

# **NOACA Technical Memorandum**

## **Access to Transit**



July 2002



The Northeast Ohio Areawide Coordinating Agency (NOACA) is a public Organization serving the counties of and municipalities & townships within Cuyahoga, Geauga, Lake, Lorain and Medina (covering an area with 2.1 million people). NOACA is the agency designated or recognized to perform the following functions:

- **Serve as the Metropolitan Planning Organization (MPO), with responsibility for comprehensive cooperative and continuous planning for highways, public transit, and bikeways, as defined in the Transportation Equity Act for the 21st Century.**
- **Perform continuous water quality, transportation-related air quality and other environmental planning functions.**
- **Administer the area clearinghouse function, which includes providing local government with the opportunity to review a wide variety of local or state applications for federal funds.**
- **Conduct transportation and environmental planning and related demographic, economic and land use research.**
- **Serve as an information center for transportation and environmental and related planning.**
- **At NOACA Governing Board direction, provide transportation and environmental planning assistance to the 172 units of local, general purpose government.**

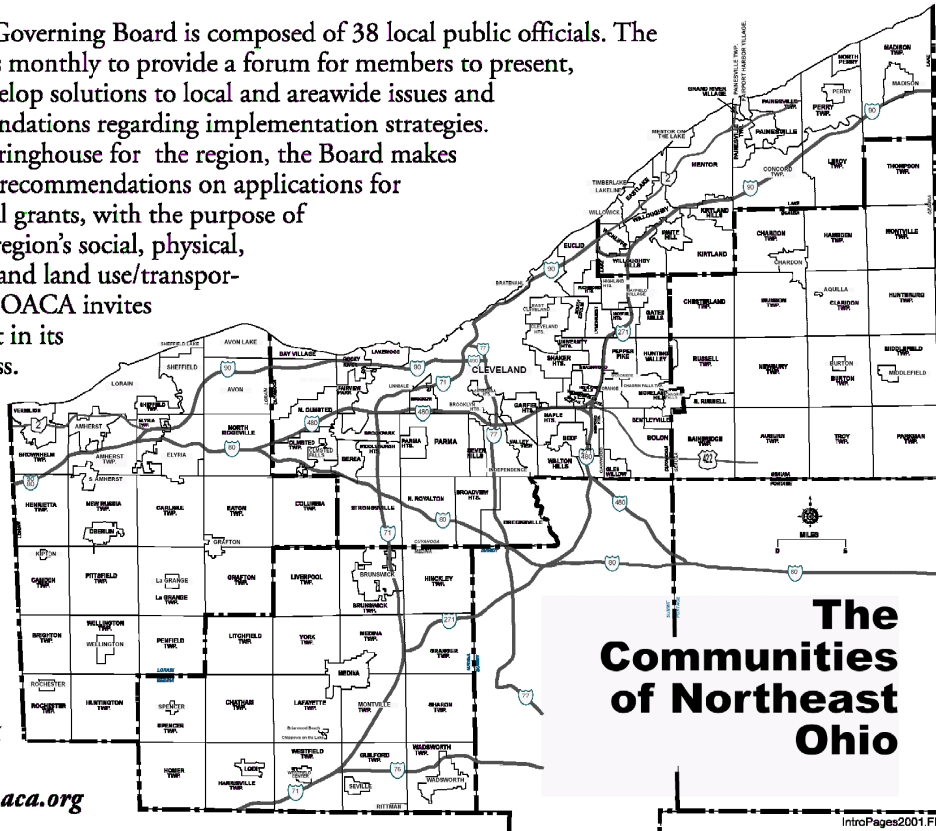
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# **ACCESS TO TRANSIT**

July 2002

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## **Abstract**

During FY 2002 many different tasks have been completed by NOACA staff, which deal with transit accessibility issues. This technical memo presents the transit accessibility products that were completed during the past year.

- For the *Framework for Action 2025 Update* transit travel time comparisons were made between a 1990 base year and our 2025 planning horizon year. This analysis showed that transit travel times improved between 1990 and 2025 in our region. This analysis was done for the Environmental Justice portion of the *Framework for Action 2025 Update*.
- From the 2000 travel demand model outputs, an analysis of total trip movements, total transit trip movements and a percentage share of transit trips to total trips was undertaken for GCRTA. This analysis was aggregated to work and non-work trips to/from different large geographic areas.
- From 2000 census data percent workers using transit was mapped. This map shows the percentage of workers by MCD (Minor Civil Division), which used transit in the NOACA region. Many MCD's had 0% transit work mode split. Both Cleveland and East Cleveland had transit mode splits over 10%, which were the highest in our area.

## **Introduction**

This memorandum documents transit accessibility issues that were analyzed by NOACA staff during FY 2002. These three work products in this memo were completed as part of other OWP products or as an outside request for information. This information gives us a better understanding of how transit is utilized by the citizens of the NOACA region.

Transit travel time information was analyzed from NOACA's 1990 and 2025 AM transit networks that are used in the travel demand modeling process. This information was used for environmental justice analysis included in the Framework for Action 2025 Update.

A request from GCRTA analyzed year 2000 transit trip usage outputs from NOACA's travel demand model. This information shows modeled transit trip movements to/from district level zone aggregations (ex Cleveland CBD, University Circle).

NOACA recently received Census information, which shows a percentage transit usage by workers for each MCD in our area. The information in this memorandum graphically displays this information. A brief comparison between 2000 transit census data and 2000-modeled transit data is included in this memorandum.

## **Modeled transit travel time**

This information was processed for the Environmental Justice analysis done at NOACA during FY2002. NOACA's computerized transit networks that are used in the travel demand modeling process were used in this exercise. The 1990 and 2025 AM transit networks along with various TRANPLAN programs were used that would generate travel times for each of these networks. The travel times are created between each origin and all possible destinations where a fixed route transit trip is possible. As part of this analysis no auto based transit trips were allowed. That is, no cars were allowed as the initial travel mode (ex driving to a park-and-ride). After the times are produced a table was created which shows movements between districts (a district can be defined an accumulation of traffic analysis zones in a similar geographic area for example the Cleveland CBD). This exercise was carried out to see if transit travel times were improving or deteriorating between 1990 and 2025, and what areas of the population are affected the most.

This comparison was carried out for the 1990 base and 2025 future transit networks. The district sets that were created were all zonal sets used in NOACA's environmental justice analysis. The sets are; Maximum EJ Area 20%, Minimum EJ area 40%, Urban Core Area, Older age Population Area, No Car Area and disabled population area<sup>1</sup>. The table on the next page shows the results of the transit travel time analysis.

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<sup>1</sup> For definitions on Environmental Justice district sets or areas, see NOACA's FINAL REPORT, IMPLEMENTING TITLE VI of the 1964 CIVIL RIGHTS ACT AND EXECUTIVE ORDER 12898 ON ENVIRONMENTAL JUSTICE IN THE NOACA REGION "Planning for All People in Northeast Ohio"

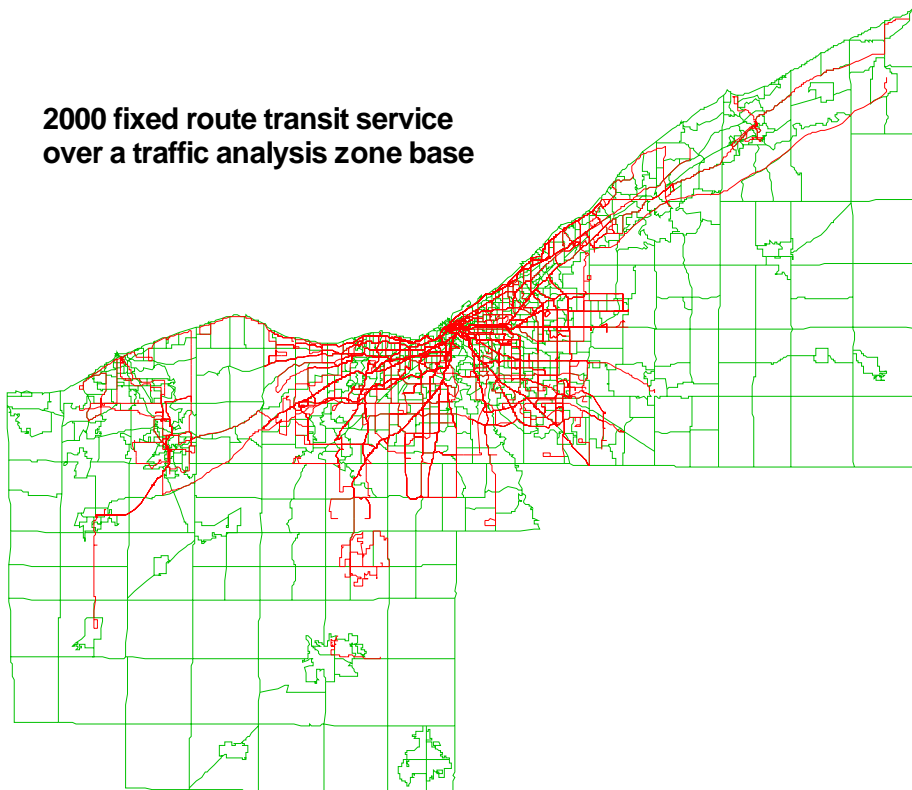
### Comparison of Transit Travel Times 1990 and 2025

	1990 Count of O/D connections	1990 Sum of Total Time	1990 Average Time	2025 Count of O/D connections	2025 Sum of Total Time	2025 Average Time	% Change from 1990
Total Time	400,627	27,658,866	<b>69.04</b>	417,526	28,526,352	<b>68.32</b>	<b>-1.04%</b>
Maximum EJ Area 20 %	224,363	14,550,620	<b>64.85</b>	231,753	14,680,952	<b>63.35</b>	<b>-2.31%</b>
Minimum EJ Area 40 %	155,206	9,745,613	<b>62.79</b>	159,474	9,757,514	<b>61.19</b>	<b>-2.55%</b>
Urban Core Area	354,764	23,658,559	<b>66.69</b>	367,556	24,127,209	<b>65.64</b>	<b>-1.57%</b>
Older Population Area >14.19%	185,351	13,336,387	<b>71.95</b>	193,550	13,879,513	<b>71.71</b>	<b>-0.33%</b>
No Car Area >13.12%	190,621	12,150,723	<b>63.74</b>	195,853	12,181,379	<b>62.20</b>	<b>-2.42%</b>
Disabled Area >5.68%	192,783	12,873,693	<b>66.78</b>	199,521	13,095,771	<b>65.64</b>	<b>-1.71%</b>

Travel times come from AM transit networks created for the NOACA travel demand model for 1990 and 2025.

The table above shows the results of the transit travel time analysis. The first column of data the 1990 count of O/D connections shows all possible origin/destination zonal connections for each district set. The NOACA region has 1003 traffic analysis zones. The maximum possible number of O/D connections is 1,006,009 (that is 1003 \*1003). Transit services without auto connections are not possible from every zone. In 1990 the possible transit connections without auto access is 400,627. The map below shows fixed route transit service over a NOACA traffic analysis zone map. There are many zones where no transit service is available.

**2000 fixed route transit service  
over a traffic analysis zone base**



In the column next to the total 1990 count of O/D connections is the 1990 sum of total time. This column shows the total Transit travel time between the 400,627 total possible O/D connections using transit. As mentioned before this travel time is added up with a series of TRANPLAN programs and the data is reported in minutes, which is 27,658,866 minutes. To get the average travel time the total number of minutes is divided by the possible O/D connections. In the example we have been using the 1990 average transit travel time was 69.04 minutes. This procedure was followed with the different Environmental Justice district sets mentioned above and average transit travel times were calculated for each. This whole procedure was done again for a 2025 transit network, and the results are displayed in the table on page three.

The results of this analysis show that the Environmental Justice district sets generally have better travel times to their possible connections when compared to the entire Am transit network. This can be seen in both the 1990 and 2025 scenarios. The 2025 travel times also show slight improvements over the 1990 travel times for the same district sets. The only exception is the older population district set which is slightly above the average. The elderly population is more evenly spread throughout the region.

**Year 2000 modeled mode split information**

A request was made for an analysis of transit trip movements from NOACA’s most recent 2000 modeling scenario. This analysis separated trip movements into district sets as was done for the Environmental Justice analysis. These trip movements were separated into work and non-work transit and non-transit trips.

From NOACA’s travel demand model specifically the mode split output a series of trip tables are created which show origin/destination of trips by purpose. These trips are also separated into peak and off-peak periods. The twelve trip tables created by the mode split program are:

<b>PEAK</b>	<b>OFF-PEAK</b>
Home Based Work Trips	Home Based Work Trips
School Trips	School Trips
Non-Home Based Work Trips	Non-Home Based Work Trips
University Trips	University Trips
Home Based Other Trips	Home Based Other Trips
Non-Home Based Other Trips	Non-Home Based Other Trips

Each of tables above has additional internal tables, which define trips as transit or non-transit trips.

- For this analysis the first step was to add up and separate all trip movements into work and Non-work purposes.
- The second step is to separate all transit only trips into work and non-work purposes.

- The third step splits this data into different district sets for analysis of mode split percentage (transit trips/ total trips)

The table below shows the total five county trip information split into work and non-work total trips and transit trips along with a mode split percentage. This table represents the first two steps mentioned above.

	Total Trips	% Total Trips	Transit Trips	% Transit Trips	% Transit Trips of Total Trips
Work	2,020,011	24.3%	107,298	62.7%	5.3%
Non-Work	6,301,172	75.7%	63,756	37.3%	1.0%
Total	8,321,183		171,054		2.1%

This table shows that of all year 2000-modeled trips made 2.1% were made by transit. 5.3% of all work trips were made by transit and only 1.0% of non-work trips are made by transit. The table also shows that 75% of the total trips made are not work trips, but of the transit trips made over 60% are work trips.

The third step of this process puts this data into different zonal district sets for analysis. The zonal district sets for this analysis are: the Cleveland CBD, University Circle, the eastside of Cleveland, the Westside of Cleveland, the Remainder of Cuyahoga County, Lorain County, Medina County, Geauga County and Lake County. With the data split into these districts you can look at trip movements or mode split percentages to and from each of the zonal district sets. The table below shows the percentage of work and non-work transit trips to and from each of zonal district sets.

**2000 MODE SPLIT (DISTRICT TO DISTRICT MOVEMENTS)  
BY TRIP PURPOSE (WORK & NON-WORK)**

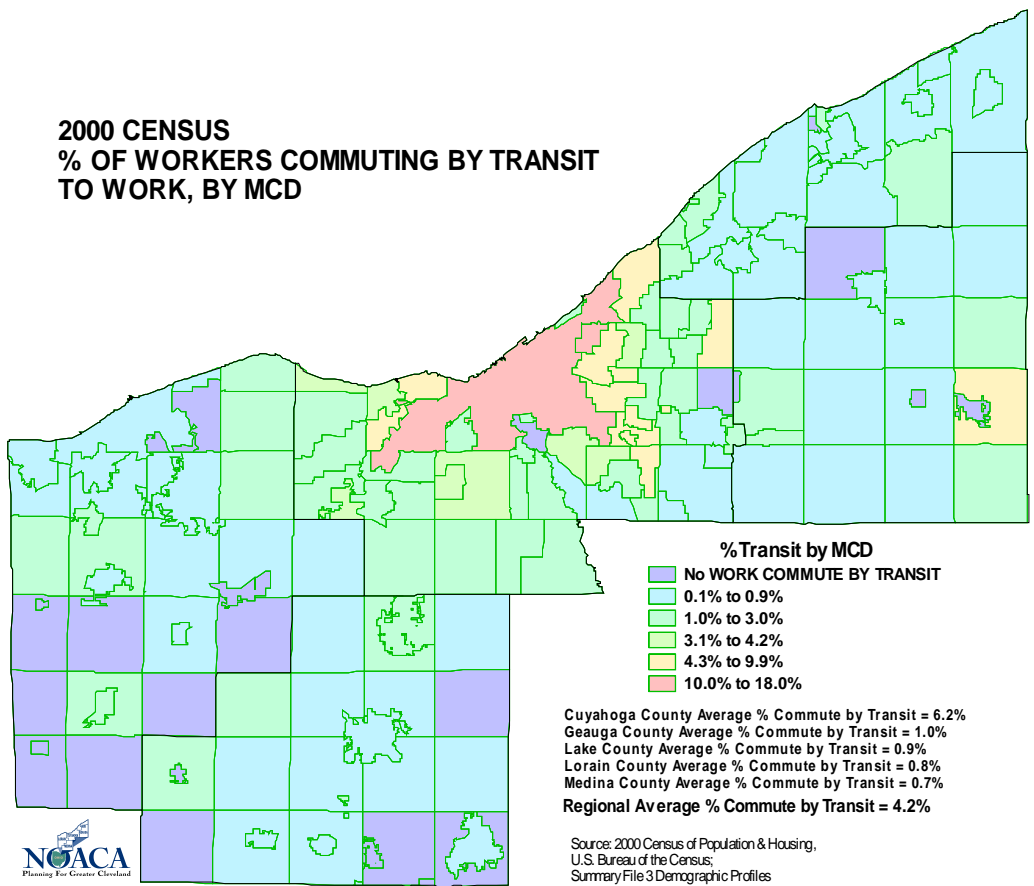
		Cleveland CBD		University Circle		Eastside Cleveland		Westside Cleveland		Remainder of Cuy Co.		Lorain County		Medina County		Gauga County		Lake County		TOTAL			
		work	non-work	work	non-work	work	non-work	work	non-work	work	non-work	work	non-work	work	non-work	work	non-work	work	non-work	work	non-work		
Cleveland CBD	work	1.0%	0.0%	11.1%	2.0%	0.3%	2.1%	7.3%	2.2%	0.4%	1.4%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	5.8%	
	non-work	14.0%	7.9%	2.7%	0.7%	0.0%	7.4%	3.4%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.6%	2.3%	
University Circle	work	24.4%	0.2%	14.4%	3.1%	9.7%	2.0%	11.0%	4.0%	0.3%	2.2%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%
	non-work	28.0%	0.3%	12.7%	0.0%	0.1%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%
Eastside Cleveland	work	10.0%	4.1%	0.0%	2.1%	0.0%	1.4%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	non-work	11.0%	0.2%	3.3%	1.0%	2.0%	0.4%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Westside Cleveland	work	7.1%	0.2%	2.4%	1.0%	2.1%	0.1%	1.5%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	non-work	9.0%	0.2%	2.0%	0.7%	2.7%	0.4%	1.7%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Remainder of Cuy Co.	work	0.1%	0.7%	1.6%	0.0%	1.4%	0.4%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	non-work	11.0%	0.2%	3.3%	1.0%	2.0%	0.4%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Lorain County	work	7.1%	0.2%	2.4%	1.0%	2.1%	0.1%	1.5%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	non-work	9.0%	0.2%	2.0%	0.7%	2.7%	0.4%	1.7%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Medina County	work	0.1%	0.7%	1.6%	0.0%	1.4%	0.4%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	non-work	11.0%	0.2%	3.3%	1.0%	2.0%	0.4%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gauga County	work	0.1%	0.7%	1.6%	0.0%	1.4%	0.4%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	non-work	11.0%	0.2%	3.3%	1.0%	2.0%	0.4%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Lake County	work	0.1%	0.7%	1.6%	0.0%	1.4%	0.4%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	non-work	11.0%	0.2%	3.3%	1.0%	2.0%	0.4%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>TOTAL</b>	<b>work</b>	<b>36.0%</b>	<b>0.7%</b>	<b>9.8%</b>	<b>0.0%</b>	<b>6.8%</b>	<b>0.3%</b>	<b>6.0%</b>	<b>0.2%</b>	<b>4.2%</b>	<b>0.2%</b>	<b>1.8%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>
	<b>non-work</b>	<b>3.0%</b>	<b>2.4%</b>	<b>7.2%</b>	<b>1.2%</b>	<b>8.8%</b>	<b>1.2%</b>	<b>8.8%</b>	<b>1.8%</b>	<b>0.5%</b>	<b>0.1%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>

TRIP TABLE INFORMATION DERIVED FROM THE TRIP MODELLED SCENARIO.

From the table above you can see where the largest transit trip movements are. Generally movements within Cuyahoga County have the largest mode split percentages, specifically trips to the Cleveland CBD.

**2000 census data – percent workers using transit**

2000 Census information, specifically from summary file 3 shows percentages of workers using transit. This data is portrayed at the MCD (Minor Civil Division) level. This data was mapped by NOACA and is displayed below. The areas with the largest number of workers using transit are generally within Cuyahoga County, where the most fixed route transit service is available and where large concentrations of transit dependent people are.



The information portrayed on the map is in part similar to the 2000 modeled work trip information looked at earlier in this memorandum. The table on page seven is a comparison between the 2000 census data displayed in the map and 2000 NOACA modeled work trip data. This comparison is done at the county level only.

**Comparison between 2000 census transit data  
and NOACA modeled data.**

(Data is shown as % of work transit use by county)

	2000 census % Workers using transit	2000 NOACA modeled Work transit trips
Cuyahoga	6.2%	7.2%
Geauga	1.0%	0.6%
Lake	0.9%	1.7%
Lorain	0.8%	2.1%
Medina	0.7%	0.7%
NOACA Region	4.2%	5.3%

Compared to year 2000 census data the NOACA travel demand model forecasts a 1% larger work mode split than reported by the census. Individual county comparisons can be seen in the table above.

This initial comparison will be revised when NOACA receives the 2000 CTPP data.