourmile Creek and Irvins Creek) do not have impaired waters. The 2008 Yadkin-Pee Dee River Basinwide Water Quality Plan notes that this stream had a Good-Fair Bioclassification in 2006 and that the stream is subject to low flow conditions. No other major issues were found.

The **Stewarts Creek watershed** includes nine waterbodies assessed by the NCDWQ. Two of these segments are listed as impaired. Stewarts Creek upstream of Lake Twitty and Lake Twitty are listed as Category 5 Impaired for various reasons noted in Table 22. The impervious surface level for this watershed is expected to increase from 15 percent to 21 percent from the Baseline to the No- Build. Under the Build Scenario the level of impervious surface would increase to 23 percent. Given the small difference in induced impacts (two percent) the induced water quality impacts would likely be small in this watershed. Currently, six of 18 watersheds have impervious surface areas of 21 percent or higher. Of these, three (McAlpine Creek, Sixmile Creek, and Richardson Creek – Middle) have streams with impaired waters while three (Bearskin Creek, Fourmile Creek, and Irvins Creek) do not have impaired waters. Stewarts Creek was noted in the 2008 Yadkin-Pee Dee River Basinwide Water Quality Plan for habitat degradation due to agricultural runoff and impervious surface runoff. The report noted that a 2006 study rated the stream fair due to degraded benthic communities. As this creek is the main water source for the City of Monroe, the City is taking steps to improve water quality by rebuilding vegetated buffers around Lake Twitty.

The **Crooked Creek watershed** includes four waterbody segments assessed by the NCDWQ and all four are listed as impaired at this time for either turbidity or bioclassification issues. The impervious surface level for this watershed is expected to increase from 21 percent to 26 percent from the Baseline to the No-Build condition. Under the Build Scenario, the level of impervious surface would increase to 28 percent. Given the small difference in induced impacts (two percent) the induced water quality impacts would likely be small in this watershed. Currently, four of 18 watersheds have impervious surface areas of 28 percent or higher. Of these, two (McAlpine Creek and Sixmile Creek) have streams with impaired waters while two (Fourmile Creek and Irvins Creek) do not have impaired waters. Crooked Creek watershed is identified in the 2008 Yadkin-Pee Dee River Basinwide Water Quality Plan as a watershed with habitat degradation, turbidity, fecal coliform and nutrient issues due to stormwater runoff and construction. The analysis of benthic communities, however, showed good to good-fair conditions for Crooked Creek in 2006, which was an improvement from previous studies.

In all cases where the Build Scenario shows greater impervious surface impacts than the No-Build Scenario (Rays Fork, Richardson Creek – Middle, Salem Creek, Richardson Creek – Lower, Stewarts Creek, Crooked Creek) those increases are less than the increases predicted between the Baseline and the No-Build. Furthermore, based on a query of the Natural Heritage Program Map View conducted on April 15, 2013, there are no federally protected listed species in these streams or watersheds and thus these small increases in impervious surface would not be affecting federally protected listed species. Overall, as these results are very similar to the results of the original Quantitative ICE, additional water quality modeling is not necessary as these differences are not large enough to see substantial differences compared to the prior water quality results and the results would likely be within the standard error of such an analysis.

5.5 What Were the Indirect and Cumulative Impacts to Endangered Species?

The cumulative definition under the ESA differs from that under NEPA in that the effects of future federal actions are not included in an ESA cumulative analysis but are included in a NEPA analysis. The cumulative analysis outlined below was performed using the NEPA definition. The Biological Assessment (BA)(Catena, 2013) of cumulative impacts similarly used the NEPA definition of cumulative effects. Therefore, the cumulative effects to endangered species may be somewhat overestimated since this Quantitative ICE analysis included the effects of future federal actions as well as non-federal actions.

Carolina Heelsplitter

The Carolina heelsplitter is found only in the Goose Creek and Sixmile Creek watersheds. As shown in previous sections of indirect effects, no measureable differences in land use and impervious surfaces were found between the 2030 No-Build and 2030 Build within the Goose Creek or Sixmile Creek watersheds. Therefore, no indirect effects are anticipated on the species associated with the Monroe Connector/Bypass project. As the BA concludes, direct effects are extremely unlikely, though cannot be unquestionably discounted. There are no anticipated indirect effects. Therefore, cumulative effects to the Carolina heelpslitter are extremely unlikely, though cannot be unquestionably discounted.

Other Endangered Species

Michaux's sumac, Schweinitz's sunflower, and the smooth coneflower are federally listed as endangered plant species. The sumac and sunflower are listed for both Mecklenburg and Union counties, but the coneflower is listed only for Mecklenburg County.[50] There are known populations of Schweinitz's Sunflower in the FLUSA, and populations of the species have been found in the vicinity of the proposed alignment for the Monroe Connector/Bypass. An evaluation of potential indirect and cumulative effects to the species is summarized below.

Michaux's sumac grows in sandy or rocky open woods on sandy or sandy loam soils with low cation-exchange capacities and appears to depend upon some form of disturbance to maintain the open quality of its habitat.[51][52] Most extant populations can be found on open disturbed areas, such as railroad, road, and utility rights-of-way that are periodically maintained and/or managed for the species. The only known occurrence of Michaux's sumac in the FLUSA was last observed in 1794 and no populations were found in surveys of suitable habitat in the FLUSA. The survey methodology is discussed in the Biological Assessment. [53] As no populations of the species have been found in the FLUSA, it is not anticipated that

[50] NC Natural Heritage Program. "Data Services." Updated January 9, 2009.
[51] USFWS. *Michaux's Sumac Recovery Plan*. 1993. Atlanta, GA: p 30.
[52] Suiter, D. Endangered Species Biologist, USFWS. Raleigh, NC. Personal Communication regarding Draft 5-year status review of Michaux's sumac. Telephone: Feb. 2 and 18, 2010.
[53] The Catena Group for NCTA, *Biological Assessment of Carolina Heelsplitter (Lasmigona decorata) and Designated Critical Habitat, Schweinitz's Sunflower (Helianthus schweinitzii), Michaux's Sumac (Rhus michauxii), and Smooth Coneflower (Echinacea laevigata)*, Monroe Connector/Bypass, October, 2013.

the Monroe Connector/Bypass project will have any indirect or cumulative effects on the species. The BA provides more detail on direct and potential indirect and cumulative impacts.

There are no know populations of smooth coneflower in the FLUSA, and surveys of the FLUSA in areas of high quality habitat for the species found no populations. Based on the ICE analysis, indirect effects are not anticipated in the Mecklenburg County portion of the FLUSA. As the BA concludes, there will be no direct effects to the species and the ICE analysis shows no indirect effects, there is no expectation that the project will cause cumulative effects to the coneflower. Since there will be no direct or indirect effects within Mecklenburg County and the lack of EO records within or near the FLUSA, the project is anticipated to have No Effect on this species. The BA provides more detail on direct and potential indirect and cumulative impacts.

Historically, it is believed that Schweinitz's sunflower occupied open prairie and Post Oak-Blackjack Oak Savannas that were maintained by relatively frequent fire.[54] Physical investigation of all suitable habitat within forest gaps was beyond the scope of this ICE analysis. In addition, the sunflower is an opportunistic species that can colonize even disturbed areas. Therefore, indirect effects to Schweinitz's sunflower are addressed through examining the conversion of land exhibiting habitat characteristics that would support the species. The NCGAP land cover categories included in the analysis were:

- Agricultural Pasture/Hay and Natural Herbaceous
- Barren (subcategory quarries, strip mines, and gravel pits)
- and Barren (subcategory bare rock and sand).

Although this species could eventually inhabit some of the lands converted to developed land use[55], such land use categories were not included in the analysis to present a more conservative estimate of the amount of suitable habitat loss. Table 23 presents the results of this analysis.

Table 23: Total Conversion of Pasture/ Hay Natural Herbaceous and Barren Land Cover to Developed Land

	Baseline (acres)	2030 No-Build (acres)	2030 Build (acres)	Change in 2030 with No-Build (acres)	Change in 2030 with Build (acres)
Acres	33,000	23,000	21,700	-10,000	-11,300
% of Baseline	-	-	-	-30%	-34%

Notes: Results have been rounded to the nearest 100 and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

With the 2030 No-Build, there is an estimated 30 percent decrease in land cover types presumed to provide potential suitable habitat for the Schweinitz's sunflower. The incremental effect with either the 2030 Build scenarios is approximately a four percent decrease in potential suitable habitat (34 percent versus 30 percent).

Continued development pressure is expected within the project FLUSA within the horizon year of this analysis. However, it is not anticipated that future development will cause substantial cumulative effects.

[54] USFWS. *Schweinitz's Sunflower Recovery Plan*. 1994. Atlanta, GA: p 28.
[55] For example, utility rights of way, which are periodically maintained could provide habitat for the Schweinitz's sunflower, whereas frequently maintained lawns and landscape areas would not provide suitable habitat.

It is anticipated that areas of forest fringe and maintained or disturbed environments will continue to supply potential habitat for Schweinitz's sunflower species within the FLUSA in the future. Therefore, the project is not anticipated to have substantial indirect or cumulative effects on the species. The BA provides more detail on direct and potential indirect and cumulative impacts.

Georgia aster (*Symphyotrichum georgianum*) is listed as a candidate species by USFWS for inclusion under the ESA for protection as an endangered species. As it is not officially listed, its habitat was not directly analyzed. As its habit typical overlaps substantially with that of the Schweinitz's sunflower, the analysis of potential indirect and cumulative habitat losses discussed above would be generally valid for the Georgia aster as well.

5.6 Land Use and Farmland Conversion

Table 24 (No-Build) and Table 25 (Build) present the estimated total effects to land use broken out by watershed with each of the alternatives in conjunction with reasonably foreseeable future actions compared to the Baseline condition. Table 26 summarizes the incremental effects, i.e., the differences as compared to the changes anticipated with the No-Build scenario for the Build.

Indirect and direct land use effects combined were presented previously, and these tables also break out the land use categories in detail. For analysis of cumulative effects, the following tables present aggregations of categories for the agricultural and forested land uses:

- Agricultural land includes: *Agricultural Fields* and *Agricultural Pasture/Hay and Natural Herbaceous*
- Forested includes: *Coniferous Cultivated Plantation, Successional Deciduous Forest, Piedmont Xeric Pine Forests, Piedmont Dry-Mesic Pine Forests, Piedmont Xeric Woodlands, Piedmont Dry-Mesic Oak and Hardwood Forests, Piedmont Deciduous Mesic Forest, Xeric Pine-Hardwood Woodlands and Forests, Dry Mesic Oak Pine Forests, Piedmont Mixed Bottomland Forests*, and *Piedmont Oak Bottomland and Swamp Forests*
- Other includes: *Barren (quarries, strip mines, and gravel pits)*, *Barren (bare rock and sand)*, *Piedmont Submerged Aquatic Vegetation*, *Piedmont Emergent Vegetation, Riverbank Shrublands*, *Floodplain Wet Shrublands*, and *Open Water*.

Table 24: Total Changes in Land Use (in acres) by Watershed with the Updated 2030 No-Build Scenario Compared to the Baseline

Area/Watershed	Low Density Residential	Medium Density Residential	High Density Residential	Commercial	Industrial/Office/ Institutional	Transportation	Total Agricultural	Total Forested	Total Other
Study Area	24,000	2,000	400	1,700	1,600	100	-15,400	-14,200	-100
Beaverdam Creek	900	0	0	0	0	0	-600	-300	0
Richardson Creek (Upper)	1,200	0	0	0	0	0	-600	-600	0
Rays Fork	1,700	0	0	0	0	0	-1,000	-800	0
Bearskin Creek	1,600	0	0	0	500	0	-1,100	-1,100	0
Richardson Creek	1,000	0	0	0	100	0	-500	-700	0
Gourdvine Creek	100	0	0	0	0	0	0	0	0
Salem Creek	2,100	100	0	100	0	0	-1,600	-600	0
Sixmile Creek	0	100	100	0	0	0	-100	-200	0
Twelvemile Creek	900	100	0	0	300	0	-500	-800	0
Richardson Creek (Lower)	3,400	0	0	0	0	0	-2,300	-1,100	0
Stewarts Creek	4,300	0	0	300	200	0	-2,900	-1,800	-100
Fourmile Creek	0	200	0	100	0	0	-100	-400	0
Crooked Creek	2,900	200	100	400	200	0	-2,100	-1,700	0
Goose Creek	2,700	600	0	600	0	0	-1,400	-2,600	0
Irvins Creek	100	300	0	100	200	0	-100	-600	0
McAlpine Creek	100	300	100	100	0	0	0	-500	0
Bakers Branch	300	0	0	0	0	0	-100	-200	0
Wide Mouth Branch	500	0	0	0	0	0	-400	-200	0

Notes: Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Table 25: Total Changes in Land Use (in acres) by Watershed with the Updated 2030 Build Scenario Compared to the Baseline

Area/Watershed	Low Density Residential	Medium Density Residential	High Density Residential	Commercial	Industrial/Office/ Institutional	Transportation	Total Agricultural	Total Forested	Total Other
Study Area	25,000	2,700	400	2,000	1,700	1,100	-17,500	-15,400	-200
Beaverdam Creek	900	0	0	0	0	0	-600	-300	0
Richardson Creek (Upper)	1,200	0	0	0	0	0	-600	-600	0
Rays Fork	1,700	0	0	0	0	100	-1,000	-800	0
Bearskin Creek	1,600	0	0	0	500	0	-1,100	-1,100	0
Richardson Creek (Middle)	1,200	0	0	0	100	100	-600	-800	0
Gourdvine Creek	100	0	0	0	0	0	0	0	0
Salem Creek	3,200	200	0	100	0	100	-2,600	-1,000	0
Sixmile Creek	0	100	100	0	0	0	-100	-200	0
Twelvemile Creek	900	100	0	0	300	0	-500	-800	0
Richardson Creek (Lower)	3,900	200	0	0	100	100	-2,900	-1,400	0
Stewarts Creek	3,900	100	0	400	200	300	-3,100	-1,900	-100
Fourmile Creek	0	200	0	100	0	0	-100	-400	0
Crooked Creek	2,600	300	100	500	200	400	-2,200	-1,800	0
Goose Creek	2,700	600	0	600	0	0	-1,400	-2,600	0
Irvins Creek	100	300	0	100	200	0	-100	-600	0
McAlpine Creek	100	300	100	100	0	0	0	-500	0
Bakers Branch	300	0	0	0	0	0	-100	-200	0
Wide Mouth Branch	500	0	0	0	0	0	-400	-200	0

Notes: Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Table 26: Incremental Effects of Updated 2030 Build Land Use Changes (in acres) by Watershed

Area/Watershed	Difference From Updated No-Build – Total Developed	Difference From Updated No-Build – Total Agricultural	Difference From Updated No-Build – Total Forested
Study Area	3,200	-2,100	-1,200
Beaverdam Creek	0	0	0
Richardson Creek (Upper)	0	0	0
Rays Fork	100	0	0
Bearskin Creek	0	0	0
Richardson Creek (Middle)	300	-100	-200
Gourdvine Creek	0	0	0
Salem Creek	1,400	-1,000	-400
Sixmile Creek	0	0	0
Twelvemile Creek	0	0	0
Richardson Creek (Lower)	1,000	-600	-300
Stewarts Creek	300	-200	-100
Fourmile Creek	0	0	0
Crooked Creek	300	-100	-100
Goose Creek	0	0	0
Irvins Creek	0	0	0
McAlpine Creek	0	0	0
Bakers Branch	0	0	0
Wide Mouth Branch	0	0	0

Notes: Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Updated 2030 No-Build

The 2030 No-Build scenario is predicted to increase developed land by 29,900 acres throughout the study area as compared to the Baseline (existing) condition. This represents 15 percent of the total study area. Most of the estimated development (84 percent) is due to the increase in Low Density Residential growth. For this conversion to development, the following reductions in undeveloped lands are predicted: 15,400 acres of agricultural land, 14,200 acres of forested land and 100 acres of other land uses.

From 1984 to 2003, a loss of over 48,000 acres in tree cover was recorded in Union County, although a large portion of those acres may have been cleared for agriculture, logging, or non-urban development (NCTA, 2009). The further reduction in forested acreage predicted with the 2030 No-Build in this Technical Report (14,200 acres) represents an additional loss; however, the reduction is at a substantially lower rate. Some of that is attributable to the fact that the land use projection methodology used in this ICE analysis is converting more agricultural land than forested land to developed categories even though both categories are roughly equal in acreage in the Baseline 2010 Land Use. Part of the reason for the higher likelihood of agricultural conversion rather than forested conversion is in the land use projection methodology stream buffers were excluded from development and stream buffer areas are more likely to contain forested land than agricultural land.

Farmland comprises 52 percent of the total converted undeveloped lands. The predicted acreage of farmland conversion (15,400 acres) represents 29 percent of the total amount of farmland in the study area's Baseline condition (52,900 acres).

Updated 2030 Build

The 2030 Build scenario is predicted to increase developed land by 3,200 more acres throughout the study area as compared to the No-Build condition. This incremental effect is equivalent to less than two percent of the study area. Most of the estimated development increase with the Build scenario (79 percent) is due to the increase in Low Density Residential growth, but this number is smaller than with the 2030 No-Build scenario because a larger percentage of the development is predicted to be from Medium Density Residential, Commercial, and Industrial/Office/Institutional growth in the Build scenarios.

Farmland represents nearly the same amount of the converted undeveloped land as with the No-Build condition (53 percent versus 52 percent). As compared to the 2030 No-Build, the 2030 Build Scenario is predicted to have 2,100 additional acres of converted farmland which equals about an additional four percent loss in farmland over the No-Build condition.

5.7 What Were the Cumulative Impacts to Wildlife Habitat?

Total Habitable Land Changes

This section presents cumulative effects specific to wildlife habitat. Specifically, Table 27 presents the changes predicted for each alternative in the total amount of undeveloped vegetated land cover. The effect to potential aquatic habitat is inferred from the effect to water quality, detailed above. With regard to percent impervious cover as an indicator for effects to water quality and thus aquatic habitat, findings show only a one percent difference in percent impervious cover between the 2030 Build and 2030 No-Build scenarios for the study area as a whole. Findings also show a one percent to two percent incremental effect with the Build Scenario within any individual watershed, except for Salem Creek, which will have a three percent incremental effect with the Build.

For presentation of cumulative effects in Table 27, aggregates of the NCGAP land cover categories were used. The list of categories used to compile an "Undeveloped Vegetated Land" layer included all the categories below "Total Development," except the "Agricultural Fields" (i.e., croplands), "Barren (quarries, strip mines, and gravel pits)" and "Open Water" categories, which were presumed not to provide substantial amounts of suitable wildlife habitat.

Table 27: Total Changes in Undeveloped Vegetated Land and Land Cover Likely to Encompass Wetlands Compared to the Baseline

Watershed Name	Total Vegetated (acres)	
	Updated 2030 No-Build	Updated 2030 Build
Study Area	-24,200	-26,600
Beaverdam Creek	-700	-700
Richardson Creek (Upper)	-900	-900
Rays Fork	-1,400	-1,500
Bearskin Creek	-1,600	-1,600
Richardson Creek (Middle)	-1,000	-1,300
Gourdvine Creek	-100	-100
Salem Creek	-1,600	-2,500
Sixmile Creek	-300	-300
Twelvemile Creek	-1,200	-1,200
Richardson Creek (Lower)	-2,700	-3,500
Stewarts Creek	-4,000	-4,200
Fourmile Creek	-500	-500
Crooked Creek	-3,100	-3,300
Goose Creek	-3,300	-3,300
Irvins Creek	-700	-700
McAlpine Creek	-500	-500
Bakers Branch	-200	-200
Wide Mouth Branch	-400	-400

Notes: Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Updated 2030 No-Build

The 2030 No-Build scenario was predicted to decrease vegetated land cover by 24,200 acres from the Baseline condition. This represents 28 percent of the total Baseline condition vegetated land cover (85,500 acres). As shown above regarding land use changes, forest lands are predicted to be reduced by 14,200 acres with the 2030 No-Build scenario. It is likely that some of the development likely to occur by 2030 with the No-Build will fragment forest patches. Cumulative effects from this fragmentation may include effects to wildlife populations.

Updated 2030 Build

The incremental effect with the 2030 Build is 2,400 acres of additional converted vegetated land as compared to the loss predicted with the 2030 No-Build condition. This represents an additional 3 percent loss in vegetated land. These reductions are mostly concentrated in Salem Creek and Richardson Creek –

Lower, with some losses also scattered among Rays Fork, Richardson Creek – Middle, Stewarts Creek and Crooked Creek. These incremental losses represent 9 to 12 percent of the Baseline vegetated land uses for Salem Creek, Richardson Creek – Lower and Richardson Creek – Middle watersheds. The concentrated losses are a result of the Low Density Residential expected around the eastern end of the corridor. A review of the NCDENR Natural Heritage Program Map Viewer database on April 15, 2013 indicates there is only one occurrence of rare plants or animals in these three watersheds. Jesse Helms Memorial Park is designated a Significant Natural Heritage Area as it supports a population of Piedmont aster (*Eurybia mirabilis*), a Federal Species of Concern. Given that this is a public park, it is highly unlikely that this area would see development that would degrade the population. All other watersheds see incremental losses of less than 2 percent additional relative to their Baseline levels. Thus, while there may be some impacts to wildlife populations locally, these impacts are unlikely to be considerable on a regional scale nor are they likely to substantially affect habitats of protected species.

Forest Fragmentation Impacts

One of the potential effects of development is to break up previously connected habitats (fragmentation). This can impact some species that require large patches of habitat (deer, and larger predators); and the increase in edge between different types of habitat, such as forested and residential areas, can cause an increase in encounters (such as vehicle crashes) that hurt wildlife populations. To understand the effects on the wildlife habitats in the study area, a Patch Analysis was completed using ArcGIS Spatial Analyst and the FRAGSTATS program. Spatial Analyst tools were used to classify land cover categories into two classes, those land cover categories that could generally support a range of natural wildlife habitats and those that could not (i.e. developed lands). After the land covers were reclassified, the data was entered into the FRAGSTATS program for analysis.

A habitat is a continuous parcel of land that provides some wildlife habitat and is not separated by roads, structures, or other type of urban development. Patches were grouped as either a developed area or other area that would not likely be suitable as wildlife habitat (Class 1) or areas that would likely be suitable as wildlife habitat (Class 2). Land cover categories that would not likely be suitable as wildlife habitat include Transportation, Commercial, all Residential categories, Open Water, both Barren Land categories, and both Agricultural categories. Land cover categories in Class 2 that would like be suitable as wildlife habitat include Successional Deciduous Forest, Piedmont Xeric Pine Forests, Piedmont Dry-Mesic Pine Forests, Piedmont Xeric Woodlands, Piedmont Dry-Mesic Oak and Hardwood Forests, Piedmont Deciduous Mesic Forest, Xeric Pine-Hardwood Woodlands and Forests, Dry Mesic Oak Pine Forests, Piedmont Mixed Bottomland Forests, Piedmont Oak Bottomland and Swamp Forests, Piedmont Submerged Aquatic Vegetation, Piedmont Emergent Vegetation, Riverbank Shrublands, and Floodplain Wet Shrublands. A patch analysis focuses on how connected or disconnected wildlife habitats may be. The metrics used focus on the size, shape, and connections between patches of suitable habitat. Therefore, the number of patches, their density and their mean (or average) size are important factors. Table 28 summarizes the results of the analysis for the Class 2 land cover categories and the metrics are explained and the results discussed below.

An important caveat for interpreting the patch analysis results is the fact that the level of fragmentation in both future land use scenarios is likely overstated due to the methodologies used in their construction. Specifically, by allocating growth within TAZs to a proportion of all developable parcels rather than selecting entire parcels to be built-out and others to remain vacant, the projected land use pattern for this ICE analysis is more fragmented than that which would actually be expected to occur. The advantage of this approach is that it is transparent and neutral in "spreading" effects across undeveloped land within TAZs. However, by spreading growth to all developable parcels rather than specific communities, the methodology maximizes fragmentation effects. These assumptions do not affect the comparison between the No-Build and Build scenarios but rather the distribution of development in all the future land use scenarios. The assumptions thus specifically affect the comparisons of fragmentation between the existing and future land use scenarios.

Table 28: Habitat Fragmentation Analysis Results

Parameter	Existing	No-Build	Build	Difference Between Existing and No Build	Difference Between Existing and Build	Difference Between Build and No Build
# of Patches	6,642	7,856	7,785	18%	17%	-1%
Patch Density (# per 100 acres)	3.29	3.89	3.86	18%	17%	-1%
Mean Patch Area (acres)	7.86	4.82	4.72	-39%	-40%	-2%
Perimeter to Area Mean	937.19	995.25	998.12	6%	7%	<1%
Mean Nearest-Neighbor (meters)	88.59	89.77	90.79	1%	2%	1%
Clumpiness	0.71	0.66	0.66	-8%	-7%	<1%
Effective Mesh Size (acres)	109.66	39.76	37.02	-64%	-66%	-7%

The number of patches, the patch density and the mean patch area indicate how fragmented habitat may be by indicating the raw number of habitat patches, the density of those patches and the mean (average) area of each patch across the study area. The number of patches and patch density increase between the Existing and No-Build scenarios by 18 percent and between the Existing and Build scenarios by 17 percent. By these measures, the indirect effects are very small but the cumulative effects are sizeable. Similarly, the mean patch size is much smaller in both future scenarios (approximately 40 percent) while the indirect impacts are small, the cumulative effect is more substantial. The number of patches and patch density is increasing due to the encroachment of development into previously continuous patches that then reduces patch sizes and splits once continuous patches into multiple separate patches. The size of patches is decreasing for the same reasons. The mean patch area metric is a very rough approximation of habitat fragmentation, however, and can be easily skewed by adding a number of very small patches to the landscape, as might occur when new development isolates a number of small patches from a few larger patch areas.

Despite the sizable changes in density and mean area, the mean nearest-neighbor parameter shows little change, increased by only 1 to 2 percent between any scenario. The mean nearest neighbor parameter is the mean of the shortest straight-line distance between each patch and its nearest neighbor. This gives an indication of the typical distance between each patch across the study area and thus the distance wildlife might have to traverse to get from one habitat patch to another. Thus while patches may be deceasing in size, they are not necessarily getting much farther apart.

The perimeter to area mean ratio shows much less change than the density and size metrics. The perimeter to area ratio gives an indication of how complex the shapes of habitat patches are by dividing the perimeter by the area of each patch. The higher the ratio, the more complex the shape and the more edge areas would exist relative to interior area space within each patch. The perimeter to area ratio shows a 6 to 7 percent increase from the Existing to the No-Build and Build, respectively, suggesting that the shape of patches is not changing dramatically.

The clumpiness parameter measures the distribution of patches. The parameter ranges from negative one to one, where zero indicates a random distribution of patches. Less than zero indicates a greater level of dispersion and one indicates a greater level of clumping. The clumpiness parameter for the Existing Scenario is 0.71, indicating that the distribution is rather clumpy. This is to be expected as the largest continuous patches and most of the patches are in the eastern portions of the study area. Under both future scenarios the clumpiness parameter decreases to 0.66 which is a modest decrease and indicates no indirect effect and modest cumulative effect to the clumpiness of habitats through the study area.

Finally, the effective mesh size gives an indication of overall patch structure. Effective mesh size gives an indication of the likelihood that any two randomly chosen points in the study area may or may not be connected with a continuous habitat patch. That likelihood is expressed as an effective mesh size in acres. This metric shows the greatest change, both cumulatively and indirectly, as the effective mesh size decreases by about 65 percent for both future scenarios. Between the No-Build and Build Scenario, the effective mesh size decreases by seven percent. Effective mesh size is most appropriate for species, such as deer or other larger mammals, that need larger ranges of undisturbed habitat or that face dangers from crossing between fragmented habitats.

Overall, these fragmentation metrics suggest that most habitat fragmentation will occur with or without the proposed project. Furthermore, while some metrics, such as effective mesh size and mean patch area, suggest some substantial increases in fragmentation, other, such as the clumpiness and mean nearest neighbor suggest fragmentation will be more modest. The variability in results suggests that some metrics may be skewed by very small patches drawing the results in one direction. For example, the mean patch size measure would be easily skewed by the addition of many new and very small patches even many larger patches remained intact. Overall, the indirect impacts are generally small to negligible while the cumulative results vary from small to substantial. However, the cumulative impacts would appear to be likely to occur with or without the proposed project.

5.8 What Were the Indirect and Cumulative Impacts to Traffic?

To address concerns that additional traffic generated by the estimated induced growth from the project could cause additional impacts, the Metrolina Regional Model (MRM) was used to forecast raw model volumes under three scenarios. These three scenarios were then compared to determine what, if any, traffic impacts might result from the indirect and cumulative impacts of the project. A No-Build and two Build scenarios were run through the MRM and the cumulative corridor level raw model outputs are shown in Table 29. These volumes are raw model volumes that have not been fully calibrated or adjusted per standard traffic engineering principles. These volumes therefore do not represent a fully calibrated forecast of No-Build and Build traffic conditions, but because they were developed the same way from the same MRM version, the difference between them can help reveal the induced traffic impacts of the project. For the No-Build Scenario, the MRM 11 v1.1 was edited to remove the Monroe Bypass/Connector from the model network and the model was run using the 2009 Projections for the socioeconomic input. As documented in Section 4, the 2009 Projections were used to develop the No-Build scenario and therefore were used in this analysis to represent the No-Build Scenario.

For the Build Scenario, two scenarios were run to compare the differences with and without the estimated growth impacts of the proposed project. In the first scenario, the MRM 11 v1.1 was used with the Monroe Bypass/Connector in the model network and the model was run using the 2009 Projections for the socioeconomic input. For the second Build Scenario the MRM 11 v1.1 was used with the Monroe Bypass/Connector in the model network and the model was run using an adjusted version of the 2009 Projections for the socioeconomic input. The land use differences identified in the Build Scenario ICE analysis were reviewed at the TAZ level and, based on the localized density assumptions, estimates of the additional household and employment attributable to the additional development anticipated under a Build Scenario were developed at the TAZ level. These estimates of additional households and employment were then added to the 2009 Projections to create a 2009 ICE Projections version. These adjustments added, on net, approximately 4,900 households and 3,800 employees to TAZs within the FLUSA. The raw model volumes from the MRM are shown in Appendix M. Table 29 shows a comparison of the regional vehicle miles traveled (VMT) and vehicle hours traveled (VHT) under the same three scenarios.

The segment level volumes in Appendix M show that when comparing the two Build scenarios run in the model, the project's induced growth does add to the volume level on the Monroe Connector/Bypass, US 74 and intersecting roadways. The highest percent change is along the Y-Line corridors, where there would be some road segments would see sizeable percentage increase relative to a Build Scenario without the project-induced growth. Yet, the volume increase for any given road segment is less than 3,500 AADT. On average, each roadway segment only sees an additional 1,400 vehicles per day. Along the US 74 and Monroe Connector/Bypass corridors, the percent increase is much lower, less than five percent in most cases. The eastern end of US 74 sees the greatest percentage increases, but again, most of these segments see relatively modest AADT increases of less than 5,000 vehicles per day. Also of note, is the comparison between the Build (2009 Projections) and the Build (Adjusted Projections) volume along the US 74 corridor. Under both scenarios, volume on the US 74 corridor drops by between 8 and 36 percent, depending on the segment, meaning that under the Build Scenario, with or without project-induced growth, US 74 would see substantially less traffic than under a No-Build Scenario.

With respect to total vehicle miles traveled within Union County, the Build Scenario with project-induced growth shows total VMT three percent higher than the Build Scenario without project-induced growth and eight percent higher than the No-Build Scenario. At the regional level, however, the difference is only one percent relative to the No-Build. For vehicle hours traveled, within Union County, the Build Scenario with project-induced growth is three percent higher than the No-Build and four percent higher than the Build without project-induced growth.

Table 29: County and Regional Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT)

County		Union	Mecklenburg	All Others	Regional Total
No-Build	VMT	9,253,669	44,616,030	51,580,950	105,450,650
	VHT	307,176	1,659,686	1,533,217	
Build (2009 Projections)	VMT	9,612,887	44,747,461	51,525,166	105,885,514
	VHT	302,260	1,664,994	1,529,494	
Build (Adj. Projections)	VMT	9,948,279	44,745,210	51,543,589	106,237,079
	VHT	315,582	1,665,283	1,529,690	
No-Build vs Build (2009 Projections)	% Change VMT	4%	0%	0%	0%
	% Change VHT	-2%	0%	0%	
No-Build vs Build (Adj. Projections)	% Change VMT	8%	0%	0%	1%
	% Change VHT	3%	0%	0%	
Build (2009 Projections) vs Build (Adj. Projections)	% Change VMT	3%	0%	0%	0%
	% Change VHT	4%	0%	0%	

Overall, these forecasted traffic levels indicate that the induced growth impacts of the proposed project will add to the total volume of traffic in Union County and to the total vehicle miles traveled and vehicle hours traveled. Roads that connect to the Monroe Connector/Bypass will likely see some increases in traffic. Overall, however, the increases in traffic are modest and would not likely create substantial congestion issues within the design year of the project, particularly given that the impacts will be spread across the many miles of transportation facilities throughout Union County. Thus, the traffic impacts of induced growth do not appear to be substantial enough to result in indirect or cumulative effects to roadway congestion or overall traffic levels.

5.9 Is the Monroe Connector/Bypass Consistent with Local Plans?

Many of the long-range planning documents for the FLUSA did not include the Monroe Connector/Bypass, or were uncertain as to when it might be constructed. The current draft of the 2035 LRTP estimates that the project will be constructed by 2015. During interviews with local planners, most indicated that their existing long-term land use plans did not include the project. This includes the communities of Unionville and Fairview, Charlotte-Mecklenburg Planning, the City of Monroe, as well as the Towns of Marshville, Mint Hill, Stallings and Wingate. It should be noted that the Wingate/Marshville Economic Development Plan does include the Monroe Connector/Bypass.

The Town of Matthews includes the Monroe Connector/Bypass in its long term land use plans, but they include a general project location without finalized designs. The Town of Indian Trail's Comprehensive Plan anticipates the project will be constructed (although it assumes an alignment different than DSA D) with the US 601 Interchange. The updated Union County Comprehensive Plan does anticipate the proposed project.

Several jurisdictions are in the process of updating their long-range land use plans, and they anticipate that the Monroe Connector/Bypass will be included in these updated documents. These jurisdictions include the Town of Wingate and the City of Monroe. Furthermore, the current US 74 corridor is under study for land use and infrastructure changes that might be completed if the Monroe Bypass/Connector is constructed through the US 74 Revitalization Study. Most of the land use recommendations included in the draft plan for the corridor are consistent with existing land use plans for the relevant jurisdictions.

5.10 Conclusions

As with any attempt to project future growth or development, there are limitations to the accuracy and certainty of the results of these analyses. Most of these analyses rely on the land use projections developed using recommended methods as described in the NCDOT ICE Guidance[56]. Specifically, the land use projections rely on the socioeconomic projections developed by CDOT, and therefore the results are only as accurate as those projections. Projection of socioeconomic conditions, and any projection of the future, is an uncertain process fraught with the potential for error. Despite the best efforts of researchers and forecasters, the error rates for long-range projections are still quite high and thus any projection or estimate of induced and cumulative effects must be considered the best estimate within a wide range of error. The accuracy of growth projections under any future scenario could be affected by many variables. These include individual owner or developer actions, the timing of or changes in utility provision, changes in local or state regulations on land use and, most importantly, changes in national or regional economic conditions. While the potential for error is high, the techniques used by the MPO are the best available and provide the best available data for trying to project population and employment conditions in the future.

As discussed above, the MRM socioeconomic projections appear to be robust in light of their basis in empirical research and the accuracy of the 2009 Projections in comparison to 2010 Census data, and while the potential for error is still large, these projections are the best resource available to estimate future growth in the study area. The methods used to distribute land use effects are based on reasonable assumptions to produce a valid comparative analysis, but these methods also result in high, conservative estimates of effects.

Land Use

- All changes in land use within the entire study area from the Baseline to the Build are within two percent (i.e., between negative one percent and one percent) of the change that is predicted for the 2030 No-Build.
- Additional development (including direct and indirect effects) estimated to occur under the 2030 Build Scenario totals approximately 3,400 acres more, about 2 percent more than the total development expected under the 2030 No-Build.
- The indirect land use effects are modest, totaling about 2,300 acres of additional development, an increase of less than 2 percent over the No-Build and an increase in development of about 1 percent of the total land area within the study area.
- Incremental effects to agricultural and forested lands are a reduction of 2,000 and 1,200 acres respectively as a result of the additional developed land. For both these land uses, the decrease equals a less than one percent change as a percent of total land.
- It is likely that some portion of the household increase would shift within the study area and the remainder would shift from elsewhere in the greater metropolitan area. However, in an effort to

[56] NCDOT & NCDENR, 2001a

estimate the environmental impacts without underestimating them, no portion of this induced household growth has been subtracted from elsewhere in the study area.

Impervious Surface

- Findings show the incremental effect of the 2030 Build Scenario will be a one percent increase in impervious surface throughout the study area as compared to the change predicted for the 2030 No-Build Scenario which results in approximately 2,000 additional acres of impervious surface throughout the study area.
- With the 2030 Build Scenario, increases in percent impervious surface as compared to the change predicted for the 2030 No-Build are found in 7 of the 18 watersheds. These increases are between one and three percent.
- There is no difference in impervious surface resulting from direct or indirect effects in the Goose Creek or Sixmile Creek watersheds between the 2030 No-Build and 2030 Build scenarios.

Water Quality

- With regard to percent impervious cover as an indicator for water quality effects and effects to aquatic species, findings show only a one percent difference in percent impervious cover between the 2030 Build and 2030 No-Build for the study area as a whole.
- With regard to individual watersheds, findings show no incremental difference from No-Build to Build scenarios for 12 of the 18 watersheds, including Goose Creek and Sixmile Creek. For the remaining six watersheds, the Build scenario will have a one to three percent greater change in impervious surfaces as compared to the change predicted for the No-Build scenario.
- Overall, as these results are very similar to the results of the original Quantitative ICE, additional water quality modeling is not necessary as these differences are not large enough to see substantial differences compared to the prior water quality results.

Endangered Species

- With regard to percent impervious cover as an indicator of potential effects that could affect habitat for the endangered mussel, findings show no direct or indirect effects within the Goose Creek or Sixmile Creek watersheds as a result of the 2030 Build. Therefore, no cumulative effect to the Carolina heelsplitter is anticipated based on results of this study.
- For the 2030 Build, findings indicate a four percent greater decrease of land exhibiting habitat characteristics that might support the Schweinitz's sunflower as compared to the change predicted for the 2030 No-Build based on results of this study.

Land Use and Farmland Conversion

- The 2030 Build is predicted to have one percent additional conversion of land to development as compared to the conversion predicted with the No-Build scenario.
- The composition of the development is different between the Build and the No-Build scenarios. With the 2030 Build, there is more Low Density and Medium Density Residential, Commercial, and Industrial/Office/Institutional growth.
- The 2030 Build is predicted to convert 2,100 additional acres of agricultural land to low density residential or other developed uses. This represents four percent greater loss of farmland compared to the No-Build but just a one percent greater overall conversion relative to the total land area than that predicted with the No-Build scenario.

Wildlife Habitat

- The 2030 Build is predicted to convert approximately three percent more undeveloped vegetated land in the study area as compared to that predicted for the No-Build scenario. These conversions are mostly concentrated in Salem Creek and Richardson Creek – Lower, with some lesser amounts scattered among Richardson Creek – Middle, Stewarts Creek and Crooked Creek. The incremental losses represent a maximum of 9 to 12 percent additional loss relative to the Baseline conditions for the three most affected watersheds.
- The forest fragmentation analysis indicates that indirect impacts will be modest but that cumulative effects may be more substantial. Nevertheless, most of the cumulative effects are likely to occur with or without the proposed project.

Traffic

- The forecasted traffic levels indicate that the growth-induced impacts of the proposed project will add to the total volume of traffic in Union County and to the total vehicle miles traveled and vehicle hours traveled. Roads that connect to the Monroe Connector/Bypass will likely see some increases in traffic. Overall, however, the increases in traffic are modest and would not likely create substantial congestion issues within the design year of the project.

6.0 POTENTIAL STEPS TO MINIMIZE DEVELOPMENT IMPACTS

Cumulative effects occur as a result of decisions made not just by NCTA and FHWA, but also by other local, state and federal entities as well as private institutions. Separating, quantifying and minimizing and possibly avoiding the environmental effects from individual contributors continues to prove challenging.

First, one should note that the assumptions used in the methodology of this report and the reports summarized herein were generally designed to overestimate impacts to sensitive resources and water quality. For example, the water quality analysis assumed that relevant stream buffer regulations would be maintained through the design year of the project, but did not apply other land use or zoning controls that are currently in place or may be adopted in the future. The DEIS Qualitative ICE, summarized the regulations currently in place and their impacts on land use.[57] Many of these ordinances have been updated since the publication of the Qualitative ICE, as shown in the FEIS Quantitative ICE, Table 4[58], and this report in Section 1. For example, the Site Specific Water Quality Management Plan for the Goose Creek Watershed, states that any new development would be required to have stormwater controls to remove 85 percent of the average annual amount of total suspended solids (TSS) and discharge the storage volume at a rate less than or equal to the pre-development discharge rate for the one-year, 24-hour storm. The methods used to reduce TSS and stormwater discharge also reduce nutrient (nitrogen and phosphorous) runoff. Other portions of this regulation place limits on ammonia concentrations, and permitted activities within riparian buffer areas. These regulations have proven to limit future potential impacts from development to water quality.

In an effort to promote the use of "nature friendly" growth management strategies, the North Carolina Wildlife Resources Commission (NCWRC) developed the Green Growth Toolbox.[59] The handbook for the toolbox document provides a background on green growth practices, offers tips on green planning, sample land use zoning ordinances, and provides examples of green growth projects. The goal of the NCWRC is to eliminate or significantly reduce incremental effects from individual contributors before they occur. When used, the tools from the "Green Growth Toolbox" equip local governments and private interests to achieve their respective development goals efficiently, economically and sustainably.

As detailed in Section 1, area planners were asked the following questions pertaining to the Green Growth Toolbox:

- *Have you attempted to implement any of the practices, ordinances or other policies recommended by the toolbox?*
- *Have you attempted to incorporate any other low-impact design type policies into zoning, subdivision or other land development ordinances?*
- *How would you rate the likelihood of incorporating any low-impact design principles in future regulations or plans?*

Among respondents, only Mint Hill expressed a familiarity with the toolbox, and they stated that their Low Impact Development (LID) policies were incorporated through the Mecklenburg County Post Construction Control Ordinance (PCCO). Charlotte-Mecklenburg Planning and Development stated that

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[57] FEIS Appendix G: *Indirect and Cumulative Effects Assessment*. January 2009. p 23-39.
[58] FEIS Appendix H: *Indirect and Cumulative Effects Quantitative Analysis*. Michael Baker Engineering, Inc. April 2010. p 5.
[59] NCWRC, 2012. http://www.ncwildlife.org/Conserving/Programs/GreenGrowthToolbox.aspx

many of the Toolbox principles are incorporated in the Environment Chapter of the General Development Policies for the jurisdiction. Other respondents did not mention familiarity with the toolbox prior to the interview, but did state that they would consider aspects of the Toolbox approach. Respondents in the Union County area include several respondents who are familiar with LID concepts and practices but were not familiar with the Toolbox, suggesting additional outreach on this effort may be needed.

As stated above, the respondents did suggest support for aspects of the Green Growth Toolbox. Practices included in the Toolbox could reduce overall cumulative effects for development throughout North Carolina. For many local jurisdictions in the study area, the first step would be to begin implementing “Green Planning.” The “Green Planning” tool incorporates habitat and green space conservation into a local government's planning processes/documents or creating a new planning document designed specifically for this purpose. This provides an opportunity for the public to provide input specific to these issues, communicates the importance of these issues across internal organizational boundaries and to external planning process users, and provides a necessary step towards funding for habitat conservation and new green space. Since some localities indicated that they lacked much knowledge of LID principles, “Green Planning” is a first step toward basing land use and development decisions with both the economic and environmental landscapes in mind.

Other localities that have already started implementing some LID principles would benefit from furthering those efforts through more intensive tools like “Greening Ordinances” and “Greening Development Review.” “Greening Ordinances” means structuring zoning and development ordinances to conserve priority habitats beside developments. Zoning and development ordinances provide effective means for managing developmental objectives and outcomes. By using these types of land use controls, local governments within the study area can focus intensive, high density developments into areas that are less environmentally sensitive to such development. Using ordinances, local governments can do things like set minimum lot size requirements that are more compatible with sensitive habitats, establish maximum impervious cover requirements with water quality and quantity in mind, or set minimum riparian zone widths specific to stream characteristics and water quality concerns.

Examples of “Greening Ordinances” and “Greening Development Review and Site Design” in action could include a requirement for the protection of 100-foot native, forested buffers on each side of perennial streams and 50-foot native, forested buffers on each side of intermittent streams in sub-watersheds (14 digit hydrologic unit codes) without federally-listed aquatic species. Another requirement established via ordinance could exclude roads and driveways from upland areas within 750 feet of priority wetland habitats. Reviewing staff would insure compliance with these ordinance requirements and work with developers to modify development plans so that they would be more compatible with the environments in which they are located. When used by local governments and the development community, these approaches can significantly reduce cumulative effects to environmental resources like wildlife, habitat, and water. They also aid in NCDOT's transportation planning process because they can help establish avoidance areas or require specific mitigation when avoidance is not practical.

Local governments can also incorporate Low Impact Development (LID) techniques and green design criteria into project planning to further reduce incremental environmental effects, create community assets, and can lower lifecycle costs by reducing maintenance and operations expenditures. LID integrates stormwater practices into site design using a customized layout for each project. Some of the most commonly used integrated management practices (IMPs) include: permeable pavement, cisterns, grassed swales, bioretention, rain gardens, and level spreaders (North Carolina University, 2012). LID replaces the high maintenance "Collect, capture, control and release" approach by using the natural landscape for managing stormwater. As summarized in a 2007 EPA report the use of bioretention, topographical depressions, grass channels, swales, and stormwater basins at the 270-unit Poplar Street Apartment complex located in Aberdeen, North Carolina improved stormwater treatment and lowered construction costs. [60] The design allowed almost all conventional underground storm drains to be eliminated from the design. The design features created longer flow paths, reduced runoff volume, and filtered pollutants from runoff. The use of LID techniques on this private development in North Carolina resulted in a $175,000 savings (72 percent) over a traditional stormwater management approach while significantly reducing effects to water quality.

Low Impact Development (LID) practices have also been shown to reduce contaminant loads in streams. As summarized in a 2010 EPA report, which highlighted examples of LID results for 12 local governments, the City of Philadelphia passed a new stormwater standard that requires properties to retain the first inch of rainfall onsite.[61] The Philadelphia Water Department estimated that the ordinance as reduced Combined Sewer Overflow (CSO) inputs by a quarter of a billion gallons, saving the City approximately $170 million in wastewater treatment costs. Portland, Oregon, used various strategies to retain stormwater onsite. The City was able to implement these procedures on 56,000 properties, keeling 1.2 billion gallons of water out of the combined sewer system from 1994 to 2010. On a smaller scale, installing a "green roof" at the City of Chicago's City Hall reduced stormwater runoff by 50 percent. Another instructive example is that of Alachua County, Florida, which, similar to Union County, was seeing water quality impacts from fast growing development in the middle of the last decade. The County took a number of steps including requiring clustered development patterns, allowing narrower streets in subdivisions, and an aggressive land acquisition strategy to conserve open space. The Madera subdivision provides a good example of what can be done in a typical suburban development pattern. In building the subdivision, the developer retained many mature trees and used narrower streets, native landscaping, and depressed bioretention areas in each cul-de-sac to reduce runoff.

Cumulative effects to specific environmental resources occur as the result of the actions of many different public and private entities over time. Effectively minimizing or avoiding cumulative effects requires collaboration and coordination among the local governments within the study area along with the efforts of FHWA and NCDOT and other agencies. The "Green Growth Toolbox" and LID techniques offer valuable tools for local governments and NCDOT to use for reducing cumulative effects to resources within the study area.

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[60] U.S Environmental Protection Agency (EPA). 2007. Reducing Stormwater Costs through Low Impact Development (LID) Strategies. EPA Nonpoint Source Control Branch. Washington, DC http://water.epa.gov/polwaste/green/costs07_index.cfm

[61] U.S. Environmental Protection Agency (EPA). 2010. Green Infrastructure Case Studies. EPA Office of Wetlands, Oceans, and Watersheds. Washington, DC. http://water.epa.gov/polwaste/green/upload/gi_case_studies_2010.pdf

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Maps

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APPENDIX E-2

SUPPORTING DOCUMENTATION REFERENCED IN THE ICE TECHNICAL REPORT

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INTERIM GUIDANCE ON THE APPLICATION OF TRAVEL AND LAND USE FORECASTING IN NEPA

FEDERAL HIGHWAY ADMINISTRATION

MARCH 2010

EXECUTIVE SUMMARY

Travel and land use forecasting is critical to project development and National Environmental Policy Act (NEPA) processes. In light of the importance of forecasting, the high variation in practice, and the litigation risk involved, the Federal Highway Administration (FHWA) created this guidance to encourage improvement in how project-level forecasting is applied in the context of the NEPA process. While technical guidelines for producing forecasts for projects have been documented by others, little has been published on the procedural or process considerations in forecasting. This guidance attempts to fill that gap. The primary audiences are NEPA project managers, FHWA staff, forecasting groups at Metropolitan Planning Organizations (MPOs) and State Departments of Transportation (DOTs), as well as consultants that support MPOs and DOTs in conducting corridor and NEPA studies. Following this guidance is strictly voluntary. It is based on lessons learned and best practices and does not constitute the establishment of an FHWA standard. Not all studies are the same; therefore this guidance is intended to be non-prescriptive, and its application flexible and scalable to the type and complexity of the travel analysis to be undertaken.

This guidance document identifies seven key considerations:

- **Assess project conditions and scope the forecasting needs of the study:** It is crucial to scope the forecasting effort to meet the project analysis, decision-maker and stakeholder needs in the study area. For this reason it is useful to begin the forecasting process by understanding the requirements of the study and anticipating decision-maker and stakeholder interests with respect to forecasting.
- **Review the suitability of modeling methods, tools, and underlying data:** It is important that the study team review the suitability of available modeling methods and the underlying data, including consideration of the currency and quality of the model data and methods, and that they analyze the data and methods' ability to adequately examine alternatives.
- **Conduct scoping and collaborate on methodologies:** Scoping is a collaborative process involving the lead agencies, resource and regulatory agencies, and the public and is typically how a NEPA study begins. It is critical for the study team to document the broad agreements reached during scoping on the assumptions to be used for the land use and travel forecasting.
- **Objective application of forecasting in alternatives analysis:** The requirement for the alternatives analysis to be an objective evaluation makes it essential for the study team to apply forecasting data and methods objectively without any bias towards a particular alternative. Important considerations include understanding uncertainty in assumptions and forecasts and how induced demand and land development effects are taken into account.
- **Project management considerations:** NEPA studies are often complex undertakings and may be accompanied by various special considerations that warrant extra attention, such as the potential for re-do analysis loops and ensuring documentation consistency.
- **Forecasting for noise and air emissions analyses:** Land use and travel demand forecasting models are used to provide inputs to noise and air quality assessments. It is important that assumptions that are made in general forecasting applications as part of the NEPA study are consistent with those used in the noise and air quality analyses.
- **Documentation and archiving:** It is important for NEPA documentation to include enough technical detail to explain complex information in an understandable manner, and to describe how analytical methods were chosen, what assumptions were made, and who made those choices.

As a companion to this guidance, the FHWA is creating a document that will include case studies and best practices to help further the improvement of forecasting techniques at the project level. Training and technical assistance will also be made available to provide educational and peer exchange opportunities to State DOTs, MPOs, resource agencies, and the consultant community, to encourage needed dialogue and discussion to improve the state-of-the-practice.

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1.0 BACKGROUND

1.1 Rationale and Need for Guidance

Travel and land use forecasting is critical to project development and National Environmental Policy Act (NEPA) processes. Forecasts provide important information to project managers and decision-makers, and provide foundations for determining purpose and need. They are essential in evaluating: the performance of alternatives; the estimation of environmental impacts such as noise and safety (based on traffic volume or exposure) and emissions (based on traffic volume and speed); induced land development effects (change in land development patterns due to changes in accessibility); and resulting indirect and/or cumulative effects (such as watershed effects). In short, travel and land use forecasting is integral to a wide array of corridor and NEPA impact assessments and analyses.

Forecasting methodologies and their applications are often a source of significant disagreement among agencies and interest groups, and are frequently the focus of project-level litigation. While many of the issues raised are technical and methodological, often they are process-related or procedural in nature: misunderstandings regarding what work was done, what assumptions were made or input used, how the methods and approaches were chosen, and how the procedures were carried out. Forecasting is not a heavily legislated or regulated area of science, and is thus mainly driven by professional practice. This situation makes assessments of standards of practice difficult, and results in a large variation in practice and experience among transportation and resource agencies and consultants.

In light of the importance of forecasting in project development and NEPA, the high variation in practice, and the litigation risk involved, the Federal Highway Administration (FHWA) created this guidance to encourage improvement in the state-of-the-practice in relation to how project-level forecasting is applied in the context of the NEPA process. While technical guidelines for producing forecasts for projects have been documented by others,[1] little has been published on the procedural or process considerations in forecasting (how to apply forecasting in the context of NEPA). This guidance attempts to fill that gap.

1.2 Process for Developing Guidance

In 2007, the FHWA initiated a project to provide practitioners and stakeholders with process and procedural guidance on how to apply forecasting in the context of project development and NEPA studies. The project was scoped to include:

- Creation of an FHWA expert panel, consisting of modeling, NEPA, and planning experts to advise the project
- Outreach to stakeholders and interest groups
- Formulation of project development and NEPA guidance and a review of relevant case law
- Development of a guidebook to include case studies and best practice examples
- Creation of training materials and technical assistance

Early in 2008, the FHWA expert panel was assembled to discuss and provide advice on the purpose and format of the guidance, and how to move forward on supporting activities. The panel included active participation by FHWA headquarters and field offices. The panel provided invaluable input to the guidance development process. In addition, during 2008 and 2009, the FHWA Office of Chief Counsel developed a case law summary that related forecasting issues and the NEPA process; this was also used to inform the guidance. Information on the project was provided to stakeholder and interest groups at various national meetings and venues.

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[1] See *NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning and Design* (1982), available at: http://www.oregon.gov/ODOT/TD/TPAU/references.shtml#NCHRP_Report_255

1.3 Using the Guidance

This guidance is intended to provide assistance to NEPA and forecasting practitioners on improving how forecasting is used and applied in the project development and NEPA processes. It does not examine the details of how to calibrate and validate models; rather, it provides procedural and process considerations in developing forecasts in NEPA studies. The primary audiences are NEPA project managers, FHWA staff, forecasting groups at Metropolitan Planning Organizations (MPOs) and State Departments of Transportation (DOTs), as well as consultants that support MPOs and DOTs in conducting corridor and NEPA studies.

Following this guidance is strictly voluntary,[2] and it is suggested that it be adjusted to the individual planning and project contexts, and the scale, size and capabilities of the project and the lead agencies. The guidance is based on lessons learned and best practices and does not constitute the establishment of an FHWA standard. Not all studies are the same; therefore this guidance is intended to be non-prescriptive, and its application flexible and scalable to the type and complexity of the travel analysis to be undertaken.

It is also intended that this guidance will improve communication between forecasters and NEPA practitioners. Travel and land use forecasters are encouraged to demonstrate and explain the validity of the forecasting process along with the reasonableness of the forecasts as a way to mitigate litigation risk. Significant efforts were made to consider relevant case law in the creation of the guidance and, where applicable, specific cases are cited. Hopefully, applying this guidance will assist agencies in creating better and more legally defensible forecasting applications.

1.4 Evolving Forecasting Methods

The state-of-the-art and the state-of-the-practice in travel forecasting are always evolving, and the practice typically changes based on careful consideration of the potential or known benefits and costs of different approaches. While this guidance outlines important considerations in developing and documenting forecasts, the intent is not to advocate specific technical model design elements or models to produce forecasts. Because the practice is constantly evolving, forecasting methods are evaluated based on what peers are successfully doing with a reasonable effort.[3]

Travel forecasting methods are evolving because of: (1) advancements in software and hardware; (2) improved data collection methods; (3) a need for improved approaches for analyzing the wide array of transportation-related policies, pricing initiatives, and investments; and (4) the evolution of planning and project development processes and regulations. Each of these factors was considered when this guidance was drafted.

Clearly, it is very important that the methods utilized to produce forecasts are defensible and that the forecasts are reasonable. The specific methods used to produce forecasts can and do vary widely based on the timeframe for the study, and the defensibility of the methods must be judged based on the needs of the study. While certain aspects of models and approaches to forecasting are relatively common, well understood, and accepted, it can often be difficult to judge the merits, costs, and schedule considerations of one modeling approach over another. Additionally, it is not always the case that more difficult or costly modeling methods produce the best forecasts. One motivation for this guidance is to present a framework for considering these challenges in the context of a NEPA study where the forecasts may be questioned and the methods used to produce forecasts will be reviewed and compared to applications elsewhere.

[2] There are instances where this guidance references regulatory requirements; following those regulatory requirements is not voluntary

[3] For more information about the latest forecasting techniques see the FHWA's Travel Model Improvement Program (TMIP) website: http://tmip.fhwa.dot.gov, or contact TMIP staff

2.0 GUIDANCE

This guidance document is organized around seven key considerations: (1) the project conditions and forecasting needs of the study; (2) the suitability of modeling methods, tools, and underlying data; (3) scoping and collaboration on methodologies; (4) forecasting in the alternatives analysis; (5) project management considerations; (6) forecasting for noise and air emissions analyses; and (7) documentation and archiving.

2.1 Project Conditions and Forecasting Needs

It is crucial to scope the forecasting effort to meet the project analysis, decision-maker and stakeholder needs in the study area. For this reason it is useful to begin the forecasting process by understanding the requirements of the study and anticipating decision-maker and stakeholder interests with respect to forecasting.

Far too often, the forecasting process is not given enough thoughtful proactive attention, and it is not scoped in a detailed manner that will minimize or account for potential issues or problems. It is common for one of the first exercises to be the production of a no-build forecast, with little consideration given to the credibility of and the assumptions made in the forecast. If, instead, the NEPA study team[4] determines the appropriate level of the forecasting effort at the outset and begins by ensuring the suitability of the tools, then the NEPA process can proceed more reasonably.

2.1.1 Conceptual Review of Anticipated Analysis

The NEPA lead agencies often define the study area while also developing the purpose and need statement. They typically base the boundary of the study area on the logical geographic termini, the project purpose and need, and the expected limits of potential impacts. It is important that the study area be large enough to encompass the range of alternatives that will be developed to meet the project purpose and need. The area within which transportation impacts can be measured will likely be substantially larger than the area within which direct environmental impacts are measured. It is important to ensure that the forecasting is extensive enough in its geographic reach to reasonably estimate the transportation and land development impacts.

An early assessment of the current and anticipated travel demand in the study area is important to the success of both the NEPA process and the forecasting effort. It is helpful to document what is understood about the existing travel demand and growth potential in the corridor or area being evaluated. For example:

- What is the nature of demand in the corridor in terms of trucks versus passenger cars, through versus local trips, or non-discretionary trips (such as commute to work) versus discretionary trips (such as shopping trips)?
- Are there unique major generators in the corridor?
- What magnitude of growth in travel demand is anticipated?
- To what extent is the need for the project based on today's travel conditions versus anticipation of growth?

Answers to these questions, as well as others, can inform data collection and help assess the suitability of the forecasting models.

[4] "The study team" refers to the lead agencies and their staff and consultants conducting the analysis for the study

2.1.2 Establishment of Forecasting Analysis Requirements

Once the lead agencies have considered the anticipated study needs, it is important to establish the travel forecasting requirements for the study. The principal forecasting analysis requirements to be defined early in the process include:

- Specifying the analysis years
- Identifying the geographic scope of the transportation and land development analysis
- Considering the level of detail required in the analysis
- Outlining an initial list of what travel and land use-related or -dependent impacts are to be estimated (see section 2.4.1 on direct, indirect, and cumulative impacts).

2.1.2.1 Identifying Analysis Years

Selecting the appropriate timeframes for analysis is essential. Forecasters typically use a 20- to 30-year horizon for long-range transportation planning purposes. In addition to a base year and a future forecast year, intermediate forecast years are usually considered, including (most notably) the opening date of the project. It is common for these intermediate forecast years to be chosen to correspond to future planning horizons already examined in the region or State's long-range plan since modeling inputs, such as land use forecasts, for these years are readily available. Table 1 presents a list of possible analysis years.

Table1: Possible analysis years for travel forecasting

Base Years	**Base model year**	The calibration year for the travel model
	Base project year	This could be different from the base model year; it is an up-dated base year that is validated and is as close as possible to the current year
Forecast Years	**Open-to-traffic year**	Expected future year that the project will open; in the case of phased projects this might be a sequence of intermediate forecast years
	Plan horizon year	A future forecast year that often corresponds with the long-range plan horizon
	Design year	An alternative future forecast year for the project that may be earlier or further into the future than the forecast year

The appropriate base and future analysis years for a particular study may not align with the available analysis years, which may lead the study team to update the travel model's base year and/or create new land use and travel forecasts for NEPA analysis. Two common examples of this situation are:

- The travel model's base year is several years ago and travel demand in the study area has changed. A more recent base year, as close to the current year as possible, is needed so that the travel model adequately represents current travel demand in the study area.
- The planning horizon year is different from the design year of the project. For example, the planning horizon is 25 years in the future and the design year of the project is 30 years.

Similarly, air quality or noise analysis requirements are a consideration; for example, when a hot-spot or noise analysis is needed this may require the selection of a unique analysis year(s) for that work.[5]

It is important for assumptions regarding open-to-traffic years to be explicit and discussed in the documentation. Also, a project might not rely on future performance to meet purpose and need, and its "design year" may be shorter, or the project is designed to manage current congestion. In that case, while

[5] See Section 2.5 for more information

forecasts could be required for potential impacts, forecasting to support purpose and need is less essential.

Phasing and sequencing considerations are also crucial when the study team is establishing forecasting analysis requirements. If an alternative will be implemented over time, or if alternatives could be implemented with phases in different sequences (for example the sections of a new highway may be built in phases as travel demand increases over time) then it is important for these assumptions to be discussed in the documentation as they will lead to particular analysis needs, such as intermediate analysis years and additional road network and land use assumptions.

2.1.2.2 Geographic Scope of Analysis

It is important to ensure that the forecasting is extensive enough in its geographic reach to estimate travel behavior, transportation, and land development effects.[6] Unique issues may arise when applying a model to evaluate a project near a model boundary. In such cases, model refinements may be needed. In these boundary conditions the traffic analysis zones (TAZs) are typically large, the coded road network is sparse, and travel patterns are heavily affected by external demand. Taken together, these issues lead to both less detail and less model sensitivity. If the project is proximate to the boundary of the model area, it is suggested that the study team code a more detailed road network. It is also suggested that the study team consider both adding more detail to the TAZ structure and expansion of the model to extend its boundary. Refining or expanding the model may lead to significant efforts such as the collection of additional land use data and the need to forecast land use changes for that area, the need to do additional model validation, or, in the case of expanding the model, the integration of land use data and forecasts from a different planning jurisdiction.

2.1.2.3 Level of Detail Required in the Analysis

Using a variety of methods, one can produce forecasts and output indicators at a regional scale (e.g., regional vehicle miles traveled, or VMT), at a microscopic scale (e.g., intersection turning movements), and at a corridor scale (e.g., difference in roadway volumes under two scenarios).[7] It is important for the lead agencies to determine the appropriate level of detail for forecasting analysis based on the specifics of the study, including considerations related to the stage of the project development process and stakeholder issues. It is suggested that performance measures reflect non-automobile impacts, such as transit use. It is important for the lead agencies to select the performance measures so that the impacts of each alternative can be fully explained in the NEPA documentation. It is also important to select the performance measures that can illustrate the relative merits of each alternative in the context of the project purpose and need.

The project development process can be long, with varying levels of forecasting detail typically necessary at different stages in the process; it is essential to avoid confusing *detail* with *accuracy.* Because more detail tends to require more time and effort, it is generally advised to begin a study focusing on more aggregated and large-scale impacts, particularly when the possible alternatives are numerous (prescreening) or forecasting methods are being refined. Different forecasting tools and processes allow for analysis at different geographic scales; it is important for the study team to judge and explain which modeling tools are appropriate for which analyses and also to recognize the level of detail required at each stage in the study. Forecasting is an iterative process, and with iteration generally comes more confidence and ability to add detail to better inform complex decisions.

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[6] Often different study areas exist on the same project for a variety of reasons, for example the Area of Potential Effect under Section 106 of the National Historic Preservation Act will not be the same as study areas for air or noise impacts or for wetland mitigation purposes

[7] See, for example, *Volume I: Traffic Analysis Tools Primer* (July 2004) in the FHWA Traffic Analysis Toolbox

2.1.3 Consideration of Tools Required to Forecast Needs

It is suggested that the lead agencies prepare a brief history describing the tools that have been used to make forecasts in the corridor and region. Once the available data and models have been reviewed, it is important for the study team to consider what data and tools are appropriate for the analyses. Depending on the needs of the study, this can include consideration of readily available data and models, as well as supplementing what is available. As the study team considers applying current models to evaluate the increasingly complex strategies and policies of interest in the project area, it is important to assess the limitations and sensitivity of those models. By identifying the significant issues related to alternatives to be considered, such as pricing, high-occupancy vehicles (HOVs), transit, and transportation control measures, the study team can ensure that methodology and analysis decisions are made with these factors in mind.

In many areas where land use and travel demand models are frequently used in planning and project development, multiple users may exist. For example, modeling staff within the MPO or DOT may be undertaking modifications to the land use or travel model as part of an ongoing model improvement process. In addition, consultants working on other studies in the region may be incorporating additional model functionality and/or correcting existing model errors and deficiencies. It is therefore critically important that the study team consider modeling tools under development, or ones that might be developed in the short term, for inclusion in the land use and travel forecasting process, especially when an improvement to the model would directly affect the project being studied. This is particularly true when the study team expects the project development process to be relatively long or complicated. See section 2.2.1 for additional discussion of these issues.

2.1.4 Review of Prior Forecasts and Technical Issues

Before producing new forecasts, it is useful to critically review past efforts to be aware of the prior work and to improve on or complement that work. In its review of prior planning studies and prior NEPA studies either for the current study project or other projects in or close to the same study area, it is important for the study team to consider travel and land use forecasting needs, in terms of both the forecasts themselves and any known technical concerns related to forecasting. In many cases, projects have been in the planning phase for 10, 20, or more years, and transportation plans identify specific alternatives. To some degree, past decisions are supported by these prior analyses. Therefore, it is critical to assess the comprehensiveness and usefulness of past analyses and compare new analyses and forecasts to previously documented forecasts. In some cases, lead agencies in NEPA may choose to directly use previously developed forecasts. It is recommended that this decision be taken with some care, as previously developed forecasts may not have been subject to the same rigorous review that forecasts produced as part of a NEPA study are likely to face. See section 2.1.5 below for more detail.

To the extent that prior litigation has raised issues related to land use and travel forecasting in the project's region or identified issues in the corridor germane to forecasting, it is important to ensure that these issues are fully addressed or that prior responses are understood and reconsidered. It is important for the study team to describe and clearly and completely address both past judgments in cases pertaining to the project and any ongoing litigation. It is also important to consider and adequately address the less obvious cases that have stalled or stopped planning and project development efforts in other regions with relevance to the subject project. Remedying the concerns raised by legal findings and opinions may lead to significant changes in the team's approach to the analysis for the study.

2.1.5 Incorporating Analyses Done in Transportation Planning Studies

Often, forecasts are prepared for a project or corridor prior to the beginning of the NEPA process. Forecasting may have been done as part of system-level planning activities, or as part of corridor, feasibility, or sub-area studies. At the system level, major efforts include defining the transportation problem, and developing and testing potential solutions. Many times these problems and potential solutions are identified and tested during planning because that is the scale at which they are appropriately analyzed. For example, developing system-level land development estimates is best done at a regional level, where systemic interactions between transportation and land use policies and the characteristics of existing land availability and transportation accessibility can be analyzed. Travel and land use forecasting procedures play a central role in these analyses.

Corridor, feasibility, and sub-area studies done in a transportation planning context are not as detailed as analyses performed for project-level NEPA alternatives analysis, but are often conducted to refine purpose and need in a corridor, to screen out unreasonable alternatives, and to preliminarily evaluate potential impacts of alternatives, including travel and land development effects. Again, forecasting is critical to performing these studies. All too often, these analyses are redone in the NEPA process, resulting in duplication of effort. This situation also can result in potentially undermining past analyses, and discounting public and agency involvement in the prior studies.

Recognizing these issues, the FHWA and the Federal Transit Administration (FTA) have worked over the past decade to improve the ability of agencies to utilize analyses done as part of planning studies in the NEPA process. Typically referred to as "linking planning and NEPA," these efforts have culminated in a revision to 23 CFR Part 450 (the FHWA and FTA regulations for the Statewide and metropolitan transportation planning process), and 23 CFR Part 771 (FHWA and FTA NEPA implementing regulations).[8] These regulatory provisions represent new authority to the FHWA, FTA, State DOTs, and MPOs to use decisions and analyses conducted in transportation planning to be used in the NEPA process. Since forecasting is so central to planning studies and analyses, the methods and results can be incorporated by reference in the NEPA process. Such analyses or results should be made available during the NEPA scoping process.

However, the regulatory authority discussed above does not come without conditions.[9] The NEPA lead agencies determine the applicability and appropriateness of the methods used and the continued validity of the results before they can be used on a specific NEPA study or project. The studies must have contained a reasonable opportunity for public review and comment, must be adequately documented, and must have had appropriate interagency involvement in the efforts. From a forecasting perspective, the technical documentation must be adequate to explain and defend those decisions in the context of NEPA. Also, early public and interagency involvement in the forecasting efforts for the planning studies is essential as it helps build trust and comfort with how these analyses were performed, and increases the comfort level in using these forecasts in the NEPA process.[10]

2.1.6 Documentation of Project Conditions and Forecasting Needs

This section of the guidance has discussed the importance of beginning the analysis effort with a careful review of forecasting needs. To ensure that the findings of this review are retained and can be referred to as the analysis progresses, it is important for the study team to produce documentation of this work. A possible structure for the documentation follows.

- Conceptual review of anticipated analysis
- Establishment of forecasting analysis requirements
    - Identifying analysis years
    - Geographic scope of analysis
    - Level of detail required in the analysis
- Consideration of tools required to forecast needs
- Review of prior forecasts and technical concerns
- Incorporating analyses done in transportation planning studies

[8] See 23 CFR § 450.212 , 450.318, and Appendix A, and 23 CFR § 771.111(a)(2) and 771.123(b)

[9] See 23 CFR § 450.212 (b), 450.318 (b) and Appendix A

[10] For more information see the Planning and Environmental Linkages website at: http://environment.fhwa.dot.gov/integ/index.asp

A key purpose of this documentation is to demonstrate that these issues have been considered by the study team. In addition to documenting the decisions that were reached regarding technical issues such as selection of analysis years, such documentation can demonstrate the process and rationale used to make the decision, the information considered in the decision-making process, and who was involved in the decision-making process. In other words, it is very important to document that the decisions made are reasoned and thoughtful.[11]

2.2 Suitability of Modeling Methods, Tools, and Underlying Data

Once the conditions and forecasting needs of the study have been assessed, including a consideration of the forecasting tools and requirements, it is suggested that the study team review the suitability of available modeling methods and the underlying data. For this, it is important for the study team to both consider the currency and quality of the model data and methods and analyze the data and methods' ability to adequately examine alternatives. The purpose of FHWA guidance on travel models and other published resources[12] is to promote good practice. Good practice in model development and application has positive consequences in project development.

2.2.1 Age of Forecasts, Models, Data, and Methods

It is important for the study team to establish how current the land use forecasts, travel demand model, data, and methods are before the alternatives can be analyzed. This process may begin with identifying whether the land use forecasts and the travel demand model are the current versions adopted by the MPO or DOT and whether the methods proposed for the analysis conform to current Federal, State and local requirements, as applicable. Section 2.5.2 explains that it is also important for the study team to identify which methods are being used by concurrent NEPA studies in the same region. However, requesting and receiving the latest land use forecasts and the travel demand model available from the MPO or DOT is only the first step. It may be advisable to update certain elements of the land use forecasts, travel demand model, or model data if they are based on data that were collected a significant time prior to the study. For example, trip generation rates based on survey data collected 20 years before the study may need to be updated. It is important that the study team ensures that the data reflect the most up-to-date assumptions about the relevant transportation infrastructure and land use and socioeconomic conditions. However, there is a limit to the scope of updates to forecasts, models, and data that are required as part of the analysis for a NEPA study. If the costs for updating tools and collecting data would be "exorbitant" then 40 CFR § 1502.22 (b) may apply. It is important to document decisions regarding model updates and also why the decisions were made.

If the study team refines a land use forecast, a travel demand model, or their inputs, it is critical that the study team knows which forecast and model version are being used and, if necessary, institute a system to track and manage the versions of forecast and model tools and inputs. It is important to do more than simply state that "the model" was used to generate travel forecasts. Because the travel demand model and land use forecasts for a particular region may often be in flux (as discussed in section 2.1.3), it is recommended that the study team use the most recently adopted version of the land use forecasts and the travel demand model. Although forecast and model refinements between versions may be few and unrelated to questions pertaining to the study, it is possible that the differences in results produced by a "Version 2.2" versus a "Version 2.3" could be substantial.

An MPO or DOT will not typically adopt a new version of a travel demand model until it has been validated and the results checked for reasonableness, although the thoroughness of these checks varies. It is important to keep in mind that a version of a travel model is made up of both the model code and the various model inputs, such as land use forecasts. Therefore, it is necessary to confirm that the proper

[11] See case law summary Section 4.1.2,discussion of *North Buckhead Civic Ass'n v. Skinner*, 903 F.2d 1533, 1543 (11th Cir.1990)

[12] See, for example, the resources section of FHWA's Travel Model Improvement Program website: http://tmip.fhwa.dot.gov/resources

model code is being used with the corresponding set of model inputs that together represent the current adopted version of the model.

During the course of a study, an MPO or DOT may adopt a new land use forecast or a new version of the travel demand model. In this situation, it is important for the study team to consider the implications of changing their analysis approach to use the newly adopted forecast or model; section 2.5.1 on consideration of the potential for re-do analysis loops discusses this issue.

2.2.2 Calibration, Validation, and Reasonableness Checking of Travel Models

The calibration, validation, and reasonableness checking of travel models constitute an important and necessary sequence of steps that are taken to prepare a travel model for making reasonable forecasts.

- Calibration, where adjustments are made to the model so that current observed conditions in the study area are reasonably reproduced, ensures that the travel model's forecasts are built on a foundation that is a good representation of existing travel characteristics.
- Validation, where the sensitivity of the model to changes in inputs and assumptions is tested, ensures that the travel model responds reasonably to transportation system changes and will have the ability to produce forecasts.
- Reasonableness checks are additional tests of a model's forecasting performance, including evaluating the travel model in terms of acceptable levels of error and its ability to perform according to theoretical and logical expectations. The checks help to ensure that the model tells a coherent story about travel behavior.

Forecasts from appropriately calibrated and validated models are likely to be more useful throughout a study and raise fewer questions. It is important to demonstrate that the modeling methods proposed for the study corridor have a strong foundation in observed data, are able to represent change, and credibly compare alternatives in a forecasting setting. The calibration and validation of travel models provide the best evidence that the models adequately represent the transportation system supply characteristics and traveler behaviors that are crucial to subsequent forecasts for NEPA studies. Consequently, the lead agencies have a substantial interest in exerting appropriate efforts to calibrate and validate models.

In the context of a NEPA study, it is important for the study team to focus any calibration and validation efforts that they undertake on the study area. Typically, a regional travel demand model will have been adequately calibrated and validated at least at a regional level prior to adoption. While it is important for the study team to critically review the documentation of this effort, it is suggested that more emphasis be placed on checks at the study area level.

It is suggested that the study team scale their calibration and validation effort according to the scale of the analysis, such as its geographic scope. For example, studies that involve the analysis of major changes to transportation system supply with impacts across a large study area require a much broader calibration and validation effort than a simpler project with a smaller study area.

There are several published sources[13] documenting useful calibration and validation checks, and the key elements of a comprehensive review are outlined below.

Calibration - A meaningful calibration effort would include:

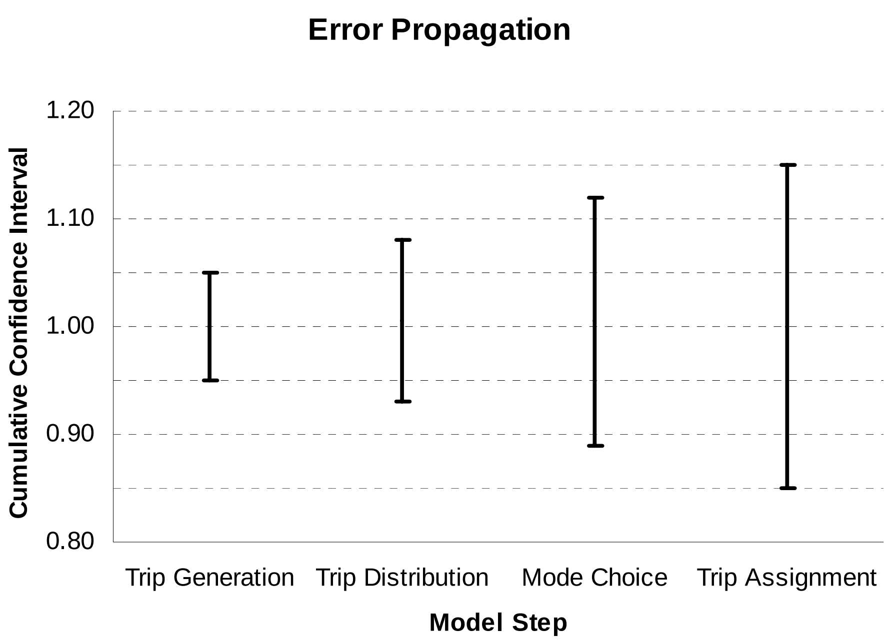
- Review of trip generation particularly at key generators in the study area
- Detailed inspection of modeled origin–destination patterns in the study area to demonstrate that they compare closely to observed travel within and through the study area

[13] See, for example, *Travel Model Improvement Program Model Validation and Reasonableness Checking Manual*, available at: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/mvrcm/ ; *Federal Transit Administration Guidance on New Starts/Small Starts Policies and Procedures*, available at: http://www.fta.dot.gov; several state DOTs such as California, Michigan, Ohio, and Oregon maintain guidance on model calibration and validation

- Careful comparison of point-to-point travel times or speeds on individual road segments, to demonstrate that the model responds appropriately to changing traffic volumes
- Comparison of modeled traffic volumes with traffic counts both for individual roadway segments and at more aggregate levels such as throughout the study area
- Network checks to identify coding errors in, for example, posted speeds and capacities.

Figure 1[14] shows the possible effect of compounding error in travel models, where each step in the modeling process increases the overall error. This underscores the importance of identifying sources of error in each element of the travel model. Implementing a calibration effort such as described above is aimed at minimizing error in each step in the modeling process.

Figure 1: Effects of compounding error in model validation



Validation and Reasonableness Checking – It is important for the study team to conduct validation of the travel model at a level of detail that supports reliable forecasts and output indicators, focusing on the ability of the model to represent the effects of transportation system changes. This suggests validation of the travel markets deemed important in the study corridor by analyzing, for example, their trip generation, geographic distribution of trips, traffic volumes, and travel speeds.

The validation effort involves reviewing forecasting results, and results of sensitivity tests, to evaluate the credibility of the changes produced by the model. Sensitivity tests check the responsiveness of the travel forecasting tool to changes in the transportation system, socioeconomic data, and transportation policies. Often, sensitivity is expressed as the elasticity of an independent variable. For example, modelers can express a travel model's sensitivity to the effects of a parking rate increase in an area by relating the increase in parking prices to the reduction in demand for travel to that area.

Reasonableness checks include the comparison of input such as rates and parameters, outputs such as total regional values, values for subregions covered by the model, and logic tests. Model parameters can be checked for consistency against observed values, parameters estimated in other regions, or secondary

[14] Adapted from Figure 1-3 from *Travel Model Improvement Program Model Validation and Reasonableness Checking Manual*, available at: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/mvrcm/

data sources. A model can be evaluated in terms of acceptable levels of error, its ability to perform according to theoretical and logical expectations, and the consistency of model results with the assumptions used to generate them.

There are several useful types of validation and reasonableness checks, including the following:

- **Forecasting buildup to understand how the different model inputs contribute to changes from the base year to the forecasting year.** It is useful to isolate and understand changes in travel patterns and congestion in a corridor that are due to land use growth versus transportation system expansion. Other inputs that may be important in a corridor include assumptions related to external trips and special generators. This series of tests could easily be conducted using the long-range transportation plan model inputs. Section 2.4.2 discusses the importance of the study team explicitly defining and documenting the future no-build highway (and transit) networks. Understanding the impact of planned changes to the transportation system is an important element of the forecasting buildup.
- **Interpretation of the story told by the models themselves about the behavior of travelers.** This test helps to ensure that the various parameters, assumptions, network coding conventions, and other decision rules in the models tell a coherent story about travel behavior. This helps prevent (by highlighting the need for correction) implausible relationships and explains the properties of the models to non-travel forecasters.
- **Demonstration of reasonable predictions of change between today and the future as well as in response to changes in the transportation system.** This last set of tests adds a major new dimension to the understanding of the properties of a new model set: the ability to respond reasonably to demographic growth and consequent changes in congestion, and to produce coherent responses to major changes in the transportation network.

2.2.3 Calibration, Validation, and Reasonableness Checking of Land Use Forecasts

Land use forecasts are one of the foundations upon which travel demand forecasts are built and, as such, it is important for the study team to invest effort in reviewing and checking both base year land use for accuracy and future year land use forecasts for reasonableness, and to understand the implications of growth on the transportation forecasts. A range of land use forecasting techniques may be used during a study from more qualitative techniques such as expert panels to quantitative techniques utilizing land use models. At the simplest level, it is important to understand how much of the justification for a project is based on current demand versus future growth and the implications of these findings related to the uncertainty in the forecasts; at a more complex level, where the study team's analysis involves more complex land use analysis tools and models, a process akin to the calibration and validation of the travel model described above may be necessary.

As discussed in the context of reviewing the travel demand model, it is suggested that the study team scale their land use review effort according to the scale of the analysis, such as its geographic scope and potential for land development or redistribution effects. Section 2.4.6 discusses in detail considerations for addressing land development or redistribution effects in the preparation of project level forecasts.

A review of the base year land use in the study area will often be undertaken as the first step of travel demand model calibration and validation checks. Published sources[15] discuss recommended approaches to check base year land use and socioeconomic data, and also explain the importance of checking these input data to reduce the level of effort needed to perform other validation steps; indeed, it is critical as errors in these data propagate through the subsequent steps in the model system (as shown in Figure 1).

[15] See, for example, *Travel Model Improvement Program Model Validation and Reasonableness Checking Manual*, available at: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/mvrcm/

In addition, errors that appear unimportant at a regional level may increase in significance as they are proportionally more important at a study area level.

The complexity of the review of the land use forecasts will depend on the approach selected for land use forecasting. A general framework for producing land use forecasts is as follows:[16]

- *Understand existing conditions and trends*: This principally involves assembling data that will be necessary to conduct the analysis.
- *Establish policy assumptions*: This step involves determining currently anticipated changes in regulatory or economic policies such as zoning, environmental regulations, and impact fees.
- *Estimate regional population and employment growth resulting from change in accessibility*: This step uses local population and employment trends; broader State and national economic industry trends; and economic forecasting models.
- *Inventory land with development potential*: This step identifies undeveloped and underdeveloped land and, in combination with environmental restrictions and zoning regulations, quantifies land available to absorb growth.
- *Assign population and employment to specific locations*: This step uses land availability, the cost of development, and the attractiveness of various areas to estimate the amount and type of growth that will occur in each zone.

The approaches used in this process vary from qualitative techniques (such as utilizing an expert panel and/or the Delphi process) to quantitative models to forecast regional population and employment changes (such as regional economic impact models) to land use models that are integrated with travel demand models.

For project level analysis in cases where alternative specific land development effects are not expected, it is common for the study team to review adopted regional level land use forecasts or use an integrated land use and travel demand model that has been calibrated at a regional level, rather than producing new forecasts. It is important that the study team reviews and understands how each of the steps in the forecast framework was undertaken and how each step applies to the land in the study area. This review might include checks of:

- Whether regional level trends used to produce forecasts have been reflected historically in the study area
- The accuracy of the land inventory (such as the amount of vacant land) for the study area
- Pending development/redevelopment proposals, particularly those that will exceed regulatory limits on density or other factors
- The reasonableness and feasibility of the resulting development allocations to the study area.

Consultation with local governments and others with knowledge of land development patterns can enhance this process.

A critical element of this review is for the study team to understand the future transportation network assumed in the land use forecasts, and particularly whether any of the alternatives under consideration are included in the transportation network assumed in the land use forecasts (see Section 2.4.2).

2.2.4 Policy Evaluation Considerations

Forecasting models have been widely used to estimate the effects of standard roadway capacity improvements, like road widening or the addition of a new road. While these types of forecasting efforts can still be complicated and the models may need refinement to be useful, models are built with the basic intention of modeling roadway and major transit capacity improvements. Increasingly, however, requests

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[16] Adapted from *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*, prepared for AASHTO by ICF Consulting, March 2005

are being made to assess the impacts of transportation demand and supply policies that models were not designed for when they were originally constructed. For example, alternatives in a study may include ramp metering to better manage flow on limited access facilities, a transit technology not currently existing in the region, or various pricing strategies. While some models are equipped to assess these policies, many that are routinely applied in current studies are not. Determining the extent to which some of these policies will be major components of a NEPA study will help ascertain the amount of effort it may require to test alternatives and model changes and/or adjustments that may be needed.

2.2.4.1 Evaluating Transportation System Management/Transportation Demand Management Strategies

Transportation system management (TSM) strategies, or intelligent transportation system (ITS) strategies, are put in place to reduce both recurring congestion and incident-related congestion. To the extent TSM strategies affect recurring congestion, the FHWA recommends that they be represented in road or transit networks as capacity improvements relative to facilities without these improvements. Additionally, ITS technologies are increasingly being implemented to monitor and collect travel data (e.g., speeds and volumes) and in this respect are valuable sources of model calibration and reasonableness checking data that can be used to assess capacities, free-flow and congested speeds, volumes by time of day, and the relationship between speed and volume.

Transportation demand management (TDM) strategies vary widely and are designed typically to discourage single-occupant vehicle use during peak hours. These include, but are not limited to, changes in parking policies, ride-sharing, employer-subsidized transit passes or van pools, policies allowing flexible work schedules and telecommuting, HOV lanes, and road or parking pricing. Since these policies vary dramatically in terms of the scale of the impacts and their cost, different analytical approaches may be warranted in each case. Generally speaking, it is reasonable to assess the impacts of the employer-based policies by reducing the number of auto trips to specific destinations during peak hours by a percentage agreed to be reasonable to account for the relevant policies. This exercise can quickly become daunting in its detail, so it is best to acknowledge the effects and develop a quick and reasonable approach to account for the effects if necessary.

2.2.4.2 Evaluating Managed Lanes and Pricing Strategies

Managed lanes and in particular roadway pricing are crucial elements of some regions' networks and nationally are becoming particularly relevant as States and regions consider how to pay for maintaining and expanding their road networks. However, models are typically not well equipped to evaluate such policies as HOV lanes, high-occupancy toll (HOT) lanes, or tolled facilities. The consideration of managed lanes investments and in particular road pricing policies involves thoughtful consideration of how different travelers trade-off time and cost, along with a realistic representation of travel times and trip patterns.

While there are different methods that can be used to estimate demand for a managed lane or a toll facility (e.g., diversion curves, toll mode choice models, or traffic assignment methods that incorporate time and cost), for each approach to be successful it is recommended that the basic components leading to the demand estimate (trip distribution patterns by market segment, values-of-time, and travel time differences) be demonstrated to be reasonable and reliable. Traffic assignment models typically produce better estimates of volumes than speeds and, in the case of managed lanes, both are important.

Road pricing strategies also involve reliable estimation of the revenue potential for a facility, which adds an additional layer of complexity to the forecasting exercise. Typically, for projects involving private investment or bonding, a separate "investment-grade" forecasting study is carried out, which serves a different purpose from the NEPA study. While the NEPA travel forecasts are intended to form the basis for an informed Federal decision about the project, the "investment-grade" study provides assurances to investors that traffic levels will be sufficient to support the toll revenues anticipated for the project. The "investment-grade" study may involve different methodologies and produce different results from the

NEPA study. If the results of the "investment-grade" study are released during the NEPA process, it is suggested that the study team explain differences between the two sets of forecasts in the NEPA documentation.[17]

2.2.4.3 Evaluating Transit Strategies

Transit provides important mobility benefits in congested corridors throughout the country and it is often necessary in a major NEPA study with highway alternatives to consider the potential benefits of upgrading transit services. While most models have the ability to represent transit to some degree, the models may not be a reliable predictor of travel by new transit modes, depending on the extent of the use of this aspect of the model. The introduction of a new transit mode in a corridor or a region is complicated to model and calls for careful consideration. The use of models that have been recently vetted and refined through the FTA's New Starts project evaluation process[18] are most likely able to evaluate major transit alternatives. In situations where there is no transit modeling component, or one exists but has not been carefully reviewed, it is suggested that care be given to ensure that the transit model is working reasonably well, that transit model parameters are reasonable, and that transit markets and forecasts are validated.

2.2.4.4 Evaluating Integrated Land Use and Transportation Scenarios

From a travel demand forecasting perspective, the type of land use development can influence travel behavior and choices. A paper written by Cervero and Kockelman[19] provides the basic premise and foundation for subsequently developed sketch planning elasticity-based modeling methodologies. The "3D's" were eventually expanded to 4, and include land-use density, land-use design, destinations (i.e., the appeal of the places), and diversity in the attractions.

Incorporation of a 4D component into travel demand forecasting models is a very complex undertaking that, to be done correctly, requires extensive data collection to first observe how these components affect travel behavior, and then model the effects of urban design elements on each aspect of the travel model. Due to the high degree of complexity and high cost associated with such an endeavor, efforts to capture these effects have often utilized off-model adjustments based on elasticities, whereby auto trips are removed to represent reductions in travel associated with specific land development characteristics. An additional and important layer of complexity is that models tend to capture some of these phenomena in some direct and indirect ways. Therefore, it is important for the study team to be very careful if they decide to apply additional off-model effects, and to document the need for the adjustments in addition to any effects captured by the model.

2.2.5 Advancing Technologies and Methods

With research efforts continually developing new and improving existing technologies and methods, the state of the practice in land use and travel forecasting will never be static. Two particular methods that are becoming commonly used are integrated land use and transportation models and activity-based models, which are discussed below.

The use of integrated land use and transportation models is becoming more widespread, with implemented models in use in a number of metropolitan areas. Integrated models are designed to allow the

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[17] For more information on modeling and forecasting considerations for pricing and tolling alternatives, see *AASHTO Practitioner Handbook #3: Managing the NEPA Process for Toll Lanes and Toll Roads* at: http://environment.transportation.org/pdf/programs/PG03.pdf.

[18] *Federal Transit Administration Guidance on New Starts/Small Starts Policies and Procedures*, FTA June 2007, available at: http://www.fta.dot.gov

[19] R. Cervero and K. Kockelmann. *Travel Demand and the 3 Ds: Density, Diversity, and Design*. Transportation Research D, 2, 3: 199-219, 1997

two-directional interactions between land use development and transportation demand to be represented: for example, land use development increases demand for personal travel, while construction of new transportation infrastructure can affect land development patterns. The use of these models, while conceptually attractive, may add to the complexity of the analysis carried out by the study team.

Despite a long history of forecasting practice using traditional models, these tools have limitations, as described in TRB Special Report 288[20] and other publications. These limitations range from the theoretical (that aggregate four-step models do not reflect travel as a "derived" demand resulting from the needs of households and individuals to participate in activities) to the practical (that these models are fairly insensitive and lack detail needed to test some policies). In the past decade, more advanced "activity-based" forecasting approaches have been developed and implemented in a number of large- and medium-sized regions. These models offer expanded analysis capabilities, more behavioral, temporal, and spatial resolution, and better integration with long-term land use forecasting models and traffic micro-simulation models. However, there are many concerns with these models that are common with traditional four-step models: they are sequential systems, and they are subject to the same concerns regarding the quality of model input data and the robustness of the model calibration and validation. In addition, calibration and validation of an activity-based model system necessarily involves greater effort than one associated with a four-step model because of the more comprehensive treatment of all aspects of travel.

It is suggested that the study team consider the potential benefits but also the practical difficulties associated with these advanced techniques during their evaluation of the suitability of modeling methods and tools available to them. As with any tool used during analysis, if the study team chooses to use one of the advanced techniques discussed above, it is important to demonstrate its suitability. In many cases, the study team will not have an advanced model available to them or they will be faced with an analysis for which an advanced technique is not necessary.

2.2.6 Consideration of Peer Review

There are substantive and procedural benefits from leveraging outside expert opinion. Lead agencies can use peer reviews to help ensure that the forecasting processes being applied meet the standards of professional practice and/or Federal, State, or local requirements. In addition, peer reviews of models inherently require an appropriate level of detailed technical documentation, and can have value for this reason alone. Finally, because forecasting can be a difficult and complicated process, an outside and objective perspective may be helpful.

There are several options for peer review of the forecasting work, including internal and external review approaches:

- **Independent review of the travel forecasting methods and preliminary output by outside experts.** A rigorous review would consist of a review of the model files and output, whereas a less rigorous review would cover the documentation only.
- **Interagency panel of MPO, transit, transportation, and land use planning agencies.** This review would be conducted by the stakeholder agencies in the study area to ensure the use of the best available forecasts and data. Effectively, this panel would form a technical advisory group for the project.
- **Review of the forecasting effort by the agency responsible for maintaining the model.** This can help ensure that the model was applied correctly, facilitate consistency across studies, and leverage the appropriate government resources and expertise.
- **Internal, semi-independent review by senior staff from the study team.** Such an effort would be analogous to the formal review required of engineers who produce designs.

[20] *TRB Special Report 288, Metropolitan Travel Forecasting: Current Practice and Future Direction*, TRB, October 2007, available at: http://onlinepubs.trb.org/onlinepubs/sr/sr288.pdf

The need for and appropriate level of review depends on the circumstances of each study. It is critical to engage in a peer review at a stage in the study where the findings of the review can still be taken into account when conducting the analysis. More complicated analyses, or situations where new methods have to be implemented, will obviously require more time.[21]

2.2.7 Documentation of Suitability of Modeling Methods, Tools, and Underlying Data

This section of the guidance discusses the importance of ensuring the suitability of modeling methods, tools, and underlying data. It is important for the study team to produce documentation that describes their review of the tools that they choose to use to support their analysis, and to document any updates or improvements that they identified as necessary for the analysis.

It is also important for the study team to focus this documentation on the needs and scale of the analysis that they are undertaking. The MPO or DOT that maintains the regional travel demand model is likely to publish a calibration report that can be referenced to demonstrate that the model is calibrated at a regional level; however, this report is unlikely to deal specifically with calibration for the study area for a particular project. Therefore, it falls to the study team to demonstrate that the travel demand model is adequately calibrated in their study area.

Other elements to consider for inclusion in the documentation are:

- Demonstration that the tools have the capability to forecast the range of policies that will be developed in the alternatives analysis
- Discussion of the appropriateness of using new or advanced methods that might be considered a departure from typical practice, given the context of the application
- Results of any peer reviews or an explanation detailing why no peer review was required.

As with forecasting needs, the key purpose of this documentation is to demonstrate that these issues have been considered by the study team. Again, the documentation can demonstrate the process used to make decisions relating to model suitability and record who was involved in the decision-making process.

The Council on Environmental Quality (CEQ) regulations for implementing the provisions of NEPA require that the lead agencies insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements,[22] and this and other elements of documentation discussed in this guidance can help the lead agencies to demonstrate that they are meeting this requirement.

2.3 Scoping and Collaboration on Methodologies

Scoping is a collaborative process involving the lead agencies, resource and regulatory agencies, and the public. Typically, this is how a NEPA study begins, and is intended to initiate activities in the most efficient and effective direction. Early consideration is given to determining what factors and resources will be issues of concern during the NEPA process and therefore have an impact on the decision being made, and conversely, what factors and resources are not likely to impact decision making.

[21] For more information on forecasting peer reviews, see the Travel Model Improvement Program Peer Review Program at: http://tmip.fhwa.dot.gov/resources/peer_review

[22] See 40 CFR § 1502.24

2.3.1 Reaching Consensus on Forecasting Methodologies

SAFETEA-LU Section 6002 provided additional direction regarding the scoping process for environmental impact statements (EISs) by specifying that lead agencies collaborate with participating agencies on the methodologies to be applied and the level of detail required in the NEPA study.[23] Participating agencies are those Federal and non-Federal agencies that have an interest in the project. These agencies may also be cooperating agencies, meaning that they have special expertise or legal authority such as a permit approval. Such collaboration can be advantageous when conducting categorical exclusions or environmental assessments as well, although it is not required. The goal of the scoping process is to provide an opportunity for agencies and the public to raise critical issues and concerns early in the NEPA study so that these can be adequately considered as the NEPA study moves forward.

For this reason it is important to reach early agreements on the methodologies and conduct of the many technical studies that will support the overall NEPA analysis. The focus of this guidance is travel and land use forecasting, but the forecasts are relied upon as inputs for other technical studies, such as air quality, noise, and land development effects. Therefore, to ensure that the effects of potential alternatives are reasonably estimated, it is important for the travel forecast to provide an adequate representation of the travel patterns and volumes to be expected with each of the alternatives. Because future land use forms the basis for demand in the travel forecasting process, it is suggested that agreements be reached first on future land use scenarios for the alternatives and the methodologies to be used to develop those estimates.

The primary reason for reaching agreement early during the scoping process is to minimize the cost and schedule risk associated with "backing up" or re-doing work during the study. It is not uncommon during the NEPA process, particularly during alternatives analysis and evaluation, for the public and agencies to question the work done prior to that stage. Because not everyone will be 100% satisfied with the alternatives under consideration, it is natural for this questioning to take place. Having documentation on the agreements reached and the assumptions used for the land use and travel forecasts will facilitate the process to move forward with minimal delay and disruption. It is important to explain why the agreements were reached and how the team arrived at the assumptions used for land use and travel forecasting. In the absence of these agreements, the likelihood that the process may cycle back to this stage increases and could result in additional delay to the study and increased costs. Several agencies have developed procedures, such as templates, to assist with reaching consensus during scoping and documenting the agreed upon analysis approach.[24]

It is important for NEPA study teams to recognize that effective use of the scoping process is integral to a successful forecasting effort, since the scoping process sets the tone for participation throughout the study and can identify key issues germane to the forecasting exercise. The definition of a successful forecasting effort would be one where there is broad acceptance of the outputs from that effort. As described above, getting to that consensus requires early agreement on the inputs to the forecasting process and methods used. In addition to land use, it is important that the agreements cover all aspects of the forecast effort, such as whether the model accounts for modal splits, tolling, "induced" travel, and other items that relate to the range of alternatives being considered. All of these considerations are discussed elsewhere in this guidance.

Agencies would be well served to adopt written procedures for scoping all studies, regardless of the type of NEPA analysis. Simply stated, scoping sets the framework for everything that follows. It is suggested that the level of effort devoted to the scoping process be tailored to the context of the proposed project and/or the range of alternatives. Typically, the level of scoping effort associated with the replacement of a deficient bridge on an existing site would be different from the level of effort for a potential freeway in a

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[23] See 23 USC § 139 (f)(4)(C), and Question 38 in FHWA and FTA "SAFETEA-LU Environmental Review Process Guidance," at: http://www.fhwa.dot.gov/hep/section6002/index.htm

[24] See, for example, North Central Texas Council of Governments pre-analysis consensus plan template, available online at: http://www.texastwg.org/files/pre-analysis_consensus_template.pdf

new location, or a new commuter rail line. In addition, the roles of forecasts are different under each of those scenarios and would also require a commensurate level of effort in terms of reaching early agreements on how they will be determined.

2.3.2 Documentation of Scoping and Interaction with Other Agencies

As discussed above, it is critical for the study team to document their work on scoping of the analysis and their interaction with other agencies, recording the broad agreements reached and the assumptions used for the land use and travel forecasts. This documentation can then be used throughout the study as a reference during analysis and later to demonstrate what decisions were made and the process by which decisions were made, and to identify who was involved in making those decisions.

2.4 Forecasting in Alternatives Analysis

The CEQ regulations require lead agencies to "rigorously explore and objectively evaluate all reasonable alternatives."[25] This provision establishes a standard for NEPA studies to treat each alternative in an unbiased manner so that the related benefits and impacts can be estimated and compared across alternatives. For EISs, the regulations go on to say that the study "shall provide full and fair discussion of significant environmental impacts and shall inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment."[26] In addition, the regulations say that the alternatives analysis is "the heart of an environmental impact statement."[27] From a land use and travel forecasting perspective, these provisions have direct relevance in how forecasting methods are applied for the purposes of analyzing alternatives.

2.4.1 Overview of Transportation-related Effects and Impacts

The CEQ regulations define the effects and impacts that Federal agencies are to address and consider in satisfying the requirements of the NEPA process. These effects include direct effects, indirect effects, and cumulative impacts:

- **Direct effects** are caused by the action and occur at the same time and place (40 CFR § 1508.8).
- **Indirect effects** are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).
- **Cumulative impact** is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7).

The terms "effect" and "impact" are used synonymously in the CEQ regulations (40 CFR § 1508.8). "Secondary impact" does not appear, nor is it defined in the CEQ regulations or related CEQ guidance, but the FHWA has used the terms "secondary impact" and "indirect effect" interchangeably.[28]

[25] See 40 CFR § 1502.14

[26] See 40 CFR § 1502.1

[27] See 40 CFR § 1502.14

[28] *FHWA's Interim Guidance on Indirect and Cumulative Impacts*, January 2003, available online at: http://www.environment.fhwa.dot.gov/guidebook/qaimpact.asp

There are several available resources that discuss the distinctions between these types of effects and provide guidance on considering and measuring them.[28], [29] From a travel forecasting standpoint, there are numerous transportation-related impacts that are measurable and may be meaningful in an alternatives analysis. Following are examples of impacts that illustrate the type of information that comes from a travel forecast, or is closely related to travel forecasting output, organized into direct effects, indirect effects, and cumulative impacts.

2.4.1.1 Direct Effects

Transportation-related direct effects are generally well understood. Table 2 presents a brief list of typical direct effects that have their basis in travel and/or land use forecasting, including how each one is usually sourced:

Table 2: Typical Direct Effects Estimated using Outputs from Forecasts

Effect	Effect Type	Effect Source
Congestion /Delay	Peak hour/period level of service	Direct output of traffic assignment and/or post processed output to produce intersection turning movement volumes (see section 2.4.5)
Congestion /Delay	Hours of congestion	Direct output of traffic assignment and/or post processed output to produce intersection turning movement volumes (see section 2.4.5)
Congestion /Delay	Intersection level of service	Direct output of traffic assignment and/or post processed output to produce intersection turning movement volumes (see section 2.4.5)
Congestion /Delay	Point-to-point travel times	Direct output of traffic assignment and/or post processed output to produce intersection turning movement volumes (see section 2.4.5)
Travel Choices	Mode shares	Direct output of mode choice model
Travel Choices	Transit boardings and loadings	Direct output of transit assignment
Revenue	Toll revenue, transit revenue	Revenue forecasts based on traffic and transit assignment results
Environmental/Social	Noise	See section 2.6.1
Environmental/Social	Air quality	See section 2.6.2
Environmental/Social	Traffic diversion	Direct output of traffic assignment
Environmental/Social	Travel benefits for different socio-economic groups	Post processed travel model outputs by socioeconomic groups
Environmental/Social	Accident rates	Post processed traffic assignment by functional class, and changes in non-motorized trips and shares from trip generation and mode choice models

2.4.1.2 Indirect Effects

Potential changes in land development patterns due to a transportation investment are typically examined as part of an indirect effects assessment, particularly on major projects.[30] These effects are not easy to forecast. The study team may undertake a land development impact assessment through the use of integrated land use and transportation models, the application of gravity or other more simplified models, or simply an analysis of regional and local trends. In some studies the team may also choose more qualitative methods such as surveys, interviews with developers, discussions with local planners, or the Delphi or expert panel process. These are considered further later in this document.

The FHWA's *Interim Guidance on Indirect and Cumulative Impacts* explains that a proposal for a new alignment project in an area where no transportation facility currently exists, or one that adds new ac-

[29] *Draft Baseline Report*, Executive Order 13274: Indirect and Cumulative Impacts Working Group, March 15, 2005

[30] CEQ regulations specifically mention "growth inducing effects" as potential indirect effects. See 40 CFR § 1508.8(b)

cess to an existing facility may indicate an increased potential for project-related indirect impacts from other distinct but connected actions, such as the opening of access to land with a new highway leading to new development.[31] Likewise, the purpose and need of a proposed project that includes a development or economic element might establish an indirect relationship to potential land use change or other action with subsequent environmental impacts.[32] It is important for the lead agencies to identify potential indirect impacts of the transportation proposal early in the NEPA project development process.

Land development effects and potential redistribution of growth within a region may be analyzed more robustly at the regional level and during the regional planning process. Increasingly, MPOs, DOTs, and other agencies are using integrated land use and transportation forecasting procedures in the planning process to better understand the interrelationship between growth and the transportation system. It is therefore possible that the study team can glean insights at the project level from a regional planning analysis. One advantage of a regional analysis is that the study team can consider the region-wide growth pressure dynamics.[33]

Table 3 presents a brief list of typical indirect effects that may be considered in a NEPA study that are based on or use forecasting outputs:

Table 3: Typical Indirect Effects That are Based on or use Forecasts

Effect	Effect Type	Effect Source
Land Use	Residential development	Based on land development impact assessment
	Commercial development	
Revenue/Economic Growth	Increased tax revenue	Based on fiscal impact assessment of land development forecasts
	Regional economic growth	
Environmental/Social	Noise	See section 2.6.1
	Air quality	See section 2.6.2
	Visual impact of development	Based on land development impact assessment
	Floodplain and wetland encroachment	
	Fragmentation of habitat	

2.4.1.3 Cumulative Impacts

The FHWA's *Interim Guidance on Indirect and Cumulative Impacts* states that cumulative impact analysis is resource-specific and generally performed for the environmental resources directly impacted by a Federal action under study, such as a transportation project. However, not all of the resources directly impacted by a project will require a cumulative impact analysis. The resources subject to a cumulative impact assessment should be determined on a case-by-case basis early in the NEPA process, generally as part of early coordination or scoping.[34]

Two types of direct impacts, both measured and part of travel model output, have potentially important cumulative effects: air emissions and noise. The study team will typically evaluate the cumulative effects

[31] This in an example of a "but for" action: induced actions that would not or could not occur except for the implementation of a project

[32] See case law summary Section 4.1.3.3, discussion of *City of Davis v. Coleman*, 521 F.2d 661, 675-677 (9th Cir. 1975)

[33] See Section 2.1.5 "Incorporating Analyses Done in Transportation Planning Studies" for more information

[34] See discussion in *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*, Council on Environmental Quality, June 2005, available online at: http://www.nepa.gov/nepa/regs/Guidance_on_CE.pdf

on air quality during the regional air quality conformity modeling process. The study team can measure the cumulative noise impacts through a noise model and an understanding of existing noise levels.

If a project is expected to induce land development, such development could potentially cause additional cumulative impacts such as (but not limited to) impacts to farmland or open space, animal habitat, wetlands, water supply and quality, and air quality. In other words, to the extent the transportation system induces land development that development may cause further impacts to the environment and public health.[35]

Table 4 presents a brief list of typical cumulative impacts that may be considered in a NEPA study:

Table 4: Typical Cumulative Impacts That are Based on or use Forecasts

Effect	Effect Type	Effect Source
Land Use	Reduction in open space, farmland, animal habitat, wetlands	Based on land development impact assessment
	Impacts on water supply and quality	
Environmental/Social	Noise	See section 2.6.1
	Air quality	See section 2.6.2

2.4.2 Objective Application of Forecasting Data and Methods

The requirement for the alternatives analysis to be an objective evaluation makes it essential for the study team to apply forecasting data and methods objectively without any bias towards a particular alternative. It is important for the forecasting data and methods applied in the alternatives analysis to be consistent and create a level playing-field where alternatives can be fairly and reasonably compared. In other words, if the lead agencies structure the analysis to be predisposed to favoring the preferred alternative, then they are not meeting NEPA requirements, thus falling short of FHWA program requirements and creating litigation risk.[36]

To ensure that the objective evaluation requirement is met, it is essential for the study team to maintain consistency in assumptions across the alternatives being considered, and to clearly understand the impact that differences in model parameters cause. Apparently small inconsistencies in assumptions or model parameters can affect particular alternatives disproportionately. For example, assuming a slightly lower maximum walk access distance to a bus stop compared to a light rail stop can lead to large differences in the forecast for a bus rapid transit alternative compared to a light rail alternative; in this case the land area accessible to each stop is related to the square of the maximum walk access distance, so small differences are magnified. There are certainly cases where the study team will be justified in varying assumptions between alternatives; in that case, it is important for the study to be as transparent as possible in documenting and justifying those variations.

It is important for the study team to explicitly define and document the no-build condition. The no-build scenario contains a highway and most likely a transit network, as well as a no-build land use forecast. Defining the no-build networks in the intermediate and final horizon year requires assumptions about which projects in both the transportation improvement program (TIP) and long-range transportation plan are to be included. This requires some dialogue among local stakeholders to determine which projects have already been approved and funded, which projects are likely to be approved, and which projects are unlikely and therefore do not need to be included in the no-build scenario. The study team needs to pay special attention to projects closely associated with the subject study alternatives (i.e., capacity enhancements upstream or downstream from the study area, or on parallel facilities). It is important for

[35] *Draft Baseline Report*, Executive Order 13274: Indirect and Cumulative Impacts Working Group, March 15, 2005

[36] See case law summary Section 4.1.3.2, discussion of *Jones v. Peters,* 2007 WL 2783387, 10-11 and 23 (D. Utah, September 21, 2007)

the study team to ensure that alternatives to be analyzed are not included in the future no-build networks.

The typical practice in forecasting for NEPA studies is to use the adopted land use forecasts, which are usually developed by the State, MPO, and/or other regional planning agency, as a basis for estimating travel demand. As a matter of good practice, it is important that the study team understand the assumptions and inputs for a travel forecasting exercise, and this applies to land use as well. Occasionally, during an alternatives analysis, the study team and/or planning officials will adjust the land use forecasts within a corridor based on a more thorough and focused review. This corridor-specific review would typically include comparisons to current land use patterns and consideration of land-use policies, land availability, and anticipated development plans.

In addition, the study team will typically use one land use forecast in the no-build scenario and the other alternatives. However, in studies where land development patterns (both new and redistribution effects) are likely to be substantially different among alternatives, it is critical to understand whether the land use forecasts provided for use in the study represent a no-build or a build condition in the corridor. The answer to this question may not be immediately obvious, and the difference will not be relevant in many studies. However, particularly in cases where a new transportation facility is being proposed, it is important that the study team consider whether the development patterns adjacent to and reliant on the proposed facility will be the same if an alternative is built or not built. This situation is discussed further below in section 2.4.6.

2.4.3 Refinement of the Analysis during Screening

The alternatives screening process varies from one study to the next but, generally speaking, analysts follow a multi-step screening process. The Administrative Procedure Act requires that decisions made by Federal agencies are rational and clearly explained, with consideration given to all reasonable options.[37]

The tiered screening process often includes the following sequential decision points as the list of alternatives is vetted during project development:

1. **Initial screening based on purpose and need.** Does the alternative meet the study purpose and need? Are there fatal safety, engineering, mobility, or environmental flaws? Answers to these questions can sometimes be made with qualitative analysis. It is important to document *all* the reasons for screening out an alternative.
2. **Long list screening based on an initial impact assessment.** In a large or complicated study, it is not uncommon for a long list of alternatives to make it through the first screen. A second screen is then used that is based on preliminary analyses of impacts and performance at a level of detail that allows a reasonable decision to be made on the merits of the alternatives.
3. **Short list screening and detailed alternatives analysis during environmental review.** The short list of alternatives is the list that is carried forward to the environmental review. In this stage the analysis is typically the most detailed and time-consuming.[38]

The forecasting process typically mirrors the screening process in terms of the level of detail in the analysis. It is important for the study team to fully document the screening process and accompanying forecasting work. For example, it is important for the documentation to include an explanation of the screening performance measures and the process used to develop and select those measures (with reference to the purpose and need of the project), and to describe how each round of forecasting and screening was done and why key decisions were made.

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[37] See case law summary Section 4.1.2, discussion of *Senville v. Peters*, 327 F. Supp. 2d 335, 344-345 and 369 (D. Vt. 2004)

[38] Note that SAFETEA-LU Section 6002 added the flexibility of analyzing the preferred alternatives to a higher level of detail, see 23 USC 139 (f) (4) (D)

If the forecasting methods change during this process, it is suggested that the study team evaluate in a reasonable manner the continuing validity of the prior decisions, to the extent that travel modeling was a basis for the screening out of alternatives.[39] This evaluation can include the use of sensitivity tests to assess the differences in the modeling results, assuming that the results of the tests pertain to a group of alternatives, or in more extreme cases by redoing the prior modeling work and subsequent analysis of the results.

2.4.4 Development of Forecast Confidence

For estimates of forecasts, substantial uncertainties include, but are not limited to, the following: population and employment forecasts, housing trends and costs, global and local economic conditions, other planned transportation improvements, time-of-day assumptions, parking prices, fuel prices, and long-term changes in vehicle technology. Obviously, the further the forecasting horizon is from the current year and the larger and more complex the alternatives that are being analyzed, the greater the level of uncertainty may be. To separate the various sources of uncertainty, it is suggested that the lead agencies identify the principal drivers of changes in traffic volumes through an incremental buildup of the forecasts for an alternative.

This forecasting buildup starts with a forecast using current conditions, such as land use and travel patterns, and then prepares a series of intermediate forecasts—in each case, replacing one of the inputs that describe current conditions with the analogous description of future conditions. The buildup concludes with a forecast that uses all of the forecast year conditions—effectively reproducing the traditional forecast for the alternative. The level of effort for this analysis is modest because it involves the straightforward reapplication of travel models with input files that are already available.

Identification of the key drivers of uncertainty in forecasts for an alternative can lead to very productive discussions early in the project development process, which is the right time to consider the reasonableness of future demand projections, while there is opportunity to reevaluate the approach used to analyze an alternative. As with other assumptions made and model tests carried out during the analysis, it is important for the study team to document their work to understand forecast confidence. The findings of these analyses form a key element of the demonstration that the approach used to analyze an alternative is appropriate. The documentation of these analyses is also essential so that the lead agencies can clearly communicate a level of confidence in the forecasts and point out areas where uncertainty in assumptions may lead to uncertainty in forecasts.

2.4.5 Moving from Regional Model Output to a Project Level Forecast

In the case of a regional travel model, it may not be advisable to directly use the raw forecasted volumes from a planning model and apply them in the context of a NEPA study. In most cases, the study team will need to conduct additional post processing or refinement of the travel model output before the forecasted volumes can be used in NEPA analysis. In practice, two approaches tend to be most commonly used for adjusting forecasts from regional planning models.[40] The first is a post-processing technique that aims simply to adjust the regional planning model forecasts of roadway volumes. The second is a sub-area analysis, which may involve the use of a microsimulation model to estimate traffic volumes on a detailed road network in a corridor.

When adjusting traffic volumes produced with a regional model, the modeler develops adjustment factors using base year volumes and observed traffic counts and applies those adjustment factors to the fu-

[39] See case law summary Section 4.1.4.1, discussion of *Conservation Law Found. v. Fed. Highway Admin.*, 2007 WL 2492737, at *24 (D.N.H. August 30, 2007)

[40] One other approach worth noting is *matrix estimation*, which is less common in practice, but can be used successfully with a high degree of attention to detail. See, for example, *Improving the Estimation of Travel Demand for Traffic Simulation: Part 1*, available online at: http://tmip.fhwa.dot.gov/resources/clearinghouse/407

ture traffic volumes estimated from a model. NCHRP Report 255[41] describes methodologies for performing this post processing and remains the standard for adjusting planning models forecasts to this day.

The methods and principles outlined in NCHRP Report 255 advise the modeler to use the regional planning model to estimate future changes in traffic levels across screenlines, which are then added to or used to factor up base-year screen line counts. The modeler would then allocate traffic to specific links, with consideration given to relative capacities on the links and/or base-year traffic distributions, depending on the specifics of the analysis. This adjustment of forecasts from planning models requires an additional level of effort and attention to detail due to the number of calculations involved, but can improve the consistency and quality of the project development forecasts. However, this approach assumes that the differences between base-year traffic counts and assigned volumes across a screenline will remain relatively constant in the forecast year.

For an intersection analysis, the modeler would use the methodologies mentioned above to obtain traffic volumes in and out of the intersection. An iterative procedure can be used to convert the adjusted future-year traffic volumes to future-year intersection turning movement volumes, using the base-year turning movement patterns as a starting point. The iterative process involves alternately balancing the future inbound and outbound traffic volumes until a certain level of consistency is reached. As always, professional judgment is necessary to determine the reasonableness of the future-year turning movement volumes, particularly considering the purpose of the forecast.

While developing future-year forecasts, the study team may determine that the regional travel model lacks enough detail for the level of analysis required. In such a case, a sub-area model and analysis may be needed. This would involve the use of a model based on Highway Capacity Manual (HCM) methods or a microsimulation model. A sub-area analysis may also be warranted if the validation of the regional model is poor in the sub-area or if the regional model is too coarse in the sub-area. The best time to develop a sub-area model is at the beginning of the project development process while the regional model is being reviewed and calibrated, when it is simpler to create additional detail in the regional model (e.g., TAZ splits and new roadway links) that will be useful in a refined sub-area model.

Refined travel forecasting models, such as HCM or microsimulation models, require substantially more attention to detail than a regional travel demand model but can produce a more useful and informative forecast. As with sub-area models, it is best if the decision to utilize microsimulation methods is discussed early in the study process at scoping. It is recommended that the study team consider the evolving nature of microsimulation techniques and use the most appropriate tools available to them during the NEPA analysis.[42]

2.4.6 Addressing Land Development or Redistribution Effects

Land development and/or redistribution that is an indirect effect of specific transportation alternatives is often difficult to forecast. This is particularly true regarding changes in a transportation investment due to the complex, dynamic nature of the urban development process. More specifically, local conditions, changing policies, the incremental long-term nature of land use change, and the flexibility of travelers' responses all affect our ability to forecast transportation project outcomes. Despite these difficulties, transportation/land use impacts often need to be evaluated within the planning/NEPA process. Figure 2 presents a model of factors influencing development location decisions.[43]

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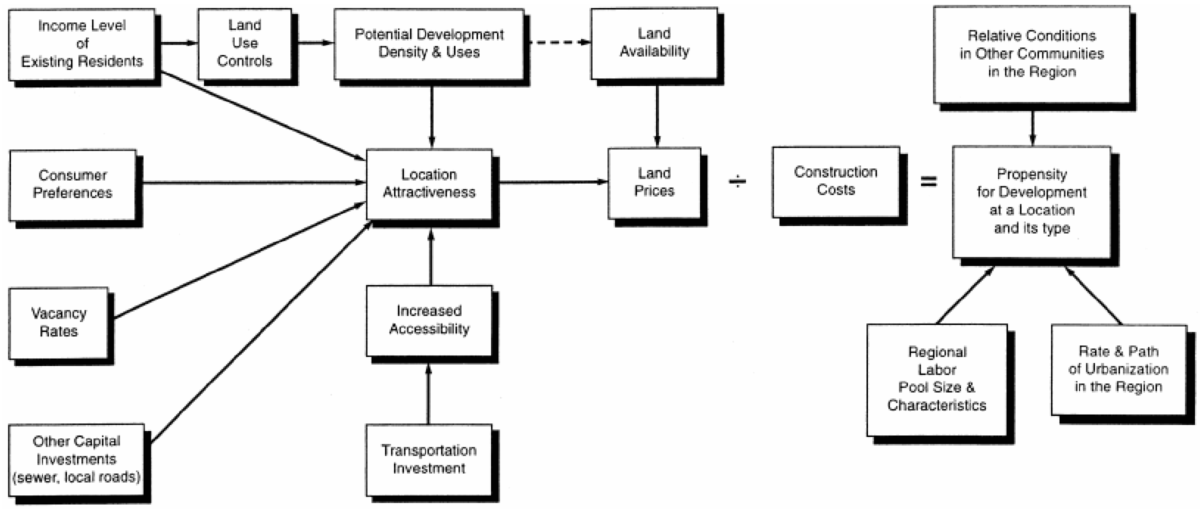
[41] *NCHRP Report 255: Highway Traffic Data for Urbanized Area Project Planning and Design,* TRB 1982

[42] *Volume II: Decision Support Methodology for Selecting Traffic Analysis Tools in the FHWA Traffic Analysis Toolbox* (June 2004) provides a detailed decision support methodology for selecting the appropriate type of analysis tool for the problem facing the study team. *Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software in the FHWA Traffic Analysis Toolbox* (July 2004) provides procedures for performing simulation modeling, including detailed information regarding the preparation of simulation models and their calibration and use in analyzing alternatives.

[43] Figure 7-6 from *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects*, TRB 2002

Figure 2: Simplified model of various factors influencing development location decisions



2.4.6.1 Options for Addressing Land Use Issues in NEPA Studies

Table 5 outlines some potential steps for conducting both base-case land use forecasts and analyses of the land use impacts from a build alternative.

Table 5: Comparison of Steps in Base-Case Forecasts and Impact Assessments

Base-Case Forecast	Impact or Policy Assessment
1. Understand existing conditions and trends	**1. Understand existing conditions and trends**
2. Establish policy assumptions	**2. Establish policy assumptions**
	3. Measure the transportation outcomes with and without project
3. Estimate regional population and employment growth	**4. Estimate total study area population and employment growth with and without project**
4. Inventory land with development potential	**5. Inventory land with development potential**
5. Assign population and employment to specific locations	**6. Estimate how the project will change the location and type of development within the study area from what would occur anyway**

Both types of analysis require understanding existing transportation and land development patterns, making assumptions about the policy framework that will guide the process, estimating the amount of growth expected during the planning period in the study area, inventorying land that might be developed and any physical and regulatory constraints on that development, and assigning the expected growth in households and jobs to specific locations.

The key difference between the processes is that, to measure transportation outcomes with and without the project, an impact assessment uses estimates of the ways that accessibility and travel behavior will change because of the transportation investment. In addition, an impact assessment requires a comparison not only with existing conditions, but also with the quantity, type, and location of future growth that would occur without the project.

There is a wide range of specific techniques to assess the indirect land use impacts of transportation alternatives. Formal land use models require the most data and time, and they generally suit analyses at a larger geographic scale and better represent the complex interactions between transportation access and land development patterns. Qualitative methods suit smaller sites and projects, though they may also be applied to larger areas. As discussed in section 2.3, close collaboration on methodologies is critical to the success of a NEPA study and, whatever the decisions taken to select a methodology, it is important that the decision-making process is well documented.

Reference documents on this topic include the following:

- *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*[44]
- NCHRP Project 25-25, Task 22, *Forecasting Indirect Land Use Effects of Transportation Projects*[45]
- NCHRP Report 423a: *Land Use Impacts of Transportation: A Guidebook.*[46]
- NCHRP Report 466: *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects*[47]

2.4.6.2 Addressing Land Development Effects in Alternatives Analysis

It is important for the study team to consider and address, when applicable, induced land development that may vary by build alternative, or simply between build and no-build. For transportation investments that are regionally important in scale, such as new or substantially improved highway facilities, it is more likely that the future land use patterns will be different if the alternative is built. If this situation exists, it is important for the study team to look at whether the differences would be simply between the build alternative(s) and the no-build, or if there would be a difference between the no-build alternatives and <u>each</u> of the build alternatives. The latter case is more likely when alternative alignments being considered are far enough apart or have such different characteristics that there would likely be a discernable difference between the land development impacts of each alternative. In many cases, however, it is reasonable to find induced land development to <u>not</u> be an important issue in a corridor, and therefore to use the same land use forecast for all alternatives. Figure 3 presents a framework for analysis of projects that warrant alternative land use forecasts for each alternative.

Likewise, the purpose and need of a proposed project that includes a development or economic element might establish an indirect relationship to potential land use change or other action with subsequent environmental impacts. It is important for the study team to establish the potential relationship of alternatives to indirect land development impacts in the scoping phase of the NEPA process on a project-by-project basis.[48]

The study team has at its disposal at least a few ways to assess the potential for induced development, including talking with land-owners in the corridor and local officials. If land is currently vacant or underutilized in the corridor, it is suggested that the study team consider whether there are development plans or land use policies related to these parcels that assume the construction of the transportation facility. This is particularly likely if a right-of-way has been preserved and/or a specific alternative is envisioned on municipal master plans. It is not uncommon for new transportation projects to be anticipated by land use planners and developers in advance of the project development process.

During NEPA studies where an analysis of land development effects is warranted, the analyses of the impacts of land development are often considered as part of a discrete indirect effects analysis. This ap-

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[44] *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*, prepared for AASHTO by ICF Consulting, March 2005

[45] *Forecasting Indirect Land Use Effects of Transportation Projects*, NCHRP 25-25 Task 22, December 2007

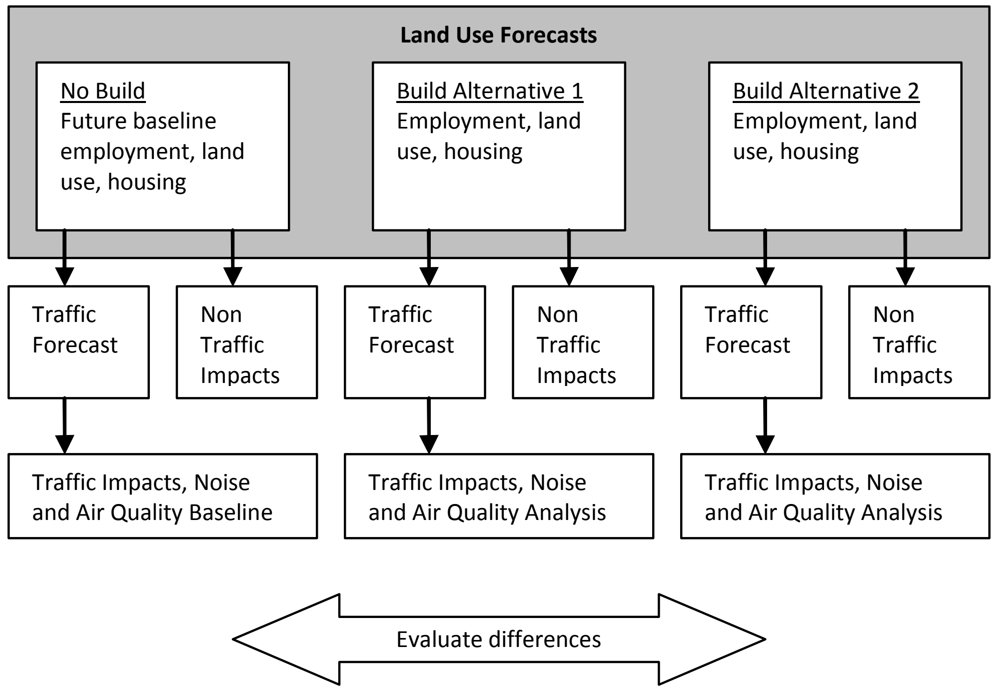
[46] *NCHRP Report 423a: Land Use Impacts of Transportation: A Guidebook*, TRB 1999

[47] *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects,* TRB 2002

[48] See case law summary Section 4.1.3.1*,* discussion of *North Carolina Alliance for Transp. Reform v. U.S. Dept. of Transp.*, 151 F. Supp. 2d 661, 686-88 (N.D. N. C. 2001)

proach differentiates the direct versus indirect effects and analyzes the resulting indirect impacts of induced development on traffic, air quality, noise, water quality, etc., as appropriate.

Figure 3: Framework for analysis of projects that warrant using alternative land use forecasts



Another option for incorporating the land development effects as part of alternatives analysis is to include the land development effects of the build alternative(s) as part of the forecasting effort that supports the direct effects analysis. In effect, this approach embeds the indirect effects of land development in the direct effects analysis. One of the likely benefits to this approach would be the streamlining of the forecasting effort by eliminating the number of needed model runs.

Finally, before making a decision on how to handle land development effects in the NEPA document, it is important to consider how the scope of NEPA analysis is affected by the degree of Federal influence and control over the project. This issue, which is sometimes referred to as the "Federal handle" on the project, can have particularly important impacts with respect to the analysis approach for land use impacts.

2.4.6.3 Induced Demand and Land Development

One of the most controversial issues with regard to forecasting as part of the NEPA process is that of induced demand. While there are limits and complex factors in reality and every corridor is unique to some degree, it is important for transportation analyses to consider the significance of induced demand. Induced demand is the volume of traffic that is drawn to a new or expanded road by providing additional capacity. This induced demand comes from a number of sources, including trips diverted from other routes, discretionary trips that might not have been made without the service improvement, and improved access to employment and other activity location choices.

Those challenging the results of a NEPA process often cite induced demand in comments on environmental documentation and litigation involving travel models.[49] In economic terms, induced demand is the notion that demand increases as a result of increased supply. In a transportation context, the idea is that

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[49] See case law summary Section 4.1.4.1, discussion of *Senville v. Peters*, 327 F. Supp.2d 335, 368-369 (D. Vt. 2004)

every action to improve travel conditions will lead to more travel demand. Table 6 shows the main components of induced demand according to prior research, and the extent to which typical practice models capture these components.[50]

Table 6: Components of Induced Demand

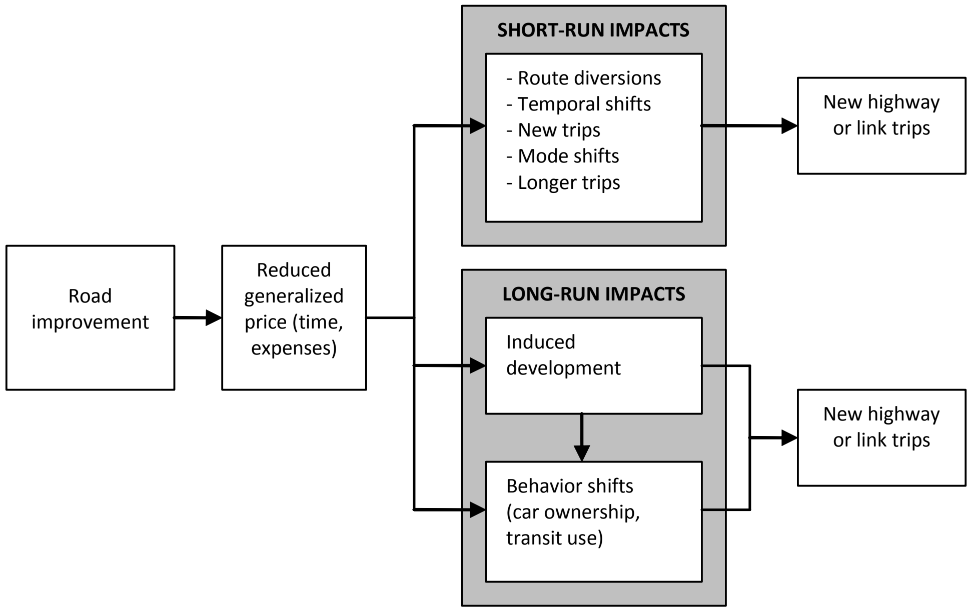
	Induced Demand Components	Effects on Forecasting Analysis	Effectiveness of Model
Short–run Impacts	Change in number of trips	The net addition of trips will affect traffic, noise, and emissions impacts	Poor – Trip generation models are typically based on demographic factors such as household size, income and auto ownership, and are insensitive to changes in travel time or accessibility.
	Change in length of trips	Change in trip length will affect duration of use of facility and emissions	Fair – Trip distribution models use an aggregate measure of impedance based largely on travel times. Feedback of travel impedances from assignment to distribution enables distribution models to be sensitive to congestion effects.
	Change in mode of travel	Change in mode to or from auto will affect noise and emissions	Good – Disaggregate mode choice models estimate mode choice probabilities based on relative attractiveness of alternative modes with respect to travel times, costs, and other factors.
	Change in route	Changes in route will affect traffic volumes on facility and emissions	Good – Equilibrium traffic assignment models reallocate trips to alternative routes based on travel impedances and volume-delay functions.
	Change in time of travel	Changes in time of travel will affect levels of congestion	Poor – Most travel models partition daily trips into fixed time periods with no option for adjustment between periods based on traffic volumes.
Long–run Impacts	Change in development patterns	Net addition of trip-generating land uses will increase traffic volumes, may increase trip lengths	Poor – Most travel models use population and employment forecasts developed outside the model and have little or no feedback between the travel model and land use forecasts.
	Change in behavior (e.g., vehicle ownership)	Changes in behavior have long run-impacts on number of trips, length of trips, mode of travel and hence affect traffic volumes	Poor – Most travel models use static assumptions about future residential locations, vehicle ownership, and mode preferences.

Short-term induced demand results from changes in the number of trips people take, where people travel to, what mode they take, and what route they take. Table 6 shows that typical practice models tend to account reasonably well for some of these short-term induced demand effects but do not generally account for changes in the number of discretionary trips taken and the time of travel. Longer-term induced demand can arise from changes in household location or vehicle ownership, and these longer-term impacts are notably harder to measure and relate to a specific transportation project with a high degree of confidence. Figure 4 illustrates short and long-run sources of induced demand.[51]

[50] Adapted from Table 1: Sensitivity to Environmental Analysis to Induced Demand, and Table 4: Effectiveness of Current Travel Models in Accounting for Components of Induced Demand from *Working Together to Address Induced Demand*, Eno Transportation Foundation, 2002

[51] Adapted from Figure 2 of *Working Together to Address Induced Demand*, Eno Transportation Foundation, 2002

Figure 4: Short-Run and Long-Run Sources of Induced Demand



Typically, the long-term land development effects are more effectively analyzed at the system, metropolitan, or regional level. At this scale of analysis, systematic interrelationships between the transportation system and land development characteristics and dynamics (including other relevant policies and conditions) can be meaningfully evaluated. The results of these planning-level analyses may be incorporated in the NEPA process if appropriate (see section 2.1.5 for a more complete discussion).

Induced land development is development that may occur as a direct or indirect result of improvements to the transportation network. While the issues of "induced demand" and "induced land development" are related, they are in reality separate and are often confused and used interchangeably. Induced land development is one of the sources of induced demand on an improved roadway, but only accounts for a portion of the induced demand components.[52]

A range of approaches are available to address induced demand components not considered as part of an agency's routine forecasting methods, and are discussed in other research.[53] When dealing with induced demand issues within a particular NEPA study, it is important to understand and document the different components of induced demand and which components are adequately dealt with within the forecasting analysis. It is also important to understand and document what elements require additional work and where it is not possible to perform this work given the unavailability of information or exorbitant cost of obtaining the information and performing the analysis.[54] These considerations should be weighed during the early stages of the analysis process and should be discussed during scoping.

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[52] See, for example, *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects,* TRB, 2002, pp 58 – 65

[53] See, for example, *NCHRP Report 423a: Land Use Impacts of Transportation: A Guidebook,* TRB 1999; *Working Together to Address Induced Demand*, Eno Transportation Foundation, 2002; *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects,* TRB, 2002; *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*, prepared for AASHTO by ICF Consulting, March 2005

[54] See 40 CFR § 1502.22 Incomplete or unavailable information. It is important to note that a high bar is placed on demonstrating the inability to obtain information or perform analysis. See case law summary Section 4.1.4.4, discussion of *Sierra Club, Ill. Chapter v. U.S. Dept. of Transp.,* 962 F. Supp. 1037, 1043-1046 (N.D. Ill. 1997)

2.4.6.4 Addressing Variations from "Approved" Forecasts

It is common for the land use forecast used in an EIS to vary from the land use forecast used in the MPO planning process and conformity analysis. If a review of the land use forecast provided by the MPO suggests that refinements are necessary within a corridor, typical practice involves starting with the MPO land use forecast and adjusting land use within a study area while preserving housing and employment control totals within an appropriate aggregate geographic area, such as the study area or a county. An essential element of a land use forecast review is to obtain and understand the assumptions that led to the forecast, such as changes to the transportation network. If refinements to the land use forecasts are made, it is important for the study team to document the changes so that they can be disclosed and explained. It is also suggested that improvements to land use forecasts made during NEPA studies be provided back to the MPO for their use to leverage the work performed during NEPA studies.

2.4.7 Documentation of Forecasting in Alternatives Analysis

There are several aspects of forecasting in the alternatives analysis that are especially important to include in the documentation, in addition to presenting the travel model results and impacts for each alternative. They are highlighted here, and discussed in more detail in the relevant sections above:

- An explicit definition of the no-build condition with regard to land use, network, and modeling assumptions
- In cases where the study team is justified in varying modeling assumptions between alternatives, documentation that explains those variations
- If the forecasting methods change during the screening process, documentation of the evaluation of prior analyses and decisions
- Analyses to understand uncertainty in assumptions and forecasts
- How the travel forecasting work takes induced demand and land development effects into account
- The approach used to develop and the reasons for variations from approved land use forecasts

2.5 Project Management Considerations

NEPA studies are often complex undertakings and may be accompanied by various special considerations that warrant extra lead agency and study team attention. These include the potential for re-do analysis loops and ensuring documentation consistency. If these issues are understood from the initiation of the study, there will be ample opportunity to proactively address them and facilitate a smooth and expeditious study process.

2.5.1 Potential for Reevaluating Analysis

In the course of a NEPA study, changed conditions may trigger a reevaluation of past forecasting work. A reevaluation could lead to revisions of data inputs and model assumptions used to produce the study's forecasts. The study team may need to conduct sensitivity tests to assess the magnitude of differences from prior analyses resulting from use of new data and their effects on past decisions. Depending on the outcome of such tests, the study team may need to decide how to choose the best and most appropriate way to address the new information. For example, updates to key data sets, such as new land use estimates or forecasts, updated project lists, or the availability of a new model version, may potentially bring into question the credibility of already-conducted forecasts, and consequently, the decisions made based on those data.

On the other hand, a sensitivity test may reveal that the changes caused by the introduction of the new data or model version do not change the conclusions made from the previous analysis. In this case, the study team would incorporate the updates to the model at a future milestone, such as for the final EIS, or simply document the change and the sensitivity analysis in the project administrative record and move on. Depending on the stage in the analysis, for example, when new land use forecasts become available, it may not be necessary to re-do analysis.[55]

Sometimes a change in the scope of the analysis may also require past model work to be reevaluated. For instance, the testing of a new alternative may be requested, such as a toll facility, that was identified after scoping and was not considered in the original analysis. It is then also possible that model refinements may be necessary to evaluate this unforeseen alternative, or existing tools may be adequate to use to test the new alternative. It is important that choices that are made regarding changes in the alternatives and analysis are the result of a deliberative process, and that the decisions and the decision process are well documented.

In sum, it is important for the scope of the modeling effort for the study to recognize the potential for re-evaluation of the analysis and thus include adequate time and budget at the outset to address such contingencies. In the case of large, unforeseen issues, adequately addressing the study requirements may require scope and/or budgetary change orders. The implications of this issue for the scopes of work for consultants conducting forecasting analyses are discussed in section 2.5.4.

2.5.2 Consistency

NEPA documentation often presents a large amount of data and uses several applications and iterations of land use and travel forecasts as the basis for alternatives screening and impact estimation. There are therefore numerous opportunities for inconsistencies of data or results. First, there are the obvious inconsistencies, such as the same performance measures for an alternative having different values in different tables or sections of the documentation. A recent NCHRP report[56] recommended systematically reviewing assumptions, data, and results to ensure internal consistency, and explained that careful cross-checking is a valuable effort that enhances the credibility of the documentation for the public, agency reviewers, and a reviewing court.

It is important that the reported differences in impacts across alternatives reflect actual differences between the alternatives instead of being the result of inconsistencies in the analysis across alternatives, such as from slightly different model versions or assumptions. It is important for the study team to explain the differences in impacts across alternatives and to demonstrate that they are the results of a consistent and reproducible modeling process. Typically, travel model results developed early in the analysis process are used for preliminary estimates of air emissions and noise impacts and preliminary engineering design. As the analysis process progresses, travel model results are refined. This refinement process creates an environment where, unless care is taken, inconsistencies can occur due to analyses being based on different sets of results. It is important for the study team to ensure consistency between the travel modeling efforts and the work that uses travel model results as inputs so that analyses are all based on a consistent set of travel model results. Finally, it is important for logical inconsistencies to be avoided between sections of the EIS (e.g., the land development effects assumed as part of the alternative analysis being different from the effects documented in the indirect and/or cumulative effects analysis). There is no easy way to eliminate these inconsistencies; careful attention to detail and review of the documentation is therefore essential.

In addition, the current project development effort may not be the first alternatives analysis prepared for the corridor; there may be a corridor or planning study, or a previous NEPA study. It is important to be aware of the differences in transportation-related impacts from one study to the next, and ideally be able

[55] See case law summary Section 4.1.4.4 for discussion of several cases that deal with the need to redo analysis, including *Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1464-1465 (9th Cir. 1984), *Audubon Naturalist Society of the Central Atlantic States, Inc. v U.S. Dept. of Transportation*, 524 F. Supp. 2d 642, 673 (D. Maryland 2007), and *Town of Winthrop v. Federal Aviation Administration*, 535 F.3d 1, 9-12 (1th Cir. 2008)

[56] *Synthesis of Data Needs for EA and EIS Documentation – A Blueprint for NEPA Document Content*, NCHRP Project 25-25(01), January 2005

to explain generally and credibly why the differences are logical. Further, this particular study may not be the only one occurring in the region or even in the same general area, and consistency across studies is important. Although it is not necessary that all the details are exactly the same, in some cases that may be necessary; in general, consistent methods are preferable. The likelihood of maintaining consistency between parallel studies can be enhanced by appointing a member of the study team to be responsible for consistency by checking with the other studies.

2.5.3 Enhanced Communication between NEPA Study Team and Forecasting Practitioners

Because the NEPA process is often highly complex and, by its very nature, requires the involvement of multiple entities and individuals, it is appropriate to take special care to ensure logical and clear communication protocols are in place during the course of the study. This is particularly true with regard to communications between the project manager(s), other members of the NEPA study team, and the forecasting practitioners. Each needs to have an appropriately substantive level of understanding of the other's work, especially regarding analytical assumptions, data sources and reliability, interpretation of analysis results, and documentation of work performed. Establishing clear and well-understood protocols for communication among the management and forecasting parties will help ensure a credible and defensible NEPA product.

The extent to which communication protocols need to be documented will vary depending on the specific circumstances of the study. For example, for a study in which the project manager and forecasting practitioners are co-located and generally work closely on a day-to-day basis, a relatively simple agreement describing the general information flow between parties, documented in a memorandum, may be sufficient. However, for a complex study involving a large team of practitioners, who may be located in various sites across a region or the country, it will likely be very important to clearly describe a protocol for communication between and among the project manager and forecasting practitioners. Such a protocol, documented in writing, could include, but not be limited to, the following:

- Personnel (management, forecasting, others as appropriate) and responsibilities
- Description of decision-making structure within the NEPA team (possibly in writing and flowchart form)
- Schedule of communication events (e.g., regular meetings/conference calls of forecasting team and project manager)
- Format for documenting key assumptions, decisions, and communications and maintenance of that documentation

The NEPA project manager and other key players will need to determine what is appropriate for a particular project regarding the structure of a communication protocol. The goal of any such protocol should be to facilitate consistent and useful communication between the project manager and forecasting practitioners.

In addition, the involvement of legal counsel may be needed during the NEPA study on complex, controversial, and/or previously litigated projects. The role of counsel in this context is to ensure that the work being done and the documentation of the work are legally sufficient and adequately address typical legal issues with regard to forecasting. This involvement will help to ensure that the forecasting work performed meets legal requirements and improves the defensibility of the study.

2.5.4 Considerations for Developing Scopes of Work for Forecasting Practitioners

It is typical for the majority of the forecasting work carried out during a NEPA analysis to be performed by a transportation consultant hired by the lead agency. In practice, the level of detail of scopes of work for these forecasting efforts vary considerably from a few lines to a very detailed discussion of the needs of the forecasting effort. Beyond the provision for basic forecasting work to be conducted, the following are a few of the important elements of a scope of work that warrant consideration by a lead agency:

- Potential reevaluations and re-do loops: As mentioned above, new information, updated data and assumptions, or updated model versions can impact forecasting efforts, often in the middle of the NEPA study. While this may only happen on a few, complex or controversial projects, the impact on a study contract can be sizable. Incorporating resources into contracts to account for the potential of these occurrences will help ensure that needed analysis can be conducted. Professional judgment should be utilized to determine projects where this may be appropriate.
- Contract length and litigation contingency: a NEPA process can take place over a considerable time frame. That time-frame may be unexpectedly extended if the project is the subject of litigation. Because forecasting is often the focus of litigation, and to ensure continuity in the study team, it is important to consider that the work may need to be extended to provide additional analyses and support from the forecasting practitioners during responses to litigation.

2.6 Forecasting for Noise and Air Emissions Analyses

Land use and travel demand forecasting models are used to provide existing and future traffic volumes on the road network, estimated operating speeds, and information on mode usage that are used as inputs to noise and air quality assessments. This information is crucial to the successful completion of these analyses. It is important that lead agencies assure that assumptions that are made in general forecasting applications as part of the NEPA study are consistent with those used in the noise and air quality analyses. As an example, noise and air analyses may have specialized requirements regarding the needed forecasting analysis years, scales, or time periods. As a result, it is appropriate that the NEPA and forecasting practitioners take this into account early in the model development and scoping process.

More detail on the evaluation of noise and air impacts is provided below.

2.6.1 Noise Analysis

The results of travel demand forecasts are used as inputs to noise analyses routinely conducted as part of the NEPA process. The procedures used to identify and estimate noise impacts are found in 23 CFR Part 772, the FHWA regulations for the evaluation and mitigation of traffic noise in the planning and design of Federally funded highway projects.[57] This regulation establishes:

1. Methodologies for conducting a traffic noise analysis, and
2. Guidelines and requirements for the consideration of noise abatement measures.

In preparing traffic projections for NEPA documents, it is important to understand certain requirements of the FHWA regulations with respect to traffic volume estimation and modeling:

- Noise levels are established for the existing condition and a no-build and build scenario in the design year. The "design year" is "[t]he future year used to estimate the probable traffic volume for which a highway is designed" and is usually consistent with the design year established for other impact analyses in the EIS process.
- Impacts are measured during the one-hour period where the worst-case noise levels are expected to occur. This may or may not be the peak hour of traffic. That is, higher traffic volumes can lead to higher congestion and lower operating speeds. Since higher speeds lead to higher noise emissions from motor vehicles, the worst-case noise levels may occur in hours with lower volumes and higher speeds. In addition, vehicle mix may also change hourly. On many highways, the percentage of heavy trucks is reduced during peak hour. Since heavy

[57] Additional guidance can be found in *Highway Traffic Noise Analysis and Abatement: Policy and Guidance* (1995)

trucks have greater sound emissions than passenger cars, vehicle mix is an important component in determining the peak hour of noise impact. It may be necessary to conduct screening runs on several hours to determine which combination of traffic volume, speed, and vehicle mix yields the greatest impact. It may be the case that the peak hour of noise impact changes as the result of the proposed project. For example, the introduction of a multimodal facility like a freight terminal could introduce a large volume of heavy trucks during off-peak hours. In this case, a different analysis hour could be evaluated for the no-build and build alternative scenarios.

If the hour to be modeled is not included as a direct output of the travel demand forecasting model, then adjustments can be considered based on factors developed for similar types of roads. For example, if a transportation model is used to develop annual average daily traffic (AADT), then adjustment factors based on automatic traffic recorders (ATRs) could be used to estimate time-of-day hourly volumes and vehicle mix. The methodology for adjustments of model volumes used in the noise analysis should be consistent with that used in other sections of the EIS, and should be documented.

2.6.2 Air Quality Emissions Analyses

Results from travel demand forecasting models are used as inputs for estimating the regional and project-level emissions impacts of transportation plans, programs, and projects, as well as NEPA project alternatives. Emissions analyses are required to demonstrate that transportation plans, programs, and projects conform to the goals as identified in the State Implementation Plan (for areas in non-attainment or maintenance for a specific pollutant) to meet specific Clean Air Act requirements.[58] Emissions analysis may also be conducted to estimate the potential impacts of a specific alternative for other pollutants such as mobile source air toxics (MSATs) and greenhouse gases (GHGs). In addition, two levels of analyses are typically conducted with regard to transportation emissions: regional and micro-scale or hot-spot analyses. The analyses required for a specific NEPA study will depend on several factors, including:

- The context of the project: Is the area a non-attainment or maintenance area? Are there sensitive groups near the project area?
- The scale of the project alternatives being considered: Are there alternatives that are major expansions of an existing highway or new alignment? Or are they minor improvements on an arterial?
- The type of pollutant involved: Is a regional or local-level analysis required for a particular pollutant? Have other pollutants been raised as issues of concern by the public or other agencies?

The details of how emissions analyses will be conducted for a plan or project in order to meet Clean Air Act requirements are too extensive to discuss here, so this guidance will focus on the forecasting implications of both regional and local-scale analysis.[59]

2.6.2.1 Regional Emissions Analysis

Regional emissions analyses are conducted to produce estimates of emissions over a large area, typically the air quality non-attainment or maintenance areas (such analyses are not routinely conducted in attainment areas). This type of analysis is usually conducted to assess regional emissions to support a conformity determination for an MPO long-range transportation plan to demonstrate conformity or for a project in an isolated rural non-attainment or maintenance area. Travel demand forecasting models are generally used to supply inputs for the emissions estimation process, although some areas may use other appropriate forecasting methodologies. Typically, forecasting models or methodologies are used to pro-

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[58] 42 U.S.C. § 7506(c) (Clean Air Act § 176(c))

[59] See 40 CFR § 93 for transportation conformity requirements. For more information, see the *Transportation Conformity Reference Guide* at: http://www.fhwa.dot.gov/environment/conformity/ref_guid/index.htm

duce future VMT and speed estimates for the regional network. These estimates are used to represent travel activity in the study area. Emission rate models (such as MOBILE6.2 or MOVES) are used to create emission rates based on travel activity, vehicle fleet mix, temperature, and other variables. Emissions are estimated by multiplying the appropriate VMT estimate to the corresponding emission rate.

From a NEPA study forecasting perspective, the key considerations include consistency of assumptions and data and evolving analysis methods. It is important that the design concept and scope of the project in the NEPA analysis be consistent with that included in the conforming transportation plan and TIP in non-attainment or maintenance areas. Any substantial change in a project's design concept or scope will require a new plan/TIP conformity determination[60] and could require a reevaluation of regional and local-level emissions and a new project-level conformity determination. Also, certain analysis years will be required for the regional emissions analysis. These years may be different from the analysis years used in the NEPA study. The methodologies employed and assumptions used should be as consistent as practicable between the regional emissions analysis and the NEPA study. For example, if the land use assumptions in the NEPA study are sizably different from those used in the regional emissions analysis, then it is suggested that the differences be explained and documented. In addition, analysts are required to ensure that the latest planning assumptions are used in an emissions analysis.[61]

Periodically, a new emissions model is released by the Environmental Protection Agency (EPA) and is typically phased in over time. For example, the current emissions rate model from EPA is MOVES,[62] although MOBILE6.2 has been used until very recently, and will be required when conducting emissions analyses. It is strongly recommended that analysts ensure that the latest emissions model is being used and anticipate if new models or updates will be available during the course of the NEPA study. This may mean that updated emissions analyses are required prior to the final approval of the NEPA analyses.

2.6.2.2 Micro-Scale Emissions Analysis

Hot-spot analyses are conducted to determine the ground-level concentration of a pollutant of concern. In most cases, carbon monoxide (CO) is evaluated at intersections, as this is where the greatest concentrations are often found. However, these types of analyses can also be conducted for other pollutants, such as PM.[63], [64] Hot-spot analysis typically includes information on traffic volumes and free flow travel speeds on each roadway segment in the analysis. There are CO standards for both the 8-hour and 1-hour averaging period, although the 1-hour averaging period is almost never exceeded without the 8-hour averaging period being exceeded first. In general, the average of the highest consecutive 8 hours of traffic volume is chosen for the 8-hour analysis, or the peak hour is analyzed with a persistence factor to adjust the 1-hour impacts to 8 hours. When travel demand models are used to generate the peak 1-hour traffic volume, the latter method is most often used.

The evaluation of MSATs is generally conducted using a project level analysis.[65] As with CO, emissions of MSATs are dependent on traffic volume, vehicle mix, and operating speed. Other factors are also taken into account, such as fuel characteristics, but these are independent of whether traffic data are provided by a travel demand model or by other means. Since many of these air toxics are carcinogenic, long-term exposure is generally of the greatest concern. As a result, averaging times for analysis is usually one year. Therefore, AADT models are often sufficient for generating the traffic volumes, vehicle mix, and operating speeds.

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[60] See 40 CFR § 93.104(d)

[61] More information on current planning assumptions can be found at: http://www.fhwa.dot.gov/environment/conformity/assumpts.htm

[62] For more information see the MOVES website: http://www.epa.gov/otaq/models/moves/

[63] See 40 CFR § 93.123(b)(1)

[64] *Transportation Conformity Guidance for Qualitative Hot-spot Analysis in PM2.5 and PM10 Nonattainment and Maintenance Areas*, joint FHWA and EPA guidance, March 29, 2006. Available at: http://www.fhwa.dot.gov/environment/conformity/pmhotspotguidmemo.htm

[65] The current guidance on this topic is *Interim Guidance on Air Toxic Analysis in NEPA Documents* (February 3, 2006). Available at: http://www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm

Models of air impacts are required to be conducted during the year of peak emissions from the project.[66] This can typically be achieved by analyzing both the first build year and the design year, although an intermediate analysis year may also be necessary. This is because there is a tradeoff between traffic volume and emissions. That is, in the design year, traffic volumes are usually higher due to background growth, but emissions are lower due to the retirement of older and dirtier vehicles. Therefore, depending on which factor is more important, the worst-case impacts could occur earlier in the project life (such as the "open to traffic" year) or later.

2.7 Documenting and Archiving Forecast Analyses

2.7.1 Documenting Forecast Analyses

As mentioned throughout this guidance, documentation is an essential component of the NEPA and the project development process, which supports transportation decision making and complements public involvement and interagency coordination. NEPA requires that Federal agencies disclose the results of their analysis and the effects of project implementation on the environment and solicit comments on the proposals from interested and affected parties. The purposes of documenting the NEPA process are to:

- Provide for full disclosure to the public
- Allow others an opportunity to provide input and comment on alternatives and environmental impacts
- Provide the appropriate information for the decision-maker to make a reasoned choice among alternatives
- Provide an adequate administrative record for potential legal challenges.

A forecasting effort typically involves a tremendous amount of technical work that the study team then documents and describes in a manner so that it can be understood and meaningful to both technical readers (i.e., other modelers) and non-technical readers more interested in the results of the analysis (i.e., decision-makers and the public). Given the amount of work that must be documented in a typical NEPA study, it is important for lead agencies to provide the study team with sufficient time and budget to complete this critical phase of the study.

From a legal standpoint, any work <u>not</u> documented as part of the Administrative Record (AR) is not useful, since the AR is the documentation that would be used by a judge reviewing the procedural aspects of project litigation.[67] Consequently, the technical documentation typically goes in an appendix, whereas the main document presents the salient points from the analysis relevant to decision making and comparing alternatives. CEQ regulations (40 CFR § 1502.18) support this use of technical appendices, stating that "if an agency prepares an appendix to an environmental impact statement the appendix shall...normally be analytical and relevant to the decision to be made."

If a peer review is to be done, it is important for the study team's technical documentation to present the forecasting process in enough detail for the peer reviewers to analyze. It is suggested that this documentation describe the forecasting methods, key assumptions, and data used in the analysis, as well as any changes made during the study, and fully explain the methods used. This explanation may cover base-year model calibration and validation, as well as any technical evidence supporting the reasonableness of the forecasts (or incorporate existing documentation by reference). It is advisable for the study team to coordinate and share refinements made to model inputs, algorithms, or methodology with the agency that maintains the model and data (such as an MPO).

It is important for NEPA documentation to include enough technical detail to explain complex information in an understandable manner and present information in a way that is easy to follow for agency re-

[66] See 40 CFR § 93.116(a)

[67] See, for example, *Protect Our Water v, County of Merced (03 C.D.O.S. 6067 July 9, 2003, _Cql. App. 4th_)*

viewers, courts, and the public. In addition to explaining the technical information, it is important for agency reviewers, courts, and the public to understand the reasoning behind how analytical methods were chosen, what assumptions were made, and who made those choices. The study team can take several steps to achieve this balance, as outlined in a 2005 NCHRP report:[68]

- **Identify and Explain Key Assumptions**. The technical analyses contained in NEPA documentation generally are based on a series of assumptions. For example, travel forecasts are based on assumptions about future population and employment trends, and future transportation investments. It is important for decisions regarding these underlying assumptions to be reached using a reasoned approach. Also, it is important for the assumptions themselves to be reasonable in order for the results of the forecasts to be reasonable. Therefore, in presenting technical information, it is important for preparers of NEPA documentation to specifically identify key assumptions and *explain why* those assumptions were made.
- **Describe Methods Used to Develop Forecasting Results**. The persuasive power of technical data depends heavily on the reader's confidence in the methods used to generate those data. If the reader cannot understand how the data were developed, the reader is essentially being asked to "take it on faith." Thus, describing the methodologies used to develop the data can enhance the credibility of NEPA documentation. This approach requires more than giving the name and version of the model used; it requires explaining in simple terms how that model works and what type of information it provides. It also means explaining any inherent limitations in that model.
- **Summarize and Explain the Forecasting Results**. NEPA documentation presents a vast quantity of technical information. A critical task of a NEPA documentation preparer is to explain the data. Explaining the data involves more than reciting in text the data that appear in an accompanying table or figure. It is suggested that the explanation identify patterns in the data, explain causal relationships, and explain anomalous or otherwise unexpected results.
- **Systematically Review Assumptions, Data, and Results to Ensure Internal Consistency**. The large amount of data presented in NEPA documentation creates numerous opportunities for internal inconsistencies and contradictions. Careful cross-checking to ensure rigorous consistency is a valuable effort that enhances the credibility of the documentation for the public, agency reviewers, and a reviewing court.

An important job of the documentation writer is to explain what the technical data mean in relation to the decision(s) to be made. The writer might achieve this objective by capturing compelling cross-cutting issues that are important for the study and by summarizing key issues with perspective.[69] It is not enough to simply describe the technical work completed. Quality NEPA documentation effectively tells the project story through clear, concise writing; effective organization and formatting; and effective use of visual elements. It is suggested that if this story is to be presented in the main body of the documentation then it will present reasonable information and indicators describing how each alternative meets or does not meet the project's purpose and need, explaining any technical details in a way that is understandable to non-technical readers, and referencing the technical documentation in an appendix.

Telling the story of a forecasting effort requires a shift in the thinking away from the technical aspects of the modeling work and towards the impacts of the project that stakeholders are concerned about. A recent report from AASHTO illustrates how an EIS can be reorganized to be more engaging to readers. This reorganization of the EIS document mirrors the shift in thinking necessary to convey forecasts—that it is important for the results of the technical analysis to be relevant and understandable. The report has several suggestions for improving the readability of NEPA documents that reflect the intent of the CEQ regulations:

- Use clear, concise writing
- Provide effective summaries

[68] *Synthesis of Data Needs for EA and EIS Documentation – A Blueprint for NEPA Document Content*, NCHRP Project 25-25(01), January 2005

[69] *Improving the Quality of Environmental Documents*, A report of the joint AASHTO/ACEC Committee in cooperation with FHWA, May 2006

- Select an easy-to-use format
- Summarize information and use pictures and effective graphics to help communicate complex issues or comparisons[70]
- Separate technical information or high-volume materials into appendices or use cross-references as appropriate
- Include only the most relevant information—do not discuss effects that do not matter.

2.7.2 Archiving Forecast Analyses

In addition to producing thorough and understandable documentation of the forecasting effort, it is important for the study team to preserve the ability to replicate the forecasts in the future by archiving the relevant modeling information. Relevant modeling information includes the data inputs, outputs, and the model setup files, including a written description of the model methodology, model version, and the software used in the analysis.

During a land use and travel forecasting effort, the study team will produce a tremendous amount of intermediate data. Not all of these data are pertinent to the decisions made in the NEPA process and, consequently, these may not need to be archived as part of the NEPA documentation. It is important that all decisions about whether to archive data are made between the NEPA project manager and the documenters; it is also important to retain any data that might be needed in the future. The study team may also want to keep in mind that the NEPA process can be lengthy, which may mean that examinations or interpretations of forecasting inputs, assumptions, or results may come at the end of the NEPA process or during a legal challenge. The study team may need to look at this information several years into the future. The archiving procedure, including the selection of storage medium, should reflect this.

3.0 CONCLUSION

Few analysis methods are as integral to NEPA and other project development studies as travel and land use forecasting. Forecasts provide important information to project managers and decision-makers, and are used throughout the project development and NEPA processes, providing foundations for purpose and need. They are important in evaluating the performance of alternatives, the estimation of environmental impacts, induced land development effects, and resulting indirect and/or cumulative effects.

Even though it is so integral to the NEPA process, forecasting is not a heavily legislated or regulated area and is mainly driven by the standards of professional practice. This results in a large variation in practice and experience. Forecasting methods are often the source of disagreements among agencies, and forecasting is often the subject of litigation.

The FHWA embarked on creating this guidance to help improve the state-of-the-practice in relation to how project-level forecasting is applied in the NEPA process, since no procedural or process guidance has been issued in the past. As a companion to this guidance, the FHWA is creating a document that will include case studies and best practices to help further the improvement of forecasting techniques at the project level. Training and technical assistance will also be made available to provide educational and peer exchange opportunities to State DOTs, MPOs, resource agencies, and the consultant community, to encourage needed dialogue and discussion to improve the state-of-the-practice.

Another important area that is not addressed by this guidance or any of the complementary activities discussed above is the need to improve the actual technical methods used to forecast land use and travel behavior as applied to NEPA processes. The FHWA is involved in efforts to initiate research, in coopera-

[70] For example, effective graphics could include the use of GIS and thematic mapping tools to display benefits and tabulations of forecasts at aggregated levels of geography (e.g., district to district trip tables)

tion with the Transportation Research Board and AASHTO, and to create information that discusses up-to-date technical methods and improvements that can be applied to project-level forecasting.[71]

4.0 APPENDICES

4.1 Case Law Summary (January 2009)

4.1.1 Introduction

This document was prepared to serve as a resource for the FHWA research project entitled "Development of Guidance on Travel Demand and Land Use Forecasting in NEPA." The summaries below are intended to provide a sense of the current judicial perspectives on issues surrounding the preparation and use of travel demand and land use forecasts in evaluations prepared pursuant to the National Environmental Policy Act (NEPA).[72]

A word of caution is in order about how readers use this material. This document does not constitute legal advice to any party. Readers should keep in mind that judicial interpretations of issues under NEPA differ from court to court. While decisions from the various jurisdictions can be instructive, as the summaries below illustrate, jurisdictional differences or differences in case facts often lead to variations in outcomes.

Finally, these summaries are much abbreviated descriptions from more detailed decisions. Those wishing to use these decisions for other than background purposes are advised to review the decisions in their entirety.

4.1.2 Standard of Review

A reviewing court determines whether the agency took a "hard look" at environmental issues. As a part of its review, the court will consider whether the agency's actions were arbitrary or capricious, an abuse of agency discretion, or otherwise not in accordance with the law or with procedures required by law. The court will consider whether the agency has compiled sufficient information to permit the agency to make a decision, considered relevant factors, articulated the reasoning behind its decisions, and disclosed this information to the public. Where these standards have been met, the courts will accord deference to the agency's decisions.

1. *Kleppe v. Sierra Club*, 427 U.S. 390, 410 (1976)

In a footnote to its decision (footnote 21), the Supreme Court noted the limitations on the role of a reviewing court, favorably citing to earlier cases on this point:

> Neither the statute nor its legislative history contemplates that a court should substitute its judgment for that of the agency as to the environmental consequences of its actions….The only role for a court is to insure that the agency has taken a "hard look" at environmental consequences; it cannot 'interject itself within the area of discretion of the executive as to the choice of the action to be taken….'

(citations omitted).

This "**hard look**" doctrine has been applied consistently since *Kleppe*.

[71] For example, a key reference document in this field is *NCHRP Report 255: Highway Traffic Data for Urbanized Area Project Planning and Design*, TRB, 1982, which documents techniques that were the state of the practice over 25 years ago; since then there have been many technological innovations that are now in common use

[72] 42 U.S.C. § 4231 *et seq*.

2. *Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council Inc.*, 435 U.S. 519, 557-58 (1978)

The Supreme Court considered the standard of review under NEPA and emphasized that judicial review under NEPA is primarily focused on procedural requirements of the statute:

> NEPA does set forth significant substantive goals for the Nation, but its mandate to the agencies is essentially procedural.… It is to insure a fully informed and well-considered decision, not necessarily a decision the judges of the Court of Appeals or of this Court would have reached had they been members of the decision making unit of the agency. Administrative decisions should be set aside in this context … only for substantial procedural or substantive reasons as mandated by statute … not simply because the court is unhappy with the result reached.

(citations omitted).

3. *Strycker's Bay Neighborhood Council v. Karlen*, 444 U.S. 223, 227 (1980)

The Supreme Court further clarified the standard of judicial review under NEPA, emphasizing again the procedural nature of NEPA and limiting the ability of the reviewing court to substitute its judgment on substantive issues.

> … the Court of Appeals [concluded in its earlier decision in *Strycker*] that an agency, in selecting a course of action, must elevate environmental concerns over other appropriate considerations. On the contrary, once an agency has made a decision subject to NEPA's procedural requirements, the only role for a court is to insure that the agency has considered the environmental consequences; it cannot 'interject itself within the area of discretion of the executive as to the choice of the action to be taken.'

(citations omitted).

4. *Marsh v. Oregon Natural Res.*, 490 U.S. 360, 375-78 (1989)

In examining the question whether there was significant new information that required preparation of a supplemental EIS, the Supreme Court held that the proper standard of review is found in the Administrative Procedure Act (APA) at 5 U.S.C. § 706(2)(A), which provides that a reviewing court shall "hold unlawful and set aside agency action, findings, and conclusions found to be arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." The Court noted that the question presented for review was a 'classic example of a factual dispute the resolution of which implicates substantial agency expertise' and that the dispute involved primarily issues of fact that could be analyzed only by the application of a high level of technical expertise. The Court did note that, when determining whether an agency decision was 'arbitrary or capricious,' the reviewing court 'must consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment.' This inquiry must 'be searching and careful,' but 'the ultimate standard of review is a narrow one.'

(citations omitted).

5. *N. Buckhead Civic Ass'n v. Skinner*, 903 F.2d 1533, 1543 (11th Cir. 1990)

Where an EIS was challenged on the basis that the agencies' review of the available traffic and environmental information was incomplete or inaccurate, the Court held that

> [r]esolution of this dispute requires analysis of the relevant environmental documents and traffic projections, so we cannot accept appellants' contentions that our review is of a legal question. The questions presented for review in this section are classic examples of 'a factual dispute the resolution of which implicates substantial agency expertise, so we must defer to the informed discretion of the responsible agencies.' Accordingly, as noted above, the agencies' decisions on the adequacy of the environmental and traffic data should not be set aside unless arbitrary and capricious.

(footnotes and citations omitted).

6. *Senville v. Peters*, 327 F. Supp. 2d 335, 344-45, 69 (D. Vt. 2004)

The Court summarized the provisions of the APA, which governs judicial review of a Federal agency's compliance with NEPA, and of its application in NEPA cases. The Court noted that under the relevant provisions of the APA, a reviewing court shall “hold unlawful and set aside agency action, findings, and conclusions found to be...arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law, ... [or] without observance of procedure required by law.”[73] The *Senvill*e Court went on to state that a reviewing court may not substitute its judgment for that of the agency, but

> an agency decision may be set aside where the agency ‘has relied on factors which Congress has not intended it to consider, entirely failed to consider an important part of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.’… An EIS will be upheld as adequate if the agency has followed a ‘rule of reason’ in its preparation, and has compiled it in good faith, and set forth ‘sufficient information to enable the decision-maker to consider fully the environmental factors involved and to make a reasoned decision after balancing the risks of harm ... against the benefits to be derived from the proposed action, as well as to make a reasoned choice between alternatives.’

However, the Court went on to hold that where there had not been a “hard look” at cumulative impacts,

> [t]his neglect of a statutory duty is not subject to the arbitrary and capricious standard afforded an agency determination of whether new information is likely to have a significant impact on the environment; the Court concludes that the failure to produce any environmental document that addresses the cumulative impacts of the [project] when considered with other projects was ‘not in accordance with law.’ 5 U.S.C. § 706(2)(A).

(footnotes and citations omitted).

7. *Senville v Peters*, 2006 WL 2585130, at *2 (D. Vt. July 20, 2006)

The Court denied a government motion to amend its judgment in the 2004 case (see above). With respect to the scope of review, the Court noted that

> [i]n this Circuit a court must ascertain that ‘the agency has made an adequate compilation of relevant information, has analyzed it reasonably, has not ignored pertinent data, and has made disclosures to the public.’ This Court was able to perform this task with respect to a portion of the induced growth analysis, and concluded that FHWA took the requisite ‘hard look.’

(footnotes and citations omitted).

8. *Laguna Greenbelt v. U.S. Dep’t of Transp.*, 42 F.3d 517, 523 (9th Cir. 1994)

The Court, considering a challenge to a decision not to prepare a supplemental EIS, noted that “[we] may not substitute [our] judgment for that of the agency concerning the wisdom or prudence of a proposed action.” Under our “rule of reason,” we determine “ ‘whether the [EIS] contains a reasonably thorough discussion of the significant aspects of the probable environmental consequences' by making ‘a pragmatic judgment whether the [EIS's] form, content and preparation foster both informed decision-making and informed public participation.’ ”

(citations omitted).

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[73] 5 U.S.C.A 706(2)(A), (D)

4.1.3 Travel and Land Use Forecasts: When Are They Relevant?

Forecasts relating to future travel demand and land use have relevance for defining project purpose and need, selecting project alternatives, and determining likely project impacts (direct, indirect, and cumulative).

4.1.3.1 Purpose and Need

Data-driven determinations of purpose and need typically will be upheld so long as the data is valid and is interpreted in a reasonable and credible manner.

1. *North Carolina Alliance for Transp. Reform v. U.S. Dept. of Transp.*, 151 F. Supp. 2d 661, 686-88 (N.D. N. C. 2001)

Although the parties settled the underlying case, the Court reviewed the NEPA issues in order to determine whether the plaintiffs were entitled to attorneys fees. The Court recognized that traffic projections prepared for the project played a legitimate role in establishing purpose and need. With respect to purpose, the Court found that providing a continuous north-south connecting road that would link the existing radial farm-to-market roadways was not an overly narrow statement of purpose where traffic projections showed that only 10 percent of the projected traffic in the relevant area would be through traffic and that the vast majority of the traffic needed to travel within that local area. The Court also indicated that it would defer to the transportation agencies on whether the traffic projections for the proposed facility sufficiently established need, but that the agencies' intentional misstatement of traffic modeling data showing expected daily traffic volumes on the new facility was impermissible.

> In this case, the traffic projections used in the [Final Environmental Impact Statement] FEIS were not only overstated, they were considerably higher than the updated figures that Defendants decided to omit. While a need for the proposed project might have existed even under the lower traffic projections, the decision to purposefully include the higher, significantly overstated estimates of traffic projections in the FEIS conflicts with one of the major policy goals of NEPA and fails to accurately examine an important aspect of the project. Defendants violated NEPA by purposefully including the inaccurate data in the FEIS. *See* 40 C.F.R. § 1500.1(b) ("Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA.").

The Court concluded that the plaintiffs were entitled to attorneys' fees under the Equal Access to Justice Act, 28 U.S.C. § 2412.

2. *Burkholder v. Wykle*, 268 F. Supp.2d 835, 849-50 (N.D. Ohio 2002)

Plaintiffs challenged a Finding of No Significant Impact issued for a project that would upgrade and/or relocate various highway segments in Ohio. Plaintiffs' claims included an attack on the project's purpose and need. Plaintiffs alleged that the purpose and need was overly narrow and based, in part, on faulty forecasting of the project's probable benefits to traffic volume, safety, and economic prosperity. The District Court held that the purpose and need statement satisfied NEPA requirements. The Court found that

> …the project's stated justification is supported by sufficient data. In fact, the record is clear that the data, upon which the defendants relied, showed that the level of service on the present U.S. 30 was seriously deficient… that traffic could be expected to increase as it had during the previous decade, that the safety of the route was a significant concern of both the public and highway officials, and that the improvement would be economically beneficial. Moreover, in light of the foregoing, the Court finds a factual basis for the defendants' conclusion that a limited-access, four-lane freeway would best solve the road's problems. While it is clear that the plaintiffs' expert has reached a different conclusion, the Court must be wary of interposing itself in such a technical or methodological dispute. This being so, the Court finds that the defendants' projection of the im-

> provement's benefits was not arbitrary and capricious and rejects the plaintiffs' contention in this regard.

(citations omitted).

3. *Sierra Club, Ill. Chapter v. U.S. Dep't of Transp.*, 962 F. Supp. 1037, 1043 (N.D. Ill. 1997)

The Court found that, while it is legally sufficient to rely on existing transportation needs to justify a project even if the future needs analysis is flawed, in this case the FEIS contained no analysis of how the project would improve travel times, enhance community linkages, or alleviate other existing transportation problems. The Court found the FEIS legally insufficient because of the absence of such information.

4.1.3.2 Analysis of Alternatives

NEPA documentation must demonstrate that forecasts have been used in a rational and supportable manner when they serve as part of the underpinning for project purpose, and where project alternatives are judged based on their ability to satisfy forecasted needs. Courts may, of course, come out with differing views of what is adequate based on the particular facts of the case. *See also* section 4.1.4.4 below.

1. *Sierra Club, Ill. Chapter v. U.S. Dep't of Transp.*, 962 F. Supp. 1037, 1043 (N.D. Ill. 1997)

Challengers alleged that the use of the same land use forecast for the build and no build scenarios prevented a rational analysis of alternatives. The Court agreed, stating that

> …the final impact statement in this case relies on the implausible assumption that the same level of transportation needs will exist whether or not the tollroad is constructed....The result is a forecast of future needs that only the proposed tollroad can satisfy. As a result, the final impact statement creates a self-fulfilling prophecy that makes a reasoned analysis of how different alternatives satisfy future needs impossible.

(footnotes and citations omitted).

2. *Laguna Greenbelt v. U.S. Dept. of Transp.,* 42 F.3d 517, 526-27 (9th Cir. 1994)

The Appellate Court upheld the agencies' use of data for the build and no-build alternatives where they relied on local planning documents. The challengers claimed that the EIS's analysis was flawed because it purported to reflect a comparison between the environment with and without the tollroad through the year 2010, but that the traffic projections used in the EIS failed to provide a true comparison because they were based on population and housing data that assumed existence of the tollroad. The Court agreed that the projections did assume the existence of the tollroad, but held that the incongruity was not fatal because "the need for the corridor is based on existing as well as future traffic congestion…and the county's population probably will grow in the coming years even without the corridor, AR 31:013173 (population increased by 2.1 million from 1950 to 1989 with little highway improvement…)."

(citations omitted).

3. *Jones v. Peters,* 2007 WL 2783387, at *10-11, 23 (D. Utah September 21, 2007)

Plaintiffs challenged FHWA approval of two highway projects in Utah. Claims included the allegation that the traffic modeling used to screen alternatives was flawed and incorrectly calculated the ability of various alternatives to improve mobility. As a result, the plaintiffs claimed that the alternatives analysis failed to satisfy the NEPA requirement to "rigorously explore and objectively evaluate all reasonable alternatives...."40 C.F.R. § 1502.14(a) (2006). The Court rejected the claims, finding that

> The traffic modeling relied upon by the agencies in …evaluating alternatives comprehends nearly 40 current regional transportation plans, federal and state, as well as the projected traffic demand for the region within and beyond the study area boundaries. It takes into account the phasing of plans from now through 2030, including increased mass transit development that may affect the study area. Alternatives to the proposed action are thus evaluated using projections that take into account that larger context.

> While the plaintiffs dispute the methodology used and conclusions drawn from the agencies' traffic modeling, they have not persuaded this court that the agencies' traffic modeling and the analysis flowing from that modeling lacked a rational basis, lacked consistency, or failed to take relevant considerations into account. Expert opinions do clash over the efficacy of one approach to traffic flow analysis compared with another. But disagreement between experts often does not present an 'either-or' question, and each of the opinions may be footed upon its own rational basis.
>
> Here, neither NEPA nor § 4(f) call upon this court to resolve those differences of expert opinion-to make a *de novo* determination of the comparative accuracy of the experts' contrasting approaches to traffic modeling, or to choose between differing interpretations of the modeled data. Those choices are for the FHWA, not the court. Instead, this court must decide whether the agencies' choices of method and interpretation as to the modeling of traffic data had a rational footing. Based upon the record now before us, this court concludes that they did.

(footnotes and citations omitted).

4.1.3.3 Direct, Indirect, and Cumulative Impacts Analyses

Impacts must be addressed if they are "reasonably foreseeable." That standard has been interpreted as meaning that the impact is "sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision."[74] The Supreme Court in *U.S. Dep't. of Transp. v Public Citizen*, 541 U.S. 752, 769, 124 S.Ct. 2204, 2216 (2004) rejected the "but for" test that had evolved to determine whether effects required NEPA analysis because they were causally linked to a Federal action. The Court held that that the correct test is whether the Federal action is the "legally relevant cause" of the effects. Application of the *Public Citizen* test is requires a more complex analysis than the earlier "but for" analysis and practitioners are encourage to consult with counsel if there is any question whether the effects they are considering meet the *Public Citizen* test.[75]

CEQ regulations explicitly recognize induced growth among the potential indirect effects of a project:

> Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. 40 CFR § 1508.8(b).

As with alternatives, care should be taken to ensure that information is developed and used in a rational and supportable way.

1. *City of Davis v. Coleman*, 521 F.2d 661, 675-77 (9th Cir. 1975)

In an early case addressing the linkage between land use and transportation, the Court held that FHWA must prepare an EIS and must address the land use impacts of the proposed action. The Court found it particularly problematic that the environmental review performed by FHWA and the State had ignored such impacts even though the purpose of the project was to facilitate economic development in the project area. The Court stated that

> … it is obvious that constructing a large interchange on a major interstate highway in an agricultural area where no connecting road currently exists will have a substantial impact on a number of environmental factors….The growth-inducing effects of the [interchange project] are its raison d' etre, and with growth will come growth's problems: increased population, increased traffic, increased pollution, and increased demand for services such as utilities, education, police and fire protection, and recreational facilities.

[74] *Dubois v. U.S. Dep't of Agric.,* 102 F.3d 1273, 1286 (1th Cir.1996) (quoting *Sierra Club v. Marsh,* 976 F.2d 763, 767 (1th Cir.1992)).

[75] For a helpful discussion of *Public Citizen* and its progeny, see *Humane Soc. of U.S. v Johanns*, 520 F.Supp.2d 8, 22-28 (D.D.C. 2007).

> The expert opinions and studies that [the plaintiff] has submitted during this litigation bolster the conclusion that [the State]…could not have known enough about the environmental effects of this project to 'reasonably conclude' that they would not be significant…. In this context the purpose of an EIS/EIR is to evaluate the possibilities in light of current and contemplated plans and to produce an informed estimate of the environmental consequences. That the exact type of development is not known is not an excuse for failing to file an impact statement at all. Uncertainty about the pace and direction of development merely suggests the need for exploring in the EIS/EIR alternative scenarios based on these external contingencies….It must be remembered that the basic thrust of an agency's responsibilities under NEPA is to predict the environmental effects of proposed action before the action is taken and those effects fully known. Reasonable forecasting and speculation is thus implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as 'crystal ball inquiry.'

2. *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.2d 1152, 1179-80 (10th Cir. 2002)

The geographic scope of forecasted land use changes does not necessarily define the areas of evaluation for impact analysis. Where the Federal agencies considered impacts on wildlife habitat only within an "arbitrary" 1000 foot distance from the right of way, the Court held the FEIS was inadequate. The Court noted that while the FWS had submitted information to show that "roads can cause significant adverse effects to bird populations as far as 1.24 miles from roadways, especially in open terrain like that adjacent to the proposed Legacy Parkway," the agencies had decided to limit the analysis to the 1000-foot area because "the data …collected for land use (which extended to 1 mile from the edge of the wetland) did not result in any statistical difference from the data collected at 1000 feet." The Court concluded that the 1000-foot limitation was overly restrictive and eliminated evaluation of species of concern to agencies and the public, including migratory birds. The failure to address migratory bird impacts rendered the FEIS inadequate.

3. *Sierra Club v. U.S. Dep't of Transp.*, 310 F. Supp. 2d 1168, 1186-88 (D. Nev. 2004)

Plaintiffs brought several challenges to the EIS for a proposed highway project. One of these challenges alleged that FHWA inadequately analyzed the indirect impacts of the project, including induced growth and induced travel. The Court upheld the sufficiency of the FEIS analysis of induced growth, finding that the FEIS discussed at length various land use and zoning issues including existing plans for master planned communities and other land uses in the area, city and county growth plans and zoning regulations and patterns, current and anticipated land use and zoning, and "induced" or "accelerated development impacts."

The Court was more troubled by the treatment of induced travel. After reciting the effect that failure to account for induced travel may have on decision-making ("…may lead agencies to select projects which provide no relief from congestion combined with increased adverse impacts to air quality…."), the Court discussed the degree to which the modeling accounted for the full range of induced travel impacts. The FHWA admitted that the model did not account for impacts from new trips made in direct response to a perceived reduction in congestion, but said that the portion of induced travel that the model did not address was a small and indeterminate part of induced travel effects and that current models cannot accurately capture the information. In the end, the Court upheld the sufficiency of the EIS on this point, finding that

> …the FEIS's treatment of induced travel effects is a reasonably thorough analysis. The FEIS considered nearly all induced travel effects. The portion not considered is the subject of scientific debate, and current models vary in their calculations to quantify induced travel effects. … Consequently, FHWA included a reasonably thorough evaluation of induced travel effects based on the information and modeling techniques available to the agency at that time.

(citations omitted).

4.1.4 Issues Affecting Sufficiency Under NEPA

The NEPA document's discussion must be adequate to inform decision-makers and the public about the various ways in which induced growth and other effects may occur. The agency must examine the relevant data and articulate a reasoned basis for its choice of methodologies and its decisions. Conclusory statements are not enough. It is important to think through all of the "links in the chain" of potential effects and to disclose and discuss information on all sides of an issue.

4.1.4.1 Consideration of an Appropriate Range of Impacts

When public or agency comments, or the transportation agencies' own evaluation, suggest that impacts may occur, the agencies should address those impacts in the NEPA documentation. The nature of the impact at issue will dictate the degree of evaluation and explanation required. The failure to provide *any* information on identified potential impacts often leads reviewing courts to find that the agencies have violated NEPA.

1. *Senville v. Peters*, 327 F. Supp. 2d 335, 368-69 (D. Vt. 2004)

The Court held that, even though the FHWA had taken a "hard look" at whether an alternative would cause growth that would not have occurred without construction, the agency failed to consider other requisite aspects of the induced growth issue.

> Induced growth consists not only of growth that would not have occurred absent the project, however, but of relocated or redirected growth due to changes in accessibility. The 1986 FEIS assumed that relocated development would occur generally in the vicinity of the new intersections and in high density zoning districts. There was no discussion of the potential detrimental impact upon areas from which population and resources would be drained….In response to comments pointing out this omission, FHWA noted that growth rates in the urban core cities have been declining for thirty years and are predicted to continue, and that the change attributable to the [project] is too small to be material….To the charge that FHWA underestimated the impact on communities that will experience increased development pressure due to increased accessibility, FHWA responded only that towns in the area will experience increased but insignificant development pressure. The dismissive treatment of relocated growth pressures on the outlying towns … is inconsistent with a hard look at relocated or redirected growth, particularly when the issue was not part of the original EIS. Despite the massive number of pages devoted to attempting to quantify induced growth, the Court cannot conclude that the determination that relocated growth will have an insignificant impact upon the inner cities or outlying towns is based upon reason.

(citations omitted).

2. *Conservation Law Found. v. Fed. Highway Admin.*, 2007 WL 2492737, at *24 (D.N.H. August 30, 2007)

The Court found that the agencies failed to consider appropriately the population growth and attendant traffic impacts on air quality.

> Because Defendants based their air quality analysis on traffic counts derived from the use of an outdated OEP population forecast that did not account for induced population growth, they did not consider how air quality will be affected by the additional traffic that will result if the Delphi Panel's population growth forecasts are correct. Accordingly, they must revise their analysis to address the foreseeable air quality effects of the additional baseline and induced population growth forecast by the Delphi Panel.

4.1.4.2 Sufficient Disclosure and Discussion

Agencies have an obligation to disclose potential environmental impacts, including those identified by others (and especially those identified by agencies with relevant expertise). NEPA documentation should include at least a brief summary of potential impacts and the results of the evaluations of those impacts. Courts consistently reject documentation that contains a "mere conclusory statement" not accompanied by any rationale for the conclusion about the impact. With some regularity, courts find a NEPA violation where there is a failure to disclose new or conflicting data, or a failure to explain the rationale behind the agency's choice about which data to use. The level of detail required in the documentation's discussion depends upon the importance of the impact under consideration.

1. *Davis v. Mineta,* 302 F.3d 1104, 1123 (10th Cir. 2002)

The Court held the EA inadequate where it failed to do more than make conclusory statements. For example, stand-alone statements like "growth would increase with or without the project," or "development is inevitable" are insufficient. The Court pointed out that the minimal and conflicting statements in the EA, which were the subject of an EPA comment calling for further analysis, failed to provide an adequate discussion of growth-inducing impacts. The Court also noted that the agencies apparently did not adequately address the EPA's comments in the EA.

> The EPA's viewpoint on this issue is undeniably relevant. While it is true that NEPA 'requires agencies preparing environmental impact statements to consider and respond to the comments of other agencies, not to agree with them,' it is also true that a reviewing court 'may properly be skeptical as to whether an EIS's conclusions have a substantial basis in fact if the responsible agency has apparently ignored the conflicting views of other agencies having pertinent expertise.'

(footnotes and citations omitted).

2. *Senville v. Peters,* 327 F. Supp. 2d 335, 369 (D. Vt. 2004)

In ruling that the FHWA has failed to comply with NEPA, the Court found that

> [o]ther than the bald assertion in the introduction to the induced growth study that 'induced growth, as utilized in this study, includes both secondary and cumulative impacts'…the Court has been unable to find any discussion of cumulative impacts in the study or the [EA] overall.
>
> NEPA requires a 'sponsoring agency to consider the impact on the environment resulting from the *cumulative* effect of the contemplated action and other past, present, and 'reasonably foreseeable' future actions.' As noted above, there has been no environmental analysis whatsoever, in the entire life of this project, of the cumulative effect of the [project] considered in conjunction with other past, present and reasonably foreseeable future actions.

(citations omitted).

The Court also pointed to "the cursory treatment of induced growth impacts in the 1986 FEIS; its failure to recognize that there will be induced growth impacts on outlying towns and on the cities; its inadequate treatment of secondary impacts on agricultural lands; the [EA's] omission of analysis of the effects of relocated growth on the inner cities and outlying towns" and other factors as grounds for its determination.

3. *Laguna Greenbelt v. U.S. Dept. of Transp.*, 42 F.3d 517, 525-26 (9th Cir. 1994).

The Court, reviewing a challenge to the sufficiency of an EIS discussion of growth-inducing impacts, upheld the adequacy of the EIS. The Court noted the distinction between cases where the EIS contained unsupported, conclusory statements and those cases where an EIS's discussion of growth-inducing impacts was reasonably thorough. The Court acknowledged that the EIS's analysis of growth-inducing impacts had weaknesses, including some data that could be interpreted as contradicting the EIS's conclusion about growth-inducing effects; but the Court determined that the weaknesses did not prevent a conclusion that the discussion of growth-inducing impacts in the EIS easily met the "rule of reason."

> NEPA does not require us to decide whether an EIS is based on the best scientific methodology available or to resolve disagreements among various experts. While Laguna may disagree with the EIS's substantive conclusion regarding growth-inducing impacts, the EIS's discussion of those impacts was reasonably thorough.

(footnotes and citations omitted).

4. *Citizens Advocate Team v. U.S. Dep't of Transp.,* 2004 WL 725279, at *5-6 (N.D. Ill. March 31, 2004)

Reviewing an allegation that the FEIS failed to satisfy NEPA because it failed to provide a detailed assessment of growth and traffic inducing impacts, the Court found that the FEIS was adequate and noted that the extent of discussion required should be determined based on the "overall level of significance the agency places on the impacts." The Court looked to whether the agency had made a "reasonable, good faith, objective presentation of the impacts sufficient to foster public participation and informed decision making." It concluded that

> …[a]lthough the Final EIS contains only a limited discussion of the projected traffic and population increases associated with the construction of the [project], the FHWA's decision to issue the ROD was not arbitrary and capricious in light of the minor role these growth-inducing impacts were determined to have on the surrounding area….Where the growth-inducing impacts or effects are determined to be minor, however, the agency is not required to quantify all possible effects provided it has reasonably explained why such a quantification is not necessary or feasible.

(footnotes and citations omitted).

5. *Conservation Law Found. v. Fed. Highway Admin.,* 2007 WL 2492737, at *23 (D.N.H. August 30, 2007)

In addition to studies, the agencies used a Delphi Panel to estimate growth-inducing effects of the proposed project. The Court held that the agencies are obliged to disclose the effects of that panel's work on traffic projections for the project. The Court rejected the agencies' position that disclosure was not required because the additional traffic that would result from the panel's forecast was not significant.

> While this argument may well justify a decision to proceed with [the preferred alternative]…it cannot excuse a decision to withhold information from the public that leaves it with the mistaken impression that the selected alternative will be substantially more effective in achieving one of the project's two primary objectives than may actually be the case. Reliable information produced by the agency's own experts that casts doubt on the agency's statements concerning a selected alternative's effectiveness is not insignificant….The additional traffic projected … is also significant because it will produce foreseeable indirect effects on secondary road traffic and air quality that Defendants failed to analyze in the FEIS…. This foreseeable effect of the [preferred alternative] must be assessed by the Defendants in a manner that allows for public comment.

The Court did uphold the agencies' use of challenged forecasts for vehicle operation and parking cost assumptions in their decision to eliminate rail from further consideration as an alternative. The Court cited the fact that the agencies gave a rational explanation in the FEIS for why they relied on the assumptions, and performed an additional sensitivity test in response to DEIS comments.

(footnotes and citations omitted).

4.1.4.3 Choice of Methodology

Agencies generally are entitled to select the methodologies they will use for NEPA analyses. Courts typically will not substitute their judgment for the agencies' expertise if the agencies have explained in the NEPA documentation their reasons for choosing one method over another, including the reasons for rejecting other methodologies. There are limitations on this deference. If the chosen methodology lacks a rational basis, lacks consistency, or fails to take relevant considerations into account, or if the transportation agencies' choice of methodology ignores the comments of agencies with particular expertise and fails to explain why those comments were ignored, courts will take a harder look and may overturn the transportation agencies' decision.

1. *N. Buckhead Civic Ass'n v. Skinner,* 903 F.2d 1533, 1543- 44 (11th Cir. 1990).

Appeal of a case that attacked the validity of traffic modeling used to generate projections used in evaluating alternatives. The challengers argued that the estimates failed to take into account the possible beneficial effect of mass transit on traffic in the corridor. The traffic projections came from the State DOT's analysis of present traffic amounts and projected future amounts, which in turn relied on system-wide projections calculated using the MPO's computer model. The State DOT projected highway use statistics for the year 2010 by assuming that the calculated growth trend for 1990 to 2000 would continue into the next century and by incorporating planned improvements from the regional plan. The FHWA accepted the techniques, and it was used on several important highway projects. The MPO had agreed with the State's traffic estimates as "consistent with 1990 and 2000 system traffic assignments and with 2010 [regional] socio-economic and land use forecasts." The Court noted that the challengers had neither offered any alternate method of computation, nor identified specific errors in the calculations. The Court upheld the agencies' action, referring to an earlier case where

> this court was called on to determine the propriety of competing traffic projection methodologies. The court recognized that it could not expect the district court to designate itself as a 'super professional transportation analyst' to determine the proper traffic planning technique. The same result must obtain here. After reviewing all the evidence, the district court concluded in this case that the plaintiffs failed to show that the traffic computations were unreasonable. The choice of methodology was determined to have a rational basis and was consistently applied in an objective manner. Our review of the record convinces us that this finding [by the lower court] is not clearly erroneous.

(footnotes and citations omitted).

2. *Senville v. Peters,* 327 F. Supp 2d 335, 354, 365-67 (D. Vt. 2004)

The Court rejected several challenges to the agencies' choice of methodologies for traffic and land use forecasts, even though it found the induced growth impacts analysis inadequate on other grounds. The plaintiffs alleged that the traffic methodology was flawed because it inflated the traffic levels under the no-build scenario, and failed to consider the impact of induced travel (increased road capacity that encourages additional travel) or peak-hour shifting (off-peak trips that shift into peak-hour due to perceived decreases in congestion). They also alleged that the traffic model was flawed because the demographic and economic forecasts that were used in the model assumed that sufficient infrastructure will be available to support the population and economic growth trends that they predicted, and therefore the same socioeconomic estimates were used to model both the build and no-build scenarios. As a result, the plaintiffs alleged, the build and no-build scenarios were bound to show no significant difference in the overall amount of growth in the area. The Court found that

> [w]hile the Plaintiffs' objection may prove to be well-taken, a dispute over the inputs to a computer model is the kind of technical determination that requires deference to the agency from the Court, which is constrained to determine whether or not FHWA made a 'reasoned decision,' even if its conclusion is debatable. Given the wealth of opinion that supports the assumption of no significant increase in overall regional growth from construction of a circumferential highway, and the outcome of the … modeling, the Court cannot say that FHWA's conclusion was not a reasoned decision.

(footnotes and citations omitted).

3. *Jones v. Peters,* 2007 WL 2783387, at *23 (D. Utah September 21, 2007)

Plaintiffs alleged that the traffic modeling used in the screening of alternatives already included the future traffic flows both inside and outside of the FEIS study area. The Court found that the traffic modeling relied upon by the agencies considered

> …nearly 40 current regional transportation plans, federal and state, as well as the projected traffic demand for the region within and beyond the study area boundaries. It takes into account the phasing of plans from now through 2030, including increased mass transit development that may affect the study area. Alternatives to the proposed action are thus evaluated using projections that take into account that larger context.

The Court concluded that

> [w]hile the plaintiffs dispute the methodology used and conclusions drawn from the agencies' traffic modeling, they have not persuaded this court that the agencies' traffic modeling and the analysis flowing from that modeling lacked a rational basis, lacked consistency, or failed to take relevant considerations into account. Expert opinions do clash over the efficacy of one approach to traffic flow analysis compared with another. But disagreement between experts often does not present an 'either-or' question, and each of the opinions may be footed upon its own rational basis….Here, neither NEPA nor § 4(f) call upon this court to resolve those differences of expert opinion-to make a *de novo* determination of the comparative accuracy of the experts' contrasting approaches to traffic modeling, or to choose between differing interpretations of the modeled data. Those choices are for the FHWA, not the court. Instead, this court must decide whether the agencies' choices of method and interpretation as to the modeling of traffic data had a rational footing. Based upon the record now before us, this court concludes that they did.

4. *Sierra Club v. Marita,* 46 F.3d 606, 621-23 (7th Cir. 1995)

In a case challenging the U.S. Forest Service's adoption of a forest management plan, the Court upheld the agency's choice of methodology, stating that agencies are entitled to use their own methodology "unless it is irrational." The record demonstrated that the agency developed its own method of analysis, and that it had considered (i.e., had taken a "hard look" at) the conservation biology principles put forth by the plaintiffs but rejected them based on the scientific uncertainty about the actual application of those principles. The Court upheld the agency's application of the "uncertainty" provision in CEQ regulation.

> [The challengers] misapprehend the 'uncertainty' of which the Service and the district court spoke. We agree that an agency decision to avoid a science should not escape review merely because a theory is not certain. But, however valid a general theory may be, it does not translate into a management tool unless one can apply it to a concrete situation….Nor did [the CEQ regulation on uncertainty at 40 CFR § 1502.22] require the Service to use a methodology it reasonably found lacking in certainty of application. 'NEPA does not require that we decide whether an [EIS] is based on the best scientific methodology available, nor does NEPA require us to resolve disagreements among various scientists as to methodology.'

The Court also rejected the argument that the agency's choice of science ought to be tested against evidentiary rules governing the admissibility of scientific expert testimony.

> An EIS is designed to ensure open and honest debate of the environmental consequences of an agency action, not to prove admissibility of testimony in a court of law. *Cf.*40 CFR § 1500.1(c) ('Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork-even excellent paperwork-but to foster excellent action.').

The Court went on to conclude that, to the extent that the CEQ regulation on uncertainty requires a discussion of the issue, the agency had complied by describing the alternate approach and stating its reasons for rejecting it.

(footnotes and citations omitted).

5. *Natural Res. Def. Council v. Herrington,* 768 F.2d 1355, 1385 (D.C. Cir. 1985)

Where a Department of Energy final rule was challenged based, in part, on its choice of modeling, the Court upheld the agency's action, stating that

> As we have recently reaffirmed, '[a]n agency may utilize a predictive model so long as it explains the assumptions and methodology it used in preparing the model. If the model is challenged, the agency must provide a full analytical defense.' However, we will defer to an agency's judgment to use a particular model if the agency examines the relevant data and articulates a reasoned basis for its decision.

(footnotes and citations omitted).

4.1.4.4 Conflicts, Inconsistencies, and Validity Issues in Modeling or Data

Consistency and integrity in the selection and use of data is important. Courts often fault agencies for appearing to "pick and choose" which data or assumptions to use in different parts of the NEPA analysis. Courts also sometimes find that agencies are overly eager to determine that there is "uncertainty" that excuses analysis. Agencies should disclose and resolve data conflicts (including "old" *versus* "new" data), inconsistencies, and validity problems. The agencies must ensure that the record contains an explanation of the problem and how it was resolved. If such problem is not cured, the agencies bear the burden of providing a full and credible explanation in the NEPA documentation.

1. *Laguna Greenbelt v. U.S. Dep't of Transp.,* 42 F.3d 517, 526-27 (9th Cir. 1994)

Appellate court, in reviewing a lower court decision that EIS satisfied NEPA, upheld the adequacy of the EIS. The Court upheld the agencies' use of data for the build and no-build alternatives where they relied on local planning documents. The challengers had claimed that the EIS contained insufficient data and analysis regarding the need for the proposed tollroad, its air quality and traffic impacts, and alternatives to the project. Among the allegations was that the EIS's analysis was flawed because it purported to reflect a comparison between the environment with and without the tollroad through the year 2010, but that the traffic projections used in the EIS failed to provide a true comparison because they were based on population and housing data that assumed existence of the tollroad. The Court agreed that the projections did assume the existence of the tollroad, but held that the incongruity was not fatal because "the need for the corridor is based on existing as well as future traffic congestion…and the county's population probably will grow in the coming years even without the corridor, *see* AR 31:013173 (population increased by 2.1 million from 1950 to 1989 with little highway improvement…)."

(citations omitted).

2. *Utahns for Better Trans. v. U.S. Dep't of Transp.*, 305 F. 3d 1152, 1182 (10th Cir. 2002)

The Court of Appeals upheld a district court decision relating to alleged flaws in modeling and data analysis used for a FEIS. The challengers alleged that the agencies failed to meet their obligation to "insure the professional integrity, including scientific integrity, of the discussions and analyses in the environmental impact statements" (citing 40 CFR § 1502.24). The agencies, among other things, adjusted parameters used in the travel demand model, and used different estimates of vehicle miles traveled in future years. Describing its review as "applying the rule of reason and overlooking minor technical deficiencies," the Court upheld the agencies' decisions on these points. The Court also referenced earlier portions of its opinion, where it discussed the ability of agencies to depart from their normal protocols if a rational explanation is given for doing so.

The plaintiffs also had alleged that the agencies relied on outdated and questionable "household survey" results to determine the public's interest in using mass transit. The agencies argued that the Travel Demand Model Peer Review found the household survey to be adequate. The Court rejected the challenge, finding that the agencies were entitled to rely on their own experts and noting that the FEIS relied on the higher transit demand projection that was generated by an independent method that did not use survey results.

(citations omitted).

3. *Conservation Law Found. v. Fed. Highway Admin.*, 2007 WL 2492737, at *22 (D.N.H. August 30, 2007)

Agencies used a Delphi panel and more recent state planning data to create an updated induced population growth forecast for the EIS, then used that updated information to evaluate the indirect effects of induced population growth on land use, water quality, and wildlife. However, the agencies chose not to use the forecast to evaluate the traffic-generating effects of induced population growth on the affected interstate or secondary roads, or for air quality issues. The Court concluded that the agencies had erred, stating that the agencies

> …used the same outdated [state planning] population growth forecast in their traffic projections for both the No Action Alternative and the Four Lane Alternative even though commentators on the DEIS faulted [the agencies] for failing to modify their traffic projections to account for induced population growth forecast by the Delphi Panel. The traffic-generating effects of population changes were well understood by the Defendants as such effects can be projected through the use of the Statewide Model. Accordingly, such effects are among the least speculative effects of population growth. [The agencies'] willingness to consider the effects of induced population growth in other areas such as land use, water quality, and wildlife, where the effects of population growth are less well understood, belies [their] contention that the traffic-generating effects of induced population changes are too speculative to be considered in this case. Thus, having convened the Delphi Panel for the purpose of forecasting induced population growth, and having decided to rely upon the panel's induced growth forecast for certain purposes, [the agencies] were not free, at least without substantial additional explanation, to treat induced population growth as a non-existent factor in their traffic projections. Instead, [they] should have performed the [traffic sensitivity analysis], disclosed its results in the FEIS, and explained why the analysis did not affect their decision to proceed with the Four Lane Alternative. Their failure to do so was error.

The Court emphasized that the agencies possessed the updated information before the issuance of the DEIS. The Court determined that the agencies needed to account for both forecasts and went on to hold that

> [w]hile NEPA does not require an agency to update its population forecasts whenever new forecasts become available, it ordinarily may not rely on outdated forecasts when it sets out to prepare an EIS even though more recent forecasts from the agency's own experts are readily available. Defendants' decision to do so here was error….Defendants cannot rely on the fact that they discussed the issue in the [post-FEIS] traffic sensitivity analysis] to excuse their failure to directly address it in the FEIS because the TSA was not subject to public comment.

The Court did uphold the agencies' use of challenged forecasts for vehicle operation and parking cost assumptions in their decision to eliminate rail from further consideration as an alternative. The Court cited the fact that the agencies gave a rational explanation in the FEIS for why they relied on the assumptions, and performed an additional sensitivity test in response to DEIS comments.

(footnotes and citations omitted).

4. *Sierra Club, Ill. Chapter v. U.S. Dept. of Transp.,* 962 F. Supp. 1037, 1043- 46 (N.D. Ill. 1997)

The Court held that the EIS failed to satisfy NEPA where the agencies relied on a single population forecast for analyzing impacts with and without the proposed project. The forecast used assumed the construction of a highway like the one proposed. In particular, the Court found that the resulting analyses of alternatives and ozone impacts were flawed.

> The agencies argued that they had unsuccessfully attempted a study to provide the ‘with and without” data, but had found it impossible. The Court rejected that position, and citing 40 CFR § 1502.22, concluded that that NEPA, of course, does not require an agency to use the best scientific methodology available. Thus, this court cannot conclude, as plaintiffs urge, that the final impact statement must contain a socioeconomic forecast that reflects the growth inducing effect of the tollroad. Rather, this court merely holds that information about the growth inducing impact of tollroad construction is crucial to a reasoned conclusion as to alternatives and that the final impact statement was at least required to explain in some meaningful way why such a study was not possible….Second, the study relies on only one socioeconomic forecast in examining the effect construction would have on ozone production. As a result, the study does not accurately depict the true ozone-producing effect construction of the tollroad would have. Accordingly, defendants must either prepare a study that explicitly compares ozone production with and without the tollroad or explain why a study is not possible.

The Court also cited the agencies’ failure to address new information that had appeared in a regional planning agency’s draft report on cumulative impacts of the proposed project corridor. That report indicated that the population forecast used in the FEIS underestimated the development that would occur in the corridor as a result of construction of the tollroad. The Court ruled that further analysis was needed on ozone production and the purpose and need for the project, and that such analysis had to address the kind of information that was in the planning report even if the agencies did not use the planning report itself.

(footnotes and citations omitted)

5. *Piedmont Heights Civic Club v. Moreland,* 637 F. 2d 430, 442 (5th Cir. 1981)

The Court of Appeals rejected challenges to the validity of data used to justify the need for the project. The EIS relied on the MPO’s regional development plan estimates of population in the Atlanta metro region by the year 2000. The plaintiffs offered evidence in the lower court hearings that the Federal and state projections for the year 2000 were substantially lower than those in the regional plan. The Court stated that

> [p]roof on an issue such as the inaccuracy of population projections is inherently difficult because of the uncertainty in population projections; however, citing a conflicting projection does not prove the invalidity of another projection. Furthermore, although population growth is important to the issue of whether highway improvements are needed in Atlanta, the record indicates and the district judge found that the need for the highway projects was based on current need as well as future need. Regardless of the amount of growth, all parties agree that Atlanta will grow by the year 2000. Evidence of growth in the record along with evidence of the current need for the highway improvements justifies the district judge's finding in the case.

6. *Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1464-65 (9th Cir. 1984)

Appellate court held that EIS can rely on official demographic projections for the region at issue, even where projections subsequently were revised downward. The City and County of Honolulu had adopted a revised Oahu General Plan that altered significantly the planning objectives for Windward Oahu, changing from a large growth and development scheme to a limited one. The parties challenging the project alleged that the project was inconsistent with the population objectives and policies of the newer general plan and that the inconsistencies were not resolved in the EIS, therefore making the EIS inadequate. The Court acknowledged that the EIS analysis of the newer general plan was troubling because of a number of “old versus new” data issues, such as the EIS’s use of outdated population projections (based on the older plan) to justify project need, at the same time that the agencies relied on the newer plan’s population goals for the premise that induced growth would be controlled. Despite such inconsistencies in the agencies’ use of the old and new general plans, the Court upheld the agencies’ use of the data, stating that “…our role is not that of a ‘super-planner,’ and, under NEPA, we are not allowed to substitute our judgment for that of the agency concerning the wisdom of a proposed action. Our role is limited to insuring that the [agencies] have taken a "hard look" at [the project's] environmental consequences. The [EIS] contains a fairly detailed discussion of [the project's] relationship to state and city land use plans, policies, controls, goals, and objectives. Furthermore, the relationship between [the project] and the 1977 Plan specifically is discussed." The Court also noted that one of the terms of the Secretary's concurrence in the EIS was that the State DOT would work with the local city and county to monitor land use and development trends, including the project's impact on such trends, with the goal of achieving the current general plan objectives for the area.

The decision upheld the sufficiency under NEPA of a socio-economic analysis that used arguably "obsolete" data that had been superseded by a new general plan. The Court found that the EIS adequately updated the pre-plan study, relied on conclusions and data derived from that later general plan, and displayed "a reasonably thorough discussion of [the project's] secondary impacts in light of the planning changes that have occurred."

The Court addressed allegedly contradictory assertions in the EIS with respect to the ability of the general plan to control growth induced by the project. The Court noted that such contradictions might indicate a "less than complete evaluation of [the project's] secondary impacts," but upheld the lower court's determination that the analysis was sufficient. "…NEPA only requires a "reasonably thorough discussion" that "fosters informed decision making," not a "complete evaluation." Therefore, it is our view that the District Court was not "clearly erroneous" in finding that the EIS assesses and discusses adequately [the project's] socio-economic impacts."

(footnotes and citations omitted).

7. *Audubon Naturalist Soc'y of the Cent. Atl. States v. U.S. Dep't of Transp.*, 524 F. Supp. 2d 642, 673 (D. Md. 2007)

Plaintiffs alleged that the FEIS was inadequate because it failed to use an updated growth forecast that became available shortly before the issuance of the DEIS and that included secondary and induced growth impacts (unlike the forecasts used in the DEIS). The earlier forecast was used to model all of the traffic and air impacts of the no-build alternative and the build alternatives. The Court examined the steps taken by the agencies to address the updated forecast, including a sensitivity analysis, and found the efforts satisfied NEPA requirements.

> Federal agencies are not obligated to restart the NEPA process every time new information becomes available. Given the fact that the [updated] land use forecast became effective only a week before Defendants released its DEIS and given the sensitive analysis conducted, the Court believes that Defendants' refusal to re-calculate the traffic model did not preclude informed decision-making and informed public participation in this instance. Therefore, the Court finds that Defendants complied with NEPA and did not act arbitrarily and capriciously by not relying on the [updated] forecast.

(footnotes and citations omitted).

8. *Town of Winthrop v. Federal Aviation Admin.*, 535 F.3d 1, 9-12 (1st Cir. 2008)

This case provides useful insight on the effect of more recent data on the data used for earlier parts of the NEPA process. The core issue was whether the Federal Aviation Administration (FAA) violated NEPA by not preparing a Supplemental EIS (SEIS) in connection with approval of expansion facilities for Boston's Logan Airport. In issuing its original ROD for the project in 2002 (a revised ROD was issued after reevaluation in 2007), the FAA committed to further study of the potential effects of additional operational measures on the taxiway component of the project. The plaintiffs' alleged, among other things, that the new data gathered for the resulting study constituted significant new information triggering the need for a SEIS. The Court rejected the claim:

> …data [in the EIS] remain 'current' [within the meaning of a FAA regulation] if there has been no major change that would cause one to expect contemporaneous conditions to

> vary significantly from conditions at the time the data were gathered. By validating through the [post-ROD study] that more recent conditions generate similar data as the data used in the EIS, the FAA could reasonably conclude that all the data still reflected current conditions.

The Court went on to quote from *Vill. of Bensenville v. FAA,* 457 F.3d 52, 71 (D.C. Cir. 2006), which decided a similar issue relating to whether more recent data invalidates modeling performed with earlier data:

> However desirable it may be for agencies to use the most current and comprehensive data available when making decisions, the FAA has expressed its professional judgment that the later data would not alter its conclusions in the EIS ..., and it is reasonably concerned that an unyielding avalanche of information might overwhelm an agency's ability to reach a final decision.... The method the FAA chose, creating its models with the best information available when it began its analysis and then checking the assumptions of those models as new information became available, was a reasonable means of balancing those competing considerations, particularly given the many months required to conduct full modeling with new data.

9. *Rivers Unlimited v. U.S. Dep't of Transp.*, 533 F. Supp. 2d 1, 6-7 (D.D.C. 2008)

Claims challenging a tier 1 EIS included the allegation that the gasoline price used in economic modeling ($1.13/gallon) was unrealistically low and violated the "accurate data" requirement under NEPA. The Court rejected the claim, but did so with words of warning:

> The price of gasoline used did not inflate the economic benefits of the project, however, nor did its use give insufficient weight to environmental factors. The price of gasoline was used in the modeling to calculate the benefits of the project based on vehicle hours saved from shorter routes, decreased congestion, and improved mass transit. The use of a more realistic gasoline price would likely have raised the calculated benefits associated with the project. It is distressing that FHWA bases *many* of its calculations on unrealistic estimations of the cost of driving, but, in this particular instance, lack of realism does not appear to have skewed the analysis in the agencies' favor.

(citation omitted).

4.1.4.5 Use of Local, Regional, or State Land Use Plans and Decisions

Agencies may point to local, regional, and/or statewide land use and transportation plans as a basis for defining project needs and the range of alternatives for detailed evaluation. Caution is needed to ensure that such use of planning products and outcomes is credible and that the material used is adequately explained in the NEPA documentation or in planning materials incorporated by reference into the NEPA documentation.

1. *City of Carmel-By-The-Sea v. U. S. Dep't of Transp.*, 123 F.3d 1142, 1160- 63 (9th Cir. 1997)

The Court held that the agencies' analysis of the project's growth-inducing impacts was adequate where the FEIS acknowledged the possibility of growth inducing impacts but concluded that the development constraints imposed by local authorities would prevent such development from occurring. The Court pointed to FEIS statements that any impacts associated with the project already had been addressed in local land use plans, which meant that there was no potential for project-induced growth beyond what was in those plans. The Court also noted that the project area already was well developed. The Court stated that

> [the project] will not spur on any unintended or, more importantly, unaccounted for, development because local officials have already planned for the future use of the land, under the assumption that the [the project] would be completed…. This development is nonetheless planned for…it has been accounted for and properly analyzed. No further analysis is warranted.

(footnotes and citations omitted).

2. *N. Buckhead Civic Ass'n v. Skinner,* 903 F.2d 1533, 1541-42 (11th Cir. 1990)

The Court upheld the action of the agencies in relying on local plans for definition of the project's "need and purpose." The Court stated that

> …NEPA does not confer the power or responsibility for long range local planning on federal or state agencies. 'An obvious and indeed central aspect of this relationship must be respect for the sovereignty of local authorities.…' In the present case, the record is replete with documents indicating that the agencies consulted with and cooperated with local authorities. The district court found that '[t]he transportation demand in the corridor and the goals of the project were developed by the [MPO] and are set out in the Need and Purpose section of the FEIS ... The Georgia DOT took the goals as developed by [MPO] and did a feasibility study to try and fulfill them.' There is no evidence in the record to indicate that FHWA officials acted arbitrarily in certifying the project. The district court correctly found that federal, state and local officials complied with federally mandated regional planning procedures in developing the need and purpose section of the EIS.

(footnotes and citations omitted).

3. *Citizens Advocate Team v. U.S. Dep't of Transp.,* 2004 WL 725279, at *9 (N.D. Ill. March 31, 2004)

The Court upheld the agencies where the FEIS deemed a no-build alternative inconsistent with the project purpose and needs, which was based on a regional need "to provide transportation improvements which would increase access across the Fox River in the North Region of Kane County ... [and] to provide access to proposed land uses in the Northern region which are compatible with Kane County's 2020 Land Resource Management Plan and local land use plans." The Court noted that "[b]y its very nature, the No-Build Alternative cannot satisfy these objectives. Finding that this is adequately explained in the Final EIS, the Court concludes that no further analysis is needed."

(footnotes and citations omitted).

4. *Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1464-65 (9th Cir. 1984)

Appellate court held that EIS can rely on official demographic projections for the region at issue, even where projections subsequently revised downward. The City and County of Honolulu had adopted a revised Oahu General Plan that altered significantly the planning objectives for Windward Oahu, changing from a large growth and development scheme to a limited one. The parties challenging the project alleged that the project was inconsistent with the population objectives and policies of the newer general plan and that the inconsistencies were not resolved in the EIS, therefore making the EIS inadequate. The Court acknowledged that the EIS analysis of the newer general plan was troubling because of a number of "old versus new" data issues, but the Court upheld the agencies' use of the data, stating that "[t]he [EIS] contains a fairly detailed discussion of [the project's] relationship to state and city land use plans, policies, controls, goals, and objectives. Furthermore, the relationship between [the project] and the 1977 Plan specifically is discussed."

(footnotes and citations omitted).

5. *Jones v. Peters*, 2007 WL 2783387, at *19-20 (D. Utah Sept. 21, 2007)

The Court looked at the question whether the agencies had adopted too narrow a statement of purpose and need, thus predetermining the outcome of the alternatives analysis. The plaintiffs alleged that the agencies had included consistency with local and regional transportation plans as a part of purpose and need, then used it to eliminate alternatives from consideration. The Court stated that the purpose and need must be broad enough to encompass analysis of alternatives other than the specific project produced by the planning process, but observed that

> [o]n the other hand, the project's purpose and need cannot be divorced completely from the planning process that generated the proposed project in the first place. Pursuant to Congressional mandate, *see* 23 U.S.C. § 134, the…long-range planning process identifies the specific existing and future needs that transportation projects are designed to meet. If 'purpose and need' were to be defined for NEPA purposes in total isolation from the existing regional and local transportation plans, the federal environmental assessment process would soon supplant the regional and local planning process envisioned by Congress, and the evaluation of alternatives would soon become transportation planning *de novo* on the part of the FHWA. Neither NEPA nor § 4(f) may fairly be read to mandate that….Applying a rule of reason and practicality, this court is not persuaded that the FHWA's consideration of alternatives to the 10400 South Project as delineated in the EA/4(f) was arbitrary, capricious, 'reverse-engineered,' or pre-determined.

(footnotes and citations omitted).

6. *Sierra Club v. U.S. Dept. of Transp.*, 310 F. Supp. 2d 1168, 1189-90 (D. Nev. 2004)

Plaintiffs made several challenges to the EIS for a proposed highway project. One of these challenges alleged that FHWA relied on population and traffic forecasts generated by the metropolitan planning organizations modeling system. The Court upheld FHWA's reliance on the forecasts and modeling efforts of the designated metropolitan planning organization responsible for developing transportation plans and programs for the area, noting that

> [the metropolitan planning organization] is a government entity charged with developing transportation plans based on forecasted needs in the area. Although some citizen and agency comments suggested RTC historically underestimates growth, FHWA's reliance on figures produced by a state governmental entity statutorily charged with developing state transportation plans based on projected need is not arbitrary or capricious.

(citations omitted).

4.1.4.6 Resolution of Inconsistencies Between Project and State, Regional, or Local Plans

CEQ regulation (40 CFR § 1506.2(d)) requires that NEPA documentation discuss inconsistencies with state or local plans and laws, and describe the extent to which the differences will be reconciled (although reconciliation of differences is not required). Courts tend to apply this requirement strictly only where there is a direct and explicit conflict between the project and the plan(s). Courts may provide agencies some deference where the inconsistencies are not well-addressed, but reliance on such deference creates an unnecessary risk.

1. *Utahns for Better Transp. v. U.S. Dept. of Transp.*, 305 F. 2d 1152, 1172-76 (10th Cir. 2002)

The lawsuit challenged the agencies' alternatives analysis because of its alleged failure to consider travel demand management through a combination of alternative land use scenarios and mass transit. The Court noted that land use is a local and regional matter and cited the number of communities that would be affected if alternative scenarios were pursued.

> There are, therefore, a number of local and regional governmental entities whose cooperation would be necessary to make an alternative land use scenario a reality. The [agencies] replied to comments made after the FEIS that '[t]o date, [the state, regional and local entities with responsibility for land use planning] have resoundingly declined to alter their plans based upon such comments.' We, therefore, conclude that the Agencies' treatment of the alternative land use was adequate.

The Court also concluded that the FEIS was not inadequate for failure to discuss alleged inconsistencies between the local transportation master plan and the proposed action. The master plan reflected a shift in priorities "to mass transit and multiple forms of transportation and away from increasing road capacity and meeting the needs of the single-occupant automobile." The Court pointed to the existence of several local transportation plans, including some that referenced a project similar to the one at issue. The Court concluded that a shift in priorities was not the same as a rejection of all new highway construction and that 40 CFR § 1506.2(d) had not been violated.

(footnotes and citations omitted).

2. *Audubon Naturalist Soc'y of the Cent. Atl. States, Inc. v U.S. Dept. of Transp.*, 524 F. Supp. 2d 642, 714-15 (D. Md. 2007)

The plaintiffs alleged that the proposed project was inconsistent with the land use general plans in one of the counties that the project would traverse, and that the agencies failed to reconcile those conflicts as required by 40 CFR § 1506.2(d). The Court rejected both claims, finding that

> [t]he difference between a preference and an inconsistency is significant. An inconsistency is a point of controversy, whereas a preference is choosing one option over another. Even though the [project] is not a specific project on the General Plan, the Plan does not completely exclude the building of new roads in the county. Simply because a proposed highway is not preferred or is not specifically mentioned in a General Plan does not constitute an 'inconsistency' that NEPA requires to be explained in an EIS. Neither Plaintiffs nor *amici* provide support for such a rigid reading of the NEPA regulations.… [the county] has stressed mass transit in its General Plan, but has not abandoned the building of new highways or roads. The [project] remained a part of the General Plans for the County up until 2002, and it is currently a part of the proposed plan for 2007. Furthermore, the Record shows that the FHWA consulted with all agencies with jurisdictions for planning in the study area, reviewed more than fifty local and regional plans, and documented its considerations of national, State, and local environmental protection goals.

Another challenge rested on the alleged failure to duly consider the objections of local officials to the proposed project. The Court rejected that allegation as well, stating that the FEIS demonstrated both that the FHWA had not ignored the political opposition in the county and that views about the project among elected officials clearly varied. The Court noted that

> [a]n environmental impact statement is to discuss any inconsistency between a proposed action, but the federal regulation 'does not require that [an agency] bow to local law-only that it consider it.'

(footnotes and citations omitted)

4.1.5 Linking Planning and NEPA

Any reader contemplating the use of products from the transportation planning process in the NEPA process, should consult the FHWA and the FTA joint planning regulation at 23 CFR Part 450. Sections 450.212 and 450.318 of the regulation outline the procedures and considerations for incorporating planning products into the analysis and documentation required under NEPA. The regulation cites the relevant provisions in the NEPA statute (42 U.S.C. § 4321 *et seq*.) and implementing regulations (23 CFR Part 771 and 40 CFR Parts 1500-1508) that support the use of planning products in NEPA (23 CFR §§ 450.212 and 450.318.[76] More detailed non-binding guidance appears in Appendix A to 23 CFR 450.

The regulation envisions that material produced by or in support of the planning process may be incorporated directly or by reference if the requirements specified in 23 CFR § 450.308(b) are satisfied. This material would include any travel demand or other modeling performed in connection with the project. *See, i.e.*., 23 CFR Part 450, Section II, Questions 13-14. However, prior to using such material, it is important to consider the questions outlined in Section II, Questions 7 and 14 of 23 CFR 450 Appendix A. For

[76] *See* 23 CFR §§ 771.105(a)-(b), 771.111(a)(2), 771.123(b); 40 CFR §§ 1501.1(a)-(b), (d), and § 1501.2.

land use and travel demand modeling, those questions include the key issues discussed in the preceding sections of this summary:

- How much time has passed since the modeling was performed?
- Were the assumptions used in the modeling reasonable and clearly stated, and are they consistent with those to be used for other aspects of the NEPA process?
- Is the information (including the assumptions) still relevant and valid, or does it need to be updated?
- What changes have occurred in the area since the modeling was completed?
- Are the data, analytical methods, and modeling techniques reliable, defensible, reasonably current, and consistent with those used in other regional transportation studies and project development activities?

If all of the above questions are answered favorably, the decision whether to use modeling results from the planning phase still must take into consideration other factors. For example, it is important to consider whether the FHWA and other relevant agencies were involved in the planning process, whether the material was available to those agencies and the public during both the planning process and during NEPA scoping, and whether the proposed use of the modeling results was discussed and agreed to during NEPA scoping. *See* 23 CFR Part 450, Appendix A, Section II, Question 7.

Where the material is carried forward into the NEPA process, it is important to continue to monitor the need for updates in data, assumptions, and modeling techniques. This monitoring should be done to minimize the possibility of successful challenges after the NEPA process is complete.

The cases on the use of planning products in the NEPA process are not numerous, but do provide a sufficient body of law to validate this "linking planning and NEPA" approach. Most of the cases focus on the question of whether planning actions may be used to define purpose and need under NEPA. The courts have pointed to the long-standing regime under which community planning is the province of the States and local communities, not Federal agencies, and upheld the Federal agencies reliance on such planning decisions. Examples of such cases appear below, excerpted from a FHWA/FTA Chief Counsel joint memorandum on "Integration of Planning and NEPA Processes," dated February 22, 2005 (available at http://environment.fhwa.dot.gov/strmlng/integmemo.asp).

1. *N. Buckhead Civic Ass'n v. Skinner*, 903 F.2d 1533, 1541-42. (11th Cir. 1990)

The Plaintiffs challenged the purpose and need articulated in the EIS for a multi-lane limited access highway connecting two existing highways. The purpose and need was derived from a series of planning studies conducted by the Atlanta Regional Commission. Plaintiffs argued that the purpose and need was crafted in a way that the proposed highway was "conclusively presumed to be required" and a rail alternative perfunctorily dismissed for its failure to fully satisfy the objectives of the project. The Court of Appeals disagreed with the Plaintiffs, stating that their objections reflected "a fundamental misapprehension of the role of federal and state agencies in the community planning process established by the Federal-Aid Highway Act." The Court went on to explain that the Federal-Aid Highway Act contemplated "a relationship of cooperation between federal and local authorities; each governmental entity plays a specific role in the development and execution of a local transportation project." The Court emphasized that Federal agencies did not have responsibility for long range local planning, and found that the "federal, state and local officials complied with federally mandated regional planning procedures in developing the need and purpose section of the EIS." Although the Court in *Buckhead* acknowledged the validity of a purpose and need based on the results of the planning study, it did not in any way scale back the holdings of other cases relating to purpose and need which caution agencies not to write purpose and need statements so narrowly as to "define competing 'reasonable alternatives' out of consideration (and even out of existence)."

2. *Carmel-by-the-Sea v. U.S. Dep't of Transp.*, 123 F.3d 1142 (9th Cir. 1997)

The Plaintiffs challenged the sufficiency of an EIS for failing to adequately consider the proposed project's growth-inducing effects. The Ninth Circuit disagreed, finding that the EIS satisfied this requirement by referencing several local planning documents that specifically included construction of the highway in their growth plans and which discussed overall growth targets and limits. In addition, the Court found that achieving "Level of Service C," an objective derived from the local congestion management plan, was an appropriate part of the purpose and need statement (although ultimately the EIS was found inadequate on cumulative impact grounds).

3. *Laguna Greenbelt, Inc. v. U.S. Dep't of Transp.*, 42 F.3d 517 (9th Cir. 1994)

The court held that the absence of a more thorough discussion in an EIS of induced growth, an issue that was sufficiently analyzed in referenced state materials, does not violate NEPA. However, regardless of the source, the analysis of induced growth must be in sufficient detail and must provide an analytical basis for its assumptions in order to be adequate under NEPA.

4. *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.3d 1152, 1172 (10th Cir. 2002), *as modified on rehearing*, 319 F.3d 1207 (10th Cir. 2003)

Plaintiffs contended that the FEIS was inadequate because it failed to consider reducing travel demand through alternative land use scenarios in combination with mass transit. Noting that "reasonable alternatives" must be non-speculative, the Tenth Circuit found that Plaintiffs had not demonstrated a deficiency in the FEIS on this basis (although it was ultimately found inadequate on other grounds). The Court stated that "Land use is a local and regional matter," and that, in this case, the corridor at issue would involve the jurisdiction of several local and regional governmental entities whose cooperation would be necessary to make an alternative land use scenario a reality. The fact that these entities had clearly declined to alter their land use plans in such a way was justification for not considering their alternative.

5. *Sierra Club v. U.S. Dep't of Transp.*, 310 F. Supp. 2d 1168, 1193 (D. Nev. 2004)

Plaintiffs made several challenges to the EIS for a proposed highway project. One of these challenges alleged that the EIS had improperly rejected a fixed guideway as a reasonable alternative under NEPA. The Court disagreed, finding that FHWA reasonably relied on a "major investment study" conducted as part of its planning process to establish that such an alternative (1) would not meet the project's purpose and need, even when considered as part of a transportation strategy, (2) was too costly and (3) depended on connections to other portions of such a system for which construction was uncertain. The Court stated that

> CEQ regulations mandate federal and state cooperation 'to the fullest extent possible to reduce duplication between NEPA and State and local requirements, including joint planning, environmental research and studies, public hearings, and environmental assessments.' 40 C.F.R. § 1506.2(b). Accordingly, a federal agency does not violate NEPA by relying on prior studies and analyses performed by local and state agencies.

(citations omitted).

4.2 Definitions

The following are definitions for terms hyperlinked in the text of the guidance:

Annual Average Daily Traffic (AADT): AADT is the total volume of traffic recorded on a road during one year divided by 365 to give the traffic volume on an average day.

Automatic Traffic Recorders (ATR): ATRs are permanent traffic recorders that are placed at locations across the road network to continuously count traffic, and possibly also traffic speeds, vehicle classification data and other attributes of the traffic on the road.

Base Model Year: an analysis year that is the calibration year for the travel model.

Base Project Year: an analysis year that can be different from the base model year; it is an updated base year that is validated and is as close as possible to the current year.

Calibration: calibration of travel models is the adjustment of travel model assumptions and parameters so that current observed conditions in the study area are reasonably reproduced.

Control Totals: control totals are county or district level land use forecasts of housing or employment. During forecasting, when adjustments are made within a study area to redistribute future housing or employment locations, the total amount of housing or employment is often maintained, or controlled, at a constant level for the larger geography.

Design Year: an analysis year that is an alternative future forecast year for the project. It may be earlier or further into the future than the planning horizon year.

Gravity Model: a form of trip distribution model that develops a synthetic trip table based on assumptions that the amount of travel between two zones is related to the size of the two zones in terms of the amount of trip generating and attracting land use in the zones, and the distance between the zones in terms of travel time, travel costs, and travel distance.

Open-to-Traffic Year: an analysis year that is the expected future year that the project will open; in the case of phased projects this might be a sequence of intermediate forecast years

Persistence Factor: a persistence factor is used in CO hot-spot analysis to convert CO concentrations based on peak (one) hour traffic to estimates of eight hour CO concentrations.

Planning horizon: a future forecast year used for long range transportation planning purposes, such as in the preparation of a region or state's long range plan. It is usually 20 to 30 years in the future.

Reasonableness Checks: reasonableness checks of travel models are checks that evaluate the travel model in terms of acceptable levels of error and its ability to perform according to theoretical and logical expectations. The checks are performed to ensure that the travel model tells a coherent story about travel behavior.

Validation: validation of travel models is the systemic testing of the sensitivity of the model to changes in inputs and assumptions to ensure that the travel model responds reasonably to transportation system changes and will have the ability to produce forecasts.

Planning

Induced Travel: Frequently Asked Questions

The term "Induced Travel" is highly controversial but typically misunderstood by both highway advocates and opponents. In an effort to raise the level of understanding, which will hopefully lead to more productive discussion of this issue, FHWA has prepared the following set of frequently asked questions and answers.

1. What is Induced Travel?

"Induced travel" is a term that has been widely used to describe the observed increase in traffic volume that occurs soon after a new highway is opened or a previously congested highway is widened. The term often appears in the popular press, and has been used by some advocacy groups to support their argument that "we can't build our way out of traffic congestion," because any increase in highway capacity is quickly filled up with additional traffic.

2. Is Induced Travel real?

Economists use the term "induced travel" to describe the additional demand for travel that occurs as a result of a decrease in the generalized cost of travel, including both travel-time and out-of-pocket costs. However, this term is often misused to imply that increases in highway capacity are directly responsible for increases in traffic. In fact, the relationship between increases in highway capacity and traffic is very complex, involving various travel behavior responses, residential and business location decisions, and changes in regional population and economic growth. While some of these responses do represent new trips, much of the observed increase in traffic comes from trips that were already being made before the increase in highway capacity, or reflect predictable traveler behavior that is accounted for in travel demand forecasts.

3. Where does the additional traffic on a new or widened highway facility come from?

In metropolitan areas, highway facilities are usually built or widened where existing traffic congestion has already decreased travel speeds during certain times of the day. To avoid the congestion, some travelers may have diverted to alternative routes, changed the time they make their trips, switched to different travel modes, traveled to other destinations, or decided not to make a particular trip at all. The new or widened highway facility can carry significantly more traffic before it becomes congested. Many travelers who previously took other routes or traveled at other times may switch to the new facility to take advantage of decreased travel times. The increase in traffic on the new facility resulting from these changes is largely offset by reductions in traffic along parallel routes and at other times of the day. The net effect on region-wide daily vehicle miles of travel (VMT) resulting from these travel behavior changes is minimal.

Decreased travel times may also encourage some travelers who previously used public transit to now make the trip by automobile. Travelers might also choose to travel to a different (more distant) destination for some trips such as shopping, or they may take a trip that they previously avoided altogether, because it was simply "too much trouble" to make under congested conditions. Each of these travel decisions can result in additional daily VMT on the highway system.

The above travel behavior responses are primarily responsible for the increases in traffic that are observed shortly after a new or widened highway facility is opened. Over a longer term, increased highway capacity may improve the accessibility of one geographic area relative to other areas in the metropolitan region, making it more attractive for development. This relationship between highway capacity and land development is discussed under the question, "Do increases in highway capacity cause 'urban sprawl?'"

4. Is Induced Travel a bad thing?

Induced travel can have both positive and negative consequences. Travelers who change their tripmaking behavior to use a new highway facility do so because they perceive some benefit. This benefit may be a reduction in total daily travel time or trip cost, the value associated with a new or different destination activity (e.g., shopping at a location with more variety or lower costs), or the opportunity to make a trip at a more convenient time. Many of these "users benefits" can be quantified, and are used to justify the costs of a particular highway project.

On the other hand, each user of a highway facility contributes to increased congestion on the facility. As congestion grows on the new facility, the overall user benefits attributable to potential travel time savings may decline. In addition, increased VMT due to new or longer trips can result in air pollutant emissions and noise above the levels that would occur without the additional vehicle travel. These environmental impacts may offset some of the direct user benefits, and should also be considered in evaluating the overall costs and benefits associated with a highway project. However, neither the magnitude nor direction of any of these impacts can be generalized, and must be determined on a case-by-case basis.

5. Is Induced Travel only associated with highway capacity improvements?

No. Improvements in any transportation system can lead to changes in travel behavior that will result in increased use of the system. A new bus route, rail transit line or commuter rail service is typically developed with the expressed purpose of "attracting new riders." These new riders may come from other transit routes or former auto users, or they may represent entirely new trips to locations that have become accessible by transit.

As auto trips are diverted to transit, traffic congestion on parallel highway facilities may lessen, at least temporarily. This reduction in highway traffic congestion may attract additional highway trips, similar to an increase in highway capacity.

Increased traffic on a highway can also result from operational improvements that reduce delays on the facility, such as improved signal timing or incident management.

6. Do increases in highway capacity cause "urban sprawl?"

"Urban sprawl" is a term that has been widely used to describe the rapid and uncontrolled growth of urban areas onto previously undeveloped land at the urban fringe. It has a popular connotation of large tracts of agricultural lands and wildlife habitats being converted to suburban single-family housing developments. Construction of new highways and even some types of transit improvements (e.g., commuter rail services) are often cited as major contributors to urban sprawl by making land at the urban fringe more accessible and therefore more attractive for development.

The relationship between transportation improvements and land development is extremely complex, and even less well understood than its impacts on travel behavior. While improved transportation accessibility in a particular corridor may indeed make land more attractive for development, other factors such as water and sewer lines, quality of schools and other public services, undevelopable land (e.g., slope, floodplains, etc.), land acquisition and development costs, impact fees, and zoning ordinances also play major roles in shaping where development will take place, its nature, and its intensity.[1] Furthermore, in many cases, the new development being attracted to one part of a metropolitan region often represents development that has been redirected from other parts of the region.

7. Do highways impact development differently in urban versus rural areas?

Yes. One important difference is that in urban areas, it is relatively rare for a highway project to provide new or substantially improved access to a large geographic area (e.g., an entire county). However, in many rural areas, a new highway may provide access to large tracts of undeveloped land. In fact, a number of projects were developed specifically for this reason. Moreover, in some of the rural cases, non-highway economic development initiatives were intentionally coordinated with the improved highway access. Typically, it takes at least half a decade for such efforts to show significant economic development. FHWA has studied two cases, one in Wisconsin and one in New York, where highway improvements were completed with the purpose to encourage economic development over a multi-county corridor. [2]

8. Can transportation planning tools forecast Induced Travel?

Travel demand forecasting tools account for some, but not all of the travel behavior that may contribute to increased traffic resulting from a new or widened highway. Current 4-step travel modeling procedures typically include mode choice and trip assignment models, which can be used to forecast those travelers who change from other travel modes or alternate routes, respectively. Trip distribution models that use highway impedances (e.g., travel time) that accurately reflect congested, peak-period conditions can also account for travelers who change their destinations in response to decreased travel times.

Current models are generally insensitive to the impacts of highway improvements on travelers who change their time of travel, or those who make entirely new trips. However, travelers who simply change their time of travel do not contribute to a net increase in regional daily VMT, and there is general agreement among transportation planning professionals that entirely new trips represent a relatively small share of the increased traffic appearing on a new or widened highway facility.[3]

Travel models also do not directly address the effects of changes in transportation accessibility on residential and commercial land development. The distribution of future land use is an input to travel models. Land use forecasts are often developed by consensus among various local jurisdictions within a metropolitan area, without serious consideration of the potential impacts of improved accessibility caused by specific transportation projects. Failure to account for the effects of improved transportation accessibility on land use may result in underestimation of new trips created by higher-than-forecast development growth within a specific area or corridor.

Although land use policy and development decisions are often beyond the control of transportation planning, improved forecasts of travel attributable to development growth may be obtained by revising land use forecasts based on changes in accessibility obtained from travel models, and then rerunning the travel models.

9. What is demand elasticity?

Elasticity is an indicator used by economists to measure how much the consumption of a good or service changes in response to a change in some other factor, such as income, population, or the price of the good. One of the most common elasticity measures used in transportation planning is the price elasticity of demand, often called "demand elasticity." Demand elasticity is defined as the percentage change in the quantity demanded for a good, divided by the associated percentage change in the price of the good. For example, a demand elasticity value of -0.5 means that a 10 percent decrease in the price of a good will result in a 5 percent increase in demand for that good. Demand elasticity usually has a negative sign to indicate that demand increases when the price goes down.

The magnitude of demand elasticity depends heavily on the scope and time frame over which travel demand is being measured. For example, a demand elasticity measured with respect to a single facility includes trips diverted from other routes or time periods and would be much higher than demand elasticities measured over a corridor or region.

10. Are demand elasticities reliable measures of Induced Travel?

A number of research studies have used demand elasticities to measure the increase in vehicle travel (usually measured as VMT) associated with a change in highway travel time or highway capacity (measured in lane-miles).[4] Various advocacy groups frequently cite these studies as evidence that induced travel is much greater than what is accounted for in conventional travel demand forecasts. However, extreme caution should be used when interpreting the results of these studies to make inferences about the magnitude of induced travel.

First, many of the studies that have purported to estimate induced travel using elasticities have compared changes in VMT to changes in lane-miles. By using changes in lane-miles instead of some measure of price (such as travel time), these studies overlook the importance of congestion. They imply that additional traffic would be induced by the added capacity even if there were no congestion initially on the highway facility. This conclusion is contrary to well established economic and travel behavior theory.

Second, despite the large number of empirical studies involving travel demand elasticities, there is very little agreement among researchers or transportation planning professionals on acceptable values of demand elasticities to use in estimating induced travel. Consequently, use of any single demand elasticity value to estimate induced travel is highly unreliable.

Finally, it is very difficult to measure how much of the induced travel implied by a demand elasticity is actually accounted for by travel forecasts. Clearly, some of the travel behavior changes that contribute to increased traffic are specifically addressed in travel demand models (e.g., mode and route choice), while other changes don't add new trips (e.g., time of travel). Therefore, indiscriminate application of demand elasticities can significantly over-estimate induced travel impacts.

11. What is FHWA's position on Induced Travel?

FHWA's position reflects the consensus of the transportation planning and travel behavior research community that induced travel is neither more nor less than the cumulative result of individual traveler choices and land development decisions made in response to an improved level of transportation service. Many, but not all, of these travel choice decisions are accounted for in current travel forecasting models or land use-transportation interaction models, and FHWA is supporting additional research and development to improve travel and land use models to address the others.

Travel forecasts represent a critical input in evaluating transportation investments, and should be based on analyses that take these travel choice decisions into account to the fullest extent possible. Where current technical limitations of analysis methods preclude accounting for some of these travel decisions, they should be identified in documentation describing the analysis. However, current technical limitations of travel models should not, in and of themselves, be sufficient cause to discredit the results of travel forecasts for planning and environmental decisions.

[1] Recent empirical studies conducted in Ohio and North Carolina indicate that local patterns of population growth (measured at the Census Tract level) are not highly correlated with increases in highway capacity. See Hartgen, D.T., *The Impact of Highways and Other Major Road Improvements on Urban Growth in Ohio*, The Buckeye Institute, Columbus, OH, Jan. 2003; and Hartgen, D.T., *Highways and Sprawl in North Carolina*, The John Locke Foundation, Raleigh, NC, Sept. 2003.

[2]The case studies are described on FHWA's Planning - Economic Development web page: http://www.fhwa.dot.gov/planning/economic_development/

[3] See, for example, *Working Together to Address Induced Demand: Proceedings of a Forum*, ENO Transportation Foundation, Washington, DC, 2002, pg. 10.

[4] See Cervero, R., "Induced Demand: An Urban and Metropolitan Perspective," in *Working Together to Address Induced Demand: Proceedings of a Forum*, ENO Transportation Foundation, Washington, DC, 2002, Appendix C.

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APPENDIX E-2

SUPPORTING DOCUMENTATION REFERENCED IN THE ICE TECHNICAL REPORT

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INTERIM GUIDANCE ON THE APPLICATION OF TRAVEL AND LAND USE FORECASTING IN NEPA

FEDERAL HIGHWAY ADMINISTRATION

MARCH 2010

EXECUTIVE SUMMARY

Travel and land use forecasting is critical to project development and National Environmental Policy Act (NEPA) processes. In light of the importance of forecasting, the high variation in practice, and the litigation risk involved, the Federal Highway Administration (FHWA) created this guidance to encourage improvement in how project-level forecasting is applied in the context of the NEPA process. While technical guidelines for producing forecasts for projects have been documented by others, little has been published on the procedural or process considerations in forecasting. This guidance attempts to fill that gap. The primary audiences are NEPA project managers, FHWA staff, forecasting groups at Metropolitan Planning Organizations (MPOs) and State Departments of Transportation (DOTs), as well as consultants that support MPOs and DOTs in conducting corridor and NEPA studies. Following this guidance is strictly voluntary. It is based on lessons learned and best practices and does not constitute the establishment of an FHWA standard. Not all studies are the same; therefore this guidance is intended to be non-prescriptive, and its application flexible and scalable to the type and complexity of the travel analysis to be undertaken.

This guidance document identifies seven key considerations:

- **Assess project conditions and scope the forecasting needs of the study:** It is crucial to scope the forecasting effort to meet the project analysis, decision-maker and stakeholder needs in the study area. For this reason it is useful to begin the forecasting process by understanding the requirements of the study and anticipating decision-maker and stakeholder interests with respect to forecasting.
- **Review the suitability of modeling methods, tools, and underlying data:** It is important that the study team review the suitability of available modeling methods and the underlying data, including consideration of the currency and quality of the model data and methods, and that they analyze the data and methods' ability to adequately examine alternatives.
- **Conduct scoping and collaborate on methodologies:** Scoping is a collaborative process involving the lead agencies, resource and regulatory agencies, and the public and is typically how a NEPA study begins. It is critical for the study team to document the broad agreements reached during scoping on the assumptions to be used for the land use and travel forecasting.
- **Objective application of forecasting in alternatives analysis:** The requirement for the alternatives analysis to be an objective evaluation makes it essential for the study team to apply forecasting data and methods objectively without any bias towards a particular alternative. Important considerations include understanding uncertainty in assumptions and forecasts and how induced demand and land development effects are taken into account.
- **Project management considerations:** NEPA studies are often complex undertakings and may be accompanied by various special considerations that warrant extra attention, such as the potential for re-do analysis loops and ensuring documentation consistency.
- **Forecasting for noise and air emissions analyses:** Land use and travel demand forecasting models are used to provide inputs to noise and air quality assessments. It is important that assumptions that are made in general forecasting applications as part of the NEPA study are consistent with those used in the noise and air quality analyses.
- **Documentation and archiving:** It is important for NEPA documentation to include enough technical detail to explain complex information in an understandable manner, and to describe how analytical methods were chosen, what assumptions were made, and who made those choices.

As a companion to this guidance, the FHWA is creating a document that will include case studies and best practices to help further the improvement of forecasting techniques at the project level. Training and technical assistance will also be made available to provide educational and peer exchange opportunities to State DOTs, MPOs, resource agencies, and the consultant community, to encourage needed dialogue and discussion to improve the state-of-the-practice.

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1.0 BACKGROUND

1.1 Rationale and Need for Guidance

Travel and land use forecasting is critical to project development and National Environmental Policy Act (NEPA) processes. Forecasts provide important information to project managers and decision-makers, and provide foundations for determining purpose and need. They are essential in evaluating: the performance of alternatives; the estimation of environmental impacts such as noise and safety (based on traffic volume or exposure) and emissions (based on traffic volume and speed); induced land development effects (change in land development patterns due to changes in accessibility); and resulting indirect and/or cumulative effects (such as watershed effects). In short, travel and land use forecasting is integral to a wide array of corridor and NEPA impact assessments and analyses.

Forecasting methodologies and their applications are often a source of significant disagreement among agencies and interest groups, and are frequently the focus of project-level litigation. While many of the issues raised are technical and methodological, often they are process-related or procedural in nature: misunderstandings regarding what work was done, what assumptions were made or input used, how the methods and approaches were chosen, and how the procedures were carried out. Forecasting is not a heavily legislated or regulated area of science, and is thus mainly driven by professional practice. This situation makes assessments of standards of practice difficult, and results in a large variation in practice and experience among transportation and resource agencies and consultants.

In light of the importance of forecasting in project development and NEPA, the high variation in practice, and the litigation risk involved, the Federal Highway Administration (FHWA) created this guidance to encourage improvement in the state-of-the-practice in relation to how project-level forecasting is applied in the context of the NEPA process. While technical guidelines for producing forecasts for projects have been documented by others,[1] little has been published on the procedural or process considerations in forecasting (how to apply forecasting in the context of NEPA). This guidance attempts to fill that gap.

1.2 Process for Developing Guidance

In 2007, the FHWA initiated a project to provide practitioners and stakeholders with process and procedural guidance on how to apply forecasting in the context of project development and NEPA studies. The project was scoped to include:

- Creation of an FHWA expert panel, consisting of modeling, NEPA, and planning experts to advise the project
- Outreach to stakeholders and interest groups
- Formulation of project development and NEPA guidance and a review of relevant case law
- Development of a guidebook to include case studies and best practice examples
- Creation of training materials and technical assistance

Early in 2008, the FHWA expert panel was assembled to discuss and provide advice on the purpose and format of the guidance, and how to move forward on supporting activities. The panel included active participation by FHWA headquarters and field offices. The panel provided invaluable input to the guidance development process. In addition, during 2008 and 2009, the FHWA Office of Chief Counsel developed a case law summary that related forecasting issues and the NEPA process; this was also used to inform the guidance. Information on the project was provided to stakeholder and interest groups at various national meetings and venues.

[1] See *NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning and Design* (1982), available at: http://www.oregon.gov/ODOT/TD/TPAU/references.shtml#NCHRP_Report_255

1.3 Using the Guidance

This guidance is intended to provide assistance to NEPA and forecasting practitioners on improving how forecasting is used and applied in the project development and NEPA processes. It does not examine the details of how to calibrate and validate models; rather, it provides procedural and process considerations in developing forecasts in NEPA studies. The primary audiences are NEPA project managers, FHWA staff, forecasting groups at Metropolitan Planning Organizations (MPOs) and State Departments of Transportation (DOTs), as well as consultants that support MPOs and DOTs in conducting corridor and NEPA studies.

Following this guidance is strictly voluntary,[2] and it is suggested that it be adjusted to the individual planning and project contexts, and the scale, size and capabilities of the project and the lead agencies. The guidance is based on lessons learned and best practices and does not constitute the establishment of an FHWA standard. Not all studies are the same; therefore this guidance is intended to be non-prescriptive, and its application flexible and scalable to the type and complexity of the travel analysis to be undertaken.

It is also intended that this guidance will improve communication between forecasters and NEPA practitioners. Travel and land use forecasters are encouraged to demonstrate and explain the validity of the forecasting process along with the reasonableness of the forecasts as a way to mitigate litigation risk. Significant efforts were made to consider relevant case law in the creation of the guidance and, where applicable, specific cases are cited. Hopefully, applying this guidance will assist agencies in creating better and more legally defensible forecasting applications.

1.4 Evolving Forecasting Methods

The state-of-the-art and the state-of-the-practice in travel forecasting are always evolving, and the practice typically changes based on careful consideration of the potential or known benefits and costs of different approaches. While this guidance outlines important considerations in developing and documenting forecasts, the intent is not to advocate specific technical model design elements or models to produce forecasts. Because the practice is constantly evolving, forecasting methods are evaluated based on what peers are successfully doing with a reasonable effort.[3]

Travel forecasting methods are evolving because of: (1) advancements in software and hardware; (2) improved data collection methods; (3) a need for improved approaches for analyzing the wide array of transportation-related policies, pricing initiatives, and investments; and (4) the evolution of planning and project development processes and regulations. Each of these factors was considered when this guidance was drafted.

Clearly, it is very important that the methods utilized to produce forecasts are defensible and that the forecasts are reasonable. The specific methods used to produce forecasts can and do vary widely based on the timeframe for the study, and the defensibility of the methods must be judged based on the needs of the study. While certain aspects of models and approaches to forecasting are relatively common, well understood, and accepted, it can often be difficult to judge the merits, costs, and schedule considerations of one modeling approach over another. Additionally, it is not always the case that more difficult or costly modeling methods produce the best forecasts. One motivation for this guidance is to present a framework for considering these challenges in the context of a NEPA study where the forecasts may be questioned and the methods used to produce forecasts will be reviewed and compared to applications elsewhere.

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[2] There are instances where this guidance references regulatory requirements; following those regulatory requirements is not voluntary

[3] For more information about the latest forecasting techniques see the FHWA's Travel Model Improvement Program (TMIP) website: http://tmip.fhwa.dot.gov, or contact TMIP staff

2.0 GUIDANCE

This guidance document is organized around seven key considerations: (1) the project conditions and forecasting needs of the study; (2) the suitability of modeling methods, tools, and underlying data; (3) scoping and collaboration on methodologies; (4) forecasting in the alternatives analysis; (5) project management considerations; (6) forecasting for noise and air emissions analyses; and (7) documentation and archiving.

2.1 Project Conditions and Forecasting Needs

It is crucial to scope the forecasting effort to meet the project analysis, decision-maker and stakeholder needs in the study area. For this reason it is useful to begin the forecasting process by understanding the requirements of the study and anticipating decision-maker and stakeholder interests with respect to forecasting.

Far too often, the forecasting process is not given enough thoughtful proactive attention, and it is not scoped in a detailed manner that will minimize or account for potential issues or problems. It is common for one of the first exercises to be the production of a no-build forecast, with little consideration given to the credibility of and the assumptions made in the forecast. If, instead, the NEPA study team[4] determines the appropriate level of the forecasting effort at the outset and begins by ensuring the suitability of the tools, then the NEPA process can proceed more reasonably.

2.1.1 Conceptual Review of Anticipated Analysis

The NEPA lead agencies often define the study area while also developing the purpose and need statement. They typically base the boundary of the study area on the logical geographic termini, the project purpose and need, and the expected limits of potential impacts. It is important that the study area be large enough to encompass the range of alternatives that will be developed to meet the project purpose and need. The area within which transportation impacts can be measured will likely be substantially larger than the area within which direct environmental impacts are measured. It is important to ensure that the forecasting is extensive enough in its geographic reach to reasonably estimate the transportation and land development impacts.

An early assessment of the current and anticipated travel demand in the study area is important to the success of both the NEPA process and the forecasting effort. It is helpful to document what is understood about the existing travel demand and growth potential in the corridor or area being evaluated. For example:

- What is the nature of demand in the corridor in terms of trucks versus passenger cars, through versus local trips, or non-discretionary trips (such as commute to work) versus discretionary trips (such as shopping trips)?
- Are there unique major generators in the corridor?
- What magnitude of growth in travel demand is anticipated?
- To what extent is the need for the project based on today's travel conditions versus anticipation of growth?

Answers to these questions, as well as others, can inform data collection and help assess the suitability of the forecasting models.

[4] "The study team" refers to the lead agencies and their staff and consultants conducting the analysis for the study

2.1.2 Establishment of Forecasting Analysis Requirements

Once the lead agencies have considered the anticipated study needs, it is important to establish the travel forecasting requirements for the study. The principal forecasting analysis requirements to be defined early in the process include:

- Specifying the analysis years
- Identifying the geographic scope of the transportation and land development analysis
- Considering the level of detail required in the analysis
- Outlining an initial list of what travel and land use-related or -dependent impacts are to be estimated (see section 2.4.1 on direct, indirect, and cumulative impacts).

2.1.2.1 Identifying Analysis Years

Selecting the appropriate timeframes for analysis is essential. Forecasters typically use a 20- to 30-year horizon for long-range transportation planning purposes. In addition to a base year and a future forecast year, intermediate forecast years are usually considered, including (most notably) the opening date of the project. It is common for these intermediate forecast years to be chosen to correspond to future planning horizons already examined in the region or State's long-range plan since modeling inputs, such as land use forecasts, for these years are readily available. Table 1 presents a list of possible analysis years.

Table1: Possible analysis years for travel forecasting

Base Years	**Base model year**	The calibration year for the travel model
	Base project year	This could be different from the base model year; it is an up-dated base year that is validated and is as close as possible to the current year
Forecast Years	**Open-to-traffic year**	Expected future year that the project will open; in the case of phased projects this might be a sequence of intermediate forecast years
	Plan horizon year	A future forecast year that often corresponds with the long-range plan horizon
	Design year	An alternative future forecast year for the project that may be earlier or further into the future than the forecast year

The appropriate base and future analysis years for a particular study may not align with the available analysis years, which may lead the study team to update the travel model's base year and/or create new land use and travel forecasts for NEPA analysis. Two common examples of this situation are:

- The travel model's base year is several years ago and travel demand in the study area has changed. A more recent base year, as close to the current year as possible, is needed so that the travel model adequately represents current travel demand in the study area.
- The planning horizon year is different from the design year of the project. For example, the planning horizon is 25 years in the future and the design year of the project is 30 years.

Similarly, air quality or noise analysis requirements are a consideration; for example, when a hot-spot or noise analysis is needed this may require the selection of a unique analysis year(s) for that work.[5]

It is important for assumptions regarding open-to-traffic years to be explicit and discussed in the documentation. Also, a project might not rely on future performance to meet purpose and need, and its "design year" may be shorter, or the project is designed to manage current congestion. In that case, while

[5] See Section 2.5 for more information

forecasts could be required for potential impacts, forecasting to support purpose and need is less essential.

Phasing and sequencing considerations are also crucial when the study team is establishing forecasting analysis requirements. If an alternative will be implemented over time, or if alternatives could be implemented with phases in different sequences (for example the sections of a new highway may be built in phases as travel demand increases over time) then it is important for these assumptions to be discussed in the documentation as they will lead to particular analysis needs, such as intermediate analysis years and additional road network and land use assumptions.

2.1.2.2 Geographic Scope of Analysis

It is important to ensure that the forecasting is extensive enough in its geographic reach to estimate travel behavior, transportation, and land development effects.[6] Unique issues may arise when applying a model to evaluate a project near a model boundary. In such cases, model refinements may be needed. In these boundary conditions the traffic analysis zones (TAZs) are typically large, the coded road network is sparse, and travel patterns are heavily affected by external demand. Taken together, these issues lead to both less detail and less model sensitivity. If the project is proximate to the boundary of the model area, it is suggested that the study team code a more detailed road network. It is also suggested that the study team consider both adding more detail to the TAZ structure and expansion of the model to extend its boundary. Refining or expanding the model may lead to significant efforts such as the collection of additional land use data and the need to forecast land use changes for that area, the need to do additional model validation, or, in the case of expanding the model, the integration of land use data and forecasts from a different planning jurisdiction.

2.1.2.3 Level of Detail Required in the Analysis

Using a variety of methods, one can produce forecasts and output indicators at a regional scale (e.g., regional vehicle miles traveled, or VMT), at a microscopic scale (e.g., intersection turning movements), and at a corridor scale (e.g., difference in roadway volumes under two scenarios).[7] It is important for the lead agencies to determine the appropriate level of detail for forecasting analysis based on the specifics of the study, including considerations related to the stage of the project development process and stakeholder issues. It is suggested that performance measures reflect non-automobile impacts, such as transit use. It is important for the lead agencies to select the performance measures so that the impacts of each alternative can be fully explained in the NEPA documentation. It is also important to select the performance measures that can illustrate the relative merits of each alternative in the context of the project purpose and need.

The project development process can be long, with varying levels of forecasting detail typically necessary at different stages in the process; it is essential to avoid confusing *detail* with *accuracy.* Because more detail tends to require more time and effort, it is generally advised to begin a study focusing on more aggregated and large-scale impacts, particularly when the possible alternatives are numerous (prescreening) or forecasting methods are being refined. Different forecasting tools and processes allow for analysis at different geographic scales; it is important for the study team to judge and explain which modeling tools are appropriate for which analyses and also to recognize the level of detail required at each stage in the study. Forecasting is an iterative process, and with iteration generally comes more confidence and ability to add detail to better inform complex decisions.

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[6] Often different study areas exist on the same project for a variety of reasons, for example the Area of Potential Effect under Section 106 of the National Historic Preservation Act will not be the same as study areas for air or noise impacts or for wetland mitigation purposes

[7] See, for example, *Volume I: Traffic Analysis Tools Primer* (July 2004) in the FHWA Traffic Analysis Toolbox

2.1.3 Consideration of Tools Required to Forecast Needs

It is suggested that the lead agencies prepare a brief history describing the tools that have been used to make forecasts in the corridor and region. Once the available data and models have been reviewed, it is important for the study team to consider what data and tools are appropriate for the analyses. Depending on the needs of the study, this can include consideration of readily available data and models, as well as supplementing what is available. As the study team considers applying current models to evaluate the increasingly complex strategies and policies of interest in the project area, it is important to assess the limitations and sensitivity of those models. By identifying the significant issues related to alternatives to be considered, such as pricing, high-occupancy vehicles (HOVs), transit, and transportation control measures, the study team can ensure that methodology and analysis decisions are made with these factors in mind.

In many areas where land use and travel demand models are frequently used in planning and project development, multiple users may exist. For example, modeling staff within the MPO or DOT may be undertaking modifications to the land use or travel model as part of an ongoing model improvement process. In addition, consultants working on other studies in the region may be incorporating additional model functionality and/or correcting existing model errors and deficiencies. It is therefore critically important that the study team consider modeling tools under development, or ones that might be developed in the short term, for inclusion in the land use and travel forecasting process, especially when an improvement to the model would directly affect the project being studied. This is particularly true when the study team expects the project development process to be relatively long or complicated. See section 2.2.1 for additional discussion of these issues.

2.1.4 Review of Prior Forecasts and Technical Issues

Before producing new forecasts, it is useful to critically review past efforts to be aware of the prior work and to improve on or complement that work. In its review of prior planning studies and prior NEPA studies either for the current study project or other projects in or close to the same study area, it is important for the study team to consider travel and land use forecasting needs, in terms of both the forecasts themselves and any known technical concerns related to forecasting. In many cases, projects have been in the planning phase for 10, 20, or more years, and transportation plans identify specific alternatives. To some degree, past decisions are supported by these prior analyses. Therefore, it is critical to assess the comprehensiveness and usefulness of past analyses and compare new analyses and forecasts to previously documented forecasts. In some cases, lead agencies in NEPA may choose to directly use previously developed forecasts. It is recommended that this decision be taken with some care, as previously developed forecasts may not have been subject to the same rigorous review that forecasts produced as part of a NEPA study are likely to face. See section 2.1.5 below for more detail.

To the extent that prior litigation has raised issues related to land use and travel forecasting in the project's region or identified issues in the corridor germane to forecasting, it is important to ensure that these issues are fully addressed or that prior responses are understood and reconsidered. It is important for the study team to describe and clearly and completely address both past judgments in cases pertaining to the project and any ongoing litigation. It is also important to consider and adequately address the less obvious cases that have stalled or stopped planning and project development efforts in other regions with relevance to the subject project. Remedying the concerns raised by legal findings and opinions may lead to significant changes in the team's approach to the analysis for the study.

2.1.5 Incorporating Analyses Done in Transportation Planning Studies

Often, forecasts are prepared for a project or corridor prior to the beginning of the NEPA process. Forecasting may have been done as part of system-level planning activities, or as part of corridor, feasibility, or sub-area studies. At the system level, major efforts include defining the transportation problem, and developing and testing potential solutions. Many times these problems and potential solutions are identified and tested during planning because that is the scale at which they are appropriately analyzed. For example, developing system-level land development estimates is best done at a regional level, where systemic interactions between transportation and land use policies and the characteristics of existing land availability and transportation accessibility can be analyzed. Travel and land use forecasting procedures play a central role in these analyses.

Corridor, feasibility, and sub-area studies done in a transportation planning context are not as detailed as analyses performed for project-level NEPA alternatives analysis, but are often conducted to refine purpose and need in a corridor, to screen out unreasonable alternatives, and to preliminarily evaluate potential impacts of alternatives, including travel and land development effects. Again, forecasting is critical to performing these studies. All too often, these analyses are redone in the NEPA process, resulting in duplication of effort. This situation also can result in potentially undermining past analyses, and discounting public and agency involvement in the prior studies.

Recognizing these issues, the FHWA and the Federal Transit Administration (FTA) have worked over the past decade to improve the ability of agencies to utilize analyses done as part of planning studies in the NEPA process. Typically referred to as "linking planning and NEPA," these efforts have culminated in a revision to 23 CFR Part 450 (the FHWA and FTA regulations for the Statewide and metropolitan transportation planning process), and 23 CFR Part 771 (FHWA and FTA NEPA implementing regulations).[8] These regulatory provisions represent new authority to the FHWA, FTA, State DOTs, and MPOs to use decisions and analyses conducted in transportation planning to be used in the NEPA process. Since forecasting is so central to planning studies and analyses, the methods and results can be incorporated by reference in the NEPA process. Such analyses or results should be made available during the NEPA scoping process.

However, the regulatory authority discussed above does not come without conditions.[9] The NEPA lead agencies determine the applicability and appropriateness of the methods used and the continued validity of the results before they can be used on a specific NEPA study or project. The studies must have contained a reasonable opportunity for public review and comment, must be adequately documented, and must have had appropriate interagency involvement in the efforts. From a forecasting perspective, the technical documentation must be adequate to explain and defend those decisions in the context of NEPA. Also, early public and interagency involvement in the forecasting efforts for the planning studies is essential as it helps build trust and comfort with how these analyses were performed, and increases the comfort level in using these forecasts in the NEPA process.[10]

2.1.6 Documentation of Project Conditions and Forecasting Needs

This section of the guidance has discussed the importance of beginning the analysis effort with a careful review of forecasting needs. To ensure that the findings of this review are retained and can be referred to as the analysis progresses, it is important for the study team to produce documentation of this work. A possible structure for the documentation follows.

- Conceptual review of anticipated analysis
- Establishment of forecasting analysis requirements
  - Identifying analysis years
  - Geographic scope of analysis
  - Level of detail required in the analysis
- Consideration of tools required to forecast needs
- Review of prior forecasts and technical concerns
- Incorporating analyses done in transportation planning studies

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[8] See 23 CFR § 450.212 , 450.318, and Appendix A, and 23 CFR § 771.111(a)(2) and 771.123(b)

[9] See 23 CFR § 450.212 (b), 450.318 (b) and Appendix A

[10] For more information see the Planning and Environmental Linkages website at: http://environment.fhwa.dot.gov/integ/index.asp

A key purpose of this documentation is to demonstrate that these issues have been considered by the study team. In addition to documenting the decisions that were reached regarding technical issues such as selection of analysis years, such documentation can demonstrate the process and rationale used to make the decision, the information considered in the decision-making process, and who was involved in the decision-making process. In other words, it is very important to document that the decisions made are reasoned and thoughtful.[11]

2.2 Suitability of Modeling Methods, Tools, and Underlying Data

Once the conditions and forecasting needs of the study have been assessed, including a consideration of the forecasting tools and requirements, it is suggested that the study team review the suitability of available modeling methods and the underlying data. For this, it is important for the study team to both consider the currency and quality of the model data and methods and analyze the data and methods' ability to adequately examine alternatives. The purpose of FHWA guidance on travel models and other published resources[12] is to promote good practice. Good practice in model development and application has positive consequences in project development.

2.2.1 Age of Forecasts, Models, Data, and Methods

It is important for the study team to establish how current the land use forecasts, travel demand model, data, and methods are before the alternatives can be analyzed. This process may begin with identifying whether the land use forecasts and the travel demand model are the current versions adopted by the MPO or DOT and whether the methods proposed for the analysis conform to current Federal, State and local requirements, as applicable. Section 2.5.2 explains that it is also important for the study team to identify which methods are being used by concurrent NEPA studies in the same region. However, requesting and receiving the latest land use forecasts and the travel demand model available from the MPO or DOT is only the first step. It may be advisable to update certain elements of the land use forecasts, travel demand model, or model data if they are based on data that were collected a significant time prior to the study. For example, trip generation rates based on survey data collected 20 years before the study may need to be updated. It is important that the study team ensures that the data reflect the most up-to-date assumptions about the relevant transportation infrastructure and land use and socioeconomic conditions. However, there is a limit to the scope of updates to forecasts, models, and data that are required as part of the analysis for a NEPA study. If the costs for updating tools and collecting data would be "exorbitant" then 40 CFR § 1502.22 (b) may apply. It is important to document decisions regarding model updates and also why the decisions were made.

If the study team refines a land use forecast, a travel demand model, or their inputs, it is critical that the study team knows which forecast and model version are being used and, if necessary, institute a system to track and manage the versions of forecast and model tools and inputs. It is important to do more than simply state that "the model" was used to generate travel forecasts. Because the travel demand model and land use forecasts for a particular region may often be in flux (as discussed in section 2.1.3), it is recommended that the study team use the most recently adopted version of the land use forecasts and the travel demand model. Although forecast and model refinements between versions may be few and unrelated to questions pertaining to the study, it is possible that the differences in results produced by a "Version 2.2" versus a "Version 2.3" could be substantial.

An MPO or DOT will not typically adopt a new version of a travel demand model until it has been validated and the results checked for reasonableness, although the thoroughness of these checks varies. It is important to keep in mind that a version of a travel model is made up of both the model code and the various model inputs, such as land use forecasts. Therefore, it is necessary to confirm that the proper

[11] See case law summary Section 4.1.2,discussion of *North Buckhead Civic Ass'n v. Skinner*, 903 F.2d 1533, 1543 (11th Cir.1990)

[12] See, for example, the resources section of FHWA's Travel Model Improvement Program website: http://tmip.fhwa.dot.gov/resources

model code is being used with the corresponding set of model inputs that together represent the current adopted version of the model.

During the course of a study, an MPO or DOT may adopt a new land use forecast or a new version of the travel demand model. In this situation, it is important for the study team to consider the implications of changing their analysis approach to use the newly adopted forecast or model; section 2.5.1 on consideration of the potential for re-do analysis loops discusses this issue.

2.2.2 Calibration, Validation, and Reasonableness Checking of Travel Models

The calibration, validation, and reasonableness checking of travel models constitute an important and necessary sequence of steps that are taken to prepare a travel model for making reasonable forecasts.

- Calibration, where adjustments are made to the model so that current observed conditions in the study area are reasonably reproduced, ensures that the travel model's forecasts are built on a foundation that is a good representation of existing travel characteristics.
- Validation, where the sensitivity of the model to changes in inputs and assumptions is tested, ensures that the travel model responds reasonably to transportation system changes and will have the ability to produce forecasts.
- Reasonableness checks are additional tests of a model's forecasting performance, including evaluating the travel model in terms of acceptable levels of error and its ability to perform according to theoretical and logical expectations. The checks help to ensure that the model tells a coherent story about travel behavior.

Forecasts from appropriately calibrated and validated models are likely to be more useful throughout a study and raise fewer questions. It is important to demonstrate that the modeling methods proposed for the study corridor have a strong foundation in observed data, are able to represent change, and credibly compare alternatives in a forecasting setting. The calibration and validation of travel models provide the best evidence that the models adequately represent the transportation system supply characteristics and traveler behaviors that are crucial to subsequent forecasts for NEPA studies. Consequently, the lead agencies have a substantial interest in exerting appropriate efforts to calibrate and validate models.

In the context of a NEPA study, it is important for the study team to focus any calibration and validation efforts that they undertake on the study area. Typically, a regional travel demand model will have been adequately calibrated and validated at least at a regional level prior to adoption. While it is important for the study team to critically review the documentation of this effort, it is suggested that more emphasis be placed on checks at the study area level.

It is suggested that the study team scale their calibration and validation effort according to the scale of the analysis, such as its geographic scope. For example, studies that involve the analysis of major changes to transportation system supply with impacts across a large study area require a much broader calibration and validation effort than a simpler project with a smaller study area.

There are several published sources[13] documenting useful calibration and validation checks, and the key elements of a comprehensive review are outlined below.

Calibration - A meaningful calibration effort would include:

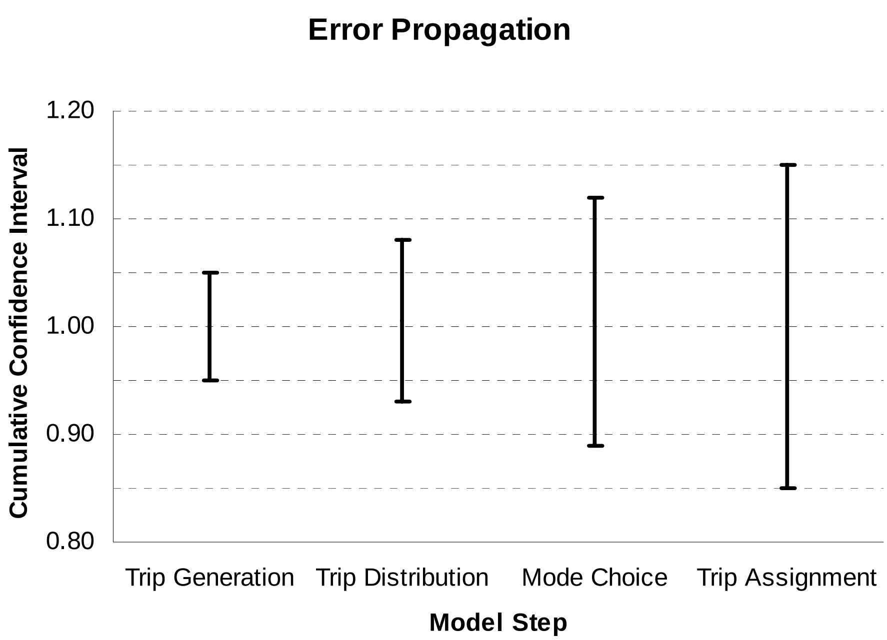
- Review of trip generation particularly at key generators in the study area
- Detailed inspection of modeled origin–destination patterns in the study area to demonstrate that they compare closely to observed travel within and through the study area

[13] See, for example, *Travel Model Improvement Program Model Validation and Reasonableness Checking Manual*, available at: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/mvrcm/ ; *Federal Transit Administration Guidance on New Starts/Small Starts Policies and Procedures*, available at: http://www.fta.dot.gov; several state DOTs such as California, Michigan, Ohio, and Oregon maintain guidance on model calibration and validation

- Careful comparison of point-to-point travel times or speeds on individual road segments, to demonstrate that the model responds appropriately to changing traffic volumes
- Comparison of modeled traffic volumes with traffic counts both for individual roadway segments and at more aggregate levels such as throughout the study area
- Network checks to identify coding errors in, for example, posted speeds and capacities.

Figure 1[14] shows the possible effect of compounding error in travel models, where each step in the modeling process increases the overall error. This underscores the importance of identifying sources of error in each element of the travel model. Implementing a calibration effort such as described above is aimed at minimizing error in each step in the modeling process.

Figure 1: Effects of compounding error in model validation



Validation and Reasonableness Checking – It is important for the study team to conduct validation of the travel model at a level of detail that supports reliable forecasts and output indicators, focusing on the ability of the model to represent the effects of transportation system changes. This suggests validation of the travel markets deemed important in the study corridor by analyzing, for example, their trip generation, geographic distribution of trips, traffic volumes, and travel speeds.

The validation effort involves reviewing forecasting results, and results of sensitivity tests, to evaluate the credibility of the changes produced by the model. Sensitivity tests check the responsiveness of the travel forecasting tool to changes in the transportation system, socioeconomic data, and transportation policies. Often, sensitivity is expressed as the elasticity of an independent variable. For example, modelers can express a travel model's sensitivity to the effects of a parking rate increase in an area by relating the increase in parking prices to the reduction in demand for travel to that area.

Reasonableness checks include the comparison of input such as rates and parameters, outputs such as total regional values, values for subregions covered by the model, and logic tests. Model parameters can be checked for consistency against observed values, parameters estimated in other regions, or secondary

[14] Adapted from Figure 1-3 from *Travel Model Improvement Program Model Validation and Reasonableness Checking Manual*, available at: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/mvrcm/

data sources. A model can be evaluated in terms of acceptable levels of error, its ability to perform according to theoretical and logical expectations, and the consistency of model results with the assumptions used to generate them.

There are several useful types of validation and reasonableness checks, including the following:

- **Forecasting buildup to understand how the different model inputs contribute to changes from the base year to the forecasting year.** It is useful to isolate and understand changes in travel patterns and congestion in a corridor that are due to land use growth versus transportation system expansion. Other inputs that may be important in a corridor include assumptions related to external trips and special generators. This series of tests could easily be conducted using the long-range transportation plan model inputs. Section 2.4.2 discusses the importance of the study team explicitly defining and documenting the future no-build highway (and transit) networks. Understanding the impact of planned changes to the transportation system is an important element of the forecasting buildup.
- **Interpretation of the story told by the models themselves about the behavior of travelers.** This test helps to ensure that the various parameters, assumptions, network coding conventions, and other decision rules in the models tell a coherent story about travel behavior. This helps prevent (by highlighting the need for correction) implausible relationships and explains the properties of the models to non-travel forecasters.
- **Demonstration of reasonable predictions of change between today and the future as well as in response to changes in the transportation system.** This last set of tests adds a major new dimension to the understanding of the properties of a new model set: the ability to respond reasonably to demographic growth and consequent changes in congestion, and to produce coherent responses to major changes in the transportation network.

2.2.3 Calibration, Validation, and Reasonableness Checking of Land Use Forecasts

Land use forecasts are one of the foundations upon which travel demand forecasts are built and, as such, it is important for the study team to invest effort in reviewing and checking both base year land use for accuracy and future year land use forecasts for reasonableness, and to understand the implications of growth on the transportation forecasts. A range of land use forecasting techniques may be used during a study from more qualitative techniques such as expert panels to quantitative techniques utilizing land use models. At the simplest level, it is important to understand how much of the justification for a project is based on current demand versus future growth and the implications of these findings related to the uncertainty in the forecasts; at a more complex level, where the study team's analysis involves more complex land use analysis tools and models, a process akin to the calibration and validation of the travel model described above may be necessary.

As discussed in the context of reviewing the travel demand model, it is suggested that the study team scale their land use review effort according to the scale of the analysis, such as its geographic scope and potential for land development or redistribution effects. Section 2.4.6 discusses in detail considerations for addressing land development or redistribution effects in the preparation of project level forecasts.

A review of the base year land use in the study area will often be undertaken as the first step of travel demand model calibration and validation checks. Published sources[15] discuss recommended approaches to check base year land use and socioeconomic data, and also explain the importance of checking these input data to reduce the level of effort needed to perform other validation steps; indeed, it is critical as errors in these data propagate through the subsequent steps in the model system (as shown in Figure 1).

[15] See, for example, *Travel Model Improvement Program Model Validation and Reasonableness Checking Manual*, available at: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/mvrcm/

In addition, errors that appear unimportant at a regional level may increase in significance as they are proportionally more important at a study area level.

The complexity of the review of the land use forecasts will depend on the approach selected for land use forecasting. A general framework for producing land use forecasts is as follows:[16]

- *Understand existing conditions and trends*: This principally involves assembling data that will be necessary to conduct the analysis.
- *Establish policy assumptions*: This step involves determining currently anticipated changes in regulatory or economic policies such as zoning, environmental regulations, and impact fees.
- *Estimate regional population and employment growth resulting from change in accessibility*: This step uses local population and employment trends; broader State and national economic industry trends; and economic forecasting models.
- *Inventory land with development potential*: This step identifies undeveloped and underdeveloped land and, in combination with environmental restrictions and zoning regulations, quantifies land available to absorb growth.
- *Assign population and employment to specific locations*: This step uses land availability, the cost of development, and the attractiveness of various areas to estimate the amount and type of growth that will occur in each zone.

The approaches used in this process vary from qualitative techniques (such as utilizing an expert panel and/or the Delphi process) to quantitative models to forecast regional population and employment changes (such as regional economic impact models) to land use models that are integrated with travel demand models.

For project level analysis in cases where alternative specific land development effects are not expected, it is common for the study team to review adopted regional level land use forecasts or use an integrated land use and travel demand model that has been calibrated at a regional level, rather than producing new forecasts. It is important that the study team reviews and understands how each of the steps in the forecast framework was undertaken and how each step applies to the land in the study area. This review might include checks of:

- Whether regional level trends used to produce forecasts have been reflected historically in the study area
- The accuracy of the land inventory (such as the amount of vacant land) for the study area
- Pending development/redevelopment proposals, particularly those that will exceed regulatory limits on density or other factors
- The reasonableness and feasibility of the resulting development allocations to the study area.

Consultation with local governments and others with knowledge of land development patterns can enhance this process.

A critical element of this review is for the study team to understand the future transportation network assumed in the land use forecasts, and particularly whether any of the alternatives under consideration are included in the transportation network assumed in the land use forecasts (see Section 2.4.2).

2.2.4 Policy Evaluation Considerations

Forecasting models have been widely used to estimate the effects of standard roadway capacity improvements, like road widening or the addition of a new road. While these types of forecasting efforts can still be complicated and the models may need refinement to be useful, models are built with the basic intention of modeling roadway and major transit capacity improvements. Increasingly, however, requests

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[16] Adapted from *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*, prepared for AASHTO by ICF Consulting, March 2005

are being made to assess the impacts of transportation demand and supply policies that models were not designed for when they were originally constructed. For example, alternatives in a study may include ramp metering to better manage flow on limited access facilities, a transit technology not currently existing in the region, or various pricing strategies. While some models are equipped to assess these policies, many that are routinely applied in current studies are not. Determining the extent to which some of these policies will be major components of a NEPA study will help ascertain the amount of effort it may require to test alternatives and model changes and/or adjustments that may be needed.

2.2.4.1 Evaluating Transportation System Management/Transportation Demand Management Strategies

Transportation system management (TSM) strategies, or intelligent transportation system (ITS) strategies, are put in place to reduce both recurring congestion and incident-related congestion. To the extent TSM strategies affect recurring congestion, the FHWA recommends that they be represented in road or transit networks as capacity improvements relative to facilities without these improvements. Additionally, ITS technologies are increasingly being implemented to monitor and collect travel data (e.g., speeds and volumes) and in this respect are valuable sources of model calibration and reasonableness checking data that can be used to assess capacities, free-flow and congested speeds, volumes by time of day, and the relationship between speed and volume.

Transportation demand management (TDM) strategies vary widely and are designed typically to discourage single-occupant vehicle use during peak hours. These include, but are not limited to, changes in parking policies, ride-sharing, employer-subsidized transit passes or van pools, policies allowing flexible work schedules and telecommuting, HOV lanes, and road or parking pricing. Since these policies vary dramatically in terms of the scale of the impacts and their cost, different analytical approaches may be warranted in each case. Generally speaking, it is reasonable to assess the impacts of the employer-based policies by reducing the number of auto trips to specific destinations during peak hours by a percentage agreed to be reasonable to account for the relevant policies. This exercise can quickly become daunting in its detail, so it is best to acknowledge the effects and develop a quick and reasonable approach to account for the effects if necessary.

2.2.4.2 Evaluating Managed Lanes and Pricing Strategies

Managed lanes and in particular roadway pricing are crucial elements of some regions' networks and nationally are becoming particularly relevant as States and regions consider how to pay for maintaining and expanding their road networks. However, models are typically not well equipped to evaluate such policies as HOV lanes, high-occupancy toll (HOT) lanes, or tolled facilities. The consideration of managed lanes investments and in particular road pricing policies involves thoughtful consideration of how different travelers trade-off time and cost, along with a realistic representation of travel times and trip patterns.

While there are different methods that can be used to estimate demand for a managed lane or a toll facility (e.g., diversion curves, toll mode choice models, or traffic assignment methods that incorporate time and cost), for each approach to be successful it is recommended that the basic components leading to the demand estimate (trip distribution patterns by market segment, values-of-time, and travel time differences) be demonstrated to be reasonable and reliable. Traffic assignment models typically produce better estimates of volumes than speeds and, in the case of managed lanes, both are important.

Road pricing strategies also involve reliable estimation of the revenue potential for a facility, which adds an additional layer of complexity to the forecasting exercise. Typically, for projects involving private investment or bonding, a separate "investment-grade" forecasting study is carried out, which serves a different purpose from the NEPA study. While the NEPA travel forecasts are intended to form the basis for an informed Federal decision about the project, the "investment-grade" study provides assurances to investors that traffic levels will be sufficient to support the toll revenues anticipated for the project. The "investment-grade" study may involve different methodologies and produce different results from the

NEPA study. If the results of the "investment-grade" study are released during the NEPA process, it is suggested that the study team explain differences between the two sets of forecasts in the NEPA documentation.[17]

2.2.4.3 Evaluating Transit Strategies

Transit provides important mobility benefits in congested corridors throughout the country and it is often necessary in a major NEPA study with highway alternatives to consider the potential benefits of upgrading transit services. While most models have the ability to represent transit to some degree, the models may not be a reliable predictor of travel by new transit modes, depending on the extent of the use of this aspect of the model. The introduction of a new transit mode in a corridor or a region is complicated to model and calls for careful consideration. The use of models that have been recently vetted and refined through the FTA's New Starts project evaluation process[18] are most likely able to evaluate major transit alternatives. In situations where there is no transit modeling component, or one exists but has not been carefully reviewed, it is suggested that care be given to ensure that the transit model is working reasonably well, that transit model parameters are reasonable, and that transit markets and forecasts are validated.

2.2.4.4 Evaluating Integrated Land Use and Transportation Scenarios

From a travel demand forecasting perspective, the type of land use development can influence travel behavior and choices. A paper written by Cervero and Kockelman[19] provides the basic premise and foundation for subsequently developed sketch planning elasticity-based modeling methodologies. The "3D's" were eventually expanded to 4, and include land-use density, land-use design, destinations (i.e., the appeal of the places), and diversity in the attractions.

Incorporation of a 4D component into travel demand forecasting models is a very complex undertaking that, to be done correctly, requires extensive data collection to first observe how these components affect travel behavior, and then model the effects of urban design elements on each aspect of the travel model. Due to the high degree of complexity and high cost associated with such an endeavor, efforts to capture these effects have often utilized off-model adjustments based on elasticities, whereby auto trips are removed to represent reductions in travel associated with specific land development characteristics. An additional and important layer of complexity is that models tend to capture some of these phenomena in some direct and indirect ways. Therefore, it is important for the study team to be very careful if they decide to apply additional off-model effects, and to document the need for the adjustments in addition to any effects captured by the model.

2.2.5 Advancing Technologies and Methods

With research efforts continually developing new and improving existing technologies and methods, the state of the practice in land use and travel forecasting will never be static. Two particular methods that are becoming commonly used are integrated land use and transportation models and activity-based models, which are discussed below.

The use of integrated land use and transportation models is becoming more widespread, with implemented models in use in a number of metropolitan areas. Integrated models are designed to allow the

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[17] For more information on modeling and forecasting considerations for pricing and tolling alternatives, see *AASHTO Practitioner Handbook #3: Managing the NEPA Process for Toll Lanes and Toll Roads* at: http://environment.transportation.org/pdf/programs/PG03.pdf.

[18] *Federal Transit Administration Guidance on New Starts/Small Starts Policies and Procedures*, FTA June 2007, available at: http://www.fta.dot.gov

[19] R. Cervero and K. Kockelmann. *Travel Demand and the 3 Ds: Density, Diversity, and Design*. Transportation Research D, 2, 3: 199-219, 1997

two-directional interactions between land use development and transportation demand to be represented: for example, land use development increases demand for personal travel, while construction of new transportation infrastructure can affect land development patterns. The use of these models, while conceptually attractive, may add to the complexity of the analysis carried out by the study team.

Despite a long history of forecasting practice using traditional models, these tools have limitations, as described in TRB Special Report 288[20] and other publications. These limitations range from the theoretical (that aggregate four-step models do not reflect travel as a "derived" demand resulting from the needs of households and individuals to participate in activities) to the practical (that these models are fairly insensitive and lack detail needed to test some policies). In the past decade, more advanced "activity-based" forecasting approaches have been developed and implemented in a number of large- and medium-sized regions. These models offer expanded analysis capabilities, more behavioral, temporal, and spatial resolution, and better integration with long-term land use forecasting models and traffic micro-simulation models. However, there are many concerns with these models that are common with traditional four-step models: they are sequential systems, and they are subject to the same concerns regarding the quality of model input data and the robustness of the model calibration and validation. In addition, calibration and validation of an activity-based model system necessarily involves greater effort than one associated with a four-step model because of the more comprehensive treatment of all aspects of travel.

It is suggested that the study team consider the potential benefits but also the practical difficulties associated with these advanced techniques during their evaluation of the suitability of modeling methods and tools available to them. As with any tool used during analysis, if the study team chooses to use one of the advanced techniques discussed above, it is important to demonstrate its suitability. In many cases, the study team will not have an advanced model available to them or they will be faced with an analysis for which an advanced technique is not necessary.

2.2.6 Consideration of Peer Review

There are substantive and procedural benefits from leveraging outside expert opinion. Lead agencies can use peer reviews to help ensure that the forecasting processes being applied meet the standards of professional practice and/or Federal, State, or local requirements. In addition, peer reviews of models inherently require an appropriate level of detailed technical documentation, and can have value for this reason alone. Finally, because forecasting can be a difficult and complicated process, an outside and objective perspective may be helpful.

There are several options for peer review of the forecasting work, including internal and external review approaches:

- **Independent review of the travel forecasting methods and preliminary output by outside experts.** A rigorous review would consist of a review of the model files and output, whereas a less rigorous review would cover the documentation only.
- **Interagency panel of MPO, transit, transportation, and land use planning agencies.** This review would be conducted by the stakeholder agencies in the study area to ensure the use of the best available forecasts and data. Effectively, this panel would form a technical advisory group for the project.
- **Review of the forecasting effort by the agency responsible for maintaining the model.** This can help ensure that the model was applied correctly, facilitate consistency across studies, and leverage the appropriate government resources and expertise.
- **Internal, semi-independent review by senior staff from the study team.** Such an effort would be analogous to the formal review required of engineers who produce designs.

[20] *TRB Special Report 288, Metropolitan Travel Forecasting: Current Practice and Future Direction*, TRB, October 2007, available at: http://onlinepubs.trb.org/onlinepubs/sr/sr288.pdf

The need for and appropriate level of review depends on the circumstances of each study. It is critical to engage in a peer review at a stage in the study where the findings of the review can still be taken into account when conducting the analysis. More complicated analyses, or situations where new methods have to be implemented, will obviously require more time.[21]

2.2.7 Documentation of Suitability of Modeling Methods, Tools, and Underlying Data

This section of the guidance discusses the importance of ensuring the suitability of modeling methods, tools, and underlying data. It is important for the study team to produce documentation that describes their review of the tools that they choose to use to support their analysis, and to document any updates or improvements that they identified as necessary for the analysis.

It is also important for the study team to focus this documentation on the needs and scale of the analysis that they are undertaking. The MPO or DOT that maintains the regional travel demand model is likely to publish a calibration report that can be referenced to demonstrate that the model is calibrated at a regional level; however, this report is unlikely to deal specifically with calibration for the study area for a particular project. Therefore, it falls to the study team to demonstrate that the travel demand model is adequately calibrated in their study area.

Other elements to consider for inclusion in the documentation are:

- Demonstration that the tools have the capability to forecast the range of policies that will be developed in the alternatives analysis
- Discussion of the appropriateness of using new or advanced methods that might be considered a departure from typical practice, given the context of the application
- Results of any peer reviews or an explanation detailing why no peer review was required.

As with forecasting needs, the key purpose of this documentation is to demonstrate that these issues have been considered by the study team. Again, the documentation can demonstrate the process used to make decisions relating to model suitability and record who was involved in the decision-making process.

The Council on Environmental Quality (CEQ) regulations for implementing the provisions of NEPA require that the lead agencies insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements,[22] and this and other elements of documentation discussed in this guidance can help the lead agencies to demonstrate that they are meeting this requirement.

2.3 Scoping and Collaboration on Methodologies

Scoping is a collaborative process involving the lead agencies, resource and regulatory agencies, and the public. Typically, this is how a NEPA study begins, and is intended to initiate activities in the most efficient and effective direction. Early consideration is given to determining what factors and resources will be issues of concern during the NEPA process and therefore have an impact on the decision being made, and conversely, what factors and resources are not likely to impact decision making.

[21] For more information on forecasting peer reviews, see the Travel Model Improvement Program Peer Review Program at: http://tmip.fhwa.dot.gov/resources/peer_review

[22] See 40 CFR § 1502.24

2.3.1 Reaching Consensus on Forecasting Methodologies

SAFETEA-LU Section 6002 provided additional direction regarding the scoping process for environmental impact statements (EISs) by specifying that lead agencies collaborate with participating agencies on the methodologies to be applied and the level of detail required in the NEPA study.[23] Participating agencies are those Federal and non-Federal agencies that have an interest in the project. These agencies may also be cooperating agencies, meaning that they have special expertise or legal authority such as a permit approval. Such collaboration can be advantageous when conducting categorical exclusions or environmental assessments as well, although it is not required. The goal of the scoping process is to provide an opportunity for agencies and the public to raise critical issues and concerns early in the NEPA study so that these can be adequately considered as the NEPA study moves forward.

For this reason it is important to reach early agreements on the methodologies and conduct of the many technical studies that will support the overall NEPA analysis. The focus of this guidance is travel and land use forecasting, but the forecasts are relied upon as inputs for other technical studies, such as air quality, noise, and land development effects. Therefore, to ensure that the effects of potential alternatives are reasonably estimated, it is important for the travel forecast to provide an adequate representation of the travel patterns and volumes to be expected with each of the alternatives. Because future land use forms the basis for demand in the travel forecasting process, it is suggested that agreements be reached first on future land use scenarios for the alternatives and the methodologies to be used to develop those estimates.

The primary reason for reaching agreement early during the scoping process is to minimize the cost and schedule risk associated with "backing up" or re-doing work during the study. It is not uncommon during the NEPA process, particularly during alternatives analysis and evaluation, for the public and agencies to question the work done prior to that stage. Because not everyone will be 100% satisfied with the alternatives under consideration, it is natural for this questioning to take place. Having documentation on the agreements reached and the assumptions used for the land use and travel forecasts will facilitate the process to move forward with minimal delay and disruption. It is important to explain why the agreements were reached and how the team arrived at the assumptions used for land use and travel forecasting. In the absence of these agreements, the likelihood that the process may cycle back to this stage increases and could result in additional delay to the study and increased costs. Several agencies have developed procedures, such as templates, to assist with reaching consensus during scoping and documenting the agreed upon analysis approach.[24]

It is important for NEPA study teams to recognize that effective use of the scoping process is integral to a successful forecasting effort, since the scoping process sets the tone for participation throughout the study and can identify key issues germane to the forecasting exercise. The definition of a successful forecasting effort would be one where there is broad acceptance of the outputs from that effort. As described above, getting to that consensus requires early agreement on the inputs to the forecasting process and methods used. In addition to land use, it is important that the agreements cover all aspects of the forecast effort, such as whether the model accounts for modal splits, tolling, "induced" travel, and other items that relate to the range of alternatives being considered. All of these considerations are discussed elsewhere in this guidance.

Agencies would be well served to adopt written procedures for scoping all studies, regardless of the type of NEPA analysis. Simply stated, scoping sets the framework for everything that follows. It is suggested that the level of effort devoted to the scoping process be tailored to the context of the proposed project and/or the range of alternatives. Typically, the level of scoping effort associated with the replacement of a deficient bridge on an existing site would be different from the level of effort for a potential freeway in a

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[23] See 23 USC § 139 (f)(4)(C), and Question 38 in FHWA and FTA "SAFETEA-LU Environmental Review Process Guidance," at: http://www.fhwa.dot.gov/hep/section6002/index.htm

[24] See, for example, North Central Texas Council of Governments pre-analysis consensus plan template, available online at: http://www.texastwg.org/files/pre-analysis_consensus_template.pdf

new location, or a new commuter rail line. In addition, the roles of forecasts are different under each of those scenarios and would also require a commensurate level of effort in terms of reaching early agreements on how they will be determined.

2.3.2 Documentation of Scoping and Interaction with Other Agencies

As discussed above, it is critical for the study team to document their work on scoping of the analysis and their interaction with other agencies, recording the broad agreements reached and the assumptions used for the land use and travel forecasts. This documentation can then be used throughout the study as a reference during analysis and later to demonstrate what decisions were made and the process by which decisions were made, and to identify who was involved in making those decisions.

2.4 Forecasting in Alternatives Analysis

The CEQ regulations require lead agencies to "rigorously explore and objectively evaluate all reasonable alternatives."[25] This provision establishes a standard for NEPA studies to treat each alternative in an unbiased manner so that the related benefits and impacts can be estimated and compared across alternatives. For EISs, the regulations go on to say that the study "shall provide full and fair discussion of significant environmental impacts and shall inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment."[26] In addition, the regulations say that the alternatives analysis is "the heart of an environmental impact statement."[27] From a land use and travel forecasting perspective, these provisions have direct relevance in how forecasting methods are applied for the purposes of analyzing alternatives.

2.4.1 Overview of Transportation-related Effects and Impacts

The CEQ regulations define the effects and impacts that Federal agencies are to address and consider in satisfying the requirements of the NEPA process. These effects include direct effects, indirect effects, and cumulative impacts:

- **Direct effects** are caused by the action and occur at the same time and place (40 CFR § 1508.8).
- **Indirect effects** are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).
- **Cumulative impact** is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7).

The terms "effect" and "impact" are used synonymously in the CEQ regulations (40 CFR § 1508.8). "Secondary impact" does not appear, nor is it defined in the CEQ regulations or related CEQ guidance, but the FHWA has used the terms "secondary impact" and "indirect effect" interchangeably.[28]

[25] See 40 CFR § 1502.14

[26] See 40 CFR § 1502.1

[27] See 40 CFR § 1502.14

[28] *FHWA's Interim Guidance on Indirect and Cumulative Impacts*, January 2003, available online at: http://www.environment.fhwa.dot.gov/guidebook/qaimpact.asp

There are several available resources that discuss the distinctions between these types of effects and provide guidance on considering and measuring them.[28], [29] From a travel forecasting standpoint, there are numerous transportation-related impacts that are measurable and may be meaningful in an alternatives analysis. Following are examples of impacts that illustrate the type of information that comes from a travel forecast, or is closely related to travel forecasting output, organized into direct effects, indirect effects, and cumulative impacts.

2.4.1.1 Direct Effects

Transportation-related direct effects are generally well understood. Table 2 presents a brief list of typical direct effects that have their basis in travel and/or land use forecasting, including how each one is usually sourced:

Table 2: Typical Direct Effects Estimated using Outputs from Forecasts

Effect	Effect Type	Effect Source
Congestion /Delay	Peak hour/period level of service	Direct output of traffic assignment and/or post processed output to produce intersection turning movement volumes (see section 2.4.5)
	Hours of congestion	
	Intersection level of service	
	Point-to-point travel times	
Travel Choices	Mode shares	Direct output of mode choice model
	Transit boardings and loadings	Direct output of transit assignment
Revenue	Toll revenue, transit revenue	Revenue forecasts based on traffic and transit assignment results
Environmental/Social	Noise	See section 2.6.1
	Air quality	See section 2.6.2
	Traffic diversion	Direct output of traffic assignment
	Travel benefits for different socio-economic groups	Post processed travel model outputs by socioeconomic groups
	Accident rates	Post processed traffic assignment by functional class, and changes in non-motorized trips and shares from trip generation and mode choice models

2.4.1.2 Indirect Effects

Potential changes in land development patterns due to a transportation investment are typically examined as part of an indirect effects assessment, particularly on major projects.[30] These effects are not easy to forecast. The study team may undertake a land development impact assessment through the use of integrated land use and transportation models, the application of gravity or other more simplified models, or simply an analysis of regional and local trends. In some studies the team may also choose more qualitative methods such as surveys, interviews with developers, discussions with local planners, or the Delphi or expert panel process. These are considered further later in this document.

The FHWA's *Interim Guidance on Indirect and Cumulative Impacts* explains that a proposal for a new alignment project in an area where no transportation facility currently exists, or one that adds new ac-

[29] *Draft Baseline Report*, Executive Order 13274: Indirect and Cumulative Impacts Working Group, March 15, 2005

[30] CEQ regulations specifically mention "growth inducing effects" as potential indirect effects. See 40 CFR § 1508.8(b)

cess to an existing facility may indicate an increased potential for project-related indirect impacts from other distinct but connected actions, such as the opening of access to land with a new highway leading to new development.[31] Likewise, the purpose and need of a proposed project that includes a development or economic element might establish an indirect relationship to potential land use change or other action with subsequent environmental impacts.[32] It is important for the lead agencies to identify potential indirect impacts of the transportation proposal early in the NEPA project development process.

Land development effects and potential redistribution of growth within a region may be analyzed more robustly at the regional level and during the regional planning process. Increasingly, MPOs, DOTs, and other agencies are using integrated land use and transportation forecasting procedures in the planning process to better understand the interrelationship between growth and the transportation system. It is therefore possible that the study team can glean insights at the project level from a regional planning analysis. One advantage of a regional analysis is that the study team can consider the region-wide growth pressure dynamics.[33]

Table 3 presents a brief list of typical indirect effects that may be considered in a NEPA study that are based on or use forecasting outputs:

Table 3: Typical Indirect Effects That are Based on or use Forecasts

Effect	Effect Type	Effect Source
Land Use	Residential development	Based on land development impact assessment
	Commercial development	
Revenue/Economic Growth	Increased tax revenue	Based on fiscal impact assessment of land development forecasts
	Regional economic growth	
Environmental/Social	Noise	See section 2.6.1
	Air quality	See section 2.6.2
	Visual impact of development	Based on land development impact assessment
	Floodplain and wetland encroachment	
	Fragmentation of habitat	

2.4.1.3 Cumulative Impacts

The FHWA's *Interim Guidance on Indirect and Cumulative Impacts* states that cumulative impact analysis is resource-specific and generally performed for the environmental resources directly impacted by a Federal action under study, such as a transportation project. However, not all of the resources directly impacted by a project will require a cumulative impact analysis. The resources subject to a cumulative impact assessment should be determined on a case-by-case basis early in the NEPA process, generally as part of early coordination or scoping.[34]

Two types of direct impacts, both measured and part of travel model output, have potentially important cumulative effects: air emissions and noise. The study team will typically evaluate the cumulative effects

[31] This in an example of a "but for" action: induced actions that would not or could not occur except for the implementation of a project

[32] See case law summary Section 4.1.3.3, discussion of *City of Davis v. Coleman*, 521 F.2d 661, 675-677 (9th Cir. 1975)

[33] See Section 2.1.5 "Incorporating Analyses Done in Transportation Planning Studies" for more information

[34] See discussion in *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*, Council on Environmental Quality, June 2005, available online at: http://www.nepa.gov/nepa/regs/Guidance_on_CE.pdf

on air quality during the regional air quality conformity modeling process. The study team can measure the cumulative noise impacts through a noise model and an understanding of existing noise levels.

If a project is expected to induce land development, such development could potentially cause additional cumulative impacts such as (but not limited to) impacts to farmland or open space, animal habitat, wetlands, water supply and quality, and air quality. In other words, to the extent the transportation system induces land development that development may cause further impacts to the environment and public health.[35]

Table 4 presents a brief list of typical cumulative impacts that may be considered in a NEPA study:

Table 4: Typical Cumulative Impacts That are Based on or use Forecasts

Effect	Effect Type	Effect Source
Land Use	Reduction in open space, farmland, animal habitat, wetlands	Based on land development impact assessment
	Impacts on water supply and quality	
Environmental/Social	Noise	See section 2.6.1
	Air quality	See section 2.6.2

2.4.2 Objective Application of Forecasting Data and Methods

The requirement for the alternatives analysis to be an objective evaluation makes it essential for the study team to apply forecasting data and methods objectively without any bias towards a particular alternative. It is important for the forecasting data and methods applied in the alternatives analysis to be consistent and create a level playing-field where alternatives can be fairly and reasonably compared. In other words, if the lead agencies structure the analysis to be predisposed to favoring the preferred alternative, then they are not meeting NEPA requirements, thus falling short of FHWA program requirements and creating litigation risk.[36]

To ensure that the objective evaluation requirement is met, it is essential for the study team to maintain consistency in assumptions across the alternatives being considered, and to clearly understand the impact that differences in model parameters cause. Apparently small inconsistencies in assumptions or model parameters can affect particular alternatives disproportionately. For example, assuming a slightly lower maximum walk access distance to a bus stop compared to a light rail stop can lead to large differences in the forecast for a bus rapid transit alternative compared to a light rail alternative; in this case the land area accessible to each stop is related to the square of the maximum walk access distance, so small differences are magnified. There are certainly cases where the study team will be justified in varying assumptions between alternatives; in that case, it is important for the study to be as transparent as possible in documenting and justifying those variations.

It is important for the study team to explicitly define and document the no-build condition. The no-build scenario contains a highway and most likely a transit network, as well as a no-build land use forecast. Defining the no-build networks in the intermediate and final horizon year requires assumptions about which projects in both the transportation improvement program (TIP) and long-range transportation plan are to be included. This requires some dialogue among local stakeholders to determine which projects have already been approved and funded, which projects are likely to be approved, and which projects are unlikely and therefore do not need to be included in the no-build scenario. The study team needs to pay special attention to projects closely associated with the subject study alternatives (i.e., capacity enhancements upstream or downstream from the study area, or on parallel facilities). It is important for

[35] *Draft Baseline Report*, Executive Order 13274: Indirect and Cumulative Impacts Working Group, March 15, 2005

[36] See case law summary Section 4.1.3.2, discussion of *Jones v. Peters,* 2007 WL 2783387, 10-11 and 23 (D. Utah, September 21, 2007)

the study team to ensure that alternatives to be analyzed are not included in the future no-build networks.

The typical practice in forecasting for NEPA studies is to use the adopted land use forecasts, which are usually developed by the State, MPO, and/or other regional planning agency, as a basis for estimating travel demand. As a matter of good practice, it is important that the study team understand the assumptions and inputs for a travel forecasting exercise, and this applies to land use as well. Occasionally, during an alternatives analysis, the study team and/or planning officials will adjust the land use forecasts within a corridor based on a more thorough and focused review. This corridor-specific review would typically include comparisons to current land use patterns and consideration of land-use policies, land availability, and anticipated development plans.

In addition, the study team will typically use one land use forecast in the no-build scenario and the other alternatives. However, in studies where land development patterns (both new and redistribution effects) are likely to be substantially different among alternatives, it is critical to understand whether the land use forecasts provided for use in the study represent a no-build or a build condition in the corridor. The answer to this question may not be immediately obvious, and the difference will not be relevant in many studies. However, particularly in cases where a new transportation facility is being proposed, it is important that the study team consider whether the development patterns adjacent to and reliant on the proposed facility will be the same if an alternative is built or not built. This situation is discussed further below in section 2.4.6.

2.4.3 Refinement of the Analysis during Screening

The alternatives screening process varies from one study to the next but, generally speaking, analysts follow a multi-step screening process. The Administrative Procedure Act requires that decisions made by Federal agencies are rational and clearly explained, with consideration given to all reasonable options.[37]

The tiered screening process often includes the following sequential decision points as the list of alternatives is vetted during project development:

1. **Initial screening based on purpose and need.** Does the alternative meet the study purpose and need? Are there fatal safety, engineering, mobility, or environmental flaws? Answers to these questions can sometimes be made with qualitative analysis. It is important to document *all* the reasons for screening out an alternative.
2. **Long list screening based on an initial impact assessment.** In a large or complicated study, it is not uncommon for a long list of alternatives to make it through the first screen. A second screen is then used that is based on preliminary analyses of impacts and performance at a level of detail that allows a reasonable decision to be made on the merits of the alternatives.
3. **Short list screening and detailed alternatives analysis during environmental review.** The short list of alternatives is the list that is carried forward to the environmental review. In this stage the analysis is typically the most detailed and time-consuming.[38]

The forecasting process typically mirrors the screening process in terms of the level of detail in the analysis. It is important for the study team to fully document the screening process and accompanying forecasting work. For example, it is important for the documentation to include an explanation of the screening performance measures and the process used to develop and select those measures (with reference to the purpose and need of the project), and to describe how each round of forecasting and screening was done and why key decisions were made.

[37] See case law summary Section 4.1.2, discussion of *Senville v. Peters*, 327 F. Supp. 2d 335, 344-345 and 369 (D. Vt. 2004)

[38] Note that SAFETEA-LU Section 6002 added the flexibility of analyzing the preferred alternatives to a higher level of detail, see 23 USC 139 (f) (4) (D)

If the forecasting methods change during this process, it is suggested that the study team evaluate in a reasonable manner the continuing validity of the prior decisions, to the extent that travel modeling was a basis for the screening out of alternatives.[39] This evaluation can include the use of sensitivity tests to assess the differences in the modeling results, assuming that the results of the tests pertain to a group of alternatives, or in more extreme cases by redoing the prior modeling work and subsequent analysis of the results.

2.4.4 Development of Forecast Confidence

For estimates of forecasts, substantial uncertainties include, but are not limited to, the following: population and employment forecasts, housing trends and costs, global and local economic conditions, other planned transportation improvements, time-of-day assumptions, parking prices, fuel prices, and long-term changes in vehicle technology. Obviously, the further the forecasting horizon is from the current year and the larger and more complex the alternatives that are being analyzed, the greater the level of uncertainty may be. To separate the various sources of uncertainty, it is suggested that the lead agencies identify the principal drivers of changes in traffic volumes through an incremental buildup of the forecasts for an alternative.

This forecasting buildup starts with a forecast using current conditions, such as land use and travel patterns, and then prepares a series of intermediate forecasts—in each case, replacing one of the inputs that describe current conditions with the analogous description of future conditions. The buildup concludes with a forecast that uses all of the forecast year conditions—effectively reproducing the traditional forecast for the alternative. The level of effort for this analysis is modest because it involves the straightforward reapplication of travel models with input files that are already available.

Identification of the key drivers of uncertainty in forecasts for an alternative can lead to very productive discussions early in the project development process, which is the right time to consider the reasonableness of future demand projections, while there is opportunity to reevaluate the approach used to analyze an alternative. As with other assumptions made and model tests carried out during the analysis, it is important for the study team to document their work to understand forecast confidence. The findings of these analyses form a key element of the demonstration that the approach used to analyze an alternative is appropriate. The documentation of these analyses is also essential so that the lead agencies can clearly communicate a level of confidence in the forecasts and point out areas where uncertainty in assumptions may lead to uncertainty in forecasts.

2.4.5 Moving from Regional Model Output to a Project Level Forecast

In the case of a regional travel model, it may not be advisable to directly use the raw forecasted volumes from a planning model and apply them in the context of a NEPA study. In most cases, the study team will need to conduct additional post processing or refinement of the travel model output before the forecasted volumes can be used in NEPA analysis. In practice, two approaches tend to be most commonly used for adjusting forecasts from regional planning models.[40] The first is a post-processing technique that aims simply to adjust the regional planning model forecasts of roadway volumes. The second is a sub-area analysis, which may involve the use of a microsimulation model to estimate traffic volumes on a detailed road network in a corridor.

When adjusting traffic volumes produced with a regional model, the modeler develops adjustment factors using base year volumes and observed traffic counts and applies those adjustment factors to the fu-

[39] See case law summary Section 4.1.4.1, discussion of *Conservation Law Found. v. Fed. Highway Admin.*, 2007 WL 2492737, at *24 (D.N.H. August 30, 2007)

[40] One other approach worth noting is *matrix estimation*, which is less common in practice, but can be used successfully with a high degree of attention to detail. See, for example, *Improving the Estimation of Travel Demand for Traffic Simulation: Part 1*, available online at: http://tmip.fhwa.dot.gov/resources/clearinghouse/407

ture traffic volumes estimated from a model. NCHRP Report 255[41] describes methodologies for performing this post processing and remains the standard for adjusting planning models forecasts to this day.

The methods and principles outlined in NCHRP Report 255 advise the modeler to use the regional planning model to estimate future changes in traffic levels across screenlines, which are then added to or used to factor up base-year screen line counts. The modeler would then allocate traffic to specific links, with consideration given to relative capacities on the links and/or base-year traffic distributions, depending on the specifics of the analysis. This adjustment of forecasts from planning models requires an additional level of effort and attention to detail due to the number of calculations involved, but can improve the consistency and quality of the project development forecasts. However, this approach assumes that the differences between base-year traffic counts and assigned volumes across a screenline will remain relatively constant in the forecast year.

For an intersection analysis, the modeler would use the methodologies mentioned above to obtain traffic volumes in and out of the intersection. An iterative procedure can be used to convert the adjusted future-year traffic volumes to future-year intersection turning movement volumes, using the base-year turning movement patterns as a starting point. The iterative process involves alternately balancing the future inbound and outbound traffic volumes until a certain level of consistency is reached. As always, professional judgment is necessary to determine the reasonableness of the future-year turning movement volumes, particularly considering the purpose of the forecast.

While developing future-year forecasts, the study team may determine that the regional travel model lacks enough detail for the level of analysis required. In such a case, a sub-area model and analysis may be needed. This would involve the use of a model based on Highway Capacity Manual (HCM) methods or a microsimulation model. A sub-area analysis may also be warranted if the validation of the regional model is poor in the sub-area or if the regional model is too coarse in the sub-area. The best time to develop a sub-area model is at the beginning of the project development process while the regional model is being reviewed and calibrated, when it is simpler to create additional detail in the regional model (e.g., TAZ splits and new roadway links) that will be useful in a refined sub-area model.

Refined travel forecasting models, such as HCM or microsimulation models, require substantially more attention to detail than a regional travel demand model but can produce a more useful and informative forecast. As with sub-area models, it is best if the decision to utilize microsimulation methods is discussed early in the study process at scoping. It is recommended that the study team consider the evolving nature of microsimulation techniques and use the most appropriate tools available to them during the NEPA analysis.[42]

2.4.6 Addressing Land Development or Redistribution Effects

Land development and/or redistribution that is an indirect effect of specific transportation alternatives is often difficult to forecast. This is particularly true regarding changes in a transportation investment due to the complex, dynamic nature of the urban development process. More specifically, local conditions, changing policies, the incremental long-term nature of land use change, and the flexibility of travelers' responses all affect our ability to forecast transportation project outcomes. Despite these difficulties, transportation/land use impacts often need to be evaluated within the planning/NEPA process. Figure 2 presents a model of factors influencing development location decisions.[43]

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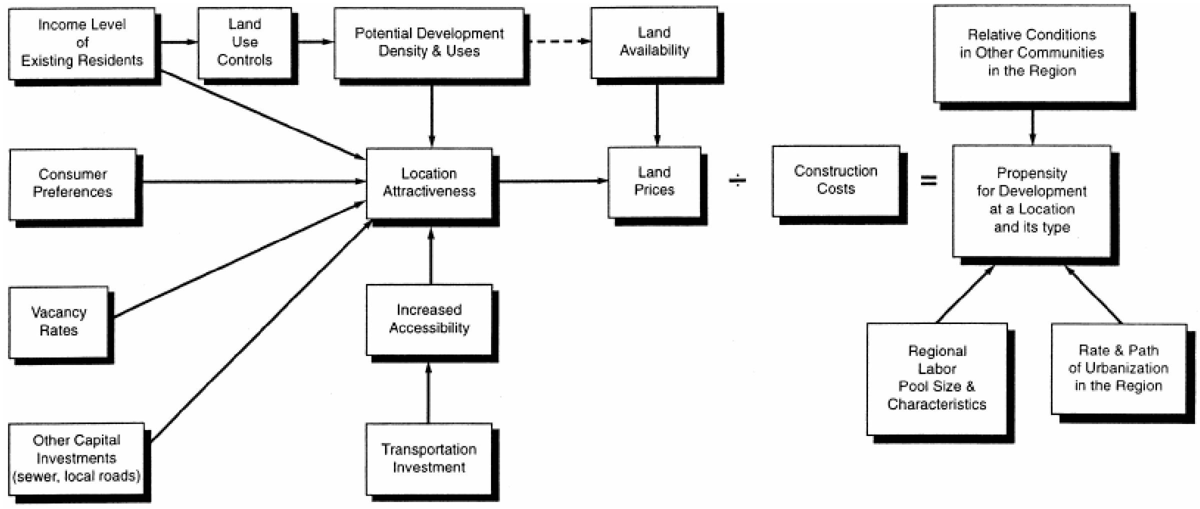
[41] *NCHRP Report 255: Highway Traffic Data for Urbanized Area Project Planning and Design,* TRB 1982

[42] *Volume II: Decision Support Methodology for Selecting Traffic Analysis Tools in the FHWA Traffic Analysis Toolbox* (June 2004) provides a detailed decision support methodology for selecting the appropriate type of analysis tool for the problem facing the study team. *Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software in the FHWA Traffic Analysis Toolbox* (July 2004) provides procedures for performing simulation modeling, including detailed information regarding the preparation of simulation models and their calibration and use in analyzing alternatives.

[43] Figure 7-6 from *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects*, TRB 2002

Figure 2: Simplified model of various factors influencing development location decisions



2.4.6.1 Options for Addressing Land Use Issues in NEPA Studies

Table 5 outlines some potential steps for conducting both base-case land use forecasts and analyses of the land use impacts from a build alternative.

Table 5: Comparison of Steps in Base-Case Forecasts and Impact Assessments

Base-Case Forecast	Impact or Policy Assessment
1. Understand existing conditions and trends	**1. Understand existing conditions and trends**
2. Establish policy assumptions	**2. Establish policy assumptions**
	3. Measure the transportation outcomes with and without project
3. Estimate regional population and employment growth	**4. Estimate total study area population and employment growth with and without project**
4. Inventory land with development potential	**5. Inventory land with development potential**
5. Assign population and employment to specific locations	**6. Estimate how the project will change the location and type of development within the study area from what would occur anyway**

Both types of analysis require understanding existing transportation and land development patterns, making assumptions about the policy framework that will guide the process, estimating the amount of growth expected during the planning period in the study area, inventorying land that might be developed and any physical and regulatory constraints on that development, and assigning the expected growth in households and jobs to specific locations.

The key difference between the processes is that, to measure transportation outcomes with and without the project, an impact assessment uses estimates of the ways that accessibility and travel behavior will change because of the transportation investment. In addition, an impact assessment requires a comparison not only with existing conditions, but also with the quantity, type, and location of future growth that would occur without the project.

There is a wide range of specific techniques to assess the indirect land use impacts of transportation alternatives. Formal land use models require the most data and time, and they generally suit analyses at a larger geographic scale and better represent the complex interactions between transportation access and land development patterns. Qualitative methods suit smaller sites and projects, though they may also be applied to larger areas. As discussed in section 2.3, close collaboration on methodologies is critical to the success of a NEPA study and, whatever the decisions taken to select a methodology, it is important that the decision-making process is well documented.

Reference documents on this topic include the following:

- *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*[44]
- NCHRP Project 25-25, Task 22, *Forecasting Indirect Land Use Effects of Transportation Projects*[45]
- NCHRP Report 423a: *Land Use Impacts of Transportation: A Guidebook.*[46]
- NCHRP Report 466: *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects*[47]

2.4.6.2 Addressing Land Development Effects in Alternatives Analysis

It is important for the study team to consider and address, when applicable, induced land development that may vary by build alternative, or simply between build and no-build. For transportation investments that are regionally important in scale, such as new or substantially improved highway facilities, it is more likely that the future land use patterns will be different if the alternative is built. If this situation exists, it is important for the study team to look at whether the differences would be simply between the build alternative(s) and the no-build, or if there would be a difference between the no-build alternatives and <u>each</u> of the build alternatives. The latter case is more likely when alternative alignments being considered are far enough apart or have such different characteristics that there would likely be a discernable difference between the land development impacts of each alternative. In many cases, however, it is reasonable to find induced land development to <u>not</u> be an important issue in a corridor, and therefore to use the same land use forecast for all alternatives. Figure 3 presents a framework for analysis of projects that warrant alternative land use forecasts for each alternative.

Likewise, the purpose and need of a proposed project that includes a development or economic element might establish an indirect relationship to potential land use change or other action with subsequent environmental impacts. It is important for the study team to establish the potential relationship of alternatives to indirect land development impacts in the scoping phase of the NEPA process on a project-by-project basis.[48]

The study team has at its disposal at least a few ways to assess the potential for induced development, including talking with land-owners in the corridor and local officials. If land is currently vacant or underutilized in the corridor, it is suggested that the study team consider whether there are development plans or land use policies related to these parcels that assume the construction of the transportation facility. This is particularly likely if a right-of-way has been preserved and/or a specific alternative is envisioned on municipal master plans. It is not uncommon for new transportation projects to be anticipated by land use planners and developers in advance of the project development process.

During NEPA studies where an analysis of land development effects is warranted, the analyses of the impacts of land development are often considered as part of a discrete indirect effects analysis. This ap-

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[44] *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*, prepared for AASHTO by ICF Consulting, March 2005

[45] *Forecasting Indirect Land Use Effects of Transportation Projects*, NCHRP 25-25 Task 22, December 2007

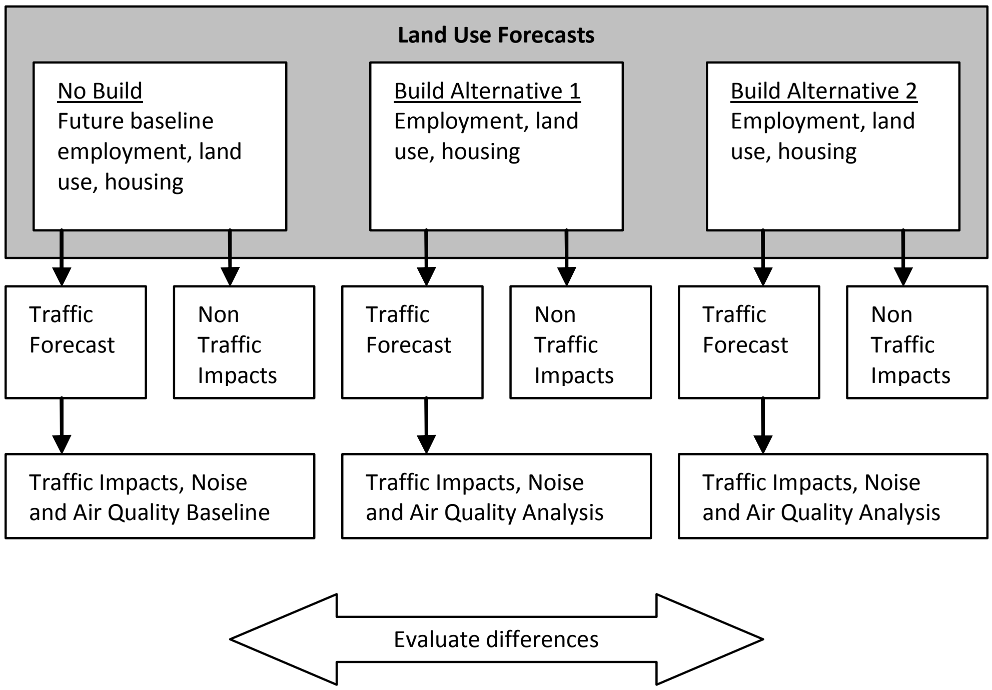
[46] *NCHRP Report 423a: Land Use Impacts of Transportation: A Guidebook*, TRB 1999

[47] *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects,* TRB 2002

[48] See case law summary Section 4.1.3.1, discussion of *North Carolina Alliance for Transp. Reform v. U.S. Dept. of Transp.*, 151 F. Supp. 2d 661, 686-88 (N.D. N. C. 2001)

proach differentiates the direct versus indirect effects and analyzes the resulting indirect impacts of induced development on traffic, air quality, noise, water quality, etc., as appropriate.

Figure 3: Framework for analysis of projects that warrant using alternative land use forecasts



Another option for incorporating the land development effects as part of alternatives analysis is to include the land development effects of the build alternative(s) as part of the forecasting effort that supports the direct effects analysis. In effect, this approach embeds the indirect effects of land development in the direct effects analysis. One of the likely benefits to this approach would be the streamlining of the forecasting effort by eliminating the number of needed model runs.

Finally, before making a decision on how to handle land development effects in the NEPA document, it is important to consider how the scope of NEPA analysis is affected by the degree of Federal influence and control over the project. This issue, which is sometimes referred to as the "Federal handle" on the project, can have particularly important impacts with respect to the analysis approach for land use impacts.

2.4.6.3 Induced Demand and Land Development

One of the most controversial issues with regard to forecasting as part of the NEPA process is that of induced demand. While there are limits and complex factors in reality and every corridor is unique to some degree, it is important for transportation analyses to consider the significance of induced demand. Induced demand is the volume of traffic that is drawn to a new or expanded road by providing additional capacity. This induced demand comes from a number of sources, including trips diverted from other routes, discretionary trips that might not have been made without the service improvement, and improved access to employment and other activity location choices.

Those challenging the results of a NEPA process often cite induced demand in comments on environmental documentation and litigation involving travel models.[49] In economic terms, induced demand is the notion that demand increases as a result of increased supply. In a transportation context, the idea is that

[49] See case law summary Section 4.1.4.1, discussion of *Senville v. Peters*, 327 F. Supp.2d 335, 368-369 (D. Vt. 2004)

every action to improve travel conditions will lead to more travel demand. Table 6 shows the main components of induced demand according to prior research, and the extent to which typical practice models capture these components.[50]

Table 6: Components of Induced Demand

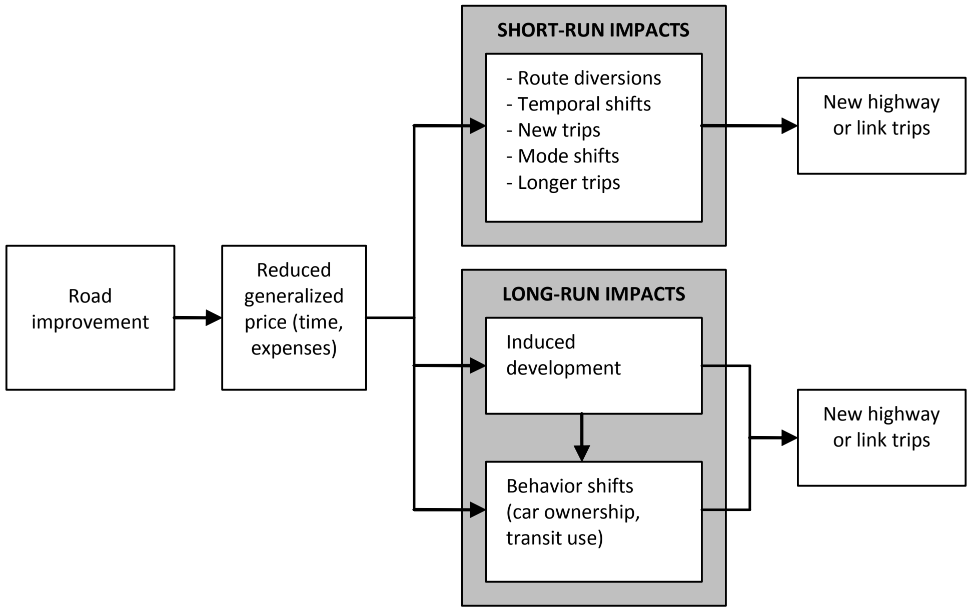
	Induced Demand Components	Effects on Forecasting Analysis	Effectiveness of Model
Short–run Impacts	Change in number of trips	The net addition of trips will affect traffic, noise, and emissions impacts	Poor – Trip generation models are typically based on demographic factors such as household size, income and auto ownership, and are insensitive to changes in travel time or accessibility.
	Change in length of trips	Change in trip length will affect duration of use of facility and emissions	Fair – Trip distribution models use an aggregate measure of impedance based largely on travel times. Feedback of travel impedances from assignment to distribution enables distribution models to be sensitive to congestion effects.
	Change in mode of travel	Change in mode to or from auto will affect noise and emissions	Good – Disaggregate mode choice models estimate mode choice probabilities based on relative attractiveness of alternative modes with respect to travel times, costs, and other factors.
	Change in route	Changes in route will affect traffic volumes on facility and emissions	Good – Equilibrium traffic assignment models reallocate trips to alternative routes based on travel impedances and volume-delay functions.
	Change in time of travel	Changes in time of travel will affect levels of congestion	Poor – Most travel models partition daily trips into fixed time periods with no option for adjustment between periods based on traffic volumes.
Long–run Impacts	Change in development patterns	Net addition of trip-generating land uses will increase traffic volumes, may increase trip lengths	Poor – Most travel models use population and employment forecasts developed outside the model and have little or no feedback between the travel model and land use forecasts.
	Change in behavior (e.g., vehicle ownership)	Changes in behavior have long run-impacts on number of trips, length of trips, mode of travel and hence affect traffic volumes	Poor – Most travel models use static assumptions about future residential locations, vehicle ownership, and mode preferences.

Short-term induced demand results from changes in the number of trips people take, where people travel to, what mode they take, and what route they take. Table 6 shows that typical practice models tend to account reasonably well for some of these short-term induced demand effects but do not generally account for changes in the number of discretionary trips taken and the time of travel. Longer-term induced demand can arise from changes in household location or vehicle ownership, and these longer-term impacts are notably harder to measure and relate to a specific transportation project with a high degree of confidence. Figure 4 illustrates short and long-run sources of induced demand.[51]

[50] Adapted from Table 1: Sensitivity to Environmental Analysis to Induced Demand, and Table 4: Effectiveness of Current Travel Models in Accounting for Components of Induced Demand from *Working Together to Address Induced Demand*, Eno Transportation Foundation, 2002

[51] Adapted from Figure 2 of *Working Together to Address Induced Demand*, Eno Transportation Foundation, 2002

Figure 4: Short-Run and Long-Run Sources of Induced Demand



Typically, the long-term land development effects are more effectively analyzed at the system, metropolitan, or regional level. At this scale of analysis, systematic interrelationships between the transportation system and land development characteristics and dynamics (including other relevant policies and conditions) can be meaningfully evaluated. The results of these planning-level analyses may be incorporated in the NEPA process if appropriate (see section 2.1.5 for a more complete discussion).

Induced land development is development that may occur as a direct or indirect result of improvements to the transportation network. While the issues of "induced demand" and "induced land development" are related, they are in reality separate and are often confused and used interchangeably. Induced land development is one of the sources of induced demand on an improved roadway, but only accounts for a portion of the induced demand components.[52]

A range of approaches are available to address induced demand components not considered as part of an agency's routine forecasting methods, and are discussed in other research.[53] When dealing with induced demand issues within a particular NEPA study, it is important to understand and document the different components of induced demand and which components are adequately dealt with within the forecasting analysis. It is also important to understand and document what elements require additional work and where it is not possible to perform this work given the unavailability of information or exorbitant cost of obtaining the information and performing the analysis.[54] These considerations should be weighed during the early stages of the analysis process and should be discussed during scoping.

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[52] See, for example, *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects,* TRB, 2002, pp 58 – 65

[53] See, for example, *NCHRP Report 423a: Land Use Impacts of Transportation: A Guidebook,* TRB 1999; *Working Together to Address Induced Demand*, Eno Transportation Foundation, 2002; *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects,* TRB, 2002; *Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth*, prepared for AASHTO by ICF Consulting, March 2005

[54] See 40 CFR § 1502.22 Incomplete or unavailable information. It is important to note that a high bar is placed on demonstrating the inability to obtain information or perform analysis. See case law summary Section 4.1.4.4, discussion of *Sierra Club, Ill. Chapter v. U.S. Dept. of Transp.,* 962 F. Supp. 1037, 1043-1046 (N.D. Ill. 1997)

2.4.6.4 Addressing Variations from "Approved" Forecasts

It is common for the land use forecast used in an EIS to vary from the land use forecast used in the MPO planning process and conformity analysis. If a review of the land use forecast provided by the MPO suggests that refinements are necessary within a corridor, typical practice involves starting with the MPO land use forecast and adjusting land use within a study area while preserving housing and employment control totals within an appropriate aggregate geographic area, such as the study area or a county. An essential element of a land use forecast review is to obtain and understand the assumptions that led to the forecast, such as changes to the transportation network. If refinements to the land use forecasts are made, it is important for the study team to document the changes so that they can be disclosed and explained. It is also suggested that improvements to land use forecasts made during NEPA studies be provided back to the MPO for their use to leverage the work performed during NEPA studies.

2.4.7 Documentation of Forecasting in Alternatives Analysis

There are several aspects of forecasting in the alternatives analysis that are especially important to include in the documentation, in addition to presenting the travel model results and impacts for each alternative. They are highlighted here, and discussed in more detail in the relevant sections above:

- An explicit definition of the no-build condition with regard to land use, network, and modeling assumptions
- In cases where the study team is justified in varying modeling assumptions between alternatives, documentation that explains those variations
- If the forecasting methods change during the screening process, documentation of the evaluation of prior analyses and decisions
- Analyses to understand uncertainty in assumptions and forecasts
- How the travel forecasting work takes induced demand and land development effects into account
- The approach used to develop and the reasons for variations from approved land use forecasts

2.5 Project Management Considerations

NEPA studies are often complex undertakings and may be accompanied by various special considerations that warrant extra lead agency and study team attention. These include the potential for re-do analysis loops and ensuring documentation consistency. If these issues are understood from the initiation of the study, there will be ample opportunity to proactively address them and facilitate a smooth and expeditious study process.

2.5.1 Potential for Reevaluating Analysis

In the course of a NEPA study, changed conditions may trigger a reevaluation of past forecasting work. A reevaluation could lead to revisions of data inputs and model assumptions used to produce the study's forecasts. The study team may need to conduct sensitivity tests to assess the magnitude of differences from prior analyses resulting from use of new data and their effects on past decisions. Depending on the outcome of such tests, the study team may need to decide how to choose the best and most appropriate way to address the new information. For example, updates to key data sets, such as new land use estimates or forecasts, updated project lists, or the availability of a new model version, may potentially bring into question the credibility of already-conducted forecasts, and consequently, the decisions made based on those data.

On the other hand, a sensitivity test may reveal that the changes caused by the introduction of the new data or model version do not change the conclusions made from the previous analysis. In this case, the study team would incorporate the updates to the model at a future milestone, such as for the final EIS, or simply document the change and the sensitivity analysis in the project administrative record and move on. Depending on the stage in the analysis, for example, when new land use forecasts become available, it may not be necessary to re-do analysis.[55]

Sometimes a change in the scope of the analysis may also require past model work to be reevaluated. For instance, the testing of a new alternative may be requested, such as a toll facility, that was identified after scoping and was not considered in the original analysis. It is then also possible that model refinements may be necessary to evaluate this unforeseen alternative, or existing tools may be adequate to use to test the new alternative. It is important that choices that are made regarding changes in the alternatives and analysis are the result of a deliberative process, and that the decisions and the decision process are well documented.

In sum, it is important for the scope of the modeling effort for the study to recognize the potential for re-evaluation of the analysis and thus include adequate time and budget at the outset to address such contingencies. In the case of large, unforeseen issues, adequately addressing the study requirements may require scope and/or budgetary change orders. The implications of this issue for the scopes of work for consultants conducting forecasting analyses are discussed in section 2.5.4.

2.5.2 Consistency

NEPA documentation often presents a large amount of data and uses several applications and iterations of land use and travel forecasts as the basis for alternatives screening and impact estimation. There are therefore numerous opportunities for inconsistencies of data or results. First, there are the obvious inconsistencies, such as the same performance measures for an alternative having different values in different tables or sections of the documentation. A recent NCHRP report[56] recommended systematically reviewing assumptions, data, and results to ensure internal consistency, and explained that careful cross-checking is a valuable effort that enhances the credibility of the documentation for the public, agency reviewers, and a reviewing court.

It is important that the reported differences in impacts across alternatives reflect actual differences between the alternatives instead of being the result of inconsistencies in the analysis across alternatives, such as from slightly different model versions or assumptions. It is important for the study team to explain the differences in impacts across alternatives and to demonstrate that they are the results of a consistent and reproducible modeling process. Typically, travel model results developed early in the analysis process are used for preliminary estimates of air emissions and noise impacts and preliminary engineering design. As the analysis process progresses, travel model results are refined. This refinement process creates an environment where, unless care is taken, inconsistencies can occur due to analyses being based on different sets of results. It is important for the study team to ensure consistency between the travel modeling efforts and the work that uses travel model results as inputs so that analyses are all based on a consistent set of travel model results. Finally, it is important for logical inconsistencies to be avoided between sections of the EIS (e.g., the land development effects assumed as part of the alternative analysis being different from the effects documented in the indirect and/or cumulative effects analysis). There is no easy way to eliminate these inconsistencies; careful attention to detail and review of the documentation is therefore essential.

In addition, the current project development effort may not be the first alternatives analysis prepared for the corridor; there may be a corridor or planning study, or a previous NEPA study. It is important to be aware of the differences in transportation-related impacts from one study to the next, and ideally be able

[55] See case law summary Section 4.1.4.4 for discussion of several cases that deal with the need to redo analysis, including *Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1464-1465 (9th Cir. 1984), *Audubon Naturalist Society of the Central Atlantic States, Inc. v U.S. Dept. of Transportation*, 524 F. Supp. 2d 642, 673 (D. Maryland 2007), and *Town of Winthrop v. Federal Aviation Administration*, 535 F.3d 1, 9-12 (1th Cir. 2008)

[56] *Synthesis of Data Needs for EA and EIS Documentation – A Blueprint for NEPA Document Content*, NCHRP Project 25-25(01), January 2005

to explain generally and credibly why the differences are logical. Further, this particular study may not be the only one occurring in the region or even in the same general area, and consistency across studies is important. Although it is not necessary that all the details are exactly the same, in some cases that may be necessary; in general, consistent methods are preferable. The likelihood of maintaining consistency between parallel studies can be enhanced by appointing a member of the study team to be responsible for consistency by checking with the other studies.

2.5.3 Enhanced Communication between NEPA Study Team and Forecasting Practitioners

Because the NEPA process is often highly complex and, by its very nature, requires the involvement of multiple entities and individuals, it is appropriate to take special care to ensure logical and clear communication protocols are in place during the course of the study. This is particularly true with regard to communications between the project manager(s), other members of the NEPA study team, and the forecasting practitioners. Each needs to have an appropriately substantive level of understanding of the other's work, especially regarding analytical assumptions, data sources and reliability, interpretation of analysis results, and documentation of work performed. Establishing clear and well-understood protocols for communication among the management and forecasting parties will help ensure a credible and defensible NEPA product.

The extent to which communication protocols need to be documented will vary depending on the specific circumstances of the study. For example, for a study in which the project manager and forecasting practitioners are co-located and generally work closely on a day-to-day basis, a relatively simple agreement describing the general information flow between parties, documented in a memorandum, may be sufficient. However, for a complex study involving a large team of practitioners, who may be located in various sites across a region or the country, it will likely be very important to clearly describe a protocol for communication between and among the project manager and forecasting practitioners. Such a protocol, documented in writing, could include, but not be limited to, the following:

- Personnel (management, forecasting, others as appropriate) and responsibilities
- Description of decision-making structure within the NEPA team (possibly in writing and flowchart form)
- Schedule of communication events (e.g., regular meetings/conference calls of forecasting team and project manager)
- Format for documenting key assumptions, decisions, and communications and maintenance of that documentation

The NEPA project manager and other key players will need to determine what is appropriate for a particular project regarding the structure of a communication protocol. The goal of any such protocol should be to facilitate consistent and useful communication between the project manager and forecasting practitioners.

In addition, the involvement of legal counsel may be needed during the NEPA study on complex, controversial, and/or previously litigated projects. The role of counsel in this context is to ensure that the work being done and the documentation of the work are legally sufficient and adequately address typical legal issues with regard to forecasting. This involvement will help to ensure that the forecasting work performed meets legal requirements and improves the defensibility of the study.

2.5.4 Considerations for Developing Scopes of Work for Forecasting Practitioners

It is typical for the majority of the forecasting work carried out during a NEPA analysis to be performed by a transportation consultant hired by the lead agency. In practice, the level of detail of scopes of work for these forecasting efforts vary considerably from a few lines to a very detailed discussion of the needs of the forecasting effort. Beyond the provision for basic forecasting work to be conducted, the following are a few of the important elements of a scope of work that warrant consideration by a lead agency:

- Potential reevaluations and re-do loops: As mentioned above, new information, updated data and assumptions, or updated model versions can impact forecasting efforts, often in the middle of the NEPA study. While this may only happen on a few, complex or controversial projects, the impact on a study contract can be sizable. Incorporating resources into contracts to account for the potential of these occurrences will help ensure that needed analysis can be conducted. Professional judgment should be utilized to determine projects where this may be appropriate.
- Contract length and litigation contingency: a NEPA process can take place over a considerable time frame. That time-frame may be unexpectedly extended if the project is the subject of litigation. Because forecasting is often the focus of litigation, and to ensure continuity in the study team, it is important to consider that the work may need to be extended to provide additional analyses and support from the forecasting practitioners during responses to litigation.

2.6 Forecasting for Noise and Air Emissions Analyses

Land use and travel demand forecasting models are used to provide existing and future traffic volumes on the road network, estimated operating speeds, and information on mode usage that are used as inputs to noise and air quality assessments. This information is crucial to the successful completion of these analyses. It is important that lead agencies assure that assumptions that are made in general forecasting applications as part of the NEPA study are consistent with those used in the noise and air quality analyses. As an example, noise and air analyses may have specialized requirements regarding the needed forecasting analysis years, scales, or time periods. As a result, it is appropriate that the NEPA and forecasting practitioners take this into account early in the model development and scoping process.

More detail on the evaluation of noise and air impacts is provided below.

2.6.1 Noise Analysis

The results of travel demand forecasts are used as inputs to noise analyses routinely conducted as part of the NEPA process. The procedures used to identify and estimate noise impacts are found in 23 CFR Part 772, the FHWA regulations for the evaluation and mitigation of traffic noise in the planning and design of Federally funded highway projects.[57] This regulation establishes:

1. Methodologies for conducting a traffic noise analysis, and
2. Guidelines and requirements for the consideration of noise abatement measures.

In preparing traffic projections for NEPA documents, it is important to understand certain requirements of the FHWA regulations with respect to traffic volume estimation and modeling:

- Noise levels are established for the existing condition and a no-build and build scenario in the design year. The "design year" is "[t]he future year used to estimate the probable traffic volume for which a highway is designed" and is usually consistent with the design year established for other impact analyses in the EIS process.
- Impacts are measured during the one-hour period where the worst-case noise levels are expected to occur. This may or may not be the peak hour of traffic. That is, higher traffic volumes can lead to higher congestion and lower operating speeds. Since higher speeds lead to higher noise emissions from motor vehicles, the worst-case noise levels may occur in hours with lower volumes and higher speeds. In addition, vehicle mix may also change hourly. On many highways, the percentage of heavy trucks is reduced during peak hour. Since heavy

[57] Additional guidance can be found in *Highway Traffic Noise Analysis and Abatement: Policy and Guidance* (1995)

trucks have greater sound emissions than passenger cars, vehicle mix is an important component in determining the peak hour of noise impact. It may be necessary to conduct screening runs on several hours to determine which combination of traffic volume, speed, and vehicle mix yields the greatest impact. It may be the case that the peak hour of noise impact changes as the result of the proposed project. For example, the introduction of a multimodal facility like a freight terminal could introduce a large volume of heavy trucks during off-peak hours. In this case, a different analysis hour could be evaluated for the no-build and build alternative scenarios.

If the hour to be modeled is not included as a direct output of the travel demand forecasting model, then adjustments can be considered based on factors developed for similar types of roads. For example, if a transportation model is used to develop annual average daily traffic (AADT), then adjustment factors based on automatic traffic recorders (ATRs) could be used to estimate time-of-day hourly volumes and vehicle mix. The methodology for adjustments of model volumes used in the noise analysis should be consistent with that used in other sections of the EIS, and should be documented.

2.6.2 Air Quality Emissions Analyses

Results from travel demand forecasting models are used as inputs for estimating the regional and project-level emissions impacts of transportation plans, programs, and projects, as well as NEPA project alternatives. Emissions analyses are required to demonstrate that transportation plans, programs, and projects conform to the goals as identified in the State Implementation Plan (for areas in non-attainment or maintenance for a specific pollutant) to meet specific Clean Air Act requirements.[58] Emissions analysis may also be conducted to estimate the potential impacts of a specific alternative for other pollutants such as mobile source air toxics (MSATs) and greenhouse gases (GHGs). In addition, two levels of analyses are typically conducted with regard to transportation emissions: regional and micro-scale or hot-spot analyses. The analyses required for a specific NEPA study will depend on several factors, including:

- The context of the project: Is the area a non-attainment or maintenance area? Are there sensitive groups near the project area?
- The scale of the project alternatives being considered: Are there alternatives that are major expansions of an existing highway or new alignment? Or are they minor improvements on an arterial?
- The type of pollutant involved: Is a regional or local-level analysis required for a particular pollutant? Have other pollutants been raised as issues of concern by the public or other agencies?

The details of how emissions analyses will be conducted for a plan or project in order to meet Clean Air Act requirements are too extensive to discuss here, so this guidance will focus on the forecasting implications of both regional and local-scale analysis.[59]

2.6.2.1 Regional Emissions Analysis

Regional emissions analyses are conducted to produce estimates of emissions over a large area, typically the air quality non-attainment or maintenance areas (such analyses are not routinely conducted in attainment areas). This type of analysis is usually conducted to assess regional emissions to support a conformity determination for an MPO long-range transportation plan to demonstrate conformity or for a project in an isolated rural non-attainment or maintenance area. Travel demand forecasting models are generally used to supply inputs for the emissions estimation process, although some areas may use other appropriate forecasting methodologies. Typically, forecasting models or methodologies are used to pro-

[58] 42 U.S.C. § 7506(c) (Clean Air Act § 176(c))

[59] See 40 CFR § 93 for transportation conformity requirements. For more information, see the *Transportation Conformity Reference Guide* at: http://www.fhwa.dot.gov/environment/conformity/ref_guid/index.htm

duce future VMT and speed estimates for the regional network. These estimates are used to represent travel activity in the study area. Emission rate models (such as MOBILE6.2 or MOVES) are used to create emission rates based on travel activity, vehicle fleet mix, temperature, and other variables. Emissions are estimated by multiplying the appropriate VMT estimate to the corresponding emission rate.

From a NEPA study forecasting perspective, the key considerations include consistency of assumptions and data and evolving analysis methods. It is important that the design concept and scope of the project in the NEPA analysis be consistent with that included in the conforming transportation plan and TIP in non-attainment or maintenance areas. Any substantial change in a project's design concept or scope will require a new plan/TIP conformity determination[60] and could require a reevaluation of regional and local-level emissions and a new project-level conformity determination. Also, certain analysis years will be required for the regional emissions analysis. These years may be different from the analysis years used in the NEPA study. The methodologies employed and assumptions used should be as consistent as practicable between the regional emissions analysis and the NEPA study. For example, if the land use assumptions in the NEPA study are sizably different from those used in the regional emissions analysis, then it is suggested that the differences be explained and documented. In addition, analysts are required to ensure that the latest planning assumptions are used in an emissions analysis.[61]

Periodically, a new emissions model is released by the Environmental Protection Agency (EPA) and is typically phased in over time. For example, the current emissions rate model from EPA is MOVES,[62] although MOBILE6.2 has been used until very recently, and will be required when conducting emissions analyses. It is strongly recommended that analysts ensure that the latest emissions model is being used and anticipate if new models or updates will be available during the course of the NEPA study. This may mean that updated emissions analyses are required prior to the final approval of the NEPA analyses.

2.6.2.2 Micro-Scale Emissions Analysis

Hot-spot analyses are conducted to determine the ground-level concentration of a pollutant of concern. In most cases, carbon monoxide (CO) is evaluated at intersections, as this is where the greatest concentrations are often found. However, these types of analyses can also be conducted for other pollutants, such as PM.[63], [64] Hot-spot analysis typically includes information on traffic volumes and free flow travel speeds on each roadway segment in the analysis. There are CO standards for both the 8-hour and 1-hour averaging period, although the 1-hour averaging period is almost never exceeded without the 8-hour averaging period being exceeded first. In general, the average of the highest consecutive 8 hours of traffic volume is chosen for the 8-hour analysis, or the peak hour is analyzed with a persistence factor to adjust the 1-hour impacts to 8 hours. When travel demand models are used to generate the peak 1-hour traffic volume, the latter method is most often used.

The evaluation of MSATs is generally conducted using a project level analysis.[65] As with CO, emissions of MSATs are dependent on traffic volume, vehicle mix, and operating speed. Other factors are also taken into account, such as fuel characteristics, but these are independent of whether traffic data are provided by a travel demand model or by other means. Since many of these air toxics are carcinogenic, long-term exposure is generally of the greatest concern. As a result, averaging times for analysis is usually one year. Therefore, AADT models are often sufficient for generating the traffic volumes, vehicle mix, and operating speeds.

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[60] See 40 CFR § 93.104(d)

[61] More information on current planning assumptions can be found at: http://www.fhwa.dot.gov/environment/conformity/assumpts.htm

[62] For more information see the MOVES website: http://www.epa.gov/otaq/models/moves/

[63] See 40 CFR § 93.123(b)(1)

[64] *Transportation Conformity Guidance for Qualitative Hot-spot Analysis in PM2.5 and PM10 Nonattainment and Maintenance Areas*, joint FHWA and EPA guidance, March 29, 2006. Available at: http://www.fhwa.dot.gov/environment/conformity/pmhotspotguidmemo.htm

[65] The current guidance on this topic is *Interim Guidance on Air Toxic Analysis in NEPA Documents* (February 3, 2006). Available at: http://www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm

Models of air impacts are required to be conducted during the year of peak emissions from the project.[66] This can typically be achieved by analyzing both the first build year and the design year, although an intermediate analysis year may also be necessary. This is because there is a tradeoff between traffic volume and emissions. That is, in the design year, traffic volumes are usually higher due to background growth, but emissions are lower due to the retirement of older and dirtier vehicles. Therefore, depending on which factor is more important, the worst-case impacts could occur earlier in the project life (such as the "open to traffic" year) or later.

2.7 Documenting and Archiving Forecast Analyses

2.7.1 Documenting Forecast Analyses

As mentioned throughout this guidance, documentation is an essential component of the NEPA and the project development process, which supports transportation decision making and complements public involvement and interagency coordination. NEPA requires that Federal agencies disclose the results of their analysis and the effects of project implementation on the environment and solicit comments on the proposals from interested and affected parties. The purposes of documenting the NEPA process are to:

- Provide for full disclosure to the public
- Allow others an opportunity to provide input and comment on alternatives and environmental impacts
- Provide the appropriate information for the decision-maker to make a reasoned choice among alternatives
- Provide an adequate administrative record for potential legal challenges.

A forecasting effort typically involves a tremendous amount of technical work that the study team then documents and describes in a manner so that it can be understood and meaningful to both technical readers (i.e., other modelers) and non-technical readers more interested in the results of the analysis (i.e., decision-makers and the public). Given the amount of work that must be documented in a typical NEPA study, it is important for lead agencies to provide the study team with sufficient time and budget to complete this critical phase of the study.

From a legal standpoint, any work <u>not</u> documented as part of the Administrative Record (AR) is not useful, since the AR is the documentation that would be used by a judge reviewing the procedural aspects of project litigation.[67] Consequently, the technical documentation typically goes in an appendix, whereas the main document presents the salient points from the analysis relevant to decision making and comparing alternatives. CEQ regulations (40 CFR § 1502.18) support this use of technical appendices, stating that "if an agency prepares an appendix to an environmental impact statement the appendix shall...normally be analytical and relevant to the decision to be made."

If a peer review is to be done, it is important for the study team's technical documentation to present the forecasting process in enough detail for the peer reviewers to analyze. It is suggested that this documentation describe the forecasting methods, key assumptions, and data used in the analysis, as well as any changes made during the study, and fully explain the methods used. This explanation may cover base-year model calibration and validation, as well as any technical evidence supporting the reasonableness of the forecasts (or incorporate existing documentation by reference). It is advisable for the study team to coordinate and share refinements made to model inputs, algorithms, or methodology with the agency that maintains the model and data (such as an MPO).

It is important for NEPA documentation to include enough technical detail to explain complex information in an understandable manner and present information in a way that is easy to follow for agency re-

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[66] See 40 CFR § 93.116(a)

[67] See, for example, *Protect Our Water v, County of Merced (03 C.D.O.S. 6067 July 9, 2003, _Cql. App. 4th_)*

viewers, courts, and the public. In addition to explaining the technical information, it is important for agency reviewers, courts, and the public to understand the reasoning behind how analytical methods were chosen, what assumptions were made, and who made those choices. The study team can take several steps to achieve this balance, as outlined in a 2005 NCHRP report:[68]

- **Identify and Explain Key Assumptions**. The technical analyses contained in NEPA documentation generally are based on a series of assumptions. For example, travel forecasts are based on assumptions about future population and employment trends, and future transportation investments. It is important for decisions regarding these underlying assumptions to be reached using a reasoned approach. Also, it is important for the assumptions themselves to be reasonable in order for the results of the forecasts to be reasonable. Therefore, in presenting technical information, it is important for preparers of NEPA documentation to specifically identify key assumptions and *explain why* those assumptions were made.
- **Describe Methods Used to Develop Forecasting Results**. The persuasive power of technical data depends heavily on the reader's confidence in the methods used to generate those data. If the reader cannot understand how the data were developed, the reader is essentially being asked to "take it on faith." Thus, describing the methodologies used to develop the data can enhance the credibility of NEPA documentation. This approach requires more than giving the name and version of the model used; it requires explaining in simple terms how that model works and what type of information it provides. It also means explaining any inherent limitations in that model.
- **Summarize and Explain the Forecasting Results**. NEPA documentation presents a vast quantity of technical information. A critical task of a NEPA documentation preparer is to explain the data. Explaining the data involves more than reciting in text the data that appear in an accompanying table or figure. It is suggested that the explanation identify patterns in the data, explain causal relationships, and explain anomalous or otherwise unexpected results.
- **Systematically Review Assumptions, Data, and Results to Ensure Internal Consistency**. The large amount of data presented in NEPA documentation creates numerous opportunities for internal inconsistencies and contradictions. Careful cross-checking to ensure rigorous consistency is a valuable effort that enhances the credibility of the documentation for the public, agency reviewers, and a reviewing court.

An important job of the documentation writer is to explain what the technical data mean in relation to the decision(s) to be made. The writer might achieve this objective by capturing compelling cross-cutting issues that are important for the study and by summarizing key issues with perspective.[69] It is not enough to simply describe the technical work completed. Quality NEPA documentation effectively tells the project story through clear, concise writing; effective organization and formatting; and effective use of visual elements. It is suggested that if this story is to be presented in the main body of the documentation then it will present reasonable information and indicators describing how each alternative meets or does not meet the project's purpose and need, explaining any technical details in a way that is understandable to non-technical readers, and referencing the technical documentation in an appendix.

Telling the story of a forecasting effort requires a shift in the thinking away from the technical aspects of the modeling work and towards the impacts of the project that stakeholders are concerned about. A recent report from AASHTO illustrates how an EIS can be reorganized to be more engaging to readers. This reorganization of the EIS document mirrors the shift in thinking necessary to convey forecasts—that it is important for the results of the technical analysis to be relevant and understandable. The report has several suggestions for improving the readability of NEPA documents that reflect the intent of the CEQ regulations:

- Use clear, concise writing
- Provide effective summaries

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[68] *Synthesis of Data Needs for EA and EIS Documentation – A Blueprint for NEPA Document Content*, NCHRP Project 25-25(01), January 2005

[69] *Improving the Quality of Environmental Documents*, A report of the joint AASHTO/ACEC Committee in cooperation with FHWA, May 2006

- Select an easy-to-use format
- Summarize information and use pictures and effective graphics to help communicate complex issues or comparisons[70]
- Separate technical information or high-volume materials into appendices or use cross-references as appropriate
- Include only the most relevant information—do not discuss effects that do not matter.

2.7.2 Archiving Forecast Analyses

In addition to producing thorough and understandable documentation of the forecasting effort, it is important for the study team to preserve the ability to replicate the forecasts in the future by archiving the relevant modeling information. Relevant modeling information includes the data inputs, outputs, and the model setup files, including a written description of the model methodology, model version, and the software used in the analysis.

During a land use and travel forecasting effort, the study team will produce a tremendous amount of intermediate data. Not all of these data are pertinent to the decisions made in the NEPA process and, consequently, these may not need to be archived as part of the NEPA documentation. It is important that all decisions about whether to archive data are made between the NEPA project manager and the documenters; it is also important to retain any data that might be needed in the future. The study team may also want to keep in mind that the NEPA process can be lengthy, which may mean that examinations or interpretations of forecasting inputs, assumptions, or results may come at the end of the NEPA process or during a legal challenge. The study team may need to look at this information several years into the future. The archiving procedure, including the selection of storage medium, should reflect this.

3.0 CONCLUSION

Few analysis methods are as integral to NEPA and other project development studies as travel and land use forecasting. Forecasts provide important information to project managers and decision-makers, and are used throughout the project development and NEPA processes, providing foundations for purpose and need. They are important in evaluating the performance of alternatives, the estimation of environmental impacts, induced land development effects, and resulting indirect and/or cumulative effects.

Even though it is so integral to the NEPA process, forecasting is not a heavily legislated or regulated area and is mainly driven by the standards of professional practice. This results in a large variation in practice and experience. Forecasting methods are often the source of disagreements among agencies, and forecasting is often the subject of litigation.

The FHWA embarked on creating this guidance to help improve the state-of-the-practice in relation to how project-level forecasting is applied in the NEPA process, since no procedural or process guidance has been issued in the past. As a companion to this guidance, the FHWA is creating a document that will include case studies and best practices to help further the improvement of forecasting techniques at the project level. Training and technical assistance will also be made available to provide educational and peer exchange opportunities to State DOTs, MPOs, resource agencies, and the consultant community, to encourage needed dialogue and discussion to improve the state-of-the-practice.

Another important area that is not addressed by this guidance or any of the complementary activities discussed above is the need to improve the actual technical methods used to forecast land use and travel behavior as applied to NEPA processes. The FHWA is involved in efforts to initiate research, in coopera-

[70] For example, effective graphics could include the use of GIS and thematic mapping tools to display benefits and tabulations of forecasts at aggregated levels of geography (e.g., district to district trip tables)

tion with the Transportation Research Board and AASHTO, and to create information that discusses up-to-date technical methods and improvements that can be applied to project-level forecasting.[71]

4.0 APPENDICES

4.1 Case Law Summary (January 2009)

4.1.1 Introduction

This document was prepared to serve as a resource for the FHWA research project entitled "Development of Guidance on Travel Demand and Land Use Forecasting in NEPA." The summaries below are intended to provide a sense of the current judicial perspectives on issues surrounding the preparation and use of travel demand and land use forecasts in evaluations prepared pursuant to the National Environmental Policy Act (NEPA).[72]

A word of caution is in order about how readers use this material. This document does not constitute legal advice to any party. Readers should keep in mind that judicial interpretations of issues under NEPA differ from court to court. While decisions from the various jurisdictions can be instructive, as the summaries below illustrate, jurisdictional differences or differences in case facts often lead to variations in outcomes.

Finally, these summaries are much abbreviated descriptions from more detailed decisions. Those wishing to use these decisions for other than background purposes are advised to review the decisions in their entirety.

4.1.2 Standard of Review

A reviewing court determines whether the agency took a "hard look" at environmental issues. As a part of its review, the court will consider whether the agency's actions were arbitrary or capricious, an abuse of agency discretion, or otherwise not in accordance with the law or with procedures required by law. The court will consider whether the agency has compiled sufficient information to permit the agency to make a decision, considered relevant factors, articulated the reasoning behind its decisions, and disclosed this information to the public. Where these standards have been met, the courts will accord deference to the agency's decisions.

1. *Kleppe v. Sierra Club*, 427 U.S. 390, 410 (1976)

In a footnote to its decision (footnote 21), the Supreme Court noted the limitations on the role of a reviewing court, favorably citing to earlier cases on this point:

> Neither the statute nor its legislative history contemplates that a court should substitute its judgment for that of the agency as to the environmental consequences of its actions….The only role for a court is to insure that the agency has taken a "hard look" at environmental consequences; it cannot 'interject itself within the area of discretion of the executive as to the choice of the action to be taken….'

(citations omitted).

This "**hard look**" doctrine has been applied consistently since *Kleppe*.

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[71] For example, a key reference document in this field is *NCHRP Report 255: Highway Traffic Data for Urbanized Area Project Planning and Design*, TRB, 1982, which documents techniques that were the state of the practice over 25 years ago; since then there have been many technological innovations that are now in common use

[72] 42 U.S.C. § 4231 *et seq.*

2. *Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council Inc.*, 435 U.S. 519, 557-58 (1978)

The Supreme Court considered the standard of review under NEPA and emphasized that judicial review under NEPA is primarily focused on procedural requirements of the statute:

> NEPA does set forth significant substantive goals for the Nation, but its mandate to the agencies is essentially procedural.... It is to insure a fully informed and well-considered decision, not necessarily a decision the judges of the Court of Appeals or of this Court would have reached had they been members of the decision making unit of the agency. Administrative decisions should be set aside in this context ... only for substantial procedural or substantive reasons as mandated by statute ... not simply because the court is unhappy with the result reached.

(citations omitted).

3. *Strycker's Bay Neighborhood Council v. Karlen*, 444 U.S. 223, 227 (1980)

The Supreme Court further clarified the standard of judicial review under NEPA, emphasizing again the procedural nature of NEPA and limiting the ability of the reviewing court to substitute its judgment on substantive issues.

> ... the Court of Appeals [concluded in its earlier decision in *Strycker*] that an agency, in selecting a course of action, must elevate environmental concerns over other appropriate considerations. On the contrary, once an agency has made a decision subject to NEPA's procedural requirements, the only role for a court is to insure that the agency has considered the environmental consequences; it cannot 'interject itself within the area of discretion of the executive as to the choice of the action to be taken.'

(citations omitted).

4. *Marsh v. Oregon Natural Res.*, 490 U.S. 360, 375-78 (1989)

In examining the question whether there was significant new information that required preparation of a supplemental EIS, the Supreme Court held that the proper standard of review is found in the Administrative Procedure Act (APA) at 5 U.S.C. § 706(2)(A), which provides that a reviewing court shall "hold unlawful and set aside agency action, findings, and conclusions found to be arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." The Court noted that the question presented for review was a 'classic example of a factual dispute the resolution of which implicates substantial agency expertise' and that the dispute involved primarily issues of fact that could be analyzed only by the application of a high level of technical expertise. The Court did note that, when determining whether an agency decision was 'arbitrary or capricious,' the reviewing court 'must consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment.' This inquiry must 'be searching and careful,' but 'the ultimate standard of review is a narrow one.'

(citations omitted).

5. *N. Buckhead Civic Ass'n v. Skinner*, 903 F.2d 1533, 1543 (11th Cir. 1990)

Where an EIS was challenged on the basis that the agencies' review of the available traffic and environmental information was incomplete or inaccurate, the Court held that

> [r]esolution of this dispute requires analysis of the relevant environmental documents and traffic projections, so we cannot accept appellants' contentions that our review is of a legal question. The questions presented for review in this section are classic examples of 'a factual dispute the resolution of which implicates substantial agency expertise, so we must defer to the informed discretion of the responsible agencies.' Accordingly, as noted above, the agencies' decisions on the adequacy of the environmental and traffic data should not be set aside unless arbitrary and capricious.

(footnotes and citations omitted).

6. *Senville v. Peters*, 327 F. Supp. 2d 335, 344-45, 69 (D. Vt. 2004)

The Court summarized the provisions of the APA, which governs judicial review of a Federal agency's compliance with NEPA, and of its application in NEPA cases. The Court noted that under the relevant provisions of the APA, a reviewing court shall "hold unlawful and set aside agency action, findings, and conclusions found to be...arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law, ... [or] without observance of procedure required by law."[73] The *Senvill*e Court went on to state that a reviewing court may not substitute its judgment for that of the agency, but

> an agency decision may be set aside where the agency 'has relied on factors which Congress has not intended it to consider, entirely failed to consider an important part of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.'… An EIS will be upheld as adequate if the agency has followed a 'rule of reason' in its preparation, and has compiled it in good faith, and set forth 'sufficient information to enable the decision-maker to consider fully the environmental factors involved and to make a reasoned decision after balancing the risks of harm ... against the benefits to be derived from the proposed action, as well as to make a reasoned choice between alternatives.'

However, the Court went on to hold that where there had not been a "hard look" at cumulative impacts,

> [t]his neglect of a statutory duty is not subject to the arbitrary and capricious standard afforded an agency determination of whether new information is likely to have a significant impact on the environment; the Court concludes that the failure to produce any environmental document that addresses the cumulative impacts of the [project] when considered with other projects was 'not in accordance with law.' 5 U.S.C. § 706(2)(A).

(footnotes and citations omitted).

7. *Senville v Peters*, 2006 WL 2585130, at *2 (D. Vt. July 20, 2006)

The Court denied a government motion to amend its judgment in the 2004 case (see above). With respect to the scope of review, the Court noted that

> [i]n this Circuit a court must ascertain that 'the agency has made an adequate compilation of relevant information, has analyzed it reasonably, has not ignored pertinent data, and has made disclosures to the public.' This Court was able to perform this task with respect to a portion of the induced growth analysis, and concluded that FHWA took the requisite 'hard look.'

(footnotes and citations omitted).

8. *Laguna Greenbelt v. U.S. Dep't of Transp.*, 42 F.3d 517, 523 (9th Cir. 1994)

The Court, considering a challenge to a decision not to prepare a supplemental EIS, noted that "[we] may not substitute [our] judgment for that of the agency concerning the wisdom or prudence of a proposed action." Under our "rule of reason," we determine " 'whether the [EIS] contains a reasonably thorough discussion of the significant aspects of the probable environmental consequences' by making 'a pragmatic judgment whether the [EIS's] form, content and preparation foster both informed decision-making and informed public participation.' "

(citations omitted).

[73] 5 U.S.C.A 706(2)(A), (D)

4.1.3 Travel and Land Use Forecasts: When Are They Relevant?

Forecasts relating to future travel demand and land use have relevance for defining project purpose and need, selecting project alternatives, and determining likely project impacts (direct, indirect, and cumulative).

4.1.3.1 Purpose and Need

Data-driven determinations of purpose and need typically will be upheld so long as the data is valid and is interpreted in a reasonable and credible manner.

1. *North Carolina Alliance for Transp. Reform v. U.S. Dept. of Transp.*, 151 F. Supp. 2d 661, 686-88 (N.D. N. C. 2001)

Although the parties settled the underlying case, the Court reviewed the NEPA issues in order to determine whether the plaintiffs were entitled to attorneys fees. The Court recognized that traffic projections prepared for the project played a legitimate role in establishing purpose and need. With respect to purpose, the Court found that providing a continuous north-south connecting road that would link the existing radial farm-to-market roadways was not an overly narrow statement of purpose where traffic projections showed that only 10 percent of the projected traffic in the relevant area would be through traffic and that the vast majority of the traffic needed to travel within that local area. The Court also indicated that it would defer to the transportation agencies on whether the traffic projections for the proposed facility sufficiently established need, but that the agencies' intentional misstatement of traffic modeling data showing expected daily traffic volumes on the new facility was impermissible.

> In this case, the traffic projections used in the [Final Environmental Impact Statement] FEIS were not only overstated, they were considerably higher than the updated figures that Defendants decided to omit. While a need for the proposed project might have existed even under the lower traffic projections, the decision to purposefully include the higher, significantly overstated estimates of traffic projections in the FEIS conflicts with one of the major policy goals of NEPA and fails to accurately examine an important aspect of the project. Defendants violated NEPA by purposefully including the inaccurate data in the FEIS. *See* 40 C.F.R. § 1500.1(b) ("Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA.").

The Court concluded that the plaintiffs were entitled to attorneys' fees under the Equal Access to Justice Act, 28 U.S.C. § 2412.

2. *Burkholder v. Wykle*, 268 F. Supp.2d 835, 849-50 (N.D. Ohio 2002)

Plaintiffs challenged a Finding of No Significant Impact issued for a project that would upgrade and/or relocate various highway segments in Ohio. Plaintiffs' claims included an attack on the project's purpose and need. Plaintiffs alleged that the purpose and need was overly narrow and based, in part, on faulty forecasting of the project's probable benefits to traffic volume, safety, and economic prosperity. The District Court held that the purpose and need statement satisfied NEPA requirements. The Court found that

> …the project's stated justification is supported by sufficient data. In fact, the record is clear that the data, upon which the defendants relied, showed that the level of service on the present U.S. 30 was seriously deficient… that traffic could be expected to increase as it had during the previous decade, that the safety of the route was a significant concern of both the public and highway officials, and that the improvement would be economically beneficial. Moreover, in light of the foregoing, the Court finds a factual basis for the defendants' conclusion that a limited-access, four-lane freeway would best solve the road's problems. While it is clear that the plaintiffs' expert has reached a different conclusion, the Court must be wary of interposing itself in such a technical or methodological dispute. This being so, the Court finds that the defendants' projection of the im-

> provement's benefits was not arbitrary and capricious and rejects the plaintiffs' contention in this regard.

(citations omitted).

3. *Sierra Club, Ill. Chapter v. U.S. Dep't of Transp.*, 962 F. Supp. 1037, 1043 (N.D. Ill. 1997)

The Court found that, while it is legally sufficient to rely on existing transportation needs to justify a project even if the future needs analysis is flawed, in this case the FEIS contained no analysis of how the project would improve travel times, enhance community linkages, or alleviate other existing transportation problems. The Court found the FEIS legally insufficient because of the absence of such information.

4.1.3.2 Analysis of Alternatives

NEPA documentation must demonstrate that forecasts have been used in a rational and supportable manner when they serve as part of the underpinning for project purpose, and where project alternatives are judged based on their ability to satisfy forecasted needs. Courts may, of course, come out with differing views of what is adequate based on the particular facts of the case. *See also* section 4.1.4.4 below.

1. *Sierra Club, Ill. Chapter v. U.S. Dep't of Transp.*, 962 F. Supp. 1037, 1043 (N.D. Ill. 1997)

Challengers alleged that the use of the same land use forecast for the build and no build scenarios prevented a rational analysis of alternatives. The Court agreed, stating that

> …the final impact statement in this case relies on the implausible assumption that the same level of transportation needs will exist whether or not the tollroad is constructed....The result is a forecast of future needs that only the proposed tollroad can satisfy. As a result, the final impact statement creates a self-fulfilling prophecy that makes a reasoned analysis of how different alternatives satisfy future needs impossible.

(footnotes and citations omitted).

2. *Laguna Greenbelt v. U.S. Dept. of Transp.,* 42 F.3d 517, 526-27 (9th Cir. 1994)

The Appellate Court upheld the agencies' use of data for the build and no-build alternatives where they relied on local planning documents. The challengers claimed that the EIS's analysis was flawed because it purported to reflect a comparison between the environment with and without the tollroad through the year 2010, but that the traffic projections used in the EIS failed to provide a true comparison because they were based on population and housing data that assumed existence of the tollroad. The Court agreed that the projections did assume the existence of the tollroad, but held that the incongruity was not fatal because "the need for the corridor is based on existing as well as future traffic congestion…and the county's population probably will grow in the coming years even without the corridor, AR 31:013173 (population increased by 2.1 million from 1950 to 1989 with little highway improvement…)."

(citations omitted).

3. *Jones v. Peters,* 2007 WL 2783387, at *10-11, 23 (D. Utah September 21, 2007)

Plaintiffs challenged FHWA approval of two highway projects in Utah. Claims included the allegation that the traffic modeling used to screen alternatives was flawed and incorrectly calculated the ability of various alternatives to improve mobility. As a result, the plaintiffs claimed that the alternatives analysis failed to satisfy the NEPA requirement to "rigorously explore and objectively evaluate all reasonable alternatives...."40 C.F.R. § 1502.14(a) (2006). The Court rejected the claims, finding that

> The traffic modeling relied upon by the agencies in …evaluating alternatives comprehends nearly 40 current regional transportation plans, federal and state, as well as the projected traffic demand for the region within and beyond the study area boundaries. It takes into account the phasing of plans from now through 2030, including increased mass transit development that may affect the study area. Alternatives to the proposed action are thus evaluated using projections that take into account that larger context.

> While the plaintiffs dispute the methodology used and conclusions drawn from the agencies' traffic modeling, they have not persuaded this court that the agencies' traffic modeling and the analysis flowing from that modeling lacked a rational basis, lacked consistency, or failed to take relevant considerations into account. Expert opinions do clash over the efficacy of one approach to traffic flow analysis compared with another. But disagreement between experts often does not present an 'either-or' question, and each of the opinions may be footed upon its own rational basis.
>
> Here, neither NEPA nor § 4(f) call upon this court to resolve those differences of expert opinion-to make a *de novo* determination of the comparative accuracy of the experts' contrasting approaches to traffic modeling, or to choose between differing interpretations of the modeled data. Those choices are for the FHWA, not the court. Instead, this court must decide whether the agencies' choices of method and interpretation as to the modeling of traffic data had a rational footing. Based upon the record now before us, this court concludes that they did.

(footnotes and citations omitted).

4.1.3.3 Direct, Indirect, and Cumulative Impacts Analyses

Impacts must be addressed if they are "reasonably foreseeable." That standard has been interpreted as meaning that the impact is "sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision."[74] The Supreme Court in *U.S. Dep't. of Transp. v Public Citizen*, 541 U.S. 752, 769, 124 S.Ct. 2204, 2216 (2004) rejected the "but for" test that had evolved to determine whether effects required NEPA analysis because they were causally linked to a Federal action. The Court held that that the correct test is whether the Federal action is the "legally relevant cause" of the effects. Application of the *Public Citizen* test is requires a more complex analysis than the earlier "but for" analysis and practitioners are encourage to consult with counsel if there is any question whether the effects they are considering meet the *Public Citizen* test.[75]

CEQ regulations explicitly recognize induced growth among the potential indirect effects of a project:

> Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. 40 CFR § 1508.8(b).

As with alternatives, care should be taken to ensure that information is developed and used in a rational and supportable way.

1. *City of Davis v. Coleman*, 521 F.2d 661, 675-77 (9th Cir. 1975)

In an early case addressing the linkage between land use and transportation, the Court held that FHWA must prepare an EIS and must address the land use impacts of the proposed action. The Court found it particularly problematic that the environmental review performed by FHWA and the State had ignored such impacts even though the purpose of the project was to facilitate economic development in the project area. The Court stated that

> … it is obvious that constructing a large interchange on a major interstate highway in an agricultural area where no connecting road currently exists will have a substantial impact on a number of environmental factors….The growth-inducing effects of the [interchange project] are its raison d' etre, and with growth will come growth's problems: increased population, increased traffic, increased pollution, and increased demand for services such as utilities, education, police and fire protection, and recreational facilities.

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[74] *Dubois v. U.S. Dep't of Agric.,* 102 F.3d 1273, 1286 (1th Cir.1996) (quoting *Sierra Club v. Marsh,* 976 F.2d 763, 767 (1th Cir.1992)).

[75] For a helpful discussion of *Public Citizen* and its progeny, see *Humane Soc. of U.S. v Johanns*, 520 F.Supp.2d 8, 22-28 (D.D.C. 2007).

> The expert opinions and studies that [the plaintiff] has submitted during this litigation bolster the conclusion that [the State]…could not have known enough about the environmental effects of this project to 'reasonably conclude' that they would not be significant…. In this context the purpose of an EIS/EIR is to evaluate the possibilities in light of current and contemplated plans and to produce an informed estimate of the environmental consequences. That the exact type of development is not known is not an excuse for failing to file an impact statement at all. Uncertainty about the pace and direction of development merely suggests the need for exploring in the EIS/EIR alternative scenarios based on these external contingencies….It must be remembered that the basic thrust of an agency's responsibilities under NEPA is to predict the environmental effects of proposed action before the action is taken and those effects fully known. Reasonable forecasting and speculation is thus implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as 'crystal ball inquiry.'

2. *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.2d 1152, 1179-80 (10th Cir. 2002)

The geographic scope of forecasted land use changes does not necessarily define the areas of evaluation for impact analysis. Where the Federal agencies considered impacts on wildlife habitat only within an "arbitrary" 1000 foot distance from the right of way, the Court held the FEIS was inadequate. The Court noted that while the FWS had submitted information to show that "roads can cause significant adverse effects to bird populations as far as 1.24 miles from roadways, especially in open terrain like that adjacent to the proposed Legacy Parkway," the agencies had decided to limit the analysis to the 1000-foot area because "the data …collected for land use (which extended to 1 mile from the edge of the wetland) did not result in any statistical difference from the data collected at 1000 feet." The Court concluded that the 1000-foot limitation was overly restrictive and eliminated evaluation of species of concern to agencies and the public, including migratory birds. The failure to address migratory bird impacts rendered the FEIS inadequate.

3. *Sierra Club v. U.S. Dep't of Transp.*, 310 F. Supp. 2d 1168, 1186-88 (D. Nev. 2004)

Plaintiffs brought several challenges to the EIS for a proposed highway project. One of these challenges alleged that FHWA inadequately analyzed the indirect impacts of the project, including induced growth and induced travel. The Court upheld the sufficiency of the FEIS analysis of induced growth, finding that the FEIS discussed at length various land use and zoning issues including existing plans for master planned communities and other land uses in the area, city and county growth plans and zoning regulations and patterns, current and anticipated land use and zoning, and "induced" or "accelerated development impacts."

The Court was more troubled by the treatment of induced travel. After reciting the effect that failure to account for induced travel may have on decision-making ("…may lead agencies to select projects which provide no relief from congestion combined with increased adverse impacts to air quality…."), the Court discussed the degree to which the modeling accounted for the full range of induced travel impacts. The FHWA admitted that the model did not account for impacts from new trips made in direct response to a perceived reduction in congestion, but said that the portion of induced travel that the model did not address was a small and indeterminate part of induced travel effects and that current models cannot accurately capture the information. In the end, the Court upheld the sufficiency of the EIS on this point, finding that

> …the FEIS's treatment of induced travel effects is a reasonably thorough analysis. The FEIS considered nearly all induced travel effects. The portion not considered is the subject of scientific debate, and current models vary in their calculations to quantify induced travel effects. … Consequently, FHWA included a reasonably thorough evaluation of induced travel effects based on the information and modeling techniques available to the agency at that time.

(citations omitted).

4.1.4 Issues Affecting Sufficiency Under NEPA

The NEPA document's discussion must be adequate to inform decision-makers and the public about the various ways in which induced growth and other effects may occur. The agency must examine the relevant data and articulate a reasoned basis for its choice of methodologies and its decisions. Conclusory statements are not enough. It is important to think through all of the "links in the chain" of potential effects and to disclose and discuss information on all sides of an issue.

4.1.4.1 Consideration of an Appropriate Range of Impacts

When public or agency comments, or the transportation agencies' own evaluation, suggest that impacts may occur, the agencies should address those impacts in the NEPA documentation. The nature of the impact at issue will dictate the degree of evaluation and explanation required. The failure to provide *any* information on identified potential impacts often leads reviewing courts to find that the agencies have violated NEPA.

1. *Senville v. Peters*, 327 F. Supp. 2d 335, 368-69 (D. Vt. 2004)

The Court held that, even though the FHWA had taken a "hard look" at whether an alternative would cause growth that would not have occurred without construction, the agency failed to consider other requisite aspects of the induced growth issue.

> Induced growth consists not only of growth that would not have occurred absent the project, however, but of relocated or redirected growth due to changes in accessibility. The 1986 FEIS assumed that relocated development would occur generally in the vicinity of the new intersections and in high density zoning districts. There was no discussion of the potential detrimental impact upon areas from which population and resources would be drained….In response to comments pointing out this omission, FHWA noted that growth rates in the urban core cities have been declining for thirty years and are predicted to continue, and that the change attributable to the [project] is too small to be material….To the charge that FHWA underestimated the impact on communities that will experience increased development pressure due to increased accessibility, FHWA responded only that towns in the area will experience increased but insignificant development pressure. The dismissive treatment of relocated growth pressures on the outlying towns … is inconsistent with a hard look at relocated or redirected growth, particularly when the issue was not part of the original EIS. Despite the massive number of pages devoted to attempting to quantify induced growth, the Court cannot conclude that the determination that relocated growth will have an insignificant impact upon the inner cities or outlying towns is based upon reason.

(citations omitted).

2. *Conservation Law Found. v. Fed. Highway Admin.*, 2007 WL 2492737, at *24 (D.N.H. August 30, 2007)

The Court found that the agencies failed to consider appropriately the population growth and attendant traffic impacts on air quality.

> Because Defendants based their air quality analysis on traffic counts derived from the use of an outdated OEP population forecast that did not account for induced population growth, they did not consider how air quality will be affected by the additional traffic that will result if the Delphi Panel's population growth forecasts are correct. Accordingly, they must revise their analysis to address the foreseeable air quality effects of the additional baseline and induced population growth forecast by the Delphi Panel.

4.1.4.2 Sufficient Disclosure and Discussion

Agencies have an obligation to disclose potential environmental impacts, including those identified by others (and especially those identified by agencies with relevant expertise). NEPA documentation should include at least a brief summary of potential impacts and the results of the evaluations of those impacts. Courts consistently reject documentation that contains a "mere conclusory statement" not accompanied by any rationale for the conclusion about the impact. With some regularity, courts find a NEPA violation where there is a failure to disclose new or conflicting data, or a failure to explain the rationale behind the agency's choice about which data to use. The level of detail required in the documentation's discussion depends upon the importance of the impact under consideration.

1. *Davis v. Mineta,* 302 F.3d 1104, 1123 (10th Cir. 2002)

The Court held the EA inadequate where it failed to do more than make conclusory statements. For example, stand-alone statements like "growth would increase with or without the project," or "development is inevitable" are insufficient. The Court pointed out that the minimal and conflicting statements in the EA, which were the subject of an EPA comment calling for further analysis, failed to provide an adequate discussion of growth-inducing impacts. The Court also noted that the agencies apparently did not adequately address the EPA's comments in the EA.

> The EPA's viewpoint on this issue is undeniably relevant. While it is true that NEPA 'requires agencies preparing environmental impact statements to consider and respond to the comments of other agencies, not to agree with them,' it is also true that a reviewing court 'may properly be skeptical as to whether an EIS's conclusions have a substantial basis in fact if the responsible agency has apparently ignored the conflicting views of other agencies having pertinent expertise.'

(footnotes and citations omitted).

2. *Senville v. Peters,* 327 F. Supp. 2d 335, 369 (D. Vt. 2004)

In ruling that the FHWA has failed to comply with NEPA, the Court found that

> [o]ther than the bald assertion in the introduction to the induced growth study that 'induced growth, as utilized in this study, includes both secondary and cumulative impacts'…the Court has been unable to find any discussion of cumulative impacts in the study or the [EA] overall.
>
> NEPA requires a 'sponsoring agency to consider the impact on the environment resulting from the *cumulative* effect of the contemplated action and other past, present, and 'reasonably foreseeable' future actions.' As noted above, there has been no environmental analysis whatsoever, in the entire life of this project, of the cumulative effect of the [project] considered in conjunction with other past, present and reasonably foreseeable future actions.

(citations omitted).

The Court also pointed to "the cursory treatment of induced growth impacts in the 1986 FEIS; its failure to recognize that there will be induced growth impacts on outlying towns and on the cities; its inadequate treatment of secondary impacts on agricultural lands; the [EA's] omission of analysis of the effects of relocated growth on the inner cities and outlying towns" and other factors as grounds for its determination.

3. *Laguna Greenbelt v. U.S. Dept. of Transp.*, 42 F.3d 517, 525-26 (9th Cir. 1994).

The Court, reviewing a challenge to the sufficiency of an EIS discussion of growth-inducing impacts, upheld the adequacy of the EIS. The Court noted the distinction between cases where the EIS contained unsupported, conclusory statements and those cases where an EIS's discussion of growth-inducing impacts was reasonably thorough. The Court acknowledged that the EIS's analysis of growth-inducing impacts had weaknesses, including some data that could be interpreted as contradicting the EIS's conclusion about growth-inducing effects; but the Court determined that the weaknesses did not prevent a conclusion that the discussion of growth-inducing impacts in the EIS easily met the "rule of reason."

> NEPA does not require us to decide whether an EIS is based on the best scientific methodology available or to resolve disagreements among various experts. While Laguna may disagree with the EIS's substantive conclusion regarding growth-inducing impacts, the EIS's discussion of those impacts was reasonably thorough.

(footnotes and citations omitted).

4. *Citizens Advocate Team v. U.S. Dep't of Transp.,* 2004 WL 725279, at *5-6 (N.D. Ill. March 31, 2004)

Reviewing an allegation that the FEIS failed to satisfy NEPA because it failed to provide a detailed assessment of growth and traffic inducing impacts, the Court found that the FEIS was adequate and noted that the extent of discussion required should be determined based on the "overall level of significance the agency places on the impacts." The Court looked to whether the agency had made a "reasonable, good faith, objective presentation of the impacts sufficient to foster public participation and informed decision making." It concluded that

> …[a]lthough the Final EIS contains only a limited discussion of the projected traffic and population increases associated with the construction of the [project], the FHWA's decision to issue the ROD was not arbitrary and capricious in light of the minor role these growth-inducing impacts were determined to have on the surrounding area….Where the growth-inducing impacts or effects are determined to be minor, however, the agency is not required to quantify all possible effects provided it has reasonably explained why such a quantification is not necessary or feasible.

(footnotes and citations omitted).

5. *Conservation Law Found. v. Fed. Highway Admin.,* 2007 WL 2492737, at *23 (D.N.H. August 30, 2007)

In addition to studies, the agencies used a Delphi Panel to estimate growth-inducing effects of the proposed project. The Court held that the agencies are obliged to disclose the effects of that panel's work on traffic projections for the project. The Court rejected the agencies' position that disclosure was not required because the additional traffic that would result from the panel's forecast was not significant.

> While this argument may well justify a decision to proceed with [the preferred alternative]…it cannot excuse a decision to withhold information from the public that leaves it with the mistaken impression that the selected alternative will be substantially more effective in achieving one of the project's two primary objectives than may actually be the case. Reliable information produced by the agency's own experts that casts doubt on the agency's statements concerning a selected alternative's effectiveness is not insignificant….The additional traffic projected … is also significant because it will produce foreseeable indirect effects on secondary road traffic and air quality that Defendants failed to analyze in the FEIS…. This foreseeable effect of the [preferred alternative] must be assessed by the Defendants in a manner that allows for public comment.

The Court did uphold the agencies' use of challenged forecasts for vehicle operation and parking cost assumptions in their decision to eliminate rail from further consideration as an alternative. The Court cited the fact that the agencies gave a rational explanation in the FEIS for why they relied on the assumptions, and performed an additional sensitivity test in response to DEIS comments.

(footnotes and citations omitted).

4.1.4.3 Choice of Methodology

Agencies generally are entitled to select the methodologies they will use for NEPA analyses. Courts typically will not substitute their judgment for the agencies' expertise if the agencies have explained in the NEPA documentation their reasons for choosing one method over another, including the reasons for rejecting other methodologies. There are limitations on this deference. If the chosen methodology lacks a rational basis, lacks consistency, or fails to take relevant considerations into account, or if the transportation agencies' choice of methodology ignores the comments of agencies with particular expertise and fails to explain why those comments were ignored, courts will take a harder look and may overturn the transportation agencies' decision.

1. *N. Buckhead Civic Ass'n v. Skinner,* 903 F.2d 1533, 1543- 44 (11th Cir. 1990).

Appeal of a case that attacked the validity of traffic modeling used to generate projections used in evaluating alternatives. The challengers argued that the estimates failed to take into account the possible beneficial effect of mass transit on traffic in the corridor. The traffic projections came from the State DOT's analysis of present traffic amounts and projected future amounts, which in turn relied on system-wide projections calculated using the MPO's computer model. The State DOT projected highway use statistics for the year 2010 by assuming that the calculated growth trend for 1990 to 2000 would continue into the next century and by incorporating planned improvements from the regional plan. The FHWA accepted the techniques, and it was used on several important highway projects. The MPO had agreed with the State's traffic estimates as "consistent with 1990 and 2000 system traffic assignments and with 2010 [regional] socio-economic and land use forecasts." The Court noted that the challengers had neither offered any alternate method of computation, nor identified specific errors in the calculations. The Court upheld the agencies' action, referring to an earlier case where

> this court was called on to determine the propriety of competing traffic projection methodologies. The court recognized that it could not expect the district court to designate itself as a 'super professional transportation analyst' to determine the proper traffic planning technique. The same result must obtain here. After reviewing all the evidence, the district court concluded in this case that the plaintiffs failed to show that the traffic computations were unreasonable. The choice of methodology was determined to have a rational basis and was consistently applied in an objective manner. Our review of the record convinces us that this finding [by the lower court] is not clearly erroneous.

(footnotes and citations omitted).

2. *Senville v. Peters,* 327 F. Supp 2d 335, 354, 365-67 (D. Vt. 2004)

The Court rejected several challenges to the agencies' choice of methodologies for traffic and land use forecasts, even though it found the induced growth impacts analysis inadequate on other grounds. The plaintiffs alleged that the traffic methodology was flawed because it inflated the traffic levels under the no-build scenario, and failed to consider the impact of induced travel (increased road capacity that encourages additional travel) or peak-hour shifting (off-peak trips that shift into peak-hour due to perceived decreases in congestion). They also alleged that the traffic model was flawed because the demographic and economic forecasts that were used in the model assumed that sufficient infrastructure will be available to support the population and economic growth trends that they predicted, and therefore the same socioeconomic estimates were used to model both the build and no-build scenarios. As a result, the plaintiffs alleged, the build and no-build scenarios were bound to show no significant difference in the overall amount of growth in the area. The Court found that

> [w]hile the Plaintiffs' objection may prove to be well-taken, a dispute over the inputs to a computer model is the kind of technical determination that requires deference to the agency from the Court, which is constrained to determine whether or not FHWA made a 'reasoned decision,' even if its conclusion is debatable. Given the wealth of opinion that supports the assumption of no significant increase in overall regional growth from construction of a circumferential highway, and the outcome of the … modeling, the Court cannot say that FHWA's conclusion was not a reasoned decision.

(footnotes and citations omitted).

3. *Jones v. Peters,* 2007 WL 2783387, at *23 (D. Utah September 21, 2007)

Plaintiffs alleged that the traffic modeling used in the screening of alternatives already included the future traffic flows both inside and outside of the FEIS study area. The Court found that the traffic modeling relied upon by the agencies considered

> …nearly 40 current regional transportation plans, federal and state, as well as the projected traffic demand for the region within and beyond the study area boundaries. It takes into account the phasing of plans from now through 2030, including increased mass transit development that may affect the study area. Alternatives to the proposed action are thus evaluated using projections that take into account that larger context.

The Court concluded that

> [w]hile the plaintiffs dispute the methodology used and conclusions drawn from the agencies' traffic modeling, they have not persuaded this court that the agencies' traffic modeling and the analysis flowing from that modeling lacked a rational basis, lacked consistency, or failed to take relevant considerations into account. Expert opinions do clash over the efficacy of one approach to traffic flow analysis compared with another. But disagreement between experts often does not present an 'either-or' question, and each of the opinions may be footed upon its own rational basis….Here, neither NEPA nor § 4(f) call upon this court to resolve those differences of expert opinion-to make a *de novo* determination of the comparative accuracy of the experts' contrasting approaches to traffic modeling, or to choose between differing interpretations of the modeled data. Those choices are for the FHWA, not the court. Instead, this court must decide whether the agencies' choices of method and interpretation as to the modeling of traffic data had a rational footing. Based upon the record now before us, this court concludes that they did.

4. *Sierra Club v. Marita,* 46 F.3d 606, 621-23 (7th Cir. 1995)

In a case challenging the U.S. Forest Service's adoption of a forest management plan, the Court upheld the agency's choice of methodology, stating that agencies are entitled to use their own methodology "unless it is irrational." The record demonstrated that the agency developed its own method of analysis, and that it had considered (i.e., had taken a "hard look" at) the conservation biology principles put forth by the plaintiffs but rejected them based on the scientific uncertainty about the actual application of those principles. The Court upheld the agency's application of the "uncertainty" provision in CEQ regulation.

> [The challengers] misapprehend the 'uncertainty' of which the Service and the district court spoke. We agree that an agency decision to avoid a science should not escape review merely because a theory is not certain. But, however valid a general theory may be, it does not translate into a management tool unless one can apply it to a concrete situation….Nor did [the CEQ regulation on uncertainty at 40 CFR § 1502.22] require the Service to use a methodology it reasonably found lacking in certainty of application. 'NEPA does not require that we decide whether an [EIS] is based on the best scientific methodology available, nor does NEPA require us to resolve disagreements among various scientists as to methodology.'

The Court also rejected the argument that the agency's choice of science ought to be tested against evidentiary rules governing the admissibility of scientific expert testimony.

> An EIS is designed to ensure open and honest debate of the environmental consequences of an agency action, not to prove admissibility of testimony in a court of law. *Cf.*40 CFR § 1500.1(c) ('Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork-even excellent paperwork-but to foster excellent action.').

The Court went on to conclude that, to the extent that the CEQ regulation on uncertainty requires a discussion of the issue, the agency had complied by describing the alternate approach and stating its reasons for rejecting it.

(footnotes and citations omitted).

5. *Natural Res. Def. Council v. Herrington,* 768 F.2d 1355, 1385 (D.C. Cir. 1985)

Where a Department of Energy final rule was challenged based, in part, on its choice of modeling, the Court upheld the agency's action, stating that

> As we have recently reaffirmed, '[a]n agency may utilize a predictive model so long as it explains the assumptions and methodology it used in preparing the model. If the model is challenged, the agency must provide a full analytical defense.' However, we will defer to an agency's judgment to use a particular model if the agency examines the relevant data and articulates a reasoned basis for its decision.

(footnotes and citations omitted).

4.1.4.4 Conflicts, Inconsistencies, and Validity Issues in Modeling or Data

Consistency and integrity in the selection and use of data is important. Courts often fault agencies for appearing to "pick and choose" which data or assumptions to use in different parts of the NEPA analysis. Courts also sometimes find that agencies are overly eager to determine that there is "uncertainty" that excuses analysis. Agencies should disclose and resolve data conflicts (including "old" *versus* "new" data), inconsistencies, and validity problems. The agencies must ensure that the record contains an explanation of the problem and how it was resolved. If such problem is not cured, the agencies bear the burden of providing a full and credible explanation in the NEPA documentation.

1. *Laguna Greenbelt v. U.S. Dep't of Transp.,* 42 F.3d 517, 526-27 (9th Cir. 1994)

Appellate court, in reviewing a lower court decision that EIS satisfied NEPA, upheld the adequacy of the EIS. The Court upheld the agencies' use of data for the build and no-build alternatives where they relied on local planning documents. The challengers had claimed that the EIS contained insufficient data and analysis regarding the need for the proposed tollroad, its air quality and traffic impacts, and alternatives to the project. Among the allegations was that the EIS's analysis was flawed because it purported to reflect a comparison between the environment with and without the tollroad through the year 2010, but that the traffic projections used in the EIS failed to provide a true comparison because they were based on population and housing data that assumed existence of the tollroad. The Court agreed that the projections did assume the existence of the tollroad, but held that the incongruity was not fatal because "the need for the corridor is based on existing as well as future traffic congestion…and the county's population probably will grow in the coming years even without the corridor, *see* AR 31:013173 (population increased by 2.1 million from 1950 to 1989 with little highway improvement…)."

(citations omitted).

2. *Utahns for Better Trans. v. U.S. Dep't of Transp.*, 305 F. 3d 1152, 1182 (10th Cir. 2002)

The Court of Appeals upheld a district court decision relating to alleged flaws in modeling and data analysis used for a FEIS. The challengers alleged that the agencies failed to meet their obligation to "insure the professional integrity, including scientific integrity, of the discussions and analyses in the environmental impact statements" (citing 40 CFR § 1502.24). The agencies, among other things, adjusted parameters used in the travel demand model, and used different estimates of vehicle miles traveled in future years. Describing its review as "applying the rule of reason and overlooking minor technical deficiencies," the Court upheld the agencies' decisions on these points. The Court also referenced earlier portions of its opinion, where it discussed the ability of agencies to depart from their normal protocols if a rational explanation is given for doing so.

The plaintiffs also had alleged that the agencies relied on outdated and questionable "household survey" results to determine the public's interest in using mass transit. The agencies argued that the Travel Demand Model Peer Review found the household survey to be adequate. The Court rejected the challenge, finding that the agencies were entitled to rely on their own experts and noting that the FEIS relied on the higher transit demand projection that was generated by an independent method that did not use survey results.

(citations omitted).

3. *Conservation Law Found. v. Fed. Highway Admin.,* 2007 WL 2492737, at *22 (D.N.H. August 30, 2007)

Agencies used a Delphi panel and more recent state planning data to create an updated induced population growth forecast for the EIS, then used that updated information to evaluate the indirect effects of induced population growth on land use, water quality, and wildlife. However, the agencies chose not to use the forecast to evaluate the traffic-generating effects of induced population growth on the affected interstate or secondary roads, or for air quality issues. The Court concluded that the agencies had erred, stating that the agencies

> …used the same outdated [state planning] population growth forecast in their traffic projections for both the No Action Alternative and the Four Lane Alternative even though commentators on the DEIS faulted [the agencies] for failing to modify their traffic projections to account for induced population growth forecast by the Delphi Panel. The traffic-generating effects of population changes were well understood by the Defendants as such effects can be projected through the use of the Statewide Model. Accordingly, such effects are among the least speculative effects of population growth. [The agencies'] willingness to consider the effects of induced population growth in other areas such as land use, water quality, and wildlife, where the effects of population growth are less well understood, belies [their] contention that the traffic-generating effects of induced population changes are too speculative to be considered in this case. Thus, having convened the Delphi Panel for the purpose of forecasting induced population growth, and having decided to rely upon the panel's induced growth forecast for certain purposes, [the agencies] were not free, at least without substantial additional explanation, to treat induced population growth as a non-existent factor in their traffic projections. Instead, [they] should have performed the [traffic sensitivity analysis], disclosed its results in the FEIS, and explained why the analysis did not affect their decision to proceed with the Four Lane Alternative. Their failure to do so was error.

The Court emphasized that the agencies possessed the updated information before the issuance of the DEIS. The Court determined that the agencies needed to account for both forecasts and went on to hold that

> [w]hile NEPA does not require an agency to update its population forecasts whenever new forecasts become available, it ordinarily may not rely on outdated forecasts when it sets out to prepare an EIS even though more recent forecasts from the agency's own experts are readily available. Defendants' decision to do so here was error….Defendants cannot rely on the fact that they discussed the issue in the [post-FEIS] traffic sensitivity analysis] to excuse their failure to directly address it in the FEIS because the TSA was not subject to public comment.

The Court did uphold the agencies' use of challenged forecasts for vehicle operation and parking cost assumptions in their decision to eliminate rail from further consideration as an alternative. The Court cited the fact that the agencies gave a rational explanation in the FEIS for why they relied on the assumptions, and performed an additional sensitivity test in response to DEIS comments.

(footnotes and citations omitted).

4. *Sierra Club, Ill. Chapter v. U.S. Dept. of Transp.,* 962 F. Supp. 1037, 1043- 46 (N.D. Ill. 1997)

The Court held that the EIS failed to satisfy NEPA where the agencies relied on a single population forecast for analyzing impacts with and without the proposed project. The forecast used assumed the construction of a highway like the one proposed. In particular, the Court found that the resulting analyses of alternatives and ozone impacts were flawed.

> The agencies argued that they had unsuccessfully attempted a study to provide the ‘with and without” data, but had found it impossible. The Court rejected that position, and citing 40 CFR § 1502.22, concluded that that NEPA, of course, does not require an agency to use the best scientific methodology available. Thus, this court cannot conclude, as plaintiffs urge, that the final impact statement must contain a socioeconomic forecast that reflects the growth inducing effect of the tollroad. Rather, this court merely holds that information about the growth inducing impact of tollroad construction is crucial to a reasoned conclusion as to alternatives and that the final impact statement was at least required to explain in some meaningful way why such a study was not possible….Second, the study relies on only one socioeconomic forecast in examining the effect construction would have on ozone production. As a result, the study does not accurately depict the true ozone-producing effect construction of the tollroad would have. Accordingly, defendants must either prepare a study that explicitly compares ozone production with and without the tollroad or explain why a study is not possible.

The Court also cited the agencies’ failure to address new information that had appeared in a regional planning agency’s draft report on cumulative impacts of the proposed project corridor. That report indicated that the population forecast used in the FEIS underestimated the development that would occur in the corridor as a result of construction of the tollroad. The Court ruled that further analysis was needed on ozone production and the purpose and need for the project, and that such analysis had to address the kind of information that was in the planning report even if the agencies did not use the planning report itself.

(footnotes and citations omitted)

5. *Piedmont Heights Civic Club v. Moreland,* 637 F. 2d 430, 442 (5th Cir. 1981)

The Court of Appeals rejected challenges to the validity of data used to justify the need for the project. The EIS relied on the MPO’s regional development plan estimates of population in the Atlanta metro region by the year 2000. The plaintiffs offered evidence in the lower court hearings that the Federal and state projections for the year 2000 were substantially lower than those in the regional plan. The Court stated that

> [p]roof on an issue such as the inaccuracy of population projections is inherently difficult because of the uncertainty in population projections; however, citing a conflicting projection does not prove the invalidity of another projection. Furthermore, although population growth is important to the issue of whether highway improvements are needed in Atlanta, the record indicates and the district judge found that the need for the highway projects was based on current need as well as future need. Regardless of the amount of growth, all parties agree that Atlanta will grow by the year 2000. Evidence of growth in the record along with evidence of the current need for the highway improvements justifies the district judge's finding in the case.

6. *Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1464-65 (9th Cir. 1984)

Appellate court held that EIS can rely on official demographic projections for the region at issue, even where projections subsequently were revised downward. The City and County of Honolulu had adopted a revised Oahu General Plan that altered significantly the planning objectives for Windward Oahu, changing from a large growth and development scheme to a limited one. The parties challenging the project alleged that the project was inconsistent with the population objectives and policies of the newer general plan and that the inconsistencies were not resolved in the EIS, therefore making the EIS inadequate. The Court acknowledged that the EIS analysis of the newer general plan was troubling because of a number of “old versus new” data issues, such as the EIS’s use of outdated population projections (based on the older plan) to justify project need, at the same time that the agencies relied on the newer plan’s population goals for the premise that induced growth would be controlled. Despite such inconsistencies in the agencies’ use of the old and new general plans, the Court upheld the agencies’ use of the data, stating that “…our role is not that of a ‘super-planner,’ and, under NEPA, we are not allowed to substitute our judgment for that of the agency concerning the wisdom of a proposed action. Our role is limited to insuring that the [agencies] have taken a "hard look" at [the project's] environmental consequences. The [EIS] contains a fairly detailed discussion of [the project's] relationship to state and city land use plans, policies, controls, goals, and objectives. Furthermore, the relationship between [the project] and the 1977 Plan specifically is discussed." The Court also noted that one of the terms of the Secretary's concurrence in the EIS was that the State DOT would work with the local city and county to monitor land use and development trends, including the project's impact on such trends, with the goal of achieving the current general plan objectives for the area.

The decision upheld the sufficiency under NEPA of a socio-economic analysis that used arguably "obsolete" data that had been superseded by a new general plan. The Court found that the EIS adequately updated the pre-plan study, relied on conclusions and data derived from that later general plan, and displayed "a reasonably thorough discussion of [the project's] secondary impacts in light of the planning changes that have occurred."

The Court addressed allegedly contradictory assertions in the EIS with respect to the ability of the general plan to control growth induced by the project. The Court noted that such contradictions might indicate a "less than complete evaluation of [the project's] secondary impacts," but upheld the lower court's determination that the analysis was sufficient. "…NEPA only requires a "reasonably thorough discussion" that "fosters informed decision making," not a "complete evaluation." Therefore, it is our view that the District Court was not "clearly erroneous" in finding that the EIS assesses and discusses adequately [the project's] socio-economic impacts."

(footnotes and citations omitted).

7. *Audubon Naturalist Soc'y of the Cent. Atl. States v. U.S. Dep't of Transp.*, 524 F. Supp. 2d 642, 673 (D. Md. 2007)

Plaintiffs alleged that the FEIS was inadequate because it failed to use an updated growth forecast that became available shortly before the issuance of the DEIS and that included secondary and induced growth impacts (unlike the forecasts used in the DEIS). The earlier forecast was used to model all of the traffic and air impacts of the no-build alternative and the build alternatives. The Court examined the steps taken by the agencies to address the updated forecast, including a sensitivity analysis, and found the efforts satisfied NEPA requirements.

> Federal agencies are not obligated to restart the NEPA process every time new information becomes available. Given the fact that the [updated] land use forecast became effective only a week before Defendants released its DEIS and given the sensitive analysis conducted, the Court believes that Defendants' refusal to re-calculate the traffic model did not preclude informed decision-making and informed public participation in this instance. Therefore, the Court finds that Defendants complied with NEPA and did not act arbitrarily and capriciously by not relying on the [updated] forecast.

(footnotes and citations omitted).

8. *Town of Winthrop v. Federal Aviation Admin.*, 535 F.3d 1, 9-12 (1st Cir. 2008)

This case provides useful insight on the effect of more recent data on the data used for earlier parts of the NEPA process. The core issue was whether the Federal Aviation Administration (FAA) violated NEPA by not preparing a Supplemental EIS (SEIS) in connection with approval of expansion facilities for Boston's Logan Airport. In issuing its original ROD for the project in 2002 (a revised ROD was issued after reevaluation in 2007), the FAA committed to further study of the potential effects of additional operational measures on the taxiway component of the project. The plaintiffs' alleged, among other things, that the new data gathered for the resulting study constituted significant new information triggering the need for a SEIS. The Court rejected the claim:

> …data [in the EIS] remain 'current' [within the meaning of a FAA regulation] if there has been no major change that would cause one to expect contemporaneous conditions to

> vary significantly from conditions at the time the data were gathered. By validating through the [post-ROD study] that more recent conditions generate similar data as the data used in the EIS, the FAA could reasonably conclude that all the data still reflected current conditions.

The Court went on to quote from *Vill. of Bensenville v. FAA,* 457 F.3d 52, 71 (D.C. Cir. 2006), which decided a similar issue relating to whether more recent data invalidates modeling performed with earlier data:

> However desirable it may be for agencies to use the most current and comprehensive data available when making decisions, the FAA has expressed its professional judgment that the later data would not alter its conclusions in the EIS ..., and it is reasonably concerned that an unyielding avalanche of information might overwhelm an agency's ability to reach a final decision.... The method the FAA chose, creating its models with the best information available when it began its analysis and then checking the assumptions of those models as new information became available, was a reasonable means of balancing those competing considerations, particularly given the many months required to conduct full modeling with new data.

9. *Rivers Unlimited v. U.S. Dep't of Transp.*, 533 F. Supp. 2d 1, 6-7 (D.D.C. 2008)

Claims challenging a tier 1 EIS included the allegation that the gasoline price used in economic modeling ($1.13/gallon) was unrealistically low and violated the "accurate data" requirement under NEPA. The Court rejected the claim, but did so with words of warning:

> The price of gasoline used did not inflate the economic benefits of the project, however, nor did its use give insufficient weight to environmental factors. The price of gasoline was used in the modeling to calculate the benefits of the project based on vehicle hours saved from shorter routes, decreased congestion, and improved mass transit. The use of a more realistic gasoline price would likely have raised the calculated benefits associated with the project. It is distressing that FHWA bases *many* of its calculations on unrealistic estimations of the cost of driving, but, in this particular instance, lack of realism does not appear to have skewed the analysis in the agencies' favor.

(citation omitted).

4.1.4.5 Use of Local, Regional, or State Land Use Plans and Decisions

Agencies may point to local, regional, and/or statewide land use and transportation plans as a basis for defining project needs and the range of alternatives for detailed evaluation. Caution is needed to ensure that such use of planning products and outcomes is credible and that the material used is adequately explained in the NEPA documentation or in planning materials incorporated by reference into the NEPA documentation.

1. *City of Carmel-By-The-Sea v. U. S. Dep't of Transp.*, 123 F.3d 1142, 1160- 63 (9th Cir. 1997)

The Court held that the agencies' analysis of the project's growth-inducing impacts was adequate where the FEIS acknowledged the possibility of growth inducing impacts but concluded that the development constraints imposed by local authorities would prevent such development from occurring. The Court pointed to FEIS statements that any impacts associated with the project already had been addressed in local land use plans, which meant that there was no potential for project-induced growth beyond what was in those plans. The Court also noted that the project area already was well developed. The Court stated that

> [the project] will not spur on any unintended or, more importantly, unaccounted for, development because local officials have already planned for the future use of the land, under the assumption that the [the project] would be completed…. This development is nonetheless planned for…it has been accounted for and properly analyzed. No further analysis is warranted.

(footnotes and citations omitted).

2. *N. Buckhead Civic Ass'n v. Skinner,* 903 F.2d 1533, 1541-42 (11th Cir. 1990)

The Court upheld the action of the agencies in relying on local plans for definition of the project's "need and purpose." The Court stated that

> …NEPA does not confer the power or responsibility for long range local planning on federal or state agencies. 'An obvious and indeed central aspect of this relationship must be respect for the sovereignty of local authorities.…' In the present case, the record is replete with documents indicating that the agencies consulted with and cooperated with local authorities. The district court found that '[t]he transportation demand in the corridor and the goals of the project were developed by the [MPO] and are set out in the Need and Purpose section of the FEIS ... The Georgia DOT took the goals as developed by [MPO] and did a feasibility study to try and fulfill them.' There is no evidence in the record to indicate that FHWA officials acted arbitrarily in certifying the project. The district court correctly found that federal, state and local officials complied with federally mandated regional planning procedures in developing the need and purpose section of the EIS.

(footnotes and citations omitted).

3. *Citizens Advocate Team v. U.S. Dep't of Transp.,* 2004 WL 725279, at *9 (N.D. Ill. March 31, 2004)

The Court upheld the agencies where the FEIS deemed a no-build alternative inconsistent with the project purpose and needs, which was based on a regional need "to provide transportation improvements which would increase access across the Fox River in the North Region of Kane County ... [and] to provide access to proposed land uses in the Northern region which are compatible with Kane County's 2020 Land Resource Management Plan and local land use plans." The Court noted that "[b]y its very nature, the No-Build Alternative cannot satisfy these objectives. Finding that this is adequately explained in the Final EIS, the Court concludes that no further analysis is needed."

(footnotes and citations omitted).

4. *Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1464-65 (9th Cir. 1984)

Appellate court held that EIS can rely on official demographic projections for the region at issue, even where projections subsequently revised downward. The City and County of Honolulu had adopted a revised Oahu General Plan that altered significantly the planning objectives for Windward Oahu, changing from a large growth and development scheme to a limited one. The parties challenging the project alleged that the project was inconsistent with the population objectives and policies of the newer general plan and that the inconsistencies were not resolved in the EIS, therefore making the EIS inadequate. The Court acknowledged that the EIS analysis of the newer general plan was troubling because of a number of "old versus new" data issues, but the Court upheld the agencies' use of the data, stating that "[t]he [EIS] contains a fairly detailed discussion of [the project's] relationship to state and city land use plans, policies, controls, goals, and objectives. Furthermore, the relationship between [the project] and the 1977 Plan specifically is discussed."

(footnotes and citations omitted).

5. *Jones v. Peters*, 2007 WL 2783387, at *19-20 (D. Utah Sept. 21, 2007)

The Court looked at the question whether the agencies had adopted too narrow a statement of purpose and need, thus predetermining the outcome of the alternatives analysis. The plaintiffs alleged that the agencies had included consistency with local and regional transportation plans as a part of purpose and need, then used it to eliminate alternatives from consideration. The Court stated that the purpose and need must be broad enough to encompass analysis of alternatives other than the specific project produced by the planning process, but observed that

> [o]n the other hand, the project's purpose and need cannot be divorced completely from the planning process that generated the proposed project in the first place. Pursuant to Congressional mandate, *see* 23 U.S.C. § 134, the…long-range planning process identifies the specific existing and future needs that transportation projects are designed to meet. If 'purpose and need' were to be defined for NEPA purposes in total isolation from the existing regional and local transportation plans, the federal environmental assessment process would soon supplant the regional and local planning process envisioned by Congress, and the evaluation of alternatives would soon become transportation planning *de novo* on the part of the FHWA. Neither NEPA nor § 4(f) may fairly be read to mandate that….Applying a rule of reason and practicality, this court is not persuaded that the FHWA's consideration of alternatives to the 10400 South Project as delineated in the EA/4(f) was arbitrary, capricious, 'reverse-engineered,' or pre-determined.

(footnotes and citations omitted).

6. *Sierra Club v. U.S. Dept. of Transp.*, 310 F. Supp. 2d 1168, 1189-90 (D. Nev. 2004)

Plaintiffs made several challenges to the EIS for a proposed highway project. One of these challenges alleged that FHWA relied on population and traffic forecasts generated by the metropolitan planning organizations modeling system. The Court upheld FHWA's reliance on the forecasts and modeling efforts of the designated metropolitan planning organization responsible for developing transportation plans and programs for the area, noting that

> [the metropolitan planning organization] is a government entity charged with developing transportation plans based on forecasted needs in the area. Although some citizen and agency comments suggested RTC historically underestimates growth, FHWA's reliance on figures produced by a state governmental entity statutorily charged with developing state transportation plans based on projected need is not arbitrary or capricious.

(citations omitted).

4.1.4.6 Resolution of Inconsistencies Between Project and State, Regional, or Local Plans

CEQ regulation (40 CFR § 1506.2(d)) requires that NEPA documentation discuss inconsistencies with state or local plans and laws, and describe the extent to which the differences will be reconciled (although reconciliation of differences is not required). Courts tend to apply this requirement strictly only where there is a direct and explicit conflict between the project and the plan(s). Courts may provide agencies some deference where the inconsistencies are not well-addressed, but reliance on such deference creates an unnecessary risk.

1. *Utahns for Better Transp. v. U.S. Dept. of Transp.*, 305 F. 2d 1152, 1172-76 (10th Cir. 2002)

The lawsuit challenged the agencies' alternatives analysis because of its alleged failure to consider travel demand management through a combination of alternative land use scenarios and mass transit. The Court noted that land use is a local and regional matter and cited the number of communities that would be affected if alternative scenarios were pursued.

> There are, therefore, a number of local and regional governmental entities whose cooperation would be necessary to make an alternative land use scenario a reality. The [agencies] replied to comments made after the FEIS that '[t]o date, [the state, regional and local entities with responsibility for land use planning] have resoundingly declined to alter their plans based upon such comments.' We, therefore, conclude that the Agencies' treatment of the alternative land use was adequate.

The Court also concluded that the FEIS was not inadequate for failure to discuss alleged inconsistencies between the local transportation master plan and the proposed action. The master plan reflected a shift in priorities "to mass transit and multiple forms of transportation and away from increasing road capacity and meeting the needs of the single-occupant automobile." The Court pointed to the existence of several local transportation plans, including some that referenced a project similar to the one at issue. The Court concluded that a shift in priorities was not the same as a rejection of all new highway construction and that 40 CFR § 1506.2(d) had not been violated.

(footnotes and citations omitted).

2. *Audubon Naturalist Soc'y of the Cent. Atl. States, Inc. v U.S. Dept. of Transp.*, 524 F. Supp. 2d 642, 714-15 (D. Md. 2007)

The plaintiffs alleged that the proposed project was inconsistent with the land use general plans in one of the counties that the project would traverse, and that the agencies failed to reconcile those conflicts as required by 40 CFR § 1506.2(d). The Court rejected both claims, finding that

> [t]he difference between a preference and an inconsistency is significant. An inconsistency is a point of controversy, whereas a preference is choosing one option over another. Even though the [project] is not a specific project on the General Plan, the Plan does not completely exclude the building of new roads in the county. Simply because a proposed highway is not preferred or is not specifically mentioned in a General Plan does not constitute an 'inconsistency' that NEPA requires to be explained in an EIS. Neither Plaintiffs nor *amici* provide support for such a rigid reading of the NEPA regulations.... [the county] has stressed mass transit in its General Plan, but has not abandoned the building of new highways or roads. The [project] remained a part of the General Plans for the County up until 2002, and it is currently a part of the proposed plan for 2007. Furthermore, the Record shows that the FHWA consulted with all agencies with jurisdictions for planning in the study area, reviewed more than fifty local and regional plans, and documented its considerations of national, State, and local environmental protection goals.

Another challenge rested on the alleged failure to duly consider the objections of local officials to the proposed project. The Court rejected that allegation as well, stating that the FEIS demonstrated both that the FHWA had not ignored the political opposition in the county and that views about the project among elected officials clearly varied. The Court noted that

> [a]n environmental impact statement is to discuss any inconsistency between a proposed action, but the federal regulation 'does not require that [an agency] bow to local law-only that it consider it.'

(footnotes and citations omitted)

4.1.5 Linking Planning and NEPA

Any reader contemplating the use of products from the transportation planning process in the NEPA process, should consult the FHWA and the FTA joint planning regulation at 23 CFR Part 450. Sections 450.212 and 450.318 of the regulation outline the procedures and considerations for incorporating planning products into the analysis and documentation required under NEPA. The regulation cites the relevant provisions in the NEPA statute (42 U.S.C. § 4321 *et seq*.) and implementing regulations (23 CFR Part 771 and 40 CFR Parts 1500-1508) that support the use of planning products in NEPA (23 CFR §§ 450.212 and 450.318.[76] More detailed non-binding guidance appears in Appendix A to 23 CFR 450.

The regulation envisions that material produced by or in support of the planning process may be incorporated directly or by reference if the requirements specified in 23 CFR § 450.308(b) are satisfied. This material would include any travel demand or other modeling performed in connection with the project. *See, i.e.*., 23 CFR Part 450, Section II, Questions 13-14. However, prior to using such material, it is important to consider the questions outlined in Section II, Questions 7 and 14 of 23 CFR 450 Appendix A. For

[76] *See* 23 CFR §§ 771.105(a)-(b), 771.111(a)(2), 771.123(b); 40 CFR §§ 1501.1(a)-(b), (d), and § 1501.2.

land use and travel demand modeling, those questions include the key issues discussed in the preceding sections of this summary:

- How much time has passed since the modeling was performed?
- Were the assumptions used in the modeling reasonable and clearly stated, and are they consistent with those to be used for other aspects of the NEPA process?
- Is the information (including the assumptions) still relevant and valid, or does it need to be updated?
- What changes have occurred in the area since the modeling was completed?
- Are the data, analytical methods, and modeling techniques reliable, defensible, reasonably current, and consistent with those used in other regional transportation studies and project development activities?

If all of the above questions are answered favorably, the decision whether to use modeling results from the planning phase still must take into consideration other factors. For example, it is important to consider whether the FHWA and other relevant agencies were involved in the planning process, whether the material was available to those agencies and the public during both the planning process and during NEPA scoping, and whether the proposed use of the modeling results was discussed and agreed to during NEPA scoping. *See* 23 CFR Part 450, Appendix A, Section II, Question 7.

Where the material is carried forward into the NEPA process, it is important to continue to monitor the need for updates in data, assumptions, and modeling techniques. This monitoring should be done to minimize the possibility of successful challenges after the NEPA process is complete.

The cases on the use of planning products in the NEPA process are not numerous, but do provide a sufficient body of law to validate this "linking planning and NEPA" approach. Most of the cases focus on the question of whether planning actions may be used to define purpose and need under NEPA. The courts have pointed to the long-standing regime under which community planning is the province of the States and local communities, not Federal agencies, and upheld the Federal agencies reliance on such planning decisions. Examples of such cases appear below, excerpted from a FHWA/FTA Chief Counsel joint memorandum on "Integration of Planning and NEPA Processes," dated February 22, 2005 (available at http://environment.fhwa.dot.gov/strmlng/integmemo.asp).

1. *N. Buckhead Civic Ass'n v. Skinner*, 903 F.2d 1533, 1541-42. (11th Cir. 1990)

The Plaintiffs challenged the purpose and need articulated in the EIS for a multi-lane limited access highway connecting two existing highways. The purpose and need was derived from a series of planning studies conducted by the Atlanta Regional Commission. Plaintiffs argued that the purpose and need was crafted in a way that the proposed highway was "conclusively presumed to be required" and a rail alternative perfunctorily dismissed for its failure to fully satisfy the objectives of the project. The Court of Appeals disagreed with the Plaintiffs, stating that their objections reflected "a fundamental misapprehension of the role of federal and state agencies in the community planning process established by the Federal-Aid Highway Act." The Court went on to explain that the Federal-Aid Highway Act contemplated "a relationship of cooperation between federal and local authorities; each governmental entity plays a specific role in the development and execution of a local transportation project." The Court emphasized that Federal agencies did not have responsibility for long range local planning, and found that the "federal, state and local officials complied with federally mandated regional planning procedures in developing the need and purpose section of the EIS." Although the Court in *Buckhead* acknowledged the validity of a purpose and need based on the results of the planning study, it did not in any way scale back the holdings of other cases relating to purpose and need which caution agencies not to write purpose and need statements so narrowly as to "define competing 'reasonable alternatives' out of consideration (and even out of existence)."

2. *Carmel-by-the-Sea v. U.S. Dep't of Transp.*, 123 F.3d 1142 (9th Cir. 1997)

The Plaintiffs challenged the sufficiency of an EIS for failing to adequately consider the proposed project's growth-inducing effects. The Ninth Circuit disagreed, finding that the EIS satisfied this requirement by referencing several local planning documents that specifically included construction of the highway in their growth plans and which discussed overall growth targets and limits. In addition, the Court found that achieving "Level of Service C," an objective derived from the local congestion management plan, was an appropriate part of the purpose and need statement (although ultimately the EIS was found inadequate on cumulative impact grounds).

3. *Laguna Greenbelt, Inc. v. U.S. Dep't of Transp.*, 42 F.3d 517 (9th Cir. 1994)

The court held that the absence of a more thorough discussion in an EIS of induced growth, an issue that was sufficiently analyzed in referenced state materials, does not violate NEPA. However, regardless of the source, the analysis of induced growth must be in sufficient detail and must provide an analytical basis for its assumptions in order to be adequate under NEPA.

4. *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.3d 1152, 1172 (10th Cir. 2002), *as modified on rehearing*, 319 F.3d 1207 (10th Cir. 2003)

Plaintiffs contended that the FEIS was inadequate because it failed to consider reducing travel demand through alternative land use scenarios in combination with mass transit. Noting that "reasonable alternatives" must be non-speculative, the Tenth Circuit found that Plaintiffs had not demonstrated a deficiency in the FEIS on this basis (although it was ultimately found inadequate on other grounds). The Court stated that "Land use is a local and regional matter," and that, in this case, the corridor at issue would involve the jurisdiction of several local and regional governmental entities whose cooperation would be necessary to make an alternative land use scenario a reality. The fact that these entities had clearly declined to alter their land use plans in such a way was justification for not considering their alternative.

5. *Sierra Club v. U.S. Dep't of Transp.*, 310 F. Supp. 2d 1168, 1193 (D. Nev. 2004)

Plaintiffs made several challenges to the EIS for a proposed highway project. One of these challenges alleged that the EIS had improperly rejected a fixed guideway as a reasonable alternative under NEPA. The Court disagreed, finding that FHWA reasonably relied on a "major investment study" conducted as part of its planning process to establish that such an alternative (1) would not meet the project's purpose and need, even when considered as part of a transportation strategy, (2) was too costly and (3) depended on connections to other portions of such a system for which construction was uncertain. The Court stated that

> CEQ regulations mandate federal and state cooperation 'to the fullest extent possible to reduce duplication between NEPA and State and local requirements, including joint planning, environmental research and studies, public hearings, and environmental assessments.' 40 C.F.R. § 1506.2(b). Accordingly, a federal agency does not violate NEPA by relying on prior studies and analyses performed by local and state agencies.

(citations omitted).

4.2 Definitions

The following are definitions for terms hyperlinked in the text of the guidance:

Annual Average Daily Traffic (AADT): AADT is the total volume of traffic recorded on a road during one year divided by 365 to give the traffic volume on an average day.

Automatic Traffic Recorders (ATR): ATRs are permanent traffic recorders that are placed at locations across the road network to continuously count traffic, and possibly also traffic speeds, vehicle classification data and other attributes of the traffic on the road.

Base Model Year: an analysis year that is the calibration year for the travel model.

Base Project Year: an analysis year that can be different from the base model year; it is an updated base year that is validated and is as close as possible to the current year.

Calibration: calibration of travel models is the adjustment of travel model assumptions and parameters so that current observed conditions in the study area are reasonably reproduced.

Control Totals: control totals are county or district level land use forecasts of housing or employment. During forecasting, when adjustments are made within a study area to redistribute future housing or employment locations, the total amount of housing or employment is often maintained, or controlled, at a constant level for the larger geography.

Design Year: an analysis year that is an alternative future forecast year for the project. It may be earlier or further into the future than the planning horizon year.

Gravity Model: a form of trip distribution model that develops a synthetic trip table based on assumptions that the amount of travel between two zones is related to the size of the two zones in terms of the amount of trip generating and attracting land use in the zones, and the distance between the zones in terms of travel time, travel costs, and travel distance.

Open-to-Traffic Year: an analysis year that is the expected future year that the project will open; in the case of phased projects this might be a sequence of intermediate forecast years

Persistence Factor: a persistence factor is used in CO hot-spot analysis to convert CO concentrations based on peak (one) hour traffic to estimates of eight hour CO concentrations.

Planning horizon: a future forecast year used for long range transportation planning purposes, such as in the preparation of a region or state's long range plan. It is usually 20 to 30 years in the future.

Reasonableness Checks: reasonableness checks of travel models are checks that evaluate the travel model in terms of acceptable levels of error and its ability to perform according to theoretical and logical expectations. The checks are performed to ensure that the travel model tells a coherent story about travel behavior.

Validation: validation of travel models is the systemic testing of the sensitivity of the model to changes in inputs and assumptions to ensure that the travel model responds reasonably to transportation system changes and will have the ability to produce forecasts.

Induced Travel: Frequently Asked Questions

The term "Induced Travel" is highly controversial but typically misunderstood by both highway advocates and opponents. In an effort to raise the level of understanding, which will hopefully lead to more productive discussion of this issue, FHWA has prepared the following set of frequently asked questions and answers.

1. What is Induced Travel?

"Induced travel" is a term that has been widely used to describe the observed increase in traffic volume that occurs soon after a new highway is opened or a previously congested highway is widened. The term often appears in the popular press, and has been used by some advocacy groups to support their argument that "we can't build our way out of traffic congestion," because any increase in highway capacity is quickly filled up with additional traffic.

2. Is Induced Travel real?

Economists use the term "induced travel" to describe the additional demand for travel that occurs as a result of a decrease in the generalized cost of travel, including both travel-time and out-of-pocket costs. However, this term is often misused to imply that increases in highway capacity are directly responsible for increases in traffic. In fact, the relationship between increases in highway capacity and traffic is very complex, involving various travel behavior responses, residential and business location decisions, and changes in regional population and economic growth. While some of these responses do represent new trips, much of the observed increase in traffic comes from trips that were already being made before the increase in highway capacity, or reflect predictable traveler behavior that is accounted for in travel demand forecasts.

3. Where does the additional traffic on a new or widened highway facility come from?

In metropolitan areas, highway facilities are usually built or widened where existing traffic congestion has already decreased travel speeds during certain times of the day. To avoid the congestion, some travelers may have diverted to alternative routes, changed the time they make their trips, switched to different travel modes, traveled to other destinations, or decided not to make a particular trip at all. The new or widened highway facility can carry significantly more traffic before it becomes congested. Many travelers who previously took other routes or traveled at other times may switch to the new facility to take advantage of decreased travel times. The increase in traffic on the new facility resulting from these changes is largely offset by reductions in traffic along parallel routes and at other times of the day. The net effect on region-wide daily vehicle miles of travel (VMT) resulting from these travel behavior changes is minimal.

Decreased travel times may also encourage some travelers who previously used public transit to now make the trip by automobile. Travelers might also choose to travel to a different (more distant) destination for some trips such as shopping, or they may take a trip that they previously avoided altogether, because it was simply "too much trouble" to make under congested conditions. Each of these travel decisions can result in additional daily VMT on the highway system.

The above travel behavior responses are primarily responsible for the increases in traffic that are observed shortly after a new or widened highway facility is opened. Over a longer term, increased highway capacity may improve the accessibility of one geographic area relative to other areas in the metropolitan region, making it more attractive for development. This relationship between highway capacity and land development is discussed under the question, "Do increases in highway capacity cause 'urban sprawl?'"

4. Is Induced Travel a bad thing?

Induced travel can have both positive and negative consequences. Travelers who change their tripmaking behavior to use a new highway facility do so because they perceive some benefit. This benefit may be a reduction in total daily travel time or trip cost, the value associated with a new or different destination activity (e.g., shopping at a location with more variety or lower costs), or the opportunity to make a trip at a more convenient time. Many of these "users benefits" can be quantified, and are used to justify the costs of a particular highway project.

On the other hand, each user of a highway facility contributes to increased congestion on the facility. As congestion grows on the new facility, the overall user benefits attributable to potential travel time savings may decline. In addition, increased VMT due to new or longer trips can result in air pollutant emissions and noise above the levels that would occur without the additional vehicle travel. These environmental impacts may offset some of the direct user benefits, and should also be considered in evaluating the overall costs and benefits associated with a highway project. However, neither the magnitude nor direction of any of these impacts can be generalized, and must be determined on a case-by-case basis.

5. Is Induced Travel only associated with highway capacity improvements?

No. Improvements in any transportation system can lead to changes in travel behavior that will result in increased use of the system. A new bus route, rail transit line or commuter rail service is typically developed with the expressed purpose of "attracting new riders." These new riders may come from other transit routes or former auto users, or they may represent entirely new trips to locations that have become accessible by transit.

As auto trips are diverted to transit, traffic congestion on parallel highway facilities may lessen, at least temporarily. This reduction in highway traffic congestion may attract additional highway trips, similar to an increase in highway capacity.

Increased traffic on a highway can also result from operational improvements that reduce delays on the facility, such as improved signal timing or incident management.

6. Do increases in highway capacity cause "urban sprawl?"

"Urban sprawl" is a term that has been widely used to describe the rapid and uncontrolled growth of urban areas onto previously undeveloped land at the urban fringe. It has a popular connotation of large tracts of agricultural lands and wildlife habitats being converted to suburban single-family housing developments. Construction of new highways and even some types of transit improvements (e.g., commuter rail services) are often cited as major contributors to urban sprawl by making land at the urban fringe more accessible and therefore more attractive for development.

The relationship between transportation improvements and land development is extremely complex, and even less well understood than its impacts on travel behavior. While improved transportation accessibility in a particular corridor may indeed make land more attractive for development, other factors such as water and sewer lines, quality of schools and other public services, undevelopable land (e.g., slope, floodplains, etc.), land acquisition and development costs, impact fees, and zoning ordinances also play major roles in shaping where development will take place, its nature, and its intensity.[1] Furthermore, in many cases, the new development being attracted to one part of a metropolitan region often represents development that has been redirected from other parts of the region.

7. Do highways impact development differently in urban versus rural areas?

Yes. One important difference is that in urban areas, it is relatively rare for a highway project to provide new or substantially improved access to a large geographic area (e.g., an entire county). However, in many rural areas, a new highway may provide access to large tracts of undeveloped land. In fact, a number of projects were developed specifically for this reason. Moreover, in some of the rural cases, non-highway economic development initiatives were intentionally coordinated with the improved highway access. Typically, it takes at least half a decade for such efforts to show significant economic development. FHWA has studied two cases, one in Wisconsin and one in New York, where highway improvements were completed with the purpose to encourage economic development over a multi-county corridor. [2]

8. Can transportation planning tools forecast Induced Travel?

Travel demand forecasting tools account for some, but not all of the travel behavior that may contribute to increased traffic resulting from a new or widened highway. Current 4-step travel modeling procedures typically include mode choice and trip assignment models, which can be used to forecast those travelers who change from other travel modes or alternate routes, respectively. Trip distribution models that use highway impedances (e.g., travel time) that accurately reflect congested, peak-period conditions can also account for travelers who change their destinations in response to decreased travel times.

Current models are generally insensitive to the impacts of highway improvements on travelers who change their time of travel, or those who make entirely new trips. However, travelers who simply change their time of travel do not contribute to a net increase in regional daily VMT, and there is general agreement among transportation planning professionals that entirely new trips represent a relatively small share of the increased traffic appearing on a new or widened highway facility.[3]

Travel models also do not directly address the effects of changes in transportation accessibility on residential and commercial land development. The distribution of future land use is an input to travel models. Land use forecasts are often developed by consensus among various local jurisdictions within a metropolitan area, without serious consideration of the potential impacts of improved accessibility caused by specific transportation projects. Failure to account for the effects of improved transportation accessibility on land use may result in underestimation of new trips created by higher-than-forecast development growth within a specific area or corridor.

Although land use policy and development decisions are often beyond the control of transportation planning, improved forecasts of travel attributable to development growth may be obtained by revising land use forecasts based on changes in accessibility obtained from travel models, and then rerunning the travel models.

9. What is demand elasticity?

Elasticity is an indicator used by economists to measure how much the consumption of a good or service changes in response to a change in some other factor, such as income, population, or the price of the good. One of the most common elasticity measures used in transportation planning is the price elasticity of demand, often called "demand elasticity." Demand elasticity is defined as the percentage change in the quantity demanded for a good, divided by the associated percentage change in the price of the good. For example, a demand elasticity value of -0.5 means that a 10 percent decrease in the price of a good will result in a 5 percent increase in demand for that good. Demand elasticity usually has a negative sign to indicate that demand increases when the price goes down.

The magnitude of demand elasticity depends heavily on the scope and time frame over which travel demand is being measured. For example, a demand elasticity measured with respect to a single facility includes trips diverted from other routes or time periods and would be much higher than demand elasticities measured over a corridor or region.

10. Are demand elasticities reliable measures of Induced Travel?

A number of research studies have used demand elasticities to measure the increase in vehicle travel (usually measured as VMT) associated with a change in highway travel time or highway capacity (measured in lane-miles).[4] Various advocacy groups frequently cite these studies as evidence that induced travel is much greater than what is accounted for in conventional travel demand forecasts. However, extreme caution should be used when interpreting the results of these studies to make inferences about the magnitude of induced travel.

First, many of the studies that have purported to estimate induced travel using elasticities have compared changes in VMT to changes in lane-miles. By using changes in lane-miles instead of some measure of price (such as travel time), these studies overlook the importance of congestion. They imply that additional traffic would be induced by the added capacity even if there were no congestion initially on the highway facility. This conclusion is contrary to well established economic and travel behavior theory.

Second, despite the large number of empirical studies involving travel demand elasticities, there is very little agreement among researchers or transportation planning professionals on acceptable values of demand elasticities to use in estimating induced travel. Consequently, use of any single demand elasticity value to estimate induced travel is highly unreliable.

Finally, it is very difficult to measure how much of the induced travel implied by a demand elasticity is actually accounted for by travel forecasts. Clearly, some of the travel behavior changes that contribute to increased traffic are specifically addressed in travel demand models (e.g., mode and route choice), while other changes don't add new trips (e.g., time of travel). Therefore, indiscriminate application of demand elasticities can significantly over-estimate induced travel impacts.

11. What is FHWA's position on Induced Travel?

FHWA's position reflects the consensus of the transportation planning and travel behavior research community that induced travel is neither more nor less than the cumulative result of individual traveler choices and land development decisions made in response to an improved level of transportation service. Many, but not all, of these travel choice decisions are accounted for in current travel forecasting models or land use-transportation interaction models, and FHWA is supporting additional research and development to improve travel and land use models to address the others.

Travel forecasts represent a critical input in evaluating transportation investments, and should be based on analyses that take these travel choice decisions into account to the fullest extent possible. Where current technical limitations of analysis methods preclude accounting for some of these travel decisions, they should be identified in documentation describing the analysis. However, current technical limitations of travel models should not, in and of themselves, be sufficient cause to discredit the results of travel forecasts for planning and environmental decisions.

[1] Recent empirical studies conducted in Ohio and North Carolina indicate that local patterns of population growth (measured at the Census Tract level) are not highly correlated with increases in highway capacity. See Hartgen, D.T., *The Impact of Highways and Other Major Road Improvements on Urban Growth in Ohio*, The Buckeye Institute, Columbus, OH, Jan. 2003; and Hartgen, D.T., *Highways and Sprawl in North Carolina*, The John Locke Foundation, Raleigh, NC, Sept. 2003.

[2]The case studies are described on FHWA's Planning - Economic Development web page: http://www.fhwa.dot.gov/planning/economic_development/

[3] See, for example, *Working Together to Address Induced Demand: Proceedings of a Forum*, ENO Transportation Foundation, Washington, DC, 2002, pg. 10.

[4] See Cervero, R., "Induced Demand: An Urban and Metropolitan Perspective," in *Working Together to Address Induced Demand: Proceedings of a Forum*, ENO Transportation Foundation, Washington, DC, 2002, Appendix C.

APPENDIX F
ERRATA

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APPENDIX F – ERRATA

Contents

Appendix F includes minor corrections and clarifications to the *Statement of Purpose and Need* (PBS&J, February 2008), the *Final Air Quality Technical Memorandum* (PBS&J, February 2009), and the May 2010 *Final Environmental Impact Statement* (EIS).

STATEMENT OF PURPOSE AND NEED

An incorrect version of the purpose and need document was inadvertently used to create the final *Statement of Purpose and Need* (PBS&J, February 2008), which was posted on the project Web site as a supporting document to the Draft EIS (March 2009). With the exception of this one document, the documentation available for public review regarding the project's purpose and need has not changed since June of 2007 when the project was presented to the public at the first round of Citizens Informational Workshops. Documents both preceding and following the February 2008 *Statement of Purpose and Need*, including public workshop displays, project newsletters, agency meeting minutes, the *Alternatives Development and Analysis Report*, the Draft EIS, and the Final EIS, maintain a consistent stated purpose. A corrected version of the *Statement of Purpose and Need* (PBS&J, February 2008) has been posted on the project Web site (www.ncdot.gov/projects/monroeconnector).

FINAL AIR QUALITY TECHNICAL MEMORANDUM

Page 18 of the *Final Air Quality Technical Memorandum* includes the following text:

> "None of the DSAs would directly affect any intersections in Mecklenburg County. The nearest signalized intersection in Mecklenburg County is the US 74 (Independence Boulevard)/ Matthews-Mint Hill Road intersection, located approximately 4,200 feet west of the I-485 mainlines (**Figure 2a**). Year 2035 traffic volumes on US 74 west of I-485 are projected to be lower with the proposed project than under the No-Build Alternative. Annual average daily traffic volumes (AADT) on US 74 west of I-485 are projected to be:
>
> - 101,700 AADT under the No-Build Alternative
> - 94,300 AADT under DSAs A, A1, A2, A3, B, B1, B2, and B3
> - 96,100 AADT under DSAs C, C1, C2, C3, D, D1, D2, and D3
>
> Year 2035 traffic projections are included in **Appendix D (***Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass*, Wilbur Smith Associates, September 2008). Since traffic volumes at the US 74 (Independence Boulevard)/Matthews-Mint Hill Road intersection would be less under any of the DSAs, none would negatively impact the operation of this intersection.

> Therefore, the DSAs would not negatively affect any intersections in Mecklenburg County, nor would they cause a change to Level of Service D, E, or F because of increased traffic volumes related to the project."

The correct 2035 No-Build Alternative traffic volume for US 74 west of I-485 is 98,000 AADT, according to the *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector/Bypass No-Build Traffic Forecast Memorandum* (HNTB, March 2010). This corrected No-Build volume is still higher than the projected volumes with the proposed project in place and therefore does not change the discussion or conclusions presented in the *Final Air Quality Technical Memorandum*.

FINAL EIS: CHAPTER 2 – PREFERRED ALTERNATIVE

SECTION 2.1.2

In the second paragraph, the typical section of the new location roadway will include 12-foot wide inside shoulders, 4-feet of which will be paved. The outside shoulders will be 14-feet wide, 12-feet of which will be paved. The typical section is represented correctly in Figure 2-2 of the Final EIS.

SECTION 2.5.3.2

In the second paragraph, the date of the *Final Archaeological Inventory and Evaluation for the US 74 Monroe Connector* (New South Associates) should be March 2010. It is referenced correctly in paragraph six.

APPENDIX G
TRAFFIC FORECAST MEMO

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Monroe Connector/Bypass Meeting

MEETING SUMMARY
(Final)

Date: October 9, 2013
1:00 PM to 3:00 PM
Conference Call

Project: STIP R-3329/R-2559 Monroe Connector/Bypass

Attendees:

John Sullivan, FHWA
Brian Gardner, FHWA
Scott Jones, FHWA
George Hoops, FHWA
Scott Slusser, NCDOJ
Jennifer Harris, NCDOT - PDEA
Jamal Alavi, NCDOT – TPB
Rick Baucom, NCDOT – Div 10
Spencer Franklin, HNTB
Bradley Reynolds, HNTB
Jill Gurak, Atkins
Jenny Noonkester, Atkins
Carl Gibilaro, Atkins
Ken Gilland, Michael Baker Eng.
Lorna Parkins, Michael Baker Eng.
Scudder Wagg, Michael Baker Eng.
Nancy Scott, The Catena Group
Michael Wood, The Catena Group
Tim Savidge, The Catena Group

Purpose

The primary purpose of this meeting was to discuss the development of the traffic forecast and the use of different socio-economic data sets and how they would alter the results of the traffic forecast with members of the FHWA headquarters' offices.

Issue

In their November 30, 2012 letter SELC asserted the alternatives analysis for the Monroe Connector/Bypass was based on a fundamentally flawed set of traffic forecasts. They stated forecasts for both "Build" and "No Build" scenarios were based on a single set of socio-economic data. SELC theorized this approach produced "No Build" forecasts for U.S. 74 which were dramatically overstated, almost double the true forecast, because the model presented a situation in which the traffic generated by both the Toll Highway and existing U.S. 74 was squeezed onto U.S. 74 alone.

Discussion

Based on this comment, NCDOT requested HNTB to prepare a traffic forecast summary memorandum for the purpose of answering this issue. NCDOT and FHWA experts reviewed the memorandum and this meeting provided these individuals with an opportunity to meet and discuss this document.

Mr. Gardner noted that along with his review of the NEPA materials, he also reread the 4th Circuit Court decision and believes that the analysis appropriately covers areas outlined in the decision.

Mr. Gardner noted that due to the number of different data sets, the information can read like a "travelogue", making it hard for the reader to see what was used for the analysis. He recommended making salient facts easily accessible and the organization of information clear. He recommended making the discussion of induced travel effects and the Build vs. No-Build analysis provided in the quantitative ICE easily accessible to the reader.

Mr. Gardner asked how local traffic vs. through traffic was addressed in the traffic impact analysis and upon review of the letter to Mayor Paxton (October 24, 2012) found the explanation included to have adequately addressed this issue.

FHWA commented that the quantitative ICE report does a good job of discussing the limitations of the travel demand model and distinguishing how modeling was performed for this ICE analysis in order to ensure project effects are accounted for in the build scenario.

Mr. Gardner asked why we decided it was appropriate to add vs. reallocate induced growth within the Future Land Use Study Area (FLUSA). Mr. Wagg noted that the choice to not reallocate growth within the FLUSA was the same choice made in the original Quantitative ICE in 2009. Based on discussions with agencies at that time, the study team had noted that if a reallocation approach was used then growth would be shifted away from western parts of the FLUSA, including sensitive watersheds such as Goose Creek. The study team and the resource agencies felt that a more conservative approach (in terms of estimating potential cumulative effects to sensitive watersheds) would be to add growth instead of reallocating growth. In other words, by adding rather than merely reallocating growth (even though reallocation would have been appropriate under the circumstances) the model essentially predicts a worst-case scenario in terms of overall growth in the study area and in terms of growth near Goose Creek, the most environmentally sensitive area within the study area. Mr. Franklin clarified that in the traffic analysis, growth was added to test the potential impacts of increased traffic associated with induced growth effects. Mr. Gardner believed that this methodology was appropriate for the reasons noted.

Mr. Gardner would like the Monroe Connector/Bypass Traffic Forecast Summary (June 20, 2013) to include a graphic to supplement the discussion about how all the different traffic models were used. He suggested something similar to Table 4 and Figure 6 from the updated quantitative ICE report. Ms. Harris suggested reviewing the applicability of using the flow chart from the NCDOT's Transportation Planning Branch website that helps determine whether an updated traffic forecast should be prepared (https://connect.ncdot.gov/projects/planning/TPB%20Systems%20Planning/Requesting%20an%20Updated%20Traffic%20Forecast.pdf). Mr. Franklin agreed that HNTB will develop and add the graphic to the traffic forecast memo to support the discussion of how various traffic forecasts were used.

Ms. Harris asked Mr. Gardner if he was comfortable with the analysis presented in the traffic forecast memo in support of the conclusion that an updated traffic forecast is not required. Mr. Gardner found that the Traffic Forecast Summary presented a reasonable and defensible approach to evaluating how changes in socioeconomic data related to indirect and cumulative effects affect the traffic forecast for the Monroe Connector/Bypass project. Mr. Gardner also found the conclusions reached to be reasonable in light of the information presented. FHWA requested that the Traffic Forecast Summary (June 20, 2013) be included in the appendix of the Draft Supplemental Final EIS in order to ensure assumptions regarding the modeling is adequately disclosed to the public.

FHWA asked if it was documented somewhere why the travel time to employment factor was not included in the Land Use Allocation Model (LUSAM) by the MPO. Mr. Wagg explained that the MPO found that this variable was not useful. Mr. Wagg will look for documentation between Baker and the MPO that explains the decision to exclude that factor. Mr. Wagg will add it to Appendix A of the updated quantitative ICE report and footnote it in the text.

FHWA stated that a clear explanation of how all the various models were used is critical. FHWA asked whether we need to re-do the traffic analysis to account for all the noted recent improvements to US 74. Mr. Franklin commented that we have real-time travel information and the current condition demonstrates a need for the project. FHWA stated that if there is a documented current need for the project, there is no need for future traffic analysis to prove project need. The forecasts are only used to show that conditions will worsen in the future. FHWA agreed that additional future traffic analyses were not needed to document the present need for the project.

NCDOT asked if the participants believe we have appropriately addressed questions about local vs. through traffic. Mr. Gardner reiterated that the letter to Mayor Paxton (October 24, 2012) is sufficient. Origin/destination data is included in the travel demand model and that model covers diversions. The benefit to US 74 is consistent with diversion projected to the bypass, with an expected diversion rate of between 14-27 percent.

Conclusion:

Mr. Gardner thought that the analysis and conclusions reached regarding the use of one set of socio-economic data set for the evaluation of both build and no build alternatives was reasonable and appropriate under the particular circumstances of this case, particularly in light of the results of the sensitivity testing performed to determine whether data generated from the indirect and cumulative effects analysis ought to be used to re-run traffic forecasting. He noted that the propriety of using one set of socio-economic data must be analyzed on a case by case basis and emphasized that the decision here should not be interpreted as a blanket statement that it is always appropriate to do so.

Mr. Gardner believed that the forecasts were used appropriately and the conclusions drawn from them were reasonable.

Action Items:

- HNTB will add a graphic or some other clarification to the traffic forecast memo to support the discussion of how various traffic forecasts were used.
- HNTB will provide the project team with a summary of their meeting with NCDOT TPB in which agreement was reached that the traffic forecast did not need to be updated.
- Meeting minutes will be developed identifying recommendations and conclusions reached. They will be circulated to Mr. Gardner to confirm that he agrees with the findings presented.
- Mr. Wagg will include correspondence from the MPO explaining why the travel time to employment factor was excluded from LUSAM in Appendix A of the quantitative ICE report and add a footnote in the text.
- Mr. Alavi agreed to help develop a graphic that shows how forecast data is created from raw model data.
- Atkins will include the traffic forecast memo in an appropriate appendix of the Draft Supplemental Final EIS.

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Final Memorandum

To: Jennifer Harris, PE

From: Spencer Franklin, PE, PTOE

Subject: Monroe Connector/Bypass Traffic Forecast Summary

Date: November 8, 2013

Project #: R-3329, R-2559

At the request of the North Carolina Turnpike Authority (NCTA), HNTB prepared this traffic forecast summary memorandum for the purpose of answering the following six questions:

1. What traffic forecasts were developed during the Monroe Connector/Bypass project development process and what were they used for?
2. Are the current No-Build traffic forecasts still valid for the purpose they were used?
3. Are the current Build traffic forecasts still valid for the purpose they were used?
4. How would the Monroe Connector/Bypass affect traffic volumes on the US 74 corridor?
5. How could changes in socioeconomic data affect the traffic forecast for the Monroe Connector/Bypass project?
6. How could changes in socioeconomic data related to indirect and cumulative effects affect the traffic forecast for the Monroe Connector/Bypass project?

This memorandum summarizes the traffic forecasts and references historical traffic data, socioeconomic data and Metrolina Regional Model (MRM) data developed throughout the Monroe Connector/Bypass project development process to aid in answering the questions above.

1. What traffic forecasts were developed during the Monroe Connector/Bypass project development process and what were they used for?

Table 1, on the following page, provides a listing and description of each traffic forecast and traffic and revenue study developed during the Monroe Connector/Bypass project development process. Following the table are descriptions of the use(s) of each forecast or study.

Table 1 – Summary of Monroe Connector/Bypass Project Traffic Forecasts

	Document Name	Prepared By, Date	Forecast Years	Forecast Scenarios	Model Version and SE Data	Used in NEPA Documents
Traffic Forecasts						
A	*Traffic Forecast for the No-Build Alternatives for NCDOT State TIP Project No. R-3329 and NCDOT State TIP Project No. R-2559, Monroe Connector/Bypass Study*	Martin/Alexiou/Bryson (MAB), June 2008	2007, 2030	2007 & 2030 No-Build	MRM05 and 2005 SE data (SE_*Year*_taz2934)	Yes
B	*Technical Memorandum for TIP Projects R-2559 & R-3329 US74 Upgrade Scenario*	Wilbur Smith Associates (WSA), June 2008	2035	2035 Upgrade Existing Build Non-Toll & Toll	MRM06 and 2005 SE data (SE_*Year*_taz2934)	Yes
C	*Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass*	WSA, September 2008	2008, 2035	2008 & 2035 No-Build, Build Non-Toll & Build Toll	MRM06 and 2005 SE data (SE_*Year*_taz2934)	Yes
Traffic Forecast Interpolations, Extrapolations and Redistributions						
D	*Monroe Connector/Bypass Alternative 3A 2013 AADT Build Toll Scenario*	HNTB, January 2009	2013	2013 Build Toll	MRM06 and 2005 SE data (SE_*Year*_taz2934).	No
E	*2035 Build Toll Forecast, Segment 2 (Alternative 3A)*	HNTB, July 2009	2035	2035 Build Toll	MRM06 and 2005 SE data (SE_*Year*_taz2934).	Yes
F	*NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector Bypass No-Build Traffic Forecast Memorandum*	HNTB, March 2010	2008, 2035	2008 & 2035 No-Build	MRM06 and 2005 SE data (SE_*Year*_taz2934).	Yes
G	*Monroe Connector / Bypass Year 2025 Build Toll Alternative 3A Traffic Volume Projections*	HNTB, August 2010	2025	2025 Build Toll	MRM06 and 2005 SE data (SE_*Year*_taz2934).	No
Traffic & Revenue Studies						
H	*Monroe Connector/Bypass 2009 Update to Preliminary Study*	WSA, April 2009	2014 thru 2054	2014 thru 2054 Build Toll	Modified MRM06 and modified 2008 Interim SE data (SE_*Year*_081119_MUMPO_interim)	No
I	*Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, Final Report*	WSA, October 2010	2015 thru 2055	2015 thru 2055 Build Toll	Modified MRM06 and modified 2008 Interim SE data (SE_*Year*_081119_MUMPO_interim)	No

For reference, **Table 2** and **Table 3** provide an estimated daily traffic volume comparison, by segment, of the No-Build and Build traffic forecasts, respectively, prepared during the Monroe Connector/Bypass project development process.

1.1 <u>Traffic Forecasts</u>

Project-Level traffic forecasts were developed for No-Build, Improve Existing, and Build scenarios. These forecasts are based on data including, but not limited to, traffic counts, historic travel trends, the MUMPO Long-Range Transportation Plan (LRTP), the MRM, and existing road network operations. It is important to note that the forecasts are not based solely on any single data source but are based on the review, comparison, and synthesis of different sources of data. These individual data sources are not intended to be traffic forecasts and do not include the level of detail ultimately developed in the traffic forecast. For example, the MRM does not include all the roadways within the study area. Therefore, those roadways are included in the traffic forecast through analyzing traffic counts or other available data sources. Another example of source data are Annual Average Daily Traffic (AADT) volumes, which are developed by annualizing traffic counts collected at one point in time. The following list describes the uses of each traffic forecast developed in the project development process:

A. *Traffic Forecast for the No-Build Alternatives for NCDOT State TIP Project No. R-3329 and NCDOT State TIP Project No. R-2559, Monroe Connector/Bypass Study*

   This forecast is used in the Draft Environmental Impact Statement (EIS) as follows:
   - *Existing and Year 2030 No-Build Traffic Operations Technical Memorandum,* completed in March 2008
   - Considered as part of the technical analysis that went into the development of the Draft EIS

   This forecast is used in the Final EIS as follows:
   - Considered as part of the technical analysis that went into the development of the Final EIS

   Ultimately this document was updated by the *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector Bypass No-Build Traffic Forecast Memorandum* (**Table 1, F**).

B. *Technical Memorandum for TIP Projects R-2559 & R-3329 US 74 Upgrade Scenario*

   This forecast is used in the Draft EIS as follows:
   - *STIP Projects R-3329/R-2559 Upgrade Existing US 74 Alternatives Study*, completed in March 2009
   - Considered as part of the technical analysis that went into the development of the Draft EIS

C. *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass*

   This forecast is used in the Draft EIS as follows:
   - *Final Air Quality Technical Memorandum for the Monroe Connector Bypass* completed in February 2009
   - *Final Traffic Noise Technical Memorandum* completed in March 2009
   - *Year 2035 Build Traffic Operations Technical Memorandum* completed in February 2009
   - Considered as part of the technical analysis that went into the development of the Draft EIS

This forecast is used in the Final EIS as follows:

- Considered as part of the technical analysis that went into the development of the Final EIS

The No-Build forecast was ultimately updated in the document *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector Bypass No-Build Traffic Forecast Memorandum* (**Table 1, F**). Additional discussion is included in **Attachment A** (*Monroe Bypass No-Build Traffic Forecast Summary Memorandum*).

1.2 Traffic Forecast Interpolations, Extrapolations or Redistributions

Traffic forecast interpolations, extrapolations, or redistributions of the original traffic forecasts were developed to state, analyze, or confirm traffic forecast volumes for conditions or years not included in the initial traffic forecasts. This approach uses the original accepted forecasts and base data assumptions to mathematically calculate traffic estimates and redistributions of traffic for conditions not included or known at the time of the initial forecast. This methodology is appropriate because the differences being considered do not change the original forecast, assumptions, methodology or base data. The interpolation and extrapolation process is a method for developing new data points for years not considered in the base forecast but within the range of volumes established by the base forecast. The redistribution process was used to evaluate a minor change in the frontage road configuration at the western terminus of the project. Examples of these differences include different interchange forms and service road connection points. The geometric differences analyzed were minor to the point of not changing the base forecast assumptions or data. The following list describes each traffic forecast's uses and the interpolations, extrapolations, or redistributions necessary for that forecast:

D. *Monroe Connector/Bypass Alternative 3A 2013 AADT Build Toll Scenario*

This 2013 Build Forecast was developed to represent the opening year traffic volumes for inclusion on the April 2009 Monroe Connector/Bypass public hearing maps. This traffic forecast was not used in any project analysis. This forecast was developed through interpolation of the 2008 and 2035 Build forecasts from the *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (**Table 1, C**).

E. *2035 Build Toll Forecast, Segment 2 (Alternative 3A)*

This 2035 Build forecast redistributed forecasted volumes from the *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (**Table 1, C**) to account for a minor change in the frontage road configuration at the western terminus of the project.

This forecast is used in the Final EIS as follows:

- *Final Addendum to Year 2035 Build Traffic Operations Technical Memorandum* completed in November 2009
- *Addendum Final Traffic Noise Technical Memorandum* completed in February 2010
- Considered as part of the technical analysis that went into the development of Final EIS

F. *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector Bypass No-Build Traffic Forecast Memorandum*

This forecast was used to confirm the Draft EIS analysis of existing and design year no-build conditions and is referenced in the Final EIS Errata. The updated 2008 and 2035 No-Build forecasts were prepared due to No-Build forecast discrepancies in the *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (**Table 1, C**). Additional discussion is included in **Attachment A** (*Monroe Bypass No-Build Traffic Forecast Summary Memorandum*).

G. *Monroe Connector / Bypass Year 2025 Build Toll Alternative 3A Traffic Volume Projections*

This forecast was provided to the Design-Build teams during construction procurement. The Design-Build teams were given an option of designing the project to the 2035 traffic forecast volumes and phase constructing the project based on the 2025 year traffic forecast volumes. Ultimately, the Design-Build teams did not choose the option of phase constructing using the 2025 year traffic forecast volumes.

1.3 Traffic and Revenue Studies

A Traffic and Revenue Study is not a project-level traffic forecast, it is a revenue forecast. The purpose of a Traffic and Revenue Study is to analyze the potential project revenue associated with the proposed toll road. Therefore, these studies are developed as part of the project financing efforts and are developed differently than a NEPA traffic forecast. Two of the major differences in a Traffic and Revenue Study are the socioeconomic data used and the travel demand model used. The project level forecasts are based on the socioeconomic data and the travel demand model as developed and approved by the Metropolitan Planning Organization (MPO). The Traffic and Revenue Study uses socioeconomic data developed by an independent economist. The Traffic and Revenue Study modifies the travel demand model including the traffic analysis zone structure, link properties, link connections, and value of time assumptions. These socioeconomic data and travel demand model assumptions and modifications are very conservative so as not to overstate the projects revenue potential. It would be inappropriate to use the same set of assumptions in the development of the NEPA analysis because it could potentially lead to the under design of the facility and the under quantification of the project's impacts. The following list describes the uses of the Traffic and Revenue Studies developed during the project development process:

H. *Monroe Connector/Bypass 2009 Update to Preliminary Study*

This preliminary traffic and revenue forecast is an update to the *Monroe Connector Preliminary Traffic and Revenue Study* issued in October 2006. These traffic and revenue forecasts were developed to support the project financing efforts. The *Monroe Connector/Bypass 2009 Update to Preliminary Study* (**Table 1, H**) is referenced in the Final EIS.

I. *Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, Final Report*

This final traffic and revenue forecast was developed to support the project financing efforts and was not used in any analysis to support the NEPA process. (Note: A Draft Final Report was issued in August 2010). **Table 4** list Monroe/Connector Bypass estimated 2015, 2020 and 2030 weekday traffic volumes.

2. Are the current No-Build traffic forecasts still valid for the purpose they were used?

The current 2008 and 2035 No-Build forecast from the document *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector Bypass No-Build Traffic Forecast Memorandum* (**Table 1, F**) was used to confirm the analysis of 2007 existing and 2030 design year no-build conditions used in the Draft EIS. The analysis was confirmed by quantitatively demonstrating 2035 forecast volumes were higher than 2030 No-Build volumes and qualitatively concluding US 74 operations would worsen with higher 2035 No-Build forecast volumes.

To determine if the current No-Build traffic forecast is still valid, it is necessary to reasonably determine if an updated No-Build forecast is expected to have lower, equal or higher forecast volumes. If forecast volumes are expected to be equal to or higher than the current No-Build forecast used in the 2007 existing and 2030 design year analysis, then it is reasonable to conclude an updated No-Build forecast would not change the conclusions in the Draft EIS. The following information was used to validate the 2007/2030 No-Build traffic forecasts:

- 2012 NCDOT Annual Average Daily Traffic (AADT) volumes,
- Latest current version of the Metrolina Regional Travel Demand Model, MRM11v1.1,
- 2009 socioeconomic (SE) data,
- Existing US 74 corridor travel time runs,
- Current 2008 and 2035 No-Build forecasts.

Based on a meeting with NCDOT Transportation Planning Branch (TPB) on March 21, 2013 and the document *Guidelines to Determine When to Request an Updated Traffic Forecast*[1] (NCDOT TPB, February 24, 2009), the current No-Build traffic forecasts meet the guidelines that indicate the existing forecast is valid and an updated forecast is not warranted. All of these guidelines are met since no new alternatives have been identified, the current let date of the project is less than the Future Forecast Year plus 20 years, the study area is not experiencing growth not previously considered in the forecast, and the traffic forecast is not five years older than the Base Year.

2.1 <u>2012 NCDOT AADT Volumes</u>

Existing traffic volumes are a primary factor in determining base year forecast volumes, such as were used for the 2007 No-Build forecast. For this reason, 2007 and 2012 NCDOT AADT's were compared along the US 74 corridor to determine if an updated base year traffic forecast would be expected to have higher volumes than the current 2007 No-Build forecasts. Over the five year period from 2007 to 2012, average volumes along the US 74 corridor cumulatively grew approximately zero percent, based on available AADT data. Based on historical AADT growth trends, it is reasonable to conclude that an updated base year forecast (i.e. 2013) would generally be equal to the 2007 No-Build Forecast. 2007 and 2012 NCDOT AADT volumes are listed in **Table 5**.

It is appropriate to compare cumulative corridor changes in terms of vehicle miles traveled (VMT) and individual segment volume and percent changes. Individual segment traffic volumes include higher degrees of variability inherent in specific traffic

[1] https://connect.ncdot.gov/projects/planning/Pages/ProjectLevelTrafficForecasting.aspx

data base on the placement of traffic counting equipment, daily, monthly and seasonal variations in data collection, weather and other factors. Corridor VMT considers the entire corridor, volumes and distance of each corridor segment and calculates VMT based on multiplying daily segment volumes times segment length. For the purposes of this memo, comparing overall corridor VMT and percent changes is more appropriate in identifying general trends in traffic patterns. Monroe Connector/Bypass and US 74 segment distances used to calculate VMT for all tables are shown on **Table 7**.

2.2 Comparison of 2030 No-Build MRM05 to 2035 No-Build MRM11v1.1 Model Data

The Metrolina Regional Travel Demand Model, referred to as the MRM, is the primary tool for evaluating existing and future travel in the Metrolina Region at the planning level. For project-level traffic forecasting, the MRM is just one tool and associated raw model outputs are just one piece of data used in the forecasting process. The MRM is continually updated through the Metrolina Region planning process. The initial No-Build traffic forecast (**Table 1, A**) was prepared using MRM05. Since then three model versions have been developed, in order of release date: MRM06, MRM08 and MRM11. MRM11v1.1, the most current available model version, was used in this memorandum for the purpose of evaluating the traffic forecasting process used to develop the initial No-Build traffic forecast (**Table 1, A**). This model version includes all the projects as shown in the 2035 Long Range Transportation Plan. A 2035 No-Build MRM11v1.1 model was developed by removing the Monroe Connector/Bypass links.

The raw travel demand model daily volume assignment for the 2030 No-Build forecast (**Table 1, A**), based on the MRM05 and 2005 SE data, was compared to 2035 No-Build raw model daily volume assignment from the most current model MRM11v1.1. The 2009 SE data was used to evaluate how changes in raw model output data may affect an updated future year No-Build traffic forecast. Raw model output is an important factor in developing traffic forecasts by, but not limited to, determining growth rates from base year to future year scenarios, traffic volume orders of magnitude, volume trends along facilities and future year volumes for new location facilities. Based on a comparison of cumulative 2030 to 2035 No-Build raw model daily volumes along the US 74 corridor, the 2035 No-Build increases 17 percent over the five year period, corresponding to a three percent annual growth rate. Raw model daily assignment volumes range from 23,000 to 70,300 and 21,200 to 101,600 for 2030 MRM05 with 2005 SE data to 2035 MRM11v1.1 with 2009 SE data, respectively. Based on this comparison, an updated future year No-Build forecast (i.e. 2035) would reasonably be expected to have volumes equal to or greater than the 2030 No-Build forecast. Thus, an updated No-Build traffic forecast would not change the conclusions in the Draft EIS. **Table 5** lists raw model daily volume assignment and VMT percent change for both scenarios.

2.3 US 74 Corridor Travel Time Runs

The US 74 corridor from I-485 to Elm Street in Marshville is approximately 22.5 miles in length and includes 30 signalized intersections, multiple unsignalized intersections, and multiple driveway access points. 2012 NCDOT AADT volumes range from 23,000 to 57,000 and are projected to increase to a new range from 31,600 to 89,100 based on 2035 No-Build forecast volumes (**Table 1, F**). This means that 2012 NCDOT AADT volumes would increase in the range of 9,800 to 33,300 vehicles per day (vpd) (or between 20 percent to 81 percent) along the US 74 corridor. See **Table 6** for the comparison of 2012 NCDOT AADT and 2035 No-Build forecast volumes. This growth in US 74 traffic volumes will negatively impact corridor operations by increasing congestion, reducing travel speeds, and increasing travel times. 2013 existing travel time runs were collected in March 2013 along the US 74 corridor. Per the *US 74 Corridor Travel Time Comparison* memorandum (HNTB, October 24, 2013), "US 74 average corridor travel speeds are limited to less than 50 mph, even during off-peak periods and free-flow conditions with very little to no congestion". These travel time runs reflect existing conditions and account for all US 74 highway improvements implemented between 2007 and the present. The 2013 travel time runs verify that US 74 does not operate as a high speed facility.

Based on 2012 NCDOT AADT's and Metrolina Regional Model results (MRM11v1.1) that utilize the most recent 2009 socioeconomic data, an updated base year and future year forecast would reasonably be expected to have equal to or higher forecast volumes than the current no-build forecasts used in the analysis of existing and design year no-build conditions. In addition, 2013 existing travel time runs along the US 74 corridor verify US 74 does not operate as a high speed facility. Comparison of 2035 No-Build traffic volume increases to 2012 AADT's also realistically demonstrate that additional future congestion will continue to decrease operating speeds along the US 74 corridor, further impairing the ability to provide high speed mobility. Therefore, it is reasonable to conclude that updated No-Build forecasts would not change the conclusions in the Draft EIS. Based on this assessment of all available information, the current No-Build traffic forecasts are still valid for the purpose they were used.

3. Are the current Build traffic forecasts still valid for the purpose they were used?

The Build forecast used in the NEPA analysis is titled *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (**Table 1, C**) and contained 2008 and 2035 Build Scenario data. This forecast utilized the Metrolina Regional Travel Demand Model, MRM06, and 2005 socioeconomic (SE) data. The validity of the 2035 Build forecasts were assessed by comparing the 2030 MRM06 raw model daily volume assignment with 2030 and 2035 Build raw model daily volume assignments utilizing MRM11v1.1 and 2009 SE data.

The regional model, such as the Metrolina Regional Model, is used as a tool in the development of traffic forecasts and raw model daily volumes are just one of the many pieces of data used to develop traffic forecast volumes. It is important to note that a travel demand model (TDM) is not an exact measure of existing or future traffic volumes but is a tool to generally measure impacts of growth and development and help forecast travel characteristics at the planning-level. The TDM employs a mathematical approach to understanding how changes in land use, population, and area employment will impact the transportation system. The Metrolina Regional Model encompasses multiple counties in two states and was developed and calibrated as a tool to evaluate existing and future travel demands on a regional basis. Raw model volumes for specific roadway links can be extracted from the regional model but inherently have levels of variability compared to existing and traffic forecast volumes. The accuracy of raw model volumes to existing and future conditions is based on a variety of factors: existing and future roadway network detail, calibration parameters, accuracy of future land use, population, area employment estimates, and other factors. Therefore, it is not appropriate to directly compare raw model daily volumes to balanced traffic forecast volumes. General comparisons of raw model daily volumes from the Build Scenario models can be used as validation of the results from previous Build Scenario forecasts, since those forecasts use model results as one of the factors in developing the forecast.

Based on a meeting with NCDOT Transportation Planning Branch (TPB) on March 21, 2013 and the document *Guidelines to Determine When to Request an Updated Traffic Forecast* [2] (NCDOT TPB, February 24, 2009), the current Build traffic forecasts meet the guidelines that indicate the existing forecast is valid and an updated forecast is not warranted. All of these guidelines are met since no new alternatives have been identified, the current let date of the project is less than the Future Forecast Year plus 20 years, the study area is not experiencing growth not previously considered in the forecast, and the traffic forecast is not five years older than the Base Year.

The following three comparisons can be made to address the current validity of the previous Build Scenario traffic forecast results. Comparative results are shown in **Table 7**.

3.1 Comparison of 2030 Build Scenario Model Data from MRM06 to MRM11v1.1

Since the 2035 WSA Build Scenario forecast (**Table 1, C**) was developed with the use of the (then current) 2030 MRM06 (with 2005 SE data), the raw model daily volume assignment data from a run of MRM06 was compared to a model run using the most current MRM11v1.1 (with 2009 SE data). It is important to note that both model scenarios included the Monroe Connector/Bypass. For the new location Monroe Connector/Bypass facility, MRM11v1.1 assigns higher traffic (8 percent to 30 percent) to the western portion of the Bypass than MRM06. Conversely, MRM11v1.1 has lower projected daily assignments (9 percent to 27 percent decreases from MRM06) in the central and eastern portions of the project. Along the existing US 74 corridor, there is some variability between the two model results, with a general trend of higher daily assignment in MRM11v1.1 (29 of 31 segments have higher volumes). In many cases, -Y- Line model volumes (the route intersecting the Monroe Connector/Bypass) are lower in MRM11v1.1 than MRM06. However, direct comparisons of individual -Y- Line volumes directly north and south of the Monroe Bypass includes too much individual variability to provide reasonable comparisons.

For raw model assignment, it is appropriate to consider cumulative changes on the corridor in terms of vehicle miles traveled (VMT) and changes on individual segments, as previously discussed in **Section 2.1**. Examining corridor VMT presents overall and regional traffic differences that more appropriately account for the inherent variability of individual links based on different segment lengths, characteristics, loading points and the impact of centroid connectors within the model. Potential reasons for variability along individual segments are different socioeconomic growth assumptions, different model networks and link characteristics, and different model methodologies for trip distribution and assignment. To compare -Y- Line VMT, a segment distance of 0.5 miles for each -Y- Line north and south of the Monroe Connector/Bypass was determined to account for ramp offsets, laneage tie-ins and grade changes. By using the same segment distance for all -Y- Lines, all facility segments were calculated similarly to determine VMT. Based on the overall corridor, cumulative VMT changes equate to a 7 percent decrease along the Monroe Connector/Bypass, a 19 percent

[2] https://connect.ncdot.gov/projects/planning/Pages/ProjectLevelTrafficForecasting.aspx

increase along the US 74 corridor and a 24 percent decrease cumulatively for -Y- Line locations.

Overall corridor VMT results indicate that, even with an updated model network (MRM11v1.1), SE data (2009), and methodology, the Monroe Connector/Bypass is still generally attracting similar levels of demand as MRM06 and 2005 SE data used in the 2030 Build forecast. In addition, the updated model is predicting more demand for the existing US 74 corridor. Thus, it is reasonable to conclude that the MRM11v1.1 assigns similar magnitudes of raw travel demand model daily volume assignment to the Monroe Connector/Bypass and US 74 compared to MRM06.

3.2 Comparison of 2030 and 2035 Build Scenario Model Data from MRM11v1.1

The next necessary comparison is to compare Build Scenario model data from the 2030 MRM 11v1.1 model to results from a 2035 MRM11v1.1 model run. This comparison was made using the methodology previously described in **Section 2.2**. These results are shown in **Table 7**. The data between the two model runs is based on the same set of 2009 SE data, and shows a high degree of consistency. All 2035 segment daily traffic assignments exceed the 2030 MRM11v1.1 results. On the new location Monroe Connector/Bypass facility, volumes increase from 7 percent to 11 percent and are expected to range between 21,600 and 67,400 in 2035. On the existing US 74 facility, volumes increase from 5 percent to 15 percent between the 2030 and 2035 model runs. Individual -Y- Line facilities show increases between 4 percent and 57 percent between 2030 and 2035 model runs. Overall, cumulative VMT changes equate to a 9 percent increase along the Monroe Connector/Bypass, a 7 percent increase along the US 74 corridor and a 7 percent increase cumulatively for -Y- Line locations. These increases are not expected to impact the interchange footprints for the Monroe Connector/Bypass facility.

The conclusion that can reasonably be drawn from this data is that traffic volumes are expected to increase for all study area facilities between the 2030 and 2035 time periods. Thus, 2030 Build Scenario forecast results might reasonably also be expected to demonstrate increases in traffic volumes along the Monroe Connector/Bypass Facility, existing US 74, and project study area -Y- Lines. This would further substantiate the viability of and need for the project.

3.3 Comparison of 2035 Build MRM11v1.1 to 2030 Build MRM06 Model Data used in the Build Scenario Traffic Forecast

As a final comparison, the 2035 MRM11v1.1 daily traffic assignment data was compared to the original 2030 MRM06 data used in the development of the 2030 Build Scenario forecasts. Along the new Monroe Connector facility, 2035 MRM11v1.1 assignments are higher than 2030 MRM06 data on the western portion of the project, but are still less (between 1 percent and 19 percent smaller) than the 2030 MRM06 data on the eastern portion of the project. US 74 corridor results are higher (for 30 of 31 segments) and have a greater variance range (3 percent to 90 percent increases) for the 2035 MRM11v1.1 results compared to the 2030 MRM06 results. -Y- Line data results have six segments showing increased daily assignment, seven segments showing decreased assignment, and one segment unchanged between 2035 data and 2030 data. Based on the overall corridor, cumulative VMT changes equate to a 1 percent increase along the Monroe Connector/Bypass, a 27 percent increase along the US 74 corridor and an 18 percent decrease cumulatively for -Y- Line locations. Similar to assessments made previously, potential reasons for the variability include the different SE data sets, different model networks and network characteristics, and model distribution and assignment methodologies employed in the two MRM versions. Even with the variability of the results, the overall trend along the new location facility shows consistently increasing volumes from east to west between the two model data sets. The model run comparison also shows the potential traffic volume growth between 2030 and 2035 along existing US 74 even with the Monroe Connector facility. It is reasonable to conclude that a traffic forecast for the Build Scenario that utilizes the latest MRM11v1.1 network and 2009 SE data in a similar manner to which they were employed for the 2008 and 2035 Build Scenario forecast would produce results that are at least to the same magnitude, if not greater (based on the data examined in these three comparisons), than the original 2008 and 2035 Build Scenario forecast data. Comparative results are shown in **Table 7**.

The differences between MRM06 and MRM11v1.1 raw model daily volume assignment, and the current Build traffic forecasts indicate that the magnitude of traffic along the Monroe Connector/Bypass and US 74 would still show the need for the project, and benefits to the existing US 74 corridor from the project, as currently supported by the Build forecast utilized in the project development process.

4. How would the Monroe Connector/Bypass affect traffic volumes on the US 74 corridor?

Three separate scenarios were analyzed to assess the effects that the Monroe Connector/Bypass may have on projected traffic volumes on existing US 74.

4.1 Comparison of the Traffic Forecast Used in the NEPA Document

Table 8 compares data from the 2035 No-Build (**Table 1, F**) and 2035 Build (**Table 1, C**) Traffic Forecast Scenarios along the existing US 74 corridor. The results show a reduction in traffic along the corridor in the range of 600 to 34,200 vehicles per day from the No-Build to Build Scenario. This equates to a range of 1 percent to 54 percent, with an average reduction of 30 percent for overall corridor VMT.

4.2 Comparison of the 2030 MRM06 Model Results

Since the MRM06 (utilizing 2005 SE data) was used in the development of the 2008 WSA Traffic Forecast that is included in the NEPA documentation, comparisons of No-Build and Build 2030 raw model daily volume assignments are included in **Table 9**. The travel demand model is the primary source of making estimates of traffic diversion and network traffic flow changes to/from existing facilities onto a new alignment facility such as the Monroe Connector/Bypass. The only difference in the two travel demand models is the inclusion of the Monroe Connector/Bypass links.

As shown in **Table 9**, construction of the Monroe Connector/Bypass caused 2030 daily traffic assignments to reduce along US 74 in the range of 4,800 to 21,900 vehicles per day. This resulted in percentage reductions of 11 percent to 51 percent of daily traffic along the corridor from 2030 No-Build data, and an average percent reduction of 31 percent for the overall corridor VMT.

4.3 Comparison of the 2035 MRM 11v1.1 Model Results

Utilizing the most current MRM11v1.1 travel demand model, with updated 2009 SE data and network information, a third comparison of No-Build/Build traffic volumes was made for the year 2035. The only difference in the two travel demand models is the inclusion of the Monroe Connector/Bypass links. As shown in **Table 9**, and similar to results in the previous two comparisons, 2035 daily traffic assignments along the existing US 74 corridor are reduced for every segment, with a range of 5,300 vpd to 25,100 vpd. The percentage of volume reduction is between 11 percent and 45 percent, with an average percent reduction of 19 percent for the overall corridor VMT.

Summarizing the three comparisons to forecast and travel demand model results made above, the effect of the Monroe Connector/Bypass is that, in every case, traffic volumes are expected to decline along the existing US 74 corridor for every corridor segment in the project study area, as some traffic will divert to the new facility and thus reduce congestion and improve traffic operations along the existing corridor with the construction of the Monroe Connector/Bypass.

5. How could changes in socioeconomic data affect the traffic forecast for the Monroe Connector/Bypass project?

Various regional socioeconomic forecasting processes and updates have occurred over the last decade in association with updated versions of the Metrolina Regional Model. **Table 10** summarizes the various socioeconomic data, file name, model version and final forecast year. **Section 4.0** of the *Monroe Connector/Bypass Indirect and Cumulative Effects Technical Report (Baker, May 2013)* provides a detailed review of socioeconomic forecast data.

Table 10 – Metrolina Regional Model Socioeconomic (SE) Data Versions

SE Data (Forecast) Name	TAZ File Name	Associated Model Version	Final Forecast Year
2005 SE Data	SE_*Year*_taz2934	MRM 05 v1.0 MRM 06 v1.0 MRM 06 v1.1	2030
2008 SE Data	SE_*Year*_081024	MRM 08 v1.0	2035
2008 Interim Data	SE_*Year*_081119_MUMPO_interim	None	2035
2009 SE Data	SE_Year_091028	MRM 09 v1.0 MRM 11 v1.0 MRM 11 v1.1	2035

The Metrolina Regional Model, MRM11v1.1, was used as the base model to evaluate raw model daily volume assignment for 2035 No-Build and Build conditions utilizing 2005, 2008 Interim and 2009 socioeconomic data. MRM05 and MRM06 were also utilized in their respective traffic forecasts, as previously listed in **Table 1**. MRM08 and MRM09 were not specifically utilized for traffic forecasts in the project development process. 2008 socioeconomic data was not evaluated or compared in this memorandum, since it was not used in any traffic forecast or traffic and revenue study. Referencing 2005 SE data raw model daily vehicles miles traveled (VMT) as the baseline, 2008 Interim and 2009 SE data VMT along the US 74 corridor increased 5 percent for the No-Build and 2 to 3 percent and 5 percent along the Monroe Bypass and US 74 for the Build, respectively. Changes in raw model daily vehicles miles traveled are to be expected and appropriate when comparing various socioeconomic data which are based on a variety of different information, assumptions, time periods and horizon years. This comparison shows that even while differences existing between various socioeconomic data, the resulting VMT are generally consistent (within 5 percent along US 74 for the No-Build and within 2 to 3 percent along the Monroe Bypass for the Build). **Table 11** lists raw model daily volume assignment for segments along the Monroe Connector/Bypass project and US 74 corridor for No-Build and Build conditions with 2005, 2008 Interim and 2009 SE data.

Based on a direct comparison of 2005 SE, 2008 Interim and 2009 SE data, the socioeconomic data sets have relatively similar volume assignments and corridor vehicle miles traveled within 2 to 3 percent and 5 percent for the Monroe Connector/Bypass and US 74 corridor, respectively. It is reasonable to conclude that the differences between the three sets of socioeconomic data would not substantially change the traffic forecast.

6. How could changes in the socioeconomic data related to indirect and cumulative effects affect the traffic forecast for the Monroe Connector/Bypass project?

Based on the *Monroe Connector/Bypass Indirect and Cumulative Effects Technical Report (Baker, May 2013)*, socioeconomic data was developed for a 2030 Build RPA (Recommended Preferred Alternative) scenario. This forecast of socioeconomic data is referenced as 2009 ICE data. The most current version of the Metrolina Regional Model, MRM11v1.1, was run with one set of socioeconomic data (2009 SE data) for the 2030 No-Build scenario and two sets of socioeconomic data (2009 SE data and 2009 ICE data) for the 2030 Build scenario. The only difference between the two Build model runs was the change in socioeconomic data. The raw model daily volume assignment along the Monroe Connector/Bypass and US 74 corridor were compared for each model run (**Table 12**). Vehicle miles traveled (VMT) and vehicle hours traveled (VHT) were compared for each model run (**Table 13**).

The raw travel demand model daily volume assignment comparison between the two Build model runs shows little variability in the results (**Table 12**). When comparing the Monroe Connector/Bypass project links as a whole, the corridor VMT difference is less than five percent, with no individual link having a difference of greater than ten percent or 3,300 vehicles per day (vpd). When comparing the US 74 corridor as a whole, the daily bi-directional volume difference is less than three percent, with 24 out of 30 individual links having a difference of less than five percent or 2,800 vpd. The eastern terminus of the project, from E. Franklin Street to the Monroe Connector/Bypass terminus, projects daily bi-directional volume differences greater than ten percent or 1,800 vpd to 4,700 vpd.

The raw travel demand model daily volume assignment comparison between the No-Build and each of the two Build model runs shows the similar variability in the results (**Table 12**). When comparing the US 74 corridor as a whole, the daily bi-directional volume differences between the No-Build and the two Builds vary greatly. In the Build scenarios, all US 74 segment volumes are projected to decrease and corridor VMT decreases between 18 to 21 percent compared to the No-Build scenario. The raw travel demand model daily volume assignment clearly shows that US 74 traffic volumes and corridor VMT is expected to be less with construction of the Monroe Connector/Bypass.

The VMT and VHT values were compared between Union County, Mecklenburg County, and the entire MRM11v1.1 model network (**Table 13**). The change in VMT and VHT in Union County is 3 percent and 4 percent, respectively, while changes in Mecklenburg County and across the MRM network are zero percent. Based on these minor network assignment changes between 2009 SE data and 2009 ICE data, it is reasonable to conclude the changes in SE data would not substantially change existing or future Build traffic forecast results.

Conclusions

1. **Question –** What traffic forecasts were developed during the Monroe Connector/Bypass project development process and what were they used for?

   Answer – Detailed listing of the traffic forecasts prepared during the Monroe Connector/Bypass project development process and uses are included on pages 1-5.

2. **Question** – Are the current No-Build traffic forecasts still valid for the purpose they were used?

   Answer – Yes. Based on the assessment of 2012 NCDOT AADT volumes, the Metrolina Regional Travel Demand Model, MRM11v1.1, utilizing 2009 socioeconomic data, existing US 74 corridor travel time runs, and current 2008 and 2035 No-Build forecast information, the No-Build traffic forecasts are still valid for the purposes they were used.

3. **Question** – Are the current Build traffic forecasts still valid for the purpose they were used?

   Answer – Yes. The differences between MRM06 and MRM11v1.1 raw model daily volume assignment, and the Build traffic forecasts indicate that the magnitude of traffic along the Monroe Connector/Bypass and US 74 would still show the need for the project, and benefits to the existing US 74 corridor from the project, as currently supported by the Build forecast utilized in the project development process.

4. **Question** – How would the Monroe Connector/Bypass affect traffic volumes on the US 74 corridor?

   Answer – When comparing Build and No-Build Traffic Forecast Scenarios and 2030 MRM06 and 2035 MRM11v1.1 raw model network assignment data, the Build volumes are lower than the No-Build for every segment along the US 74 corridor for the forecast results and model run results.

5. **Question** – How could changes in socioeconomic data affect the traffic forecast for the Monroe Connector/Bypass project?

   Answer – Based on a direct comparison of 2005 SE, 2008 Interim and 2009 SE data, the socioeconomic data sets have relatively similar volume assignments with cumulative corridor volumes within two percent and five percent for the Monroe Connector/Bypass and US 74 corridor, respectively. It is reasonable to conclude that the differences between the three sets of socioeconomic data would not substantially change the traffic forecast.

6. **Question** – How do changes in the socioeconomic data related to indirect and cumulative effects affect the traffic forecast for the Monroe Connector/Bypass project?

   Answer – Changes in SE data cause relatively minor changes in traffic volumes in the MRM model runs. Based on the comparison of 2030 Build MRM11v1.1 model runs using 2009 SE data and 2009 ICE SE data, the volume changes and percent changes are not substantial. The change in VMT and VHT in Union County is 3 percent and 4 percent respectively, while changes in Mecklenburg County and across the MRM network are approximately zero percent. These variations in raw model daily volume assignment will not affect the conclusions of the traffic forecasting development process.

Table 2 – US 74 Corridor No-Build Traffic Forecast Volumes

		Comparison Type	No-Build Traffic Forecast Volumes (Sec. 1)					
		Year	2007	2008	2008	2030	2035	2035
		Scenario	No-Build	No-Build	No-Build	No-Build	No-Build	No-Build
		Classification	Forecast	Forecast	Forecast Update	Forecast	Forecast	Forecast Update
	ID #	Source	MAB, June 2008	WSA, Sept. 2008	HNTB, March 2010	MAB, June 2008	WSA, Sept. 2008	HNTB, March 2010
US 74 Segments	1	I-485 to Stallings Rd	61,800	74,200	62,900	84,200	140,200	89,100
	2	Stallings Rd to Indian Trail Rd. North	60,000	72,000	60,900	81,600	134,300	86,300
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	53,600	62,500	54,200	66,600	123,400	69,400
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	51,800	63,300	52,500	68,600	123,500	72,300
	5	Faith Church Rd. to Sardis Church Rd.	53,800	63,800	54,300	65,400	124,500	67,900
	6	Sardis Church Rd. to Chambers Dr.	47,600	54,900	48,500	67,200	116,500	71,500
	7	Chambers Dr. to N. Rocky River Rd.	41,000	52,800	46,400	62,400	112,800	67,100
	8	N. Rocky River Rd. to Fowler Secrest Rd.	41,400	45,100	45,300	55,200	101,800	58,200
	9	Fowler Secrest Rd. to Rolling Hills Dr.	47,600	47,600	48,100	60,200	106,500	62,900
	10	Rolling Hills Dr. to Round Table Rd.	45,400	45,400	46,000	59,800	102,100	62,900
	11	Round Table Rd. to Williams Rd.	44,800	45,400	45,400	59,400	102,100	62,600
	12	Williams Rd. to Hanover Dr.	47,000	47,200	47,700	63,000	105,600	66,500
	13	Hanover Dr. to Dickerson Blvd.	58,200	57,600	58,700	69,600	121,300	72,100
	14	Dickerson Blvd. to Secrest Shortcut Rd.	56,600	56,000	56,700	59,200	110,700	59,800
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	61,600	61,300	61,700	64,400	120,900	65,000
	16	Secrest Shortcut Rd. to Concord Ave.	61,600	61,300	61,700	64,400	120,900	65,000
	17	Concord Ave. to US 601	61,800	61,500	62,000	66,200	121,400	67,200
	18	US 601 to Stafford St.	58,200	57,000	58,800	71,800	116,200	74,800
	19	Stafford St. to Boyte St.	58,000	56,800	58,500	70,600	116,200	73,300
	20	Boyte St. to NC 200	56,400	56,100	56,900	67,400	115,300	69,800
	21	NC 200 to Walkup Ave.	49,600	48,500	50,200	63,800	95,300	66,900
	22	Walkup Ave. to S. Sutherland Ave.	42,600	42,000	43,100	54,800	87,300	57,500
	23	S. Sutherland Ave. to Venus St.	40,400	40,600	40,900	52,000	85,400	54,500
	24	Venus St. to E. Franklin St.	36,600	40,300	37,100	47,000	83,800	49,300
	25	E. Franklin St. to US 601 / N. Medical Center Campus	46,200	48,400	46,700	58,000	101,400	60,600
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	31,200	34,600	31,500	38,200	77,800	39,700
	27	S. Secrest Ave. to S. Bivens Rd.	29,600	33,400	30,000	39,000	75,300	41,000
	28	S. Bivens Rd. to Bivens St.	29,200	33,400	29,600	37,600	75,300	39,400
	29	Bivens St. to Austin Chaney Rd.	28,600	32,900	29,100	40,200	74,300	42,700
	30	Austin Chaney Rd. to Forest Hills School Rd. North	24,400	26,600	24,800	33,000	51,700	35,900
	31	Forest Hills School Rd. North to Marshville	19,400	22,700	19,800	29,400	44,200	31,600

Table 3 – Monroe Bypass Build Traffic Forecast Volumes

Facility	ID #			
		Comparison Type	**Build Traffic Forecast Volumes (Sec. 1)**	
		Year	**2008**	**2035**
		Scenario	**Build Toll**	**Build Toll**
		Classification	**Forecast**	**Forecast**
Facility	**ID #**	**Source**	**WSA, Sept. 2008**	**WSA Sept. 2008**
US 74	1	I-485 to US 74 Frontage Road	73,400	115,000
US 74 / Monroe Bypass	2	US 74 Frontage Rd to US 74 / Monroe Bypass Split	71,900	95,600
Frontage Road	3	McKee Rd to Stallings Rd	n/a	19,500
Monroe Bypass Segments	1	US 74 to Indian Trail-Fairview Rd	17,500	48,200
	2	Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	18,200	51,200
	3	Unionville-Indian Trail Rd to Rocky River Rd	18,500	52,300
	4	Rocky River Rd to US 601	15,900	46,600
	5	US 601 to NC 200 (Morgan Mill Rd)	12,300	35,200
	6	NC 200 (Morgan Mill Rd) to Austin Chaney Rd	8,600	24,800
	7	Austin Chaney Rd to Forest Hills School Rd	8,400	19,600
	8	Forest Hills School Rd to US 74	8,400	16,400
US 74 Segments	2	Stallings Rd to Indian Trail Rd. North	56,400	67,400
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	40,600	51,300
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	41,400	51,400
	5	Faith Church Rd. to Sardis Church Rd.	41,900	52,400
	6	Sardis Church Rd. to Chambers Dr.	32,300	38,200
	7	Chambers Dr. to N. Rocky River Rd.	30,200	34,500
	8	N. Rocky River Rd. to Fowler Secrest Rd.	24,500	28,800
	9	Fowler Secrest Rd. to Rolling Hills Dr.	27,700	33,500
	10	Rolling Hills Dr. to Round Table Rd.	25,500	29,100
	11	Round Table Rd. to Williams Rd.	25,500	29,100
	12	Williams Rd. to Hanover Dr.	27,300	32,300
	13	Hanover Dr. to Dickerson Blvd.	37,700	48,000
	14	Dickerson Blvd. to Secrest Shortcut Rd.	36,100	37,400
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	41,400	47,600
	16	Secrest Shortcut Rd. to Concord Ave.	41,400	47,600
	17	Concord Ave. to US 601	41,600	48,100
	18	US 601 to Stafford St.	42,600	57,200
	19	Stafford St. to Boyte St.	42,400	56,900
	20	Boyte St. to NC 200	41,600	56,000
	21	NC 200 to Walkup Ave.	40,000	54,500
	22	Walkup Ave. to S. Sutherland Ave.	33,500	46,500
	23	S. Sutherland Ave. to Venus St.	32,100	44,000
	24	Venus St. to E. Franklin St.	31,800	42,400
	25	E. Franklin St. to US 601 / N. Medical Center Campus	39,900	60,000
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	26,100	36,600
	27	S. Secrest Ave. to S. Bivens Rd.	24,900	34,100
	28	S. Bivens Rd. to Bivens St.	24,900	34,100
	29	Bivens St. to Austin Chaney Rd.	24,400	33,100
	30	Austin Chaney Rd. to Forest Hills School Rd. North	19,700	26,100
	31	Forest Hills School Rd. North to Monroe Bypass	13,700	20,700

Table 4 – Monroe Connector/Bypass Traffic and Revenue Estimated Traffic Volumes

Facility	ID #	Comparison Type	Build Estimated Traffic Volumes (Sec. 1.3)		
		Year	2015	2020	2030
		Scenario	Build	Build	Build
		Model Version	MRM06	MRM06	MRM06
		Socioeconomic Data	2008 Interim	2008 Interim	2008 Interim
		Classification	Traffic & Revenue	Traffic & Revenue	Traffic & Revenue
		Source	WSA, Oct. 2010	WSA, Oct. 2010	WSA, Oct. 2010
US 74	1	I-485 to US 74 Frontage Road	72,200	77,800	92,600
US 74 / Monroe Bypass	2	US 74 Frontage Rd to US 74 / Monroe Bypass Split	40,600	45,800	58,400
Frontage Road	3	McKee Rd to Stallings Rd	33,400	35,100	35,900
Monroe Bypass Segments	1	US 74 to Indian Trail-Fairview Rd	29,000	33,600	45,600
	2	Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	31,600	35,200	43,600
	3	Unionville-Indian Trail Rd to Rocky River Rd	29,200	32,400	40,200
	4	Rocky River Rd to US 601	25,800	28,400	35,600
	5	US 601 to NC 200 (Morgan Mill Rd)	24,600	27,200	32,800
	6	NC 200 (Morgan Mill Rd) to Austin Chaney Rd	15,200	17,200	22,600
	7	Austin Chaney Rd to Forest Hills School Rd	10,200	11,800	15,600
	8	Forest Hills School Rd to US 74	9,200	10,800	14,200

Table 5 – US 74 Corridor AADT and No-Build Model Data Comparisons

	ID #	Comparison Type	NCDOT AADT (Sec. 2.1)		Raw Model Daily Volume (Sec. 2.2)	
		Year	2007	2012	2030	2035
		Scenario	n/a	n/a	No-Build	No-Build
		Model Version	n/a	n/a	MRM05	MRM11
		Socioeconomic Data	n/a	n/a	2005	2009
		Classification	AADT	AADT	Raw Model	Raw Model
	ID #	Source	NCDOT	NCDOT	Model	Model
US 74 Corridor Segments	1	I-485 to Stallings Rd	58,000*	57,000*	70,300*	101,600*
	2	Stallings Rd to Indian Trail Rd. North	53,000	53,000	65,600	90,300
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	50,000	51,000	49,500	65,500
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	49,000	48,000	54,000	66,400
	5	Faith Church Rd. to Sardis Church Rd.	n/a	n/a	58,100	56,900
	6	Sardis Church Rd. to Chambers Dr.	43,000	44,000	58,100	47,400
	7	Chambers Dr. to N. Rocky River Rd.	36,000	37,000	59,500	46,100
	8	N. Rocky River Rd. to Fowler Secrest Rd.	n/a	n/a	47,900	45,300
	9	Fowler Secrest Rd. to Rolling Hills Dr.	36,000	38,000	50,900	38,100
	10	Rolling Hills Dr. to Round Table Rd.	n/a	n/a	50,900	38,100
	11	Round Table Rd. to Williams Rd.	n/a	n/a	54,700	43,100
	12	Williams Rd. to Hanover Dr.	n/a	n/a	54,700	49,200
	13	Hanover Dr. to Dickerson Blvd.	n/a	n/a	54,700	49,200
	14	Dickerson Blvd. to Secrest Shortcut Rd.	47,000	50,000	40,000	66,400
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	n/a	n/a	44,000	71,500
	16	Secrest Shortcut Rd. to Concord Ave.	n/a	n/a	44,000	71,500
	17	Concord Ave. to US 601	53,000	55,000	44,000	73,200
	18	US 601 to Stafford St.	54,000	51,000	57,400	69,300
	19	Stafford St. to Boyte St.	n/a	n/a	57,400	67,100
	20	Boyte St. to NC 200	52,000	50,000	53,100	66,400
	21	NC 200 to Walkup Ave.	47,000	47,000	54,100	68,200
	22	Walkup Ave. to S. Sutherland Ave.	38,000	33,000	54,100	66,800
	23	S. Sutherland Ave. to Venus St.	n/a	n/a	54,100	65,500
	24	Venus St. to E. Franklin St.	n/a	n/a	54,100	66,400
	25	E. Franklin St. to US 601 / N. Medical Center Campus	n/a	n/a	54,100	75,500
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	27,000	27,000	32,200	41,500
	27	S. Secrest Ave. to S. Bivens Rd.	25,000	24,000	35,000	48,300
	28	S. Bivens Rd. to Bivens St.	24,000	25,000	33,200	36,500
	29	Bivens St. to Austin Chaney Rd.	24,000	26,000	30,200	37,700
	30	Austin Chaney Rd. to Forest Hills School Rd. North	24,000	23,000	25,800	30,700
	31	Forest Hills School Rd. North to Marshville	n/a	n/a	23,000	21,200
		Corridor VMT	**706,610**	**710,230**	**876,001**	**965,940**
		% Change in VMT	**~0%**		**10%**	
		VMT Annual Growth Rate	**~0%**		**2%**	

* US 74 Corridor Segment ID #1 not included in US 74 corridor VMT calculations to provide consistent No-Build and Build corridor comparisons.

Table 6 – US 74 Corridor AADT and No-Build Traffic Forecast Comparison

		Comparison Type	NCDOT AADT and No-Build Traffic Forecast Volumes (Sec. 2.3)			
		Year	2012	2035	Traffic Volume Increase from 2012 AADT to 2035 No-Build Forecast	Percent Volume Increase from 2012 AADT to 2035 No-Build Forecast
		Scenario	n/a	No-Build		
		Classification	AADT	Forecast Update		
	ID #	Source	NCDOT	HNTB, March 2010		
US 74 Segments	1	I-485 to Stallings Rd	57,000	89,100	**32,100**	**56%**
	2	Stallings Rd to Indian Trail Rd. North	53,000	86,300	**33,300**	**63%**
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	51,000	69,400	**18,400**	**36%**
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	48,000	72,300	**24,300**	**51%**
	5	Faith Church Rd. to Sardis Church Rd.	n/a	67,900	n/a	n/a
	6	Sardis Church Rd. to Chambers Dr.	44,000	71,500	**27,500**	**63%**
	7	Chambers Dr. to N. Rocky River Rd.	37,000	67,100	**30,100**	**81%**
	8	N. Rocky River Rd. to Fowler Secrest Rd.	n/a	58,200	n/a	n/a
	9	Fowler Secrest Rd. to Rolling Hills Dr.	38,000	62,900	**24,900**	**66%**
	10	Rolling Hills Dr. to Round Table Rd.	n/a	62,900	n/a	n/a
	11	Round Table Rd. to Williams Rd.	n/a	62,600	n/a	n/a
	12	Williams Rd. to Hanover Dr.	n/a	66,500	n/a	n/a
	13	Hanover Dr. to Dickerson Blvd.	n/a	72,100	n/a	n/a
	14	Dickerson Blvd. to Secrest Shortcut Rd.	50,000	59,800	**9,800**	**20%**
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	n/a	65,000	n/a	n/a
	16	Secrest Shortcut Rd. to Concord Ave.	n/a	65,000	n/a	n/a
	17	Concord Ave. to US 601	55,000	67,200	**12,200**	**22%**
	18	US 601 to Stafford St.	51,000	74,800	**23,800**	**47%**
	19	Stafford St. to Boyte St.	n/a	73,300	n/a	n/a
	20	Boyte St. to NC 200	50,000	69,800	**19,800**	**40%**
	21	NC 200 to Walkup Ave.	47,000	66,900	**19,900**	**42%**
	22	Walkup Ave. to S. Sutherland Ave.	33,000	57,500	**24,500**	**74%**
	23	S. Sutherland Ave. to Venus St.	n/a	54,500	n/a	n/a
	24	Venus St. to E. Franklin St.	n/a	49,300	n/a	n/a
	25	E. Franklin St. to US 601 / N. Medical Center Campus	n/a	60,600	n/a	n/a
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	27,000	39,700	**12,700**	**47%**
	27	S. Secrest Ave. to S. Bivens Rd.	24,000	41,000	**17,000**	**71%**
	28	S. Bivens Rd. to Bivens St.	25,000	39,400	**14,400**	**58%**
	29	Bivens St. to Austin Chaney Rd.	26,000	42,700	**16,700**	**64%**
	30	Austin Chaney Rd. to Forest Hills School Rd. North	23,000	35,900	**12,900**	**56%**
	31	Forest Hills School Rd. North to Marshville	n/a	31,600	n/a	n/a

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Table 7 – 2030 and 2035 Build Model Data Comparisons

Facility	ID #		Comparison Type	Travel Demand Model Raw Daily Volume Assignment					
			Year	2030	2030	Percent Change from 2030 MRM06 to 2030 MRM11 (Sec. 3.1)	2035	Percent Change from 2030 MRM06 to 2035 MRM11 (Sec. 3.3)	Percent Change from 2030 MRM11 to 2035 MRM11 (Sec. 3.2)
			Scenario	Build	Build		Build		
			Model Version	MRM06	MRM11		MRM11		
			Socioeconomic Data	2005	2009		2009		
			Classification	Raw Model	Raw Model		Raw Model		
			Source	Model	Model		Model		
US 74	1	I-485 to US 74 Frontage Road	n/a	91,300	125,400	**37%**	134,000	**47%**	**7%**
US 74 / Monroe Bypass	2	US 74 Frontage Rd to US 74 / Monroe Bypass Split	n/a	89,800	109,500	**22%**	116,500	**30%**	**6%**
Frontage Road	3	McKee Rd to Stallings Rd	n/a	n/a	7,700	n/a	8,600	n/a	**12%**
			Distance (miles)						
Monroe Bypass Segments	1	US 74 to Indian Trail-Fairview Rd	2.24	47,900	62,500	**30%**	67,400	**41%**	**8%**
	2	Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	2.26	49,000	52,900	**8%**	56,800	**16%**	**7%**
	3	Unionville-Indian Trail Rd to Rocky River Rd	1.51	52,400	47,200	**-10%**	50,800	**-3%**	**8%**
	4	Rocky River Rd to US 601	3.77	48,300	44,100	**-9%**	47,700	**-1%**	**8%**
	5	US 601 to NC 200 (Morgan Mill Rd)	1.76	48,800	39,500	**-19%**	43,100	**-12%**	**9%**
	6	NC 200 (Morgan Mill Rd) to Austin Chaney Rd	4.06	44,600	32,500	**-27%**	36,000	**-19%**	**11%**
	7	Austin Chaney Rd to Forest Hills School Rd	1.79	25,900	22,600	**-13%**	24,800	**-4%**	**10%**
	8	Forest Hills School Rd to US 74	0.92	23,200	20,000	**-14%**	21,600	**-7%**	**8%**
		Corridor VMT and % Change in VMT		***813,920***	***757,407***	***-7%***	***822,161***	***1%***	***9%***
US 74 Segments	2	Stallings Rd / Monroe Bypass to Indian Trail Rd. North	1.27	47,200	61,400	**30%**	65,200	**38%**	**6%**
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	0.68	37,500	48,200	**29%**	51,900	**38%**	**8%**
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	0.80	35,700	50,100	**40%**	53,700	**50%**	**7%**
	5	Faith Church Rd. to Sardis Church Rd.	0.60	38,500	45,800	**19%**	48,200	**25%**	**5%**
	6	Sardis Church Rd. to Chambers Dr.	1.16	33,100	37,300	**13%**	39,800	**20%**	**7%**
	7	Chambers Dr. to N. Rocky River Rd.	1.37	34,900	35,800	**3%**	38,300	**10%**	**7%**
	8	N. Rocky River Rd. to Fowler Secrest Rd.	1.17	25,400	36,200	**43%**	38,400	**51%**	**6%**
	9	Fowler Secrest Rd. to Rolling Hills Dr.	0.78	25,400	29,400	**16%**	31,300	**23%**	**6%**
	10	Rolling Hills Dr. to Round Table Rd.	0.31	30,500	29,400	**-4%**	31,300	**3%**	**6%**
	11	Round Table Rd. to Williams Rd.	0.36	38,600	35,200	**-9%**	37,400	**-3%**	**6%**
	12	Williams Rd. to Hanover Dr.	0.22	38,600	41,600	**8%**	43,900	**14%**	**6%**
	13	Hanover Dr. to Dickerson Blvd.	0.32	38,600	41,600	**8%**	43,900	**14%**	**6%**
	14	Dickerson Blvd. to Secrest Shortcut Rd.	0.27	38,600	53,300	**38%**	56,700	**47%**	**6%**
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	0.07	31,100	56,200	**81%**	59,200	**90%**	**5%**
	16	Secrest Shortcut Rd. to Concord Ave.	0.26	31,100	56,200	**81%**	59,200	**90%**	**5%**
	17	Concord Ave. to US 601	0.33	35,900	57,800	**61%**	60,900	**70%**	**5%**
	18	US 601 to Stafford St.	0.40	50,900	57,100	**12%**	60,400	**19%**	**6%**
	19	Stafford St. to Boyte St.	0.24	48,600	55,000	**13%**	57,500	**18%**	**5%**
	20	Boyte St. to NC 200	0.57	46,100	54,300	**18%**	57,500	**25%**	**6%**
	21	NC 200 to Walkup Ave.	0.23	44,900	55,200	**23%**	59,300	**32%**	**7%**
	22	Walkup Ave. to S. Sutherland Ave.	0.53	45,900	54,600	**19%**	58,000	**26%**	**6%**
	23	S. Sutherland Ave. to Venus St.	0.26	44,900	52,700	**17%**	56,100	**25%**	**6%**
	24	Venus St. to E. Franklin St.	0.19	45,000	53,100	**18%**	56,700	**26%**	**7%**
	25	E. Franklin St. to US 601 / N. Medical Center Campus	0.14	54,500	60,600	**11%**	65,200	**20%**	**8%**
	26	US 601/Metro Medical Ctr Campus to S. Secrest Ave.	1.30	26,700	30,400	**14%**	32,500	**22%**	**7%**
	27	S. Secrest Ave. to S. Bivens Rd.	0.38	31,100	37,000	**19%**	40,100	**29%**	**8%**
	28	S. Bivens Rd. to Bivens St.	1.94	24,800	26,000	**5%**	28,500	**15%**	**10%**
	29	Bivens St. to Austin Chaney Rd.	0.29	25,400	27,300	**7%**	30,000	**18%**	**10%**
	30	Austin Chaney Rd. to Forest Hills School Rd. North	2.00	18,400	19,800	**8%**	22,700	**23%**	**15%**
	31	Forest Hills School Rd. North to Monroe Connector/Bypass	0.50	10,300	10,600	**3%**	11,600	**13%**	**9%**
		Corridor VMT and % Change in VMT		***614,335***	***729,912***	***19%***	***782,051***	***27%***	***7%***
-Y- Lines	1	Indian Trail-Fairview Rd (North of Monroe Bypass)	0.50	17,000	21,500	**26%**	23,000	**35%**	**7%**
	2	Indian Trail-Fairview Rd (South of Monroe Bypass)	0.50	11,000	7,400	**-33%**	8,000	**-27%**	**8%**
	3	Unionville-Indian Trail Rd (North of Monroe Bypass)	0.50	15,000	14,000	**-7%**	15,000	**0%**	**7%**
	4	Unionville-Indian Trail Rd (South of Monroe Bypass)	0.50	21,000	12,800	**-39%**	14,100	**-33%**	**10%**
	5	Rocky River Rd (North of Monroe Bypass)	0.50	16,000	12,100	**-24%**	12,700	**-21%**	**5%**
	6	Rocky River Rd (South of Monroe Bypass)	0.50	14,000	17,800	**27%**	18,600	**33%**	**4%**
	7	US 601 (North of Monroe Bypass)	0.50	49,000	20,700	**-58%**	21,700	**-56%**	**5%**
	8	US 601 (South of Monroe Bypass)	0.50	43,000	18,000	**-58%**	18,800	**-56%**	**4%**
	9	NC 200 (Morgan Mill Rd) (North of Monroe Bypass)	0.50	19,000	14,700	**-23%**	16,100	**-15%**	**10%**
	10	NC 200 (Morgan Mill Rd) (South of Monroe Bypass)	0.50	12,000	18,500	**54%**	19,800	**65%**	**7%**
	11	Austin Chaney Rd (North of Monroe Bypass)	0.50	8,400	10,300	**23%**	11,400	**36%**	**11%**
	12	Austin Chaney Rd (South of Monroe Bypass)	0.50	14,000	14,000	**0%**	15,600	**11%**	**11%**
	13	Forest Hills School Rd (North of Monroe Bypass)	0.50	1,400	700	**-50%**	1,100	**-21%**	**57%**
	14	Forest Hills School Rd (South of Monroe Bypass)	0.50	1,600	2,100	**31%**	2,500	**56%**	**19%**
		Corridor VMT and % Change in VMT		***121,200***	***92,300***	***-24%***	***99,200***	***-18%***	***7%***

* US 74 Corridor Segment ID #1 not included in US 74 corridor VMT calculations to provide consistent No-Build and Build corridor comparisons.

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Table 8 – Effects of the Monroe Connector/Bypass on US 74 Traffic Forecast Volumes

		Comparison Type	Traffic Forecast Volumes (Sec. 4.1)			
		Year	2035	2035	Traffic Volume Reduction Due to Build Scenario	Percent Volume Reduction on US 74 in Build Scenario
		Scenario	No-Build	Build Toll		
		Classification	Forecast Update	Forecast		
	ID #	Source	HNTB, March 2010	WSA Sept. 2008		
US 74 Segments	2	Stallings Rd to Indian Trail Rd. North	86,300	67,400	**-18,900**	**-22%**
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	69,400	51,300	**-18,100**	**-26%**
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	72,300	51,400	**-20,900**	**-29%**
	5	Faith Church Rd. to Sardis Church Rd.	67,900	52,400	**-15,500**	**-23%**
	6	Sardis Church Rd. to Chambers Dr.	71,500	38,200	**-33,300**	**-47%**
	7	Chambers Dr. to N. Rocky River Rd.	67,100	34,500	**-32,600**	**-49%**
	8	N. Rocky River Rd. to Fowler Secrest Rd.	58,200	28,800	**-29,400**	**-51%**
	9	Fowler Secrest Rd. to Rolling Hills Dr.	62,900	33,500	**-29,400**	**-47%**
	10	Rolling Hills Dr. to Round Table Rd.	62,900	29,100	**-33,800**	**-54%**
	11	Round Table Rd. to Williams Rd.	62,600	29,100	**-33,500**	**-54%**
	12	Williams Rd. to Hanover Dr.	66,500	32,300	**-34,200**	**-51%**
	13	Hanover Dr. to Dickerson Blvd.	72,100	48,000	**-24,100**	**-33%**
	14	Dickerson Blvd. to Secrest Shortcut Rd.	59,800	37,400	**-22,400**	**-37%**
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	65,000	47,600	**-17,400**	**-27%**
	16	Secrest Shortcut Rd. to Concord Ave.	65,000	47,600	**-17,400**	**-27%**
	17	Concord Ave. to US 601	67,200	48,100	**-19,100**	**-28%**
	18	US 601 to Stafford St.	74,800	57,200	**-17,600**	**-24%**
	19	Stafford St. to Boyte St.	73,300	56,900	**-16,400**	**-22%**
	20	Boyte St. to NC 200	69,800	56,000	**-13,800**	**-20%**
	21	NC 200 to Walkup Ave.	66,900	54,500	**-12,400**	**-19%**
	22	Walkup Ave. to S. Sutherland Ave.	57,500	46,500	**-11,000**	**-19%**
	23	S. Sutherland Ave. to Venus St.	54,500	44,000	**-10,500**	**-19%**
	24	Venus St. to E. Franklin St.	49,300	42,400	**-6,900**	**-14%**
	25	E. Franklin St. to US 601 / N. Medical Center Campus	60,600	60,000	**-600**	**-1%**
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	39,700	36,600	**-3,100**	**-8%**
	27	S. Secrest Ave. to S. Bivens Rd.	41,000	34,100	**-6,900**	**-17%**
	28	S. Bivens Rd. to Bivens St.	39,400	34,100	**-5,300**	**-13%**
	29	Bivens St. to Austin Chaney Rd.	42,700	33,100	**-9,600**	**-22%**
	30	Austin Chaney Rd. to Forest Hills School Rd. North	35,900	26,100	**-9,800**	**-27%**
	31	Forest Hills School Rd. North to Marshville	31,600	20,700	**-10,900**	**-34%**
Corridor VMT, VMT Reduction and % Change in VMT			***1,095,695***	***760,460***	***-335,235***	***-31%***

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Table 9 – Effects of the Monroe Connector/Bypass on US 74 Travel Demand Model Assignment

		Comparison Type	Travel Demand Model Raw Output Assignment							
		Year	2030	2030	Assignment Reduction Due to Build Scenario (Sec. 4.2)	Percent Reduction on US 74 in Build Scenario (Sec. 4.2)	2035	2035	Assignment Reduction Due to Build Scenario (Sec. 4.3)	Percent Reduction on US 74 in Build Scenario (Sec. 4.3)
		Scenario	No-Build	Build			No-Build	Build		
		Model Version	MRM06	MRM06			MRM11	MRM11		
		Socioeconomic Data	2005	2005			2009	2009		
		Classification	Raw Model	Raw Model			Raw Model	Raw Model		
	ID #	Source	Model	Model			Model	Model		
US 74 Segments	2	Stallings Rd / Monroe Bypass to Indian Trail Rd. North	62,600	47,200	**-15,400**	**-25%**	90,300	65,200	**-25,100**	**-28%**
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	51,800	37,500	**-14,300**	**-28%**	65,500	51,900	**-13,600**	**-21%**
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	49,600	35,700	**-13,900**	**-28%**	66,400	53,700	**-12,700**	**-19%**
	5	Faith Church Rd. to Sardis Church Rd.	51,000	38,500	**-12,500**	**-25%**	56,900	48,200	**-8,700**	**-15%**
	6	Sardis Church Rd. to Chambers Dr.	50,600	33,100	**-17,500**	**-35%**	47,400	39,800	**-7,600**	**-16%**
	7	Chambers Dr. to N. Rocky River Rd.	52,600	34,900	**-17,700**	**-34%**	46,100	38,300	**-7,800**	**-17%**
	8	N. Rocky River Rd. to Fowler Secrest Rd.	42,600	25,400	**-17,200**	**-40%**	45,300	38,400	**-6,900**	**-15%**
	9	Fowler Secrest Rd. to Rolling Hills Dr.	47,300	25,400	**-21,900**	**-46%**	38,100	31,300	**-6,800**	**-18%**
	10	Rolling Hills Dr. to Round Table Rd.	47,300	30,500	**-16,800**	**-36%**	38,100	31,300	**-6,800**	**-18%**
	11	Round Table Rd. to Williams Rd.	55,700	38,600	**-17,100**	**-31%**	43,100	37,400	**-5,700**	**-13%**
	12	Williams Rd. to Hanover Dr.	55,700	38,600	**-17,100**	**-31%**	49,200	43,900	**-5,300**	**-11%**
	13	Hanover Dr. to Dickerson Blvd.	55,700	38,600	**-17,100**	**-31%**	49,200	43,900	**-5,300**	**-11%**
	14	Dickerson Blvd. to Secrest Shortcut Rd.	43,400	38,600	**-4,800**	**-11%**	66,400	56,700	**-9,700**	**-15%**
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	48,400	31,100	**-17,300**	**-36%**	71,500	59,200	**-12,300**	**-17%**
	16	Secrest Shortcut Rd. to Concord Ave.	48,400	31,100	**-17,300**	**-36%**	71,500	59,200	**-12,300**	**-17%**
	17	Concord Ave. to US 601	47,300	35,900	**-11,400**	**-24%**	73,200	60,900	**-12,300**	**-17%**
	18	US 601 to Stafford St.	61,700	50,900	**-10,800**	**-18%**	69,300	60,400	**-8,900**	**-13%**
	19	Stafford St. to Boyte St.	59,500	48,600	**-10,900**	**-18%**	67,100	57,500	**-9,600**	**-14%**
	20	Boyte St. to NC 200	57,100	46,100	**-11,000**	**-19%**	66,400	57,500	**-8,900**	**-13%**
	21	NC 200 to Walkup Ave.	56,200	44,900	**-11,300**	**-20%**	68,200	59,300	**-8,900**	**-13%**
	22	Walkup Ave. to S. Sutherland Ave.	57,000	45,900	**-11,100**	**-19%**	66,800	58,000	**-8,800**	**-13%**
	23	S. Sutherland Ave. to Venus St.	58,700	44,900	**-13,800**	**-24%**	65,500	56,100	**-9,400**	**-14%**
	24	Venus St. to E. Franklin St.	59,000	45,000	**-14,000**	**-24%**	66,400	56,700	**-9,700**	**-15%**
	25	E. Franklin St. to US 601 / N. Medical Center Campus	68,500	54,500	**-14,000**	**-20%**	75,500	65,200	**-10,300**	**-14%**
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	38,500	26,700	**-11,800**	**-31%**	41,500	32,500	**-9,000**	**-22%**
	27	S. Secrest Ave. to S. Bivens Rd.	41,600	31,100	**-10,500**	**-25%**	48,300	40,100	**-8,200**	**-17%**
	28	S. Bivens Rd. to Bivens St.	39,900	24,800	**-15,100**	**-38%**	36,500	28,500	**-8,000**	**-22%**
	29	Bivens St. to Austin Chaney Rd.	39,500	25,400	**-14,100**	**-36%**	37,700	30,000	**-7,700**	**-20%**
	30	Austin Chaney Rd. to Forest Hills School Rd. North	30,700	18,400	**-12,300**	**-40%**	30,700	22,700	**-8,000**	**-26%**
	31	Forest Hills School Rd. North to Monroe Connector/Bypass	21,200	10,300	**-10,900**	**-51%**	21,200	11,600	**-9,600**	**-45%**
		Corridor VMT, VMT Reduction and % Change in VMT	***888,016***	***614,335***	***-273,681***	***-31%***	***965,940***	***782,051***	***-183,889***	***-19%***

Table 11 – Effects of the Socioeconomic Data on Travel Demand Model Assignment

Facility	ID #	Comparison Type	Travel Demand Model Raw Assignment (Sec. 5)									
		Year	2035	2035	2035	Percent Change from SE 2005 to SE 2008 Interim	Percent Change from SE 2005 to SE 2009	2035	2035	2035	Percent Change from SE 2005 to SE 2008 Interim	Percent Change from SE 2005 to SE 2009
		Scenario	No-Build	No-Build	No-Build			Build	Build	Build		
		Model Version	MRM11	MRM11	MRM11			MRM11	MRM11	MRM11		
		Socioeconomic Data	2005	2008 Interim	2009			2005	2008 Interim	2009		
		Classification	Raw Model	Raw Model	Raw Model			Raw Model	Raw Model	Raw Model		
		Source	Model	Model	Model			Model	Model	Model		
US 74	1	I-485 to US 74 Frontage Road	n/a	n/a	n/a	n/a	n/a	124,700	131,800	134,000	**6%**	**7%**
US 74 / Monroe Bypass	2	US 74 Frontage Rd to US 74 / Monroe Bypass Split	n/a	n/a	n/a	n/a	n/a	110,500	116,000	116,500	**5%**	**5%**
Frontage Road	3	McKee Rd to Stallings Rd	n/a	n/a	n/a	n/a	n/a	8,300	8,100	8,600	**-2%**	**4%**
Monroe Bypass Segments	1	US 74 to Indian Trail-Fairview Rd	n/a	n/a	n/a	n/a	n/a	62,900	66,800	67,400	**6%**	**7%**
	2	Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	n/a	n/a	n/a	n/a	n/a	55,700	56,700	56,800	**2%**	**2%**
	3	Unionville-Indian Trail Rd to Rocky River Rd	n/a	n/a	n/a	n/a	n/a	49,800	50,800	50,800	**2%**	**2%**
	4	Rocky River Rd to US 601	n/a	n/a	n/a	n/a	n/a	47,100	47,300	47,700	**0%**	**1%**
	5	US 601 to NC 200 (Morgan Mill Rd)	n/a	n/a	n/a	n/a	n/a	41,700	42,800	43,100	**3%**	**3%**
	6	NC 200 (Morgan Mill Rd) to Austin Chaney Rd	n/a	n/a	n/a	n/a	n/a	35,100	35,900	36,000	**2%**	**3%**
	7	Austin Chaney Rd to Forest Hills School Rd	n/a	n/a	n/a	n/a	n/a	24,300	24,700	24,800	**2%**	**2%**
	8	Forest Hills School Rd to US 74	n/a	n/a	n/a	n/a	n/a	21,800	21,600	21,600	**-1%**	**-1%**
		Corridor VMT and % Change in VMT	***n/a***	***n/a***	***n/a***	***n/a***	***n/a***	***798,994***	***817,970***	***822,161***	***2%***	***3%***
US 74 Segments	1	I-485 to Stallings Rd	92,100*	98,800*	101,600*	**7%***	**10%***	n/a*	n/a*	n/a*	n/a*	n/a*
	2	Stallings Rd to Indian Trail Rd. North	82,300	88,500	90,300	**8%**	**10%**	61,000	64,600	65,200	**6%**	**7%**
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	60,000	64,600	65,500	**8%**	**9%**	48,500	51,800	51,900	**7%**	**7%**
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	60,700	66,300	66,400	**9%**	**9%**	49,600	53,600	53,700	**8%**	**8%**
	5	Faith Church Rd. to Sardis Church Rd.	53,100	57,200	56,900	**8%**	**7%**	45,400	48,300	48,200	**6%**	**6%**
	6	Sardis Church Rd. to Chambers Dr.	46,500	47,500	47,400	**2%**	**2%**	39,700	40,200	39,800	**1%**	**0%**
	7	Chambers Dr. to N. Rocky River Rd.	45,200	46,200	46,100	**2%**	**2%**	38,100	38,600	38,300	**1%**	**1%**
	8	N. Rocky River Rd. to Fowler Secrest Rd.	46,600	45,600	45,300	**-2%**	**-3%**	40,300	38,800	38,400	**-4%**	**-5%**
	9	Fowler Secrest Rd. to Rolling Hills Dr.	38,500	38,300	38,100	**-1%**	**-1%**	31,700	31,700	31,300	**0%**	**-1%**
	10	Rolling Hills Dr. to Round Table Rd.	38,500	38,300	38,100	**-1%**	**-1%**	31,700	31,700	31,300	**0%**	**-1%**
	11	Round Table Rd. to Williams Rd.	43,300	49,100	43,100	**13%**	**0%**	37,500	43,900	37,400	**17%**	**0%**
	12	Williams Rd. to Hanover Dr.	49,500	49,100	49,200	**-1%**	**-1%**	43,800	43,900	43,900	**0%**	**0%**
	13	Hanover Dr. to Dickerson Blvd.	49,500	49,100	49,200	**-1%**	**-1%**	43,800	43,900	43,900	**0%**	**0%**
	14	Dickerson Blvd. to Secrest Shortcut Rd.	66,400	66,300	66,400	**0%**	**0%**	57,000	56,900	56,700	**0%**	**-1%**
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	71,400	71,400	71,500	**0%**	**0%**	59,600	59,400	59,200	**0%**	**-1%**
	16	Secrest Shortcut Rd. to Concord Ave.	71,400	71,400	71,500	**0%**	**0%**	59,600	59,400	59,200	**0%**	**-1%**
	17	Concord Ave. to US 601	72,900	73,100	73,200	**0%**	**0%**	61,200	61,100	60,900	**0%**	**0%**
	18	US 601 to Stafford St.	67,000	69,200	69,300	**3%**	**3%**	58,100	50,900	60,400	**-12%**	**4%**
	19	Stafford St. to Boyte St.	65,000	67,000	67,100	**3%**	**3%**	56,100	58,100	57,500	**4%**	**2%**
	20	Boyte St. to NC 200	63,800	66,300	66,400	**4%**	**4%**	55,200	57,600	57,500	**4%**	**4%**
	21	NC 200 to Walkup Ave.	66,200	67,900	68,200	**3%**	**3%**	57,000	59,500	59,300	**4%**	**4%**
	22	Walkup Ave. to S. Sutherland Ave.	64,800	66,400	66,800	**2%**	**3%**	55,700	58,000	58,000	**4%**	**4%**
	23	S. Sutherland Ave. to Venus St.	62,800	65,300	65,500	**4%**	**4%**	53,100	56,000	56,100	**5%**	**6%**
	24	Venus St. to E. Franklin St.	63,100	66,200	66,400	**5%**	**5%**	53,300	56,600	56,700	**6%**	**6%**
	25	E. Franklin St. to US 601 / N. Medical Center Campus	71,400	75,400	75,500	**6%**	**6%**	60,700	65,100	65,200	**7%**	**7%**
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	38,900	41,400	41,500	**6%**	**7%**	29,600	32,400	32,500	**9%**	**10%**
	27	S. Secrest Ave. to S. Bivens Rd.	45,000	48,300	48,300	**7%**	**7%**	36,600	40,000	40,100	**9%**	**10%**
	28	S. Bivens Rd. to Bivens St.	33,900	36,300	36,500	**7%**	**8%**	25,700	28,300	28,500	**10%**	**11%**
	29	Bivens St. to Austin Chaney Rd.	35,000	37,600	37,700	**7%**	**8%**	27,200	30,000	30,000	**10%**	**10%**
	30	Austin Chaney Rd. to Forest Hills School Rd. North	27,600	30,900	30,700	**12%**	**11%**	17,800	21,200	22,700	**19%**	**28%**
	31	Forest Hills School Rd. North to Monroe Bypass	19,900	21,200	21,200	**7%**	**7%**	10,200	11,700	11,600	**15%**	**14%**
		Corridor VMT and % Change in VMT	***921,342***	***965,324***	***965,940***	***5%***	***5%***	***743,793***	***778,388***	***782,051***	***5%***	***5%***

* US 74 Corridor Segment ID #1 not included in US 74 corridor VMT calculations to provide consistent No-Build and Build corridor comparisons.

Table 12 – Effects of Indirect and Cumulative Effects Socioeconomic Data on Travel Demand Model Assignment

		Comparison Type	Travel Demand Model Raw Assignment (Sec. 6)					
		Year	2030	2030	Percent Change from 2030 NB 2009 SE to 2030 B 2009 SE	2030	Percent Change from 2030 NB 2009 SE to 2030 B 2009 ICE	Percent Change from 2030 B 2009 SE to 2030 B 2009 ICE
		Scenario	No-Build	Build		Build		
		Model Version	MRM11	MRM11		MRM11		
		Socioeconomic Data	2009	2009		2009 ICE		
		Classification	Raw Model	Raw Model		Raw Model		
Facility	**ID #**	**Source**	**Model**	**Model**		**Model**		
US 74	1	I-485 to US 74 Frontage Road	n/a	125,400	n/a	125,600	n/a	0%
US 74 / Monroe Bypass	2	US 74 Frontage Rd to US 74 / Monroe Bypass Split	n/a	109,500	n/a	109,700	n/a	0%
Frontage Road	3	McKee Rd to Stallings Rd	n/a	7,700	n/a	8,100	n/a	5%
Monroe Bypass Segments	1	US 74 to Indian Trail-Fairview Rd	n/a	62,500	n/a	63,100	n/a	1%
	2	Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	n/a	52,900	n/a	54,400	n/a	3%
	3	Unionville-Indian Trail Rd to Rocky River Rd	n/a	47,200	n/a	48,600	n/a	3%
	4	Rocky River Rd to US 601	n/a	44,100	n/a	46,300	n/a	5%
	5	US 601 to NC 200 (Morgan Mill Rd)	n/a	39,500	n/a	42,400	n/a	7%
	6	NC 200 (Morgan Mill Rd) to Austin Chaney Rd	n/a	32,500	n/a	35,800	n/a	10%
	7	Austin Chaney Rd to Forest Hills School Rd	n/a	22,600	n/a	23,800	n/a	5%
	8	Forest Hills School Rd to US 74	n/a	20,000	n/a	20,400	n/a	2%
		Corridor VMT and % Change in VMT	***n/a***	***757,407***	***n/a***	***793,567***	***n/a***	***5%***
US 74 Corridor Segments	1	I-485 to Stallings Rd	83,500*	n/a*	n/a*	n/a*	n/a*	n/a*
	2	Stallings Rd to Indian Trail Rd. North	83,500	61,400	-26%	61,400	-26%	0%
	3	Indian Trail Rd. North to Unionville Indian Trail Rd. West	60,300	48,200	-20%	48,400	-20%	0%
	4	Unionville Indian Trail Rd. West to Faith Church Rd.	61,700	50,100	-19%	50,200	-19%	0%
	5	Faith Church Rd. to Sardis Church Rd.	54,000	45,800	-15%	46,100	-15%	1%
	6	Sardis Church Rd. to Chambers Dr.	44,500	37,300	-16%	38,100	-14%	2%
	7	Chambers Dr. to N. Rocky River Rd.	42,200	35,800	-15%	35,500	-16%	-1%
	8	N. Rocky River Rd. to Fowler Secrest Rd.	42,900	36,200	-16%	37,300	-13%	3%
	9	Fowler Secrest Rd. to Rolling Hills Dr.	42,900	29,400	-31%	30,300	-29%	3%
	10	Rolling Hills Dr. to Round Table Rd.	40,900	29,400	-28%	30,300	-26%	3%
	11	Round Table Rd. to Williams Rd.	46,700	35,200	-25%	35,900	-23%	2%
	12	Williams Rd. to Hanover Dr.	62,600	41,600	-34%	42,000	-33%	1%
	13	Hanover Dr. to Dickerson Blvd.	62,600	41,600	-34%	42,000	-33%	1%
	14	Dickerson Blvd. to Secrest Shortcut Rd.	62,600	53,300	-15%	54,700	-13%	3%
	15	Secrest Shortcut Rd. to Secrest Shortcut Rd.	68,000	56,200	-17%	56,900	-16%	1%
	16	Secrest Shortcut Rd. to Concord Ave.	68,000	56,200	-17%	56,900	-16%	1%
	17	Concord Ave. to US 601	69,500	57,800	-17%	58,600	-16%	1%
	18	US 601 to Stafford St.	65,800	57,100	-13%	57,900	-12%	1%
	19	Stafford St. to Boyte St.	63,700	55,000	-14%	55,800	-12%	1%
	20	Boyte St. to NC 200	62,900	54,300	-14%	55,100	-12%	1%
	21	NC 200 to Walkup Ave.	63,300	55,200	-13%	56,300	-11%	2%
	22	Walkup Ave. to S. Sutherland Ave.	62,200	54,600	-12%	55,600	-11%	2%
	23	S. Sutherland Ave. to Venus St.	61,600	52,700	-14%	54,200	-12%	3%
	24	Venus St. to E. Franklin St.	62,000	53,100	-14%	55,200	-11%	4%
	25	E. Franklin St. to US 601 / N. Medical Center Campus	70,200	60,600	-14%	63,400	-10%	5%
	26	US 601/Metro Medical Center Campus to S. Secrest Ave.	38,800	30,400	-22%	33,400	-14%	10%
	27	S. Secrest Ave. to S. Bivens Rd.	44,900	37,000	-18%	41,400	-8%	12%
	28	S. Bivens Rd. to Bivens St.	33,800	26,000	-23%	29,300	-13%	13%
	29	Bivens St. to Austin Chaney Rd.	34,700	27,300	-21%	31,900	-8%	17%
	30	Austin Chaney Rd. to Forest Hills School Rd. North	27,800	19,800	-29%	24,500	-12%	24%
	31	Forest Hills School Rd. North to Monroe Bypass	19,400	10,600	-45%	12,400	-36%	17%
		Corridor VMT and % Change in VMT	***918,517***	***729,912***	***-21%***	***760,974***	***-17%***	***4%***

* US 74 Corridor Segment ID #1 not included in US 74 corridor VMT calculations to provide consistent No-Build and Build corridor comparisons.

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Table 13 – 2030 Build VMT and VHT Comparison

	2030 Build (with Monroe Connector/Bypass)				2009 SE Data vs. 2009 ICE Data	
	with 2009 SE Data		with 2009 ICE Data			
COUNTY	**TOTAL VMT**	**TOTAL VHT**	**TOTAL VMT**	**TOTAL VHT**	**% CHANGE in VMT**	**% CHANGE in VHT**
Mecklenburg County	44,747,461	1,664,994	44,745,210	1,665,283	**0%**	**0%**
Union County	9,612,887	302,260	9,948,279	315,582	**3%**	**4%**
MRM Network	105,856,112	3,494,897	106,207,332	3,508,645	**0%**	**0%**

VMT – Vehicle Miles Traveled
VHT – Vehicle Hours Traveled

Attachment A

INTEROFFICE CORRESPONDENCE

To
Spencer Franklin, PE
North Carolina Turnpike Authority

From
Craig Scheffler, PE
HNTB North Carolina, PC

Cc
Bradley Reynolds, PE
HNTB North Carolina, PC

Subject
Monroe Bypass No-Build Traffic Forecast Summary

Date
11/8/13

Per direction from NCTA, HNTB staff reviewed traffic forecast documentation related to the proposed Monroe Bypass project. Specifically, information related to the decision-making process for updating No-Build forecasts originally provided by Wilbur Smith Associates (WSA) in July 2008 is presented below.

As part of the initial traffic forecasting process for the Monroe Bypass project, WSA conducted initial planning-level forecasts of traffic for Build scenario conditions as part of their *Preliminary Traffic and Revenue Study* (WSA, October 11, 2006). These forecasts were updated and refined in the *Traffic Forecast for TIP Projects R-3229 & R-2559 Monroe Connector/Bypass* (WSA, September 19, 2008) to produce year 2008 and 2035 Build Toll project-level traffic forecasts for use in traffic analyses, preliminary project alternatives analysis and design. The WSA September 2008 document also included year 2008 and 2035 No-Build forecasts and notes that "The two No-Build scenarios forecasted in this document are updates of previously prepared forecasts for this project (2007 and 2030)." (Page 3). This statement references the Martin-Alexiou-Bryson (MAB) forecast document *Traffic Forecasts for the No-Build Alternatives for NCDOT State TIP Project No. R-3329 and NCDOT State TIP Project No. R-2559, Monroe Connector/Bypass Study* (MAB, June 2008).

The 2030 No-Build traffic forecasts were the primary forecasts used in traffic analyses, and project alternative analysis. The 2030 No-Build forecast volumes showed significant congestion in the US 74 corridor and the need for the project. The only purpose of the 2035 No-Build was to confirm an assumption that the traffic volumes on existing US 74 will stay the same or increase from 2030 to 2035 if no roadway improvements took place. Because the traffic forecasts for year 2035 for the No-Build Alternative were greater than the year 2030 forecasts, FHWA and NCTA determined that it was not necessary to update the operational analyses for the No-Build alternative from 2030 to 2035. For the Draft EIS, the results of that 2030 analysis were assumed to be representative of conditions in 2035.

The general methodology described in both forecast documents (by WSA and MAB) is similar, though the results from the two forecasts are very different when comparing No-Build Alternative daily traffic flows along US 74 through the project study area. Even though the base and future forecasts years are different between the two documents (2007 versus 2008 and 2030 versus 2035, MAB versus WSA, respectively), that difference should not produce the degree of variability presented in forecasted Average Annual Daily Traffic (AADT) for the No-Build Scenarios.

The primary concern with the WSA No-Build forecasts was clearly evident in the 2035 No-Build daily volume estimates in the range of 100,000-140,000 AADT for the US 74 corridor from I-485 (highest forecast data) to NC 200 in Monroe. However, all historical trend line data extrapolations and 2030 model run results (extrapolated to 2035) indicated the magnitude of 2035 No-Build AADT would be less than 100,000 vehicles per day on sections of US 74 in the project study area. For reference, the MAB 2030 No-Build forecast results through this section of the study area are in the range of 60,000-70,000 vehicles per day. Even if some elements of the forecasting approach, data sets, and methodology might have been different between the two forecasts, the results – particularly for a No-Build scenario where reliance on travel demand model output for a new location facility is not needed – should not have shown such large variance.

The second concern related to the WSA No-Build forecasts involves a screenline comparison to the Build forecasts in the project study area. Realistically, the combination of forecasted traffic volumes of a Build scenario new location facility (Monroe Bypass) and paralleling existing facility (US 74) should at least be equal to or greater than a No-Build scenario (US 74 without Monroe Bypass). A new location facility improves network access, increases network capacity, and is expected to divert a portion of trips from existing facilities, resulting in a redistribution of traffic and net gain across project study corridor screenlines. A comparison of the WSA No-Build and Build forecasts for both 2008 base year and 2035 future year conditions did not follow this expected pattern. Screenline comparisons of WSA Scenario 3A – Toll forecasts to the No-Build forecasts produced net decreases of east-west traffic through the project study area of 20,000-30,000 vehicles per day, which is contrary to the expected results as described in the previous paragraph.

Due to the two major discrepancies with the July 2008 WSA No-Build forecasts for the Monroe Bypass, HNTB prepared updated 2008 and 2035 No-Build forecasts which addressed these items. These updated forecasts produced reliable results that were consistent with MAB's No-Build 2007 and 2030 forecasts and methodology with realistic No-Build daily volume results when compared to Build – Toll scenarios across project study area screenlines. The updated No-Build forecasts are documented in *Revised Monroe Connector/Bypass No-Build Traffic Forecast Memorandum* (HNTB, March 2010).