APPENDIX J

Sensitivity Analysis

County staff studied the potential effects on the Wake County Transit Plan if assumptions were to differ from expectations by conducting a sensitivity analysis. The analysis serves multiple purposes including to:

a) test the strength of model results,

b) assist decision-makers with understanding the effects of uncertainty in assumptions, and

c) strengthen the understanding of relationships between key input assumptions and model outputs (primarily project schedules and debt service principal).

The model contains numerous assumptions and a review of every possible combination may reach a point of diminishing value. This analysis is intended to identify broad assumption combinations that could impact future decision-making and require modifications to the plan. The following scenarios were examined:

1) The average annual change in contribution to fund balance (increase) or use of fund balance (decrease) from any combined differences in revenues and/or expenditures.

2) Differences in the combined federal and state cost share assumptions for new bus and rail capital projects.

3) Changes in annual operating inflation assumptions.

Methodology

To conduct the sensitivity analysis, County staff started with the financial models for the Core and Enhanced Transit Plans. Starting in FY 2012, all years were expected to maintain a minimum fund balance sufficient to cover one and a quarter (1.25) times the debt service payment for the following fiscal year. If the projected fund balance fell below this threshold in any future fiscal year, debt service principal was adjusted in $5.0-million increments. From time to time, County staff would also adjust the borrowing schedule in the sensitivity analysis to maintain acceptable fund balances and match borrowing to capital projects.

If the cost of borrowing depleted cash flows in future years, County staff would delay bus and/or rail projects in one-year increments and adjust debt service schedules accordingly. County staff reduced capital projects in the following order: 1) light rail, 2) commuter rail, 3) bus facilities and infrastructure and 4) expanded bus service (vehicles). If multi-year project delays and debt service were not sufficient, County staff would eliminate capital projects using the same order of progression until adequate fund balance was achieved. The analysis assumes that projects may not be accelerated if revenues exceed projections.

Average Annual Contribution to Fund Balance

The first scenario reviewed by County staff was the average annual change in contribution to fund balance (increase) or use of fund balance (decrease) from any combined difference of revenue and/or expenditure totals. For example, if total revenues fell short of projections by an average of $1,000,000 annually, there would be a negative impact to fund balance on a recurring basis. If total expenditures also averaged $500,000 less than expected annually, there would be a positive impact to fund balance since additional resources would be retained in the fund. By combining each example, the sum would be negative $500,000 annually. The following table depicts the combined scenario.

Revenues less than expected	Expenditures less than expected	Net Impact
- $1,000,000	+ $500,000	– $500,000

If the average change in annual contributions to reserves result in a fund balance that is below the minimum threshold (one and a quarter, or 1.25, times the debt service payment for the following fiscal year), County staff would modify the debt service principal in $5-million increments and/or delay a project in one-year increments until the minimum fund balance was achieved for all fiscal years. Assuming the scenario described above were to occur, staff observed that the bus and commuter rail project could continue without interruption or delay in the Core Transit Plan without additional debt service. In the Enhanced Transit Plan, the bus and rail projects (including light rail) could continue without interruption but the plan would require an additional $5 million in borrowing (increased from $210 million to $215 million). The following table on the next page summarizes the potential impacts due to the average change in fund balance contributions at selected dollar amounts.

Sensitivity Analysis—Average Annual Change in Fund Balance Contributions (FY13–40)

	New Service Start (Fiscal Year)			Required Debt Service Principal	Fund Balance (Low Point)	
	Expand Bus Service	Commuter Rail Service	Light Rail Service	Dollars	Dollars	Fiscal Year
Core Transit Plan						
+ $ 7,500,000	2015	2020	–	$ 180,000,000	$ 16,268,000	2019
+ $ 5,000,000	2015	2020	–	$ 200,000,000	$ 16,664,000	2018
+ $ 2,500,000	2015	2020	–	$ 220,000,000	$ 16,805,000	2017
+ $ 2,000,000	2015	2020	–	$ 225,000,000	$ 14,730,000	2017
+ $ 1,500,000	2015	2020	–	$ 230,000,000	$ 17,330,000	2017
+ $ 1,000,000	2015	2020	–	$ 235,000,000	$ 15,255,000	2017
+ $ 500,000	2015	2020	–	$ 240,000,000	$ 17,856,000	2017
Current Assumptions	**2015**	**2020**	**---**	**$ 245,000,000**	**$ 20,458,000**	**2017**
- $ 500,000	2015	2020	–	$ 245,000,000	$ 18,381,000	2017
- $ 1,000,000	2015	2020	–	$ 250,000,000	$ 16,306,000	2017
- $ 1,500,000	2015	2020	–	$ 255,000,000	$ 17,989,000	2018
- $ 2,000,000	2015	2020	–	$ 260,000,000	$ 16,831,000	2017
- $ 2,500,000	2015	2020	–	$ 265,000,000	$ 14,754,000	2017
- $ 5,000,000	2015	2020	–	$ 285,000,000	$ 9,051,000	2017
- $ 7,500,000	2015	2020	–	$ 305,000,000	$ 12,703,000	2017
Enhanced Transit Plan						
+ $ 7,500,000	2015	2020	2023	$ 115,000,000	$ 18,796,000	2021
+ $ 5,000,000	2015	2020	2023	$ 150,000,000	$ 23,583,000	2021
+ $ 2,500,000	2015	2020	2023	$ 180,000,000	$ 27,555,000	2021
+ $ 2,000,000	2015	2020	2023	$ 185,000,000	$ 27,222,000	2021
+ $ 1,500,000	2015	2020	2023	$ 195,000,000	$ 29,680,000	2020
+ $ 1,000,000	2015	2020	2023	$ 200,000,000	$ 30,585,000	2020
+ $ 500,000	2015	2020	2023	$ 205,000,000	$ 30,895,000	2021
Current Assumptions	**2015**	**2020**	**2023**	**$ 210,000,000**	**$ 30,239,000**	**2021**
- $ 500,000	2015	2020	2023	$ 215,000,000	$ 28,741,000	2030
- $ 1,000,000	2015	2020	2023	$ 225,000,000	$ 20,259,000	2030
- $ 1,500,000	2015	2020	**2024**	$ 210,000,000	$ 19,477,000	2030
- $ 2,000,000	2015	2020	**2025**	$ 230,000,000	$ 20,552,000	2030
- $ 2,500,000	2015	2020	**–**	–	$ 64,877,000	2014
- $ 5,000,000	2015	2020	**–**	–	$ 62,377,000	2014
- $ 7,500,000	2015	2020	**–**	–	$ 49,478,000	2018

This scenario concluded that Core Transit Plan project schedules are achievable with a wide margin of error for projected revenue and expenditure totals. The analysis also found that on average in the Core Transit Plan, for every $500,000 increase in annual fund balance, a decrease of $5.0 million in transit borrowing is required (and vice versa).

For the Enhanced Transit Plan, project schedules can be achieved if the average contribution to fund balance does not decrease by more than $1.0 million annually. If annual contributions are decreased by more than $1.0 million, the light rail project may require a one- to two-year delay. If annual contributions are more than $2.5 million less than expected, the light rail project may require an indefinite suspension until finances allow resumption. Similar to the Core Transit Plan, the analysis also found that for every change of $500,000 in annual fund balance, a change of $5.0 million in transit borrowing is required.

Also, note that the indefinite suspension of the light rail project may allow bus and commuter projects to proceed without borrowing. These assumptions differ from the Core Transit Plan since commuter rail is expected to receive federal and state capital support in the Enhanced Transit Plan.

Combined Federal and State Cost Share Assumptions for Capital Projects

The second scenario tested in the sensitivity analysis was changes to the combined federal and state cost share assumptions for new capital projects. For example, the Core Transit Plan assumes the federal government will assist in expanding bus service by contributing 40 percent of all bus capital costs and that the state will participate at 25 percent. The combined cost share assumption for expanded bus service capital equals 65 percent. If the combined assumption was reduced by 5 percent to total 60 percent for all bus capital, the Core Transit Plan assumes that all bus and commuter rail projects may proceed as scheduled; however, the total amount of borrowing would increase by $25 million (from $245 million to $270 million).

The scenario concluded that bus and commuter rail project schedules are achievable in the Core Transit Plan with a wide margin of error in the assumptions. On average, the analysis found that for every -percent increase in federal and state cost share for capital projects, a decrease of approximately $24.0 million in transit borrowing is required (and vice versa).

For the Enhanced Transit Plan, the scenario concluded that bus, commuter rail and light rail projects may proceed as scheduled as long as the combined capital cost share assumptions do not decrease by more than 1 percent. If the combined cost share decreases more than 1 percent and less than 2.5 percent, the light rail project may require a one- to two-year delay. A combined decrease of 2.5 percent or more may compel the indefinite suspension of the light rail project until finances allow for its continuation.

The analysis also found that the amount of borrowing in the Enhanced Transit Plan can be reduced substantially, or even eliminate the need to borrow entirely, since revenues are proportional to the project's expenditures. For example, if federal participation increases 10 percent for bus and rail, the plan may be able to eliminate the need for debt service. Another situation that may occur is less federal and/or state participation. If the combined cost shares were reduced by 5 percent, light rail may require suspension; however, bus and commuter rail projects may proceed as scheduled without borrowing. The following table summarizes potential impacts to new bus and rail services if changes to the combined cost share assumptions occur.

Sensitivity Analysis - Combined Federal and State Cost Share Assumptions

	New Service Start (Fiscal Year)			Required Debt Service Principal	Fund Balance (Low Point)	
	Expand Bus Service	Commuter Rail Service	Light Rail Service	Dollars	Dollars	Fiscal Year
Core Transit Plan						
+ 20.0%	2015	2020	–	$ 150,000,000	14,696,000	2019
+ 15.0%	2015	2020	–	$ 175,000,000	17,472,000	2019
+ 10.0%	2015	2020	–	$ 200,000,000	20,569,000	2019
+ 5.0%	2015	2020	–	$ 220,000,000	19,955,000	2019
+ 2.5%	2015	2020	–	$ 235,000,000	21,240,000	2018
+ 1.0%	2015	2020	–	$ 240,000,000	18,216,000	2017
Current Assumptions	**2015**	**2020**	**---**	**$ 245,000,000**	**$ 20,458,000**	**2017**
- 1.0%	2015	2020	–	$ 245,000,000	18,017,000	2018
- 2.5%	2015	2020	–	$ 255,000,000	19,043,000	2017

	New Service Start (Fiscal Year)			Required Debt Service Principal	Fund Balance (Low Point)	
	Expand Bus Service	Commuter Rail Service	Light Rail Service	Dollars	Dollars	Fiscal Year
- 5.0%	2015	2020	–	$ 270,000,000	22,307,000	2017
- 10.0%	2015	2020	–	$ 290,000,000	17,146,000	2016
- 15.0%	2015	2020	–	$ 315,000,000	20,041,000	2017
- 20.0%	2015	2020	–	$ 340,000,000	19,226,000	2016
Enhanced Transit Plan						
+ 20.0% * **	2015	2020	2023	–	$ 73,490,000	2014
+ 15.0% * **	2015	2020	2023	–	$ 71,732,000	2014
+ 10.0% **	2015	2020	2023	–	$ 68,507,000	2021
+ 5.0%	2015	2020	2023	$ 70,000,000	$ 21,138,000	2021
+ 2.5%	2015	2020	2023	$ 135,000,000	$ 21,377,000	2020
+ 1.0%	2015	2020	2023	$ 175,000,000	$ 19,759,000	2020
Current Assumptions	**2015**	**2020**	**2023**	**$ 210,000,000**	**$ 30,239,000**	**2021**
- 1.0%	2015	2020	2023	$ 225,000,000	$ 19,299,000	2030
- 2.5%	2015	2020	2025	$ 225,000,000	$ 18,606,000	2030
- 5.0% **	2015	2020	–	–	$ 53,830,000	2018
- 10.0% **	2015	2020	–	–	$ 18,763,000	2018
- 15.0%	2015	2020	–	$ 35,000,000	$ 16,440,000	2018
- 20.0%	2015	2020	–	$ 75,000,000	$ 18,472,000	2018

NOTES:

** Rail cost share assumptions may start to exceed maximum allowed by the federal and state government. As such, assumptions are capped at 85% for federal and state rail participation.*

*** Scenario does not require debt service (borrowing).*

Annual Operating Inflation

The third scenario tested changes to operating inflation rate assumptions. The mode assumes that operating costs associated with expanded bus and rail service will inflate at 2.5 percent annually in all future years. The analysis compared operating inflation rate assumptions to three alternate assumption sets including a flat increase of one-half percent, the five-year average of annual United States Consumer Price Index (CPI) rates and a flat increase of 1 percent.

For the Core Transit Plan, the analysis found that bus and commuter rail services could continue without interruption using the alternate operating inflation assumptions. If the average operating assumption were 3.5 percent or more, additional debt service may be required to maintain an adequate fund balance. The Enhanced Transit Plan will require operating assumptions are maintained at an average of 2.5 percent for all years. If on average, operating costs increase by more than 2.5 percent, the light rail project may require indefinite suspension until finances allow for its continuation.

Sensitivity Analysis—Annual Average Operating Inflation Assumptions

	Assumption for All Future Years	New Service Start (Fiscal Year) Expand Bus Service	Commuter Rail Service	Light Rail Service	Required Debt Service Principal Dollars	Fund Balance (Low Point) Dollars	Fiscal Year
Core Transit Plan							
Current Assumptions	**2.5%**	**2015**	**2020**	**–**	**$ 245,000,000**	**$ 20,458,000**	**2017**
0.5% increase	3.0%	2015	2020	–	$ 245,000,000	$ 19,706,000	2017
5-yr CPI Average	3.2%	2015	2020	–	$ 245,000,000	$ 19,400,000	2017
1.0% increase	3.5%	2015	2020	–	$ 250,000,000	$ 22,409,000	2018
Enhanced Transit Plan							
Current Assumptions	**2.5%**	**2015**	**2020**	**2023**	**$ 210,000,000**	**$ 30,239,000**	**2021**
0.5% increase *	3.0%	2015	2020	–	–	$ 67,377,000	2014
5-yr CPI Avg *	3.2%	2015	2020	–	–	$ 67,377,000	2014
1.0% increase *	3.5%	2015	2020	–	–	$ 67,377,000	2014

NOTES:

** Scenario does not require debt service (borrowing).*

Conclusion

The intent of the sensitivity analysis is to identify the perimeters in which modifications to the Core Transit Plan or the Enhanced Transit Plan would be required without schedule slippage of more than one fiscal year. The analysis identifies situations and conditions that must exist to complete operation projects within an acceptable range.

As such, the Core Transit Plan presents a minimum set of assumptions that allows for the implementation of commuter rail service by 2020. This schedule matches that of Durham County and is favored by Triangle Transit and local transportation organizations and committees. If average contributions decrease annually by $500,000 or more, federal and/or state cost share assumptions decrease by 1 percent, or operating costs assumptions inflate by an average greater than 2.5 percent, the start of commuter rail service will require a minimum delay of one year. This analysis concludes that Triangle Transit, as the service district operator, will be required to review all assumptions regularly and be prepared to modify construction and implementation schedules if the tested scenarios occur.

The Enhanced Transit Plan allows more flexibility to address plan modifications without scheduling delays due primarily to higher federal participation in all capital projects. Prior to selecting the Enhanced Transit Plan, certain assumptions must be confirmed such as federal and state participation in new start rail projects. For capital project schedule slippage exceeding one year to occur in the Enhanced Transit Plan, the annual contribution to fund balance would need to decrease by an average amount of $2.5 million annually or federal participation in bus, commuter rail and light rail is decreased by 1 percent for each mode. The plan passed the tests related to operating assumption changes.