

Development Trends And Land Demand Analysis

MATS 2035

Macon Area Long Range Transportation Plan

Prepared by:

Macon-Bibb County Planning & Zoning Commission

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“The opinions, findings, and conclusions in this publication are those of the author(s) and not necessarily those of the Department of Transportation, State of Georgia, or the Federal Highway Administration.”

Development Trends and Land Demand Analysis

**Projected Growth and Land Development to the Year 2035 in the
MATS Planning Area: Macon-Bibb County/Jones County, Georgia**

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MATS Planning Area: Macon-Bibb County/Jones County, Georgia

Introduction

This report has been prepared in conjunction with the MATS Transportation Plan Update. The purpose of this analysis is to provide realistic forecasts of residential and nonresidential growth and change in the MATS Planning area. These forecasts are then used to estimate the amount of land that will be needed to accommodate new residential, commercial and industrial uses between now and the planning horizon of the Transportation Plan—2035.

This analysis provides an estimate of the net land that actually will be used by new development and the amount of land that will need to be identified for future development on the year 2035 Future Land Use Map. When the Future Land Use Map is prepared, consideration will be given at that time to land availability, attractions for and constraints to development, and the goals and objectives of the Transportation and Land Use Plans. Generally, it is important to identify more land for future land uses than the market will actually absorb in order to provide for the inefficiencies of the land development process and to provide for a variety of free-market choice.

This analysis estimates net land demand in two broad categories:

- Residential uses, including single-family houses, duplexes and multi-family units that will be needed to accommodate future household growth.
- Private sector nonresidential uses, such as retail stores, offices and industries that will be needed to accommodate future employment growth.

Importantly, these estimates and forecasts reflect past population and employment trends within the context of a national econometric model. In other words, the figures present a future view of Macon-Bibb County that assumes that things will continue into the future somewhat as they have in the recent past, buffeted by the local economy's share of national trends.

Forecast Area

This forecast of future growth and development has been prepared for all of Macon-Bibb County, but includes only the southern portion of Jones County. While the Macon-Bibb County Planning and Zoning Commission has jurisdiction over Macon-Bibb County for land use planning purposes, future land use planning issues for Jones County fall under the purview of the Jones County Board of Commissioners. For this reason, the forecasts and data are presented in

separate sections for Macon-Bibb County and the Jones County portion of the MATS Planning Area.

Woods & Poole Model

Much of the data used in this report are derived from forecasts made by Woods & Poole Economists, a nationally recognized firm based in Washington, D.C. Their future growth trends are viewed as basically sound, given the design of the Woods & Poole econometric model and a comparison of their estimates and forecasts for 1998-2005 to other data sources. Adjustments to their forecasts have been made where appropriate, however, and are noted in the text.

Appendix B presents a detailed discussion of the Woods & Poole model.

Section 1: Macon-Bibb County

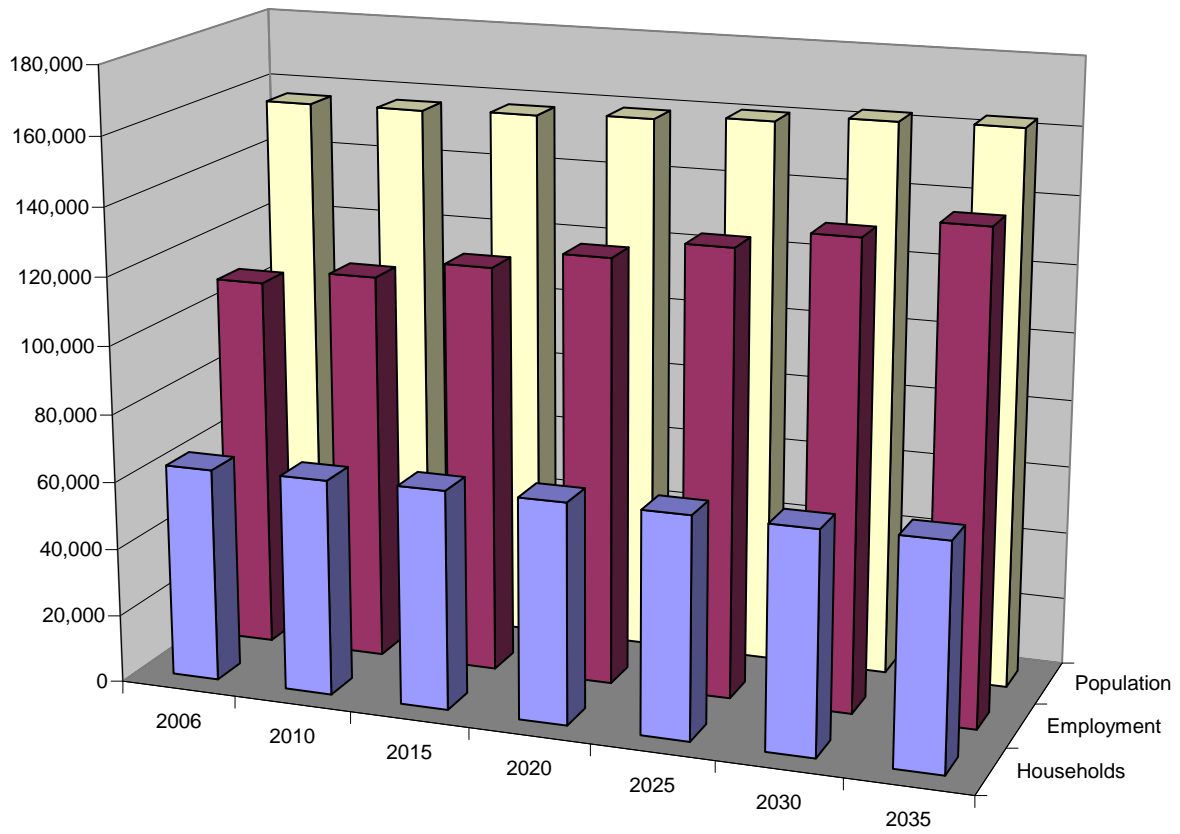
Summary

The pages that follow present a detailed analysis of population, household and employment trends over the recent past. Forecasts to the year 2035 are also presented and analyzed in order to arrive at a “most likely” scenario for Macon-Bibb County. These forecasts are summarized on the following two charts.

Macon’s position as a “central city” to its metropolitan area is clear from the forecasts for future employment, households and population. Job growth will outpace population growth, increasing from .674 of a job for every man, woman and child in the County in 2006 to .843 of a job per person by 2035.

The continued maturation of Macon’s role as a central city is underlined by continued employment growth among public and private sector jobs. Particular increases for nonresidential land development are forecast in the retail commercial category, which will create almost 2 times as much future demand for land development as for purely office, and almost 2 times as much for industrial development. By far, however, development of single-family subdivisions will dominate land absorption over the next twenty-five + years compared to all other land use categories if trends established during the 1990s continue.

Forecasts 2006-2035



**Table S-1
Population - Households - Employment
Macon-Bibb County**

	2006	2010	2015	2020	2025	2030	Change 2006-2035		
							2035 Number	Percent	
Households	63,181	63,821	64,571	65,041	65,263	65,291	66,080	2,899	4.6%
Employment	109,830	114,400	120,120	125,840	131,560	137,280	142,998	33,168	30.2%
Population	156,462	156,752	157,602	158,832	160,482	162,702	163,280	6,818	4.4%

Net Demand in Acres-2006-2035

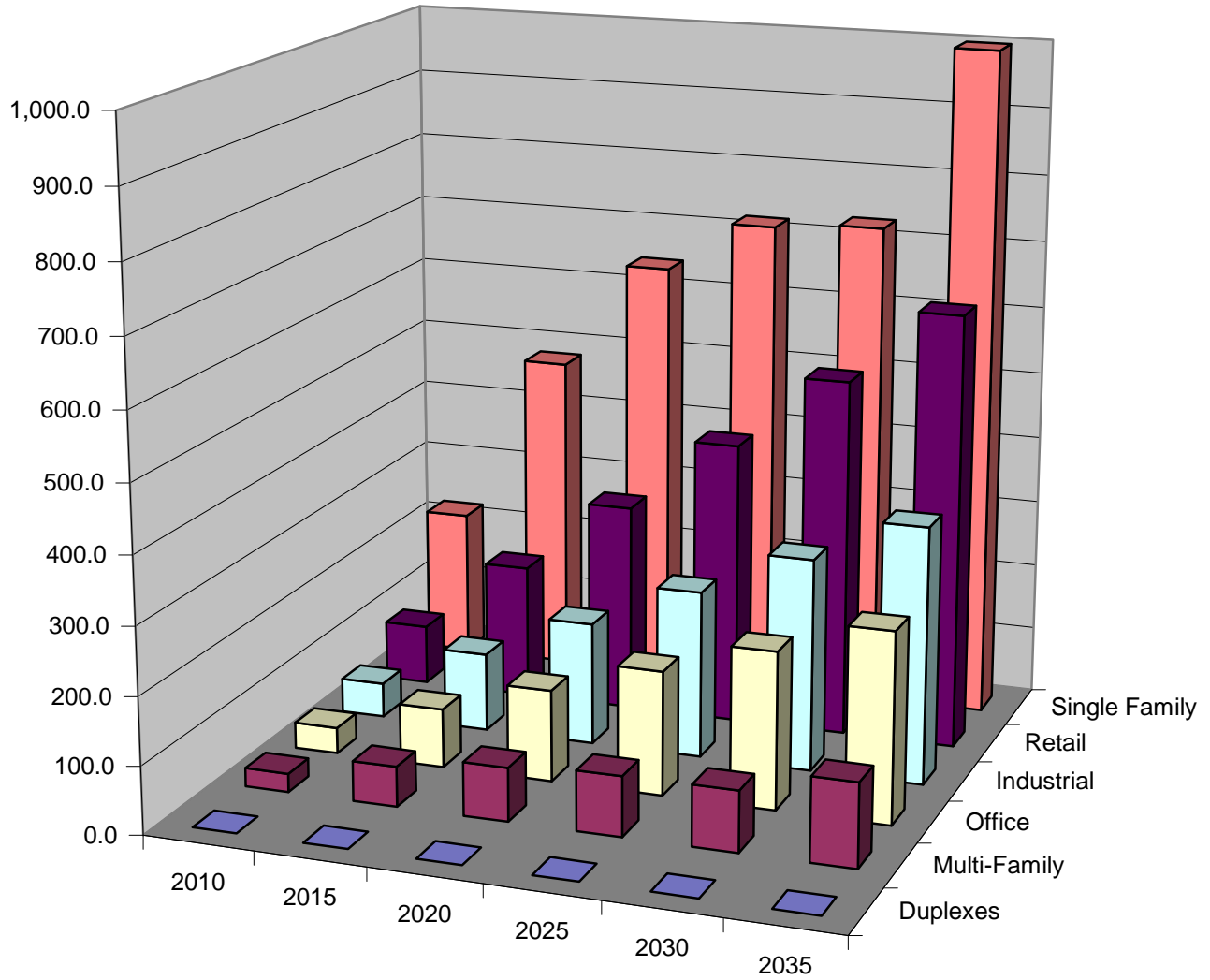


Table S-2
Net Demand in Acres-2006-2035
Macon-Bibb County

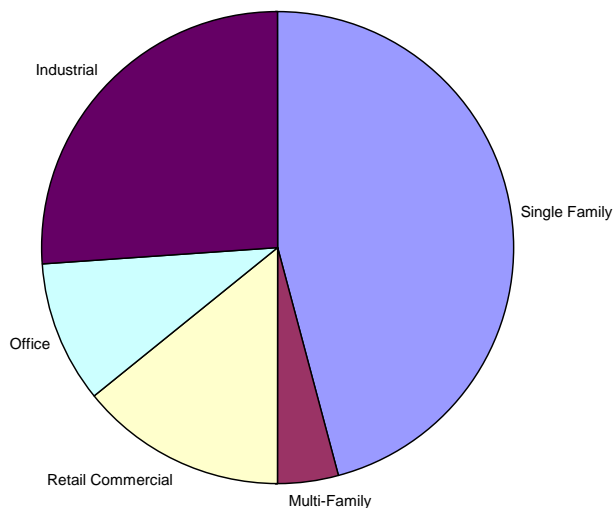
	2006 to 2010	2010 to 2015	2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035	Change 2006-2035	
							Number	Percent
Single Family	220.4	478.8	640.6	717.1	726.7	998.5	998.5	41.1%
Duplexes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Multi-Family	27.2	59.1	79.1	88.5	89.7	123.2	123.2	5.1%
Retail	89.2	200.6	312.0	423.2	534.3	645.7	645.7	26.6%
Office	38.8	87.2	135.7	184.1	232.6	281.0	281.0	11.5%
Industrial	51.7	116.7	182.6	248.8	315.6	380.5	380.5	15.6%
Total	427.3	942.4	1,349.9	1,661.7	1,898.9	2,428.9	2,428.9	100.0%

The net demand for land—that is, the actual amount of land that is expected to be occupied in the future by new buildings, driveways, yards, parking lots, etc.—must be expanded in order to allow market choice and to recognize that development projects do not use up all of their land area all at once. For instance, a single-family subdivision builds out slowly as houses are built on the individual lots. The “net” demand accounts only for the actual lots that have been built upon, while the total area of the subdivision has been “consumed” by development of the streets and the layout of the lots. Likewise, a shopping center may have the main building built but the spin sites that have been graded and included in the development are still vacant. Adding land area that will have been included in development projects but is actually vacant recognizes these “inefficiencies” in the land development process. Secondly, additional land is added to “net” demand to recognize the uncertainty as to exactly which properties will be developed within a particular area. Taken together, the land that should be designated on the Future Land Use Map to accommodate actual new growth is:

**Table S-3
Land Allocated for Future Growth to 2035
Macon-Bibb County**

	Acres	Square Miles
Single Family	4,992.5	7.80
Duplexes	0.0	0.00
Multi-Family	443.5	0.69
Retail Commercial	1,549.7	2.42
Office	1,053.8	1.65
Industrial	2,853.8	4.46
	10,893.2	17.02

Land Allocated for Future Growth to 2035



The following pages detail the methodologies used in forecasting residential growth and development, employment growth, non-residential development, and future land consumption throughout Bibb County.

Residential Growth—Macon-Bibb County

Methodology

Estimates of residential growth to the year 2035 are based on forecasts of the number of housing units, by structure type (single-family, duplex and multi-family). The housing unit forecasts themselves are based on forecasts of the number of future households, since households and occupied housing units are synonymous.

The tables below reflect the following general methodology:

- The number of housing units in Macon-Bibb County in 1990 and 2000 is obtained from the decennial Census data.
- The number of housing units built since the 2000 Census are added to the Census figure to estimate the number of units in 2006.
- Household growth is based on the forecasts for the county by Woods & Poole Economics added by each benchmark year (2006, 2010, 2015, 2020, 2025, and 2030) and projected to 2035, adjusted for actual housing counts in 2006.
- The number of new households added by each benchmark is allocated by structure type in the same proportions that were reflected in the new growth in housing units from 1990 to 2006.

It should be noted that persons living in group quarters (such as nursing homes, dormitories, fraternities and the jail) are considered separately in these forecasts since the residents represent population growth but no household growth, and therefore do not generate housing development.

Current Housing Supply

Tables H-1A and H-1B show the number of housing units, by structure type, reported in the 1990 and the 2000 Censuses for Bibb County. The data are summarized under the general categories of single-family, duplex, multi-family and "other." The Tables also show the number and the percentage of units that were vacant for each general category in the two Census years.

**Table H-1A
Housing Units - 1990
Macon-Bibb County**

Type of Structure	Total Units	Occupied	Total	
			Vacant	% Vacant
Single Family Detached	39,794	37,352	2,442	6.1%
Mobile Home	2,111	1,872	239	11.3%
Subtotal Single Family	41,905	39,224	2,681	6.4%
Two Family (Duplex)	5,105	4,278	827	16.2%
Single Family Attached	1,539	1,406	133	8.6%
3 to 4 Units	3,515	3,050	465	13.2%
5 to 9 Units	4,443	3,850	593	13.3%
10 to 19 Units	1,971	1,768	203	10.3%
20 to 49 Units	1,179	1,040	139	11.8%
50 or more Units	1,120	1,049	71	6.3%
Subtotal Multi-Family	13,767	12,163	1,604	11.7%
Other	685	642	43	6.3%
Total	61,462	56,307	5,155	8.4%

Source: U.S. Dept of Commerce, Bureau of Census, 1990 database STF1A

**Table H-1B
Housing Units - 2000
Macon-Bibb County**

Type of Structure	Total Units	Occupied	Total	
			Vacant	% Vacant
Single Family Detached	43,839	40,330	3,509	8.0%
Mobile Home	2,205	1,871	334	15.1%
Subtotal Single Family	46,026	42,201	3,825	8.3%
Two Family (Duplex)	4,574	3,527	1,047	22.9%
Single Family Attached	1,991	1,784	207	10.4%
3 to 4 Units	4,071	3,329	742	18.2%
5 to 9 Units	5,277	4,400	877	16.6%
10 to 19 Units	2,070	1,745	325	15.7%
20 to 49 Units	1,060	667	393	37.1%
50 or more Units	2,191	1,996	195	8.9%
Subtotal Multi-Family	16,660	13,921	2,739	16.4%
Other	18	18	0	0.0%
Total	67,278	59,667	7,611	11.3%

Source: U.S. Dept of Commerce, Bureau of Census, 2000 database SF3

Future Growth in Households

The increase in the number of housing units between 1990 and 2006 is shown on Table H-2, based on the number of units authorized by building permits. Of the total number of housing units added between 1990 and 2006, the percentage in single-family houses, duplexes and multi-family categories is also shown. This same proportional share by structure type is used in later calculations.

Table H-3 forecasts population and households to the year 2035. The forecasts are based on the forecasts prepared by Woods & Poole for the county to 2030, adjusted to reflect updated household and population estimates for 2006. The adjusted forecasts are projected to 2035 using “best fit” regression curve.*1 The population in group quarters is derived as the difference between the total population and those residing households.

Table H-2
Housing Units Growth - 1990-2006
Macon-Bibb County

	1990	2000	2000-2006	2006	1990-2006 Change	
					Number	Percent
Total Units						
Single Family*	42,590	46,044	2,696	48,740	6,150	14.44%
Duplexes	5,105	4,574	0	4,574	-531	-10.40%
Multi-Family	13,767	16,660	1,905	18,565	4,798	34.85%
Total**	61,462	67,278	4,601	71,879	10,417	16.95%

* Includes units classified as "other".

** New construction between 1990 and 2000 breaks down as follows:

Single Family	53.8%
Multi-Family	46.2%

*1 this regression compensates for the inaccuracies introduced by Woods & Poole’s rounding of average household sizes to two decimal places.

**Table H-3
POPULATION & HOUSEHOLDS FORECASTS - 2035
Bibb County**

	2006	2010	2015	2020	2025	2030	2035
Woods & Poole							
Total Population	155,360	155,650	156,500	157,730	159,380	161,600	
Number Households	61,050	61,690	62,440	62,910	63,132	63,160	
Persons per Households	2.44	2.42	2.40	2.39	2.40	2.41	
Population in Households	148,962	149,290	149,856	150,355	151,517	152,216	
Population in Group Quarters	6,398	6,360	6,644	7,375	7,863	9,384	
MATS Adjustment							
	Percent Difference						
Total Population	156,462	100.71%					
Number Households	63,181	103.49%					
Persons per Households	2.39	97.95%					
Population in Households	151,152						
Population in Group Quarters	5,310						
Adjusted Forecasts							
Total Population	156,462	156,752	157,602	158,832	160,482	162,702	
Number Households	63,181	63,821	64,571	65,041	65,263	65,291	
Persons per Households	2.39	2.37	2.35	2.34	2.35	2.36	
Population in Households	151,152	151,356	151,794	152,223	153,420	154,163	
Population in Group Quarters	5,310	5,396	5,808	6,609	7,062	8,539	
Revised Forecast (Regressions)							
Total Population	156,462	156,752	157,602	158,832	160,482	162,702	Increase 6,820
Number Households	63,181	63,821	64,571	65,041	65,263	65,291	2,899
Persons per Households	2.39	2.37	2.35	2.34	2.35	2.36	0
Population in Households	151,152	151,356	151,794	152,223	153,420	154,163	3,422
Population in Group Quarters	5,310	5,396	5,808	6,609	7,062	8,539	3,398
Occupancy Rates	87.90%	87.90%	87.90%	87.90%	87.90%	87.90%	87.90%
Total Dwelling Units	71,879	72,607	73,460	73,995	74,247	74,279	75,177

Table H-4 estimates the future number of households by structure type. The net number of new households added between each benchmark year is allocated to single-family houses, duplexes and multi-family buildings using the same proportions that were experienced between 1990 and 2006 (from Table H-2).

It is assumed that, on average, there is no more than a six-month lag between permit issuance and the completion of construction. Thus, units issued building permits through December of one year would be completed and available for occupancy prior to July 1 of the next year.

**Table H-4
Housing Units Growth - 2006-2035
Macon-Bibb County**

	2006	2010	2015	2020	2025	2030	2035	Increase 2006-2035
Total Households	63,181	63,821	64,571	65,041	65,263	65,291	66,080	
Net New Households								
Increase over Previous Increment		640	750	470	222	28	789	2,899
Growth Share by Type								
Single Family		53.81%	53.81%	53.81%	53.81%	53.81%	53.81%	
Duplex*		0%	0%	0%	0%	0%	0%	
Multi-Family		46.19%	46.19%	46.19%	46.19%	46.19%	46.19%	
Net New Households by Type								
Single Family		344	404	253	119	15	425	1,560
Duplex		0	0	0	0	0	0	0
Multi-Family		296	346	217	103	13	364	1,339

* No future duplex construction anticipated:
Growth allocated to Single Family and Multi-Family in same proportion
as 1990-2000.

Residential Development—Macon-Bibb County

Methodology

Once the number of new housing units is estimated, the amount of land that they will consume in development can be calculated using average density factors for each structure type. The methodology is:

- The number of new housing units that are anticipated to be built is based on the future increase in the number of households (i.e., occupied housing units) plus a factor for vacant units.
- An estimate is made of the average density at which future residential development will occur.
- The future number of housing units divided by the average density yields the number of acres that are anticipated to be consumed by actual construction.

Future Housing Demand

Table R-1 shows the estimated number of new housing units that are forecast to be constructed during each of the incremental periods between 2006 and 2035. The estimates are based on the forecasts of net new households (i.e., occupied housing units) from Table H-4, to which an estimate of vacant units is added reflecting 2000 vacancy rates.

**Table R-1
Housing Demand-2006-2035
Macon-Bibb County**

	2006 to 2010	2010 to 2015	2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035	Total
Net New Households							
Single Family	344	404	253	119	15	425	1,560
Duplex	0	0	0	0	0	0	0
Multi-Family	296	346	217	103	13	364	1,339
Net New Households	640	750	470	222	28	789	2,899
Vacancy Rates							
Single Family	8.1%	5.9%	5.9%	5.9%	5.9%	5.9%	
Duplex	22.9%	12.5%	12.5%	12.5%	12.5%	12.5%	
Multi-Family	16.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
Net New Housing Units							
Single Family	375	439	275	130	16	462	1,697
Duplex	0	0	0	0	0	0	0
Multi-Family	354	414	260	123	15	436	1,602
Net New Housing Units	728	854	535	253	32	898	3,299

Source: Vacancy rates from 2000 Census

Residential Development Densities

The total number of acres occupied by existing development has been calculated for the entire county, by land use category. Those acreages, divided into the current number of housing units, produces a countywide average density of housing units per acre. These figures have been rounded slightly for calculation of future development activity, as shown on Table R-2.

Table R-2
Average Residential Densities-2002
Macon-Bibb County

Land Use Category	Number of Acres	Total Housing Units	Housing Units per Acre
Total Single Family	27,788.28	46,868	1.69
		Single Family rounded to 1.70	
Total Duplex	795.92	4,574	5.75
		Duplex rounded to 6.00	
Total Multi-Family	1,290.71	16,660	12.91
		Multi-Family rounded to 13.00	

Source: 2002 land use acreages compiled by MBCP&Z Commission staff.

Residential Land Demand

Table R-3 shows the estimated number of acres that will be developed with actual construction to accommodate the number of new housing units that are forecast to be constructed during each of the five-year incremental periods to 2035. The net number of new units is shown for each benchmark year, as well as the cumulative total.

The demand in acres is estimated using the average density figures from Table R-2, expressed in housing units per acre, divided into the number of new units. These figures should be interpreted as being land on which housing units have been actually built. Land consumed by residential development will exceed the figures shown on Table R-3, reflecting vacant lots in subdivisions, future phases dedicated to development but not yet begun, and projects under construction but not yet completed. (This land consumption is discussed in a later section.)

**Table R-3
Residential Land Demand
Macon-Bibb County**

	2006 to 2010	2010 to 2015	2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035	Total
Net New Housing Units							
Single Family	375	439	275	130	16	462	1,697
Duplex	0	0	0	0	0	0	0
Multi-Family	354	414	260	123	15	436	1,602
Net New Housing Units by Increment							
Total Cumulative New Units	728	1,582	2,117	2,369	2,401	3,299	3,299
Average Units per Acre							
Single Family	1.7	1.7	1.7	1.7	1.7	1.7	
Duplex	6.0	6.0	6.0	6.0	6.0	6.0	
Multi-Family	13.0	13.0	13.0	13.0	13.0	13.0	
Demand in Acres							
Single Family	220.4	258.3	161.9	76.5	9.6	271.8	998.5
Duplex	0	0	0	0	0	0	0.0
Multi-Family	27.2	31.9	20.0	9.4	1.2	33.5	123.2
Net New Housing Acres by Increment							
Total Cumulative New Acres	247.6	290.2	181.9	85.9	10.8	305.3	1,121.7

Employment Growth—Macon-Bibb County

Methodology

An important distinction to bear in mind when considering future nonresidential development is the difference between “employed persons” and “employees.” The Census reports employment characteristics of the resident population, which has less relevance to the future growth of business and industry in Macon-Bibb County than the number of actual jobs. More people work in Macon-Bibb County than the number of residents who are employed, underlining the “central city” role that Macon-Bibb County plays in attracting workers from surrounding areas.

The Woods & Poole forecasts of employment are particularly useful in that the data reports jobs, not people. That is, if a person has two jobs—possibly a full-time job during the day and a part-time job nights or weekends—Woods & Poole reports two jobs, not one employed person. Since it is ultimately the number of jobs that generates floor space requirements for the number of employees, and thus future land development to accommodate that floor space, the Woods & Poole approach generates more realistic results. In addition, Woods & Poole includes in their forecasts self-employed people and sole proprietors, unlike statistics from a State Dept. of Labor or the U.S. Dept. of Commerce. This is an important consideration in estimating the true demand for space for future business growth.

The methodology proceeds along the following lines:

- Employment forecasts are obtained for each employment category.
- For each private sector employment category, the percentage of employees normally occupying retail, office or industrial space is determined.
- The percentages by land use category are applied to the employment data to estimate the number of employees in retail, office or industrial settings.

Employment Forecasts

Table E-1 shows the Woods & Poole figures for employment from 2006 to 2030 by benchmark (five-year) increments for Bibb County. The number of employees for each sector was then projected to 2035 using regressions against the Woods & Poole figures.

Table E-1
Employment Forecasts-2006-2035
Macon-Bibb County

	2006	2010	2015	2020	2025	2030	2035	Increase 2006-2035
Construction	4,495	4,553	4,629	4,708	4,789	4,871	4,946	451
Manufacturing	9,975	10,018	10,071	10,125	10,178	10,232	10,285	310
Wholesale Trade	3,730	3,688	3,637	3,589	3,543	3,498	3,447	(283)
Retail Trade	19,680	20,039	20,486	20,933	21,378	21,822	22,270	2,590
Transport., Communications & Utilities	6,648	6,833	7,066	7,300	7,535	7,772	8,004	1,356
Finance, Insurance & Real Estate	12,024	12,425	12,926	13,427	13,930	14,433	14,933	2,909
Services	40,887	44,193	48,324	52,451	56,576	60,699	64,830	23,943
Federal, State & Local Government	12,122	12,383	12,710	13,034	13,356	13,676	14,003	1,881
Total-Employees	109,561	114,132	119,849	125,567	131,285	137,003	142,718	33,157

Source: County-wide forecasts 2006-2030: Woods & Poole Economists, Inc.;
2035 estimates MATS staff.

Employment by Land Use Category

In order to estimate future demand for nonresidential development, future employment estimates must be translated from employment sector category to land use category. Table E-2 shows the percentage breakdown by land use category estimated for each of the employment sectors. The percentages are estimated from the detailed employment-by-NAICS-code data reported in *County Business Patterns: 2001*. As shown on Table A-1 in Appendix A, employment by detailed category is distributed to or among the three types of land use based on the most likely setting appropriate to the category. The number of employees by land use are then summed by general employment category and percentages calculated. These percentages are summarized on Table E-2. Government employment is allocated exclusively to “public” land use.

It should be noted that *County Business Patterns* data exclude almost all government employees, most small businesses and virtually all sole proprietors. However, the proportion of employees in each sector from *County Business Patterns* that would be expected to be located in the various land use categories is viewed as being equally valid for the larger number of workers when the “excluded” categories are added back in.

Table E-3 converts employment in Macon-Bibb County by employment sector to land use category. Employment by land use category is estimated by applying the percentages from Table E-2 to the employment data by sector on Table E-1. Because some economic sector increases, such as construction, result in limited increases in land uses, the total number of employees by land use category is less than total employment by economic sector.

The data from Table E-3 is shown in chart and tabular form on Tables E-4, *Employment by Sec-*

tor, and Table E-5, *Employment by Land Use Category*, for the 2006-2035 time period.

Table E-2
Percent Employment by Land Use
Macon-Bibb County

	Land Use Type			
	Retail	Office	Industrial	Public
Construction	0.0%	18.2%	18.2%	0.0%
Manufacturing	0.0%	0.0%	100.0%	0.0%
Wholesale Trade	0.0%	25.0%	75.0%	0.0%
Retail Trade	92.3%	0.0%	7.7%	0.0%
Transport., Communications & Utilities	9.2%	21.6%	69.3%	0.0%
Finance, Insurance & Real Estate	37.2%	62.8%	0.0%	0.0%
Services	17.8%	78.4%	3.7%	0.0%
Federal, State & Local Government	0.0%	0.0%	0.0%	100.0%

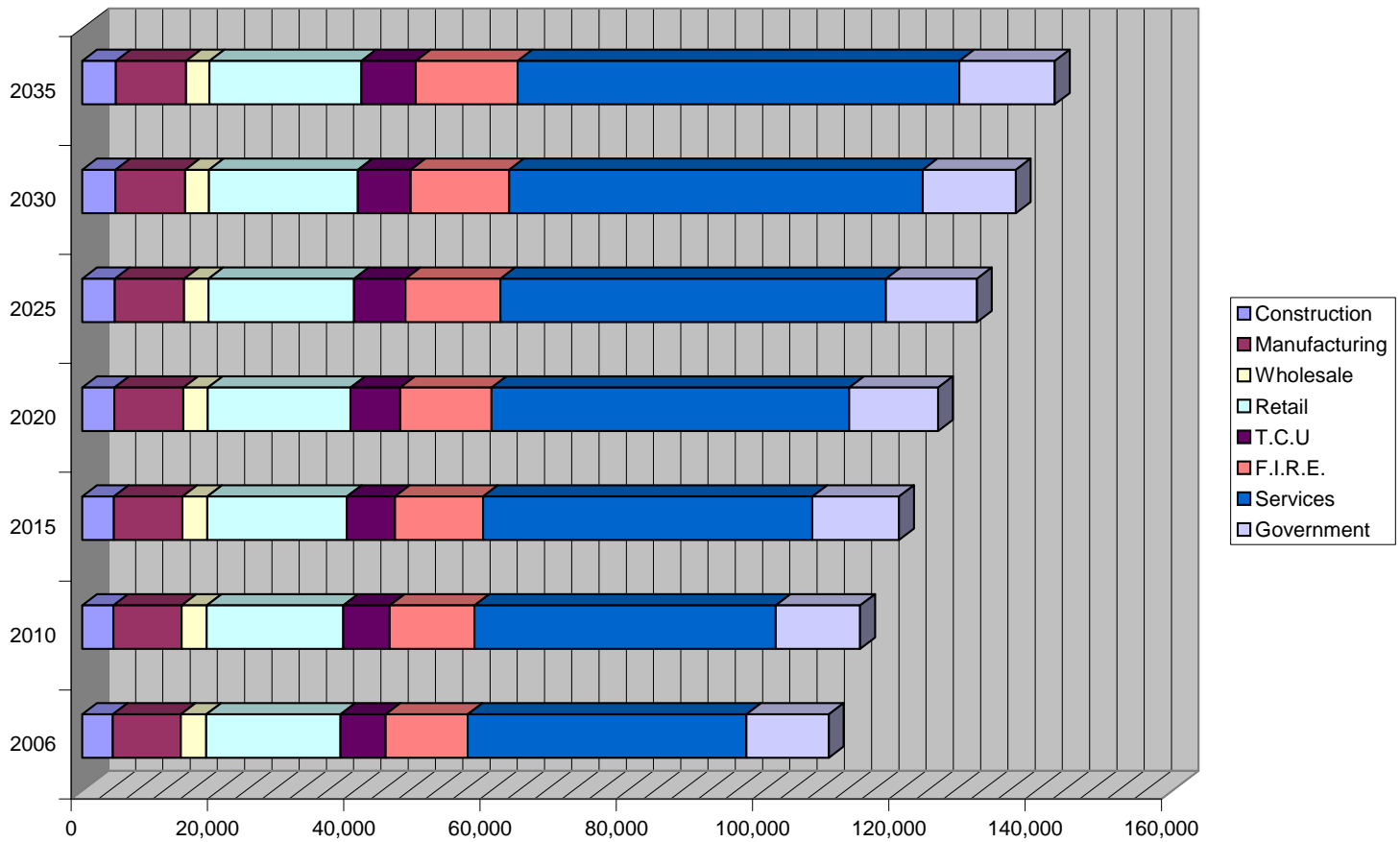
Source: Ross+associates evaluation of County Business Patterns: 2001 for Jones County, U.S. Dept of Commerce, Bureau of the Census.

Table E-3
Employment Forecasts by Land Use-2006-2035
Macon-Bibb County

Employment by Sector	2006	2010	2015	2020	2025	2030	2035	2006 to 2035
Construction	4,495	4,553	4,629	4,708	4,789	4,871	4,946	451
Manufacturing	9,975	10,018	10,071	10,125	10,178	10,232	10,285	310
Wholesale Trade	3,730	3,688	3,637	3,589	3,543	3,498	3,447	(283)
Retail Trade	19,680	20,039	20,486	20,933	21,378	21,822	22,270	2,590
Transport., Communications & Utilities	6,648	6,833	7,066	7,300	7,535	7,772	8,004	1,356
Finance, Insurance & Real Estate	12,024	12,425	12,926	13,427	13,930	14,433	14,933	2,909
Services	40,887	44,193	48,324	52,451	56,576	60,699	64,830	23,943
Federal, State & Local Government	12,122	12,383	12,710	13,034	13,356	13,676	14,003	1,881
Total Employment by Sector	109,561	114,132	119,849	125,567	131,285	137,003	142,718	33,157
Employment by Land Use Category								
Retail Commercial	30,527	31,613	32,969	34,324	35,678	37,030	38,386	7,859
Office	42,793	45,677	49,282	52,885	56,489	60,092	63,695	20,902
Industrial	21,226	21,526	21,903	22,285	22,668	23,054	23,431	2,205
Public	12,122	12,383	12,710	13,034	13,356	13,676	14,003	1,881
Total-by Land Use Category*	106,668	111,199	116,864	122,528	128,190	133,852	139,516	32,848

* Totals by land use category are less than totals by economic sector due to employment that does not permanently consume land such as construction workers

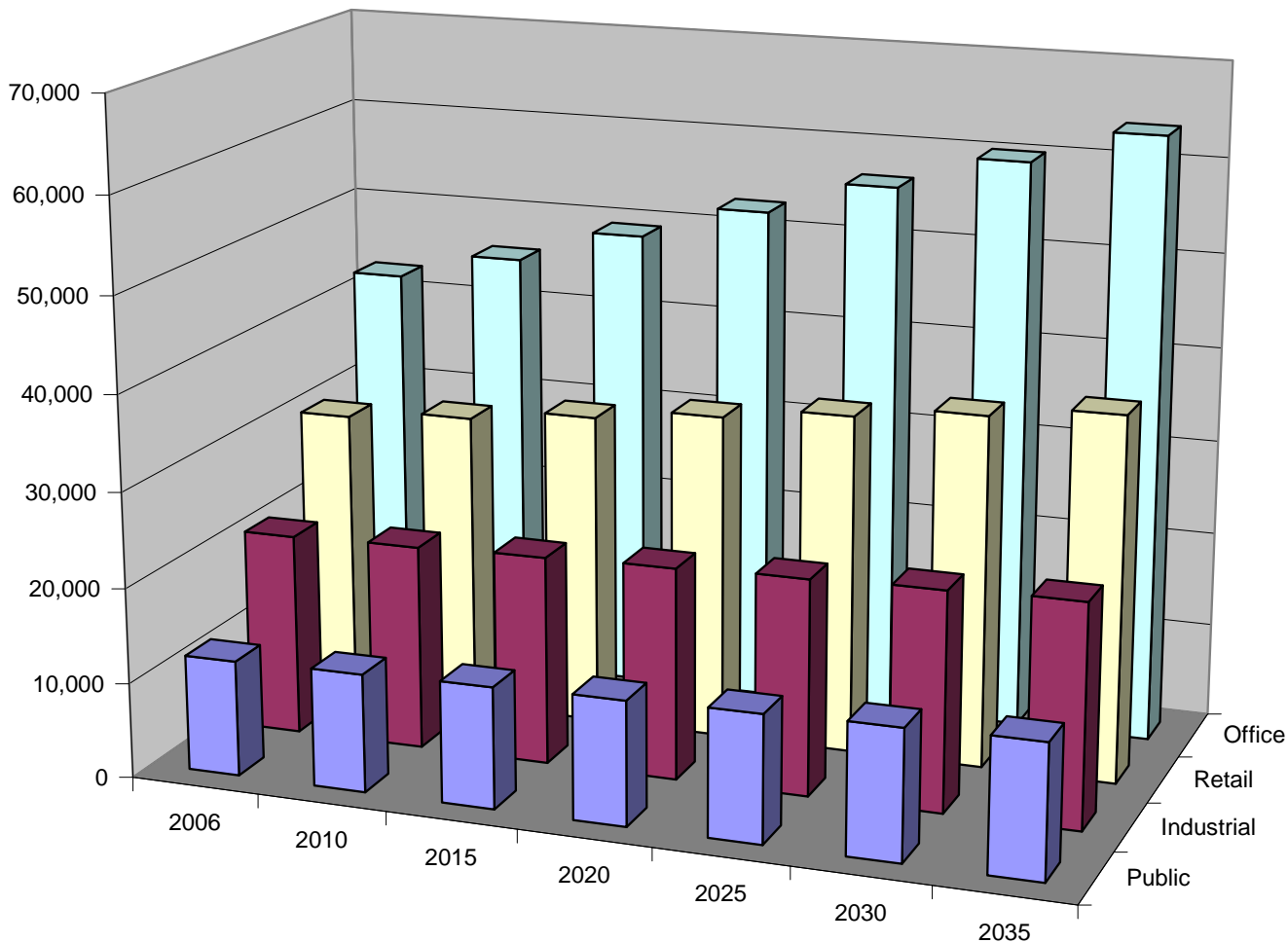
Employment by Sector-2006-2035



**Table E-4
Employment Forecasts by Land Use-2006-2035
Bibb County**

								% Increase
Employment by Sector	2006	2010	2015	2020	2025	2030	2035	2006-2035
Construction	4,495	4,553	4,629	4,708	4,789	4,871	4,946	10.0%
Manufacturing	9,975	10,018	10,071	10,125	10,178	10,232	10,285	3.1%
Wholesale Trade	3,730	3,688	3,637	3,589	3,543	3,498	3,447	-7.6%
Retail Trade	19,680	20,039	20,486	20,933	21,378	21,822	22,270	13.2%
Transport., Communications & Utilities	6,648	6,833	7,066	7,300	7,535	7,772	8,004	20.4%
Finance, Insurance & Real Estate	12,024	12,425	12,926	13,427	13,930	14,433	14,933	24.2%
Services	40,887	44,193	48,324	52,451	56,576	60,699	64,830	58.6%
Federal, State & Local Government	12,122	12,383	12,710	13,034	13,356	13,676	14,003	15.5%

Employment by Land Use Category-2006-2035



**Table E-5
Employment by Land Use Category-2006-2035
Macon-Bibb County**

	2006	2010	2015	2020	2025	2030	2035	% Increase 2006-2035
Public	12,122	12,383	12,710	13,034	13,356	13,676	14,003	15.5%
Industrial	21,226	21,526	21,903	22,285	22,668	23,054	23,431	10.4%
Retail	30,527	31,613	32,969	34,324	35,678	37,030	38,386	25.7%
Office	42,793	45,677	49,282	52,885	56,489	60,092	63,695	48.8%

Nonresidential Development—Macon-Bibb County

Methodology

Estimates are presented in the preceding section of the number of employees (i.e., jobs) that are expected in the future in retail, office and industrial settings in Macon-Bibb County. This section of the report provides estimates of the amount of building floor space and land acreage that will be needed to accommodate these future employees in each land use category. The methodology is:

- The total number of employees that will occupy retail, office or industrial space is estimated for each benchmark year.
- The number of employees is multiplied by an average floor area per employee factor, resulting in an estimate of the amount of floor area that will be needed to accommodate the future number of employees in each of the land use categories.
- The net new floor area added in each five-year increment is determined for each benchmark year.
- The amount of new development in acres is determined by dividing the net new square footage of floor area by an average floor area per acre factor, for each land use category.

New Growth Demand—Floor Area

Tables N-1, N-2 and N-3 show estimates of the total number of square feet of floor area that will be needed to accommodate employment in Macon-Bibb County at each future benchmark year. A separate table is presented for each of the three private sector land use categories—retail, office and industrial.

Each of the three tables shows the total number of employees by employment sector that is forecast for each benchmark year in the relevant land use category (retail, office or industrial). The figures are derived by multiplying the total number of employees by sector (on Table E-3) by the percentages of employment by land use category (on Table E-2) for each benchmark year.

The floor area needed to accommodate these employees is estimated by multiplying the number of employees by the average amount of floor area each employee will occupy. The “floor area per employee” factors used on the three tables are derived from national vehicle trip data, which is shown on Table A-3 of Appendix A. 2 The floor area per employee factors used on the following tables are generalized from the specific results shown on Table A-3, as appropriate to the nature of the land use type and the employment sector.

Table N-1
Retail Demand-2006-2035
Macon-Bibb County

Factor	2006	2010	2015	2020	2025	2030	2035
Retail Employment % of Total							
Construction	0	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0	0
Wholesale Trade	0	0	0	0	0	0	0
Retail Trade	18,165	18,496	18,909	19,321	19,732	20,142	20,555
T.C.U.	612	629	650	672	693	715	736
F.I.R.E.	4,473	4,622	4,808	4,995	5,182	5,369	5,555
Services	7,278	7,866	8,602	9,336	10,071	10,804	11,540
Total Retail Employment	30,527	31,613	32,969	34,324	35,678	37,030	38,386

Retail Floor Area	Floor Area per Employee *	2006	2010	2015	2020	2025	2030	2035
Construction	0	0	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0	0	0
Wholesale Trade	0	0	0	0	0	0	0	0
Retail Trade	600	10,898,784	11,097,598	11,345,147	11,592,695	11,839,136	12,085,024	12,333,126
T.C.U.	600	366,970	377,182	390,043	402,960	415,932	429,014	441,821
F.I.R.E.	300	1,341,878	1,386,630	1,442,542	1,498,453	1,554,588	1,610,723	1,666,523
Services	600	4,366,732	4,719,812	5,161,003	5,601,767	6,042,317	6,482,653	6,923,844
Total-Retail Floor Area		16,974,364	17,581,222	18,338,735	19,095,875	19,851,973	20,607,414	21,365,314

* Estimate of average gross floor area per employee based analysis of data from Trip Generation, 6th Edition, ITE

**Table N-2
Office Demand-2006-2035
Macon-Bibb County**

	Factor	2006	2010	2015	2020	2025	2030	2035
Office Employment	% of Total							
Construction	18.2%	818	829	842	857	872	887	900
Manufacturing	0.0%	0	0	0	0	0	0	0
Wholesale Trade	25.0%	933	922	909	897	886	875	862
Retail Trade	0.0%	0	0	0	0	0	0	0
T.C.U.	21.6%	1,436	1,476	1,526	1,577	1,628	1,679	1,729
F.I.R.E.	62.8%	7,551	7,803	8,118	8,432	8,748	9,064	9,378
Services	78.4%	32,055	34,647	37,886	41,122	44,356	47,588	50,827
Total Office Employment		42,793	45,677	49,282	52,885	56,489	60,092	63,695
Office Floor Area	Floor Area per Employee *							
Construction	300	245,427	248,594	252,743	257,057	261,479	265,957	270,052
Manufacturing	0	0	0	0	0	0	0	0
Wholesale Trade	330	307,725	304,260	300,053	296,093	292,298	288,585	284,378
Retail Trade	600	0	0	0	0	0	0	0
T.C.U.	300	430,790	442,778	457,877	473,040	488,268	503,626	518,659
F.I.R.E.	300	2,265,322	2,340,870	2,435,258	2,529,647	2,624,412	2,719,177	2,813,377
Services	240	7,693,298	8,315,355	9,092,644	9,869,180	10,645,340	11,421,124	12,198,413
Total-Office Floor Area		10,942,562	11,651,857	12,538,575	13,425,016	14,311,797	15,198,468	16,084,878

* Estimate of average gross floor area per employee based analysis of data from Trip Generation, 6th Edition, ITE

**Table N-3
Industrial Demand-2006-2035
Macon-Bibb County**

Factor	2006	2010	2015	2020	2025	2030	2035
Industrial Employment	21,226	21,526	21,903	22,285	22,668	23,054	23,431
% of Total							
Construction	818	829	842	857	872	887	900
Manufacturing	9,975	10,018	10,071	10,125	10,178	10,232	10,285
Wholesale Trade	2,798	2,766	2,728	2,692	2,657	2,624	2,585
Retail Trade	1,515	1,543	1,577	1,612	1,646	1,680	1,715
T.C.U.	4,607	4,735	4,897	5,059	5,222	5,386	5,547
F.I.R.E.	0	0	0	0	0	0	0
Services	1,513	1,635	1,788	1,941	2,093	2,246	2,399
Total Industrial Employment	21,226	21,526	21,903	22,285	22,668	23,054	23,431
Industrial Floor Area							
Construction	351,779	356,318	362,266	368,448	374,787	381,204	387,074
Manufacturing	5,386,500	5,409,720	5,438,340	5,467,500	5,496,120	5,525,280	5,553,900
Wholesale Trade	2,238,000	2,212,800	2,182,200	2,153,400	2,125,800	2,098,800	2,068,200
Retail Trade	1,212,288	1,234,402	1,261,938	1,289,473	1,316,885	1,344,235	1,371,832
T.C.U.	4,837,417	4,972,032	5,141,575	5,311,845	5,482,843	5,655,296	5,824,111
F.I.R.E.	0	0	0	0	0	0	0
Services	650,512	703,111	768,835	834,495	900,124	965,721	1,031,445
Total-Industrial Floor Area	14,676,496	14,888,383	15,155,153	15,425,161	15,696,559	15,970,537	16,236,562

* Estimate of average gross floor area per employee based analysis of data from Trip Generation, 6th Edition, ITE

Nonresidential Development Densities

The total number of acres occupied by existing development has been calculated for the entire county, by land use category. Those acreages divided into the current number of employees, produces a countywide average density of employees per acre. By multiplying the average number of employees per acre by the number of square feet of floor area each employee occupies, the total floor area per acre in square feet is estimated. The square feet per employee figure is derived from the average for all employees for each land use category (Tables N-1, N-2, and N-3) weighted by economic sector. These figures have been rounded slightly for calculation of future development activity, as shown on Table N-4.

**Table N-4
Average Non-Residential Densities-2002
Macon-Bibb County**

Land Use Category	Number of Acres*	Total Employment	Employees per Acre	Square Feet per Employee**	Square Feet per Acre
Total Retail	2,663.2	31,307	11.8	577	6,785.5
Retail rounded to					6,800
Total Office	589.7	42,198	71.6	256	18,318.9
Office rounded to					18,300
Total Industrial	4,380.5	24,094	5.5	737	4,053.8
Industrial rounded to					4,100

* 2002 land use acreages compiled by MBCP&Z staff.

** Square feet of floor area per employee figures reflect weighted averages for each land use category from Tables N-1, N-2, and N-3 respectively in the Development Trends of the 2030 LRTP.

Nonresidential Growth Demand—Land Area

Table N-5 converts the forecasted number of square feet of floor area by land use into land demand for new nonresidential development in acres, using the average densities shown on Table N-4. The total floor area for each of the land use categories by benchmark year are shown at the top of the Table, taken from Tables N-1, N-2 and N-3. The net increase for each five-year increment is then calculated from the totals. The total for the increment and the cumulative total since 2006 are both shown. By dividing the increase in floor area for each increment by the average density figures for each land use type, the net number of acres that the floor area will occupy can be determined.

It should be understood that the demand shown on Table N-5 reflects land on which businesses and industries have been actually built. Land consumed by nonresidential development will exceed the figures shown on Table N-5, reflecting vacant lots in office and industrial parks, future phases dedicated to development but not yet begun, and projects under construction but not yet completed.

**Table N-5
Land Area Demand-Private Non-Residential Uses
Macon_Bibb County**

	2006	2010	2015	2020	2025	2030	2035	Total to 2035
Total Floor Area for Each Land Use Category								
Retail Commercial	16,974,364	17,581,222	18,338,735	19,095,875	19,851,973	20,607,414	21,365,314	325,711
Office	10,942,562	11,651,857	12,538,575	13,425,016	14,311,797	15,198,468	16,084,878	190,988
Industrial	14,676,496	14,888,383	15,155,153	15,425,161	15,696,559	15,970,537	16,236,562	152,788
Total Non-Residential Floor Area	42,593,422	44,121,463	46,032,463	47,946,053	49,860,329	51,776,419	53,686,754	669,487
New Floor Area Added Each Increment								
Retail Commercial	606,859	757,141	757,513	757,141	756,098	755,441	757,900	-21,039,602
Office	709,295	886,718	886,718	886,441	886,781	886,671	886,410	-15,893,890
Industrial	211,887	266,770	266,770	270,008	271,398	273,978	266,025	-16,083,774
Total Added Each Increment	1,528,041	1,911,000	1,911,000	1,913,590	1,914,276	1,916,090	1,910,335	11,093,332
Cumulative New Floor Area	1,528,041	3,439,041	5,352,631	7,266,908	9,182,997	11,093,332		
Acres of Land								
Retail Commercial	6,800	89.2	111.4	111.3	111.2	111.1	111.5	645.7
Office	18,300	38.8	48.5	48.4	48.5	48.5	48.4	281.0
Industrial	4,100	51.7	65.1	65.9	66.2	66.8	64.9	380.5
Total Added Each Increment	179.7	224.9	224.9	225.6	225.8	226.4	224.8	1,307.2
Cumulative Developed Acres	179.7	404.6	630.2	856.1	1,082.5	1,307.2		

Sq. Ft. per Acre

Land Consumption—Macon-Bibb County

Previous sections of this report have estimated the net acres that will be needed to accommodate actual growth to the year 2035. These land areas are, specifically, the land upon which actual buildings will be placed (along with such accessory areas as parking lots, normal yards and, where appropriate, loading areas). For the purposes of developing a land use plan, these acreages need to be expanded to account for inefficiencies in the land development process, and for the “uncertainty” as to precisely which lands will be developed.

Table D-1 summarizes projected land demand for Macon-Bibb County to accommodate future development to 2035, and all the attendant land uses that that development implies.

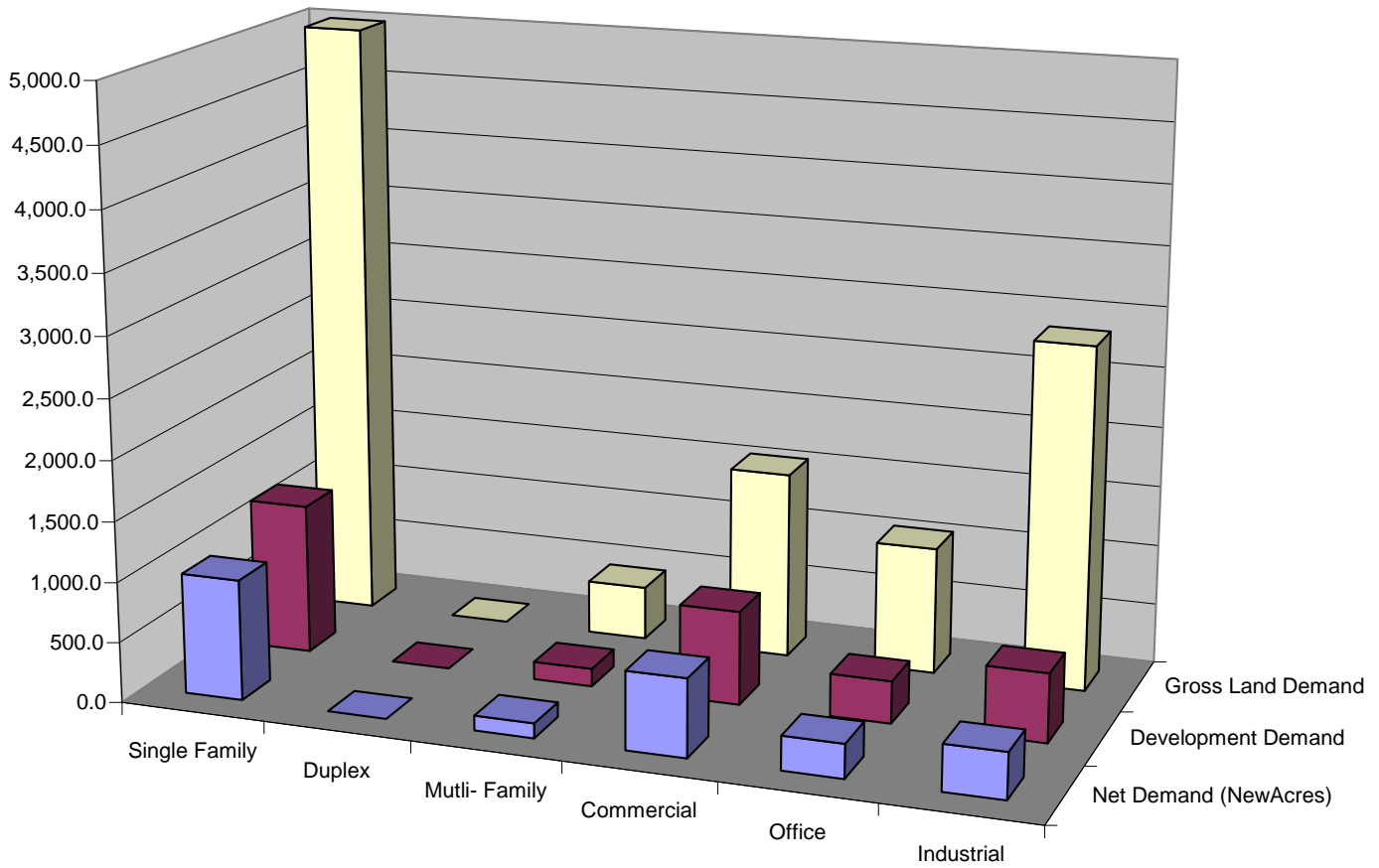
The net new demand from the various land use categories is shown on Table D-1, as estimated for the year 2035 in previous sections of this report. The “efficiency multiplier” recognizes that, during the land development process, some lands are vacant but irrevocably dedicated to development in that particular land use category. For instance, a single-family subdivision will contain vacant lots throughout development until the subdivision is 100% built out. A shopping center may contain spin sites and an industrial park may contain pad sites, all graded and ready for development, but vacant nonetheless. The “efficiency multiplier” accounts for these lands that have been included within a land development project, but have not yet been used to satisfy actual market (“net”) demand. The efficiency multiplier also recognizes that some land use developments, such as industrial parks, are generally built with comparatively more vacant sites (and build out more slowly) than other developments, such as an apartment complex.

The “market choice” multiplier differs notably from the efficiency multiplier. The “market choice” multiplier relates directly to the uncertainty of a particular property to develop, compared to other similar properties. For instance, a particular area may contain 1,000 acres, but only 400 are expected to develop within the planning horizon. The problem is that: 1) which 400 acres is not clear, and 2) all 1,000 acres may be appropriate for development for the particular land use. Thus, more acres normally will be shown on the land use plan for each land use category than are actually expected to be developed in order to allow the market to choose the appropriate sites within the appropriate areas identified for the use. Simply stated, an intersection may be appropriate for one future gas station, but which specific corner will be occupied by the new station may be uncertain, so the land use plan may designate all of the corners that are appropriate. The market choice multiplier also varies according to land use type, reflecting the level of “certainty” that one may have about the variety of appropriate locations for each use and the level of “compactness” of urban form desired.

The “gross land demand” acreages shown on Table D-1, then, represent the total number of acres that should be designated on the land use plan map to accommodate future development while allowing the market to operate freely within the designated areas.

The following chart illustrates the gross amount of land allocated to future development. Clearly, single-family residential dominates the future development scene in terms of acres of land use designated on the future land use map.

Gross Land Demand in New Acres-2035



**Table D-1
Gross Future Demand in Acres-2035
Macon-Bibb County**

	Single Family	Duplex	Mutli-Family	Commercial	Office	Industrial	Total
Net Demand (NewAcres)	998.5	0.0	123.2	645.7	281.0	380.5	2,428.9
Efficiency Multiplier	25%	10%	20%	20%	25%	50%	
Development Demand	1,248.1	0.0	147.8	774.8	351.3	570.8	3,092.8
Market Choice Multiplier	4.0	3.0	3.0	2.0	3.0	5.0	
Gross Land Demand	4,992.5	0.0	443.5	1,549.7	1,053.8	2,853.8	10,893.2

Section 2: Jones County

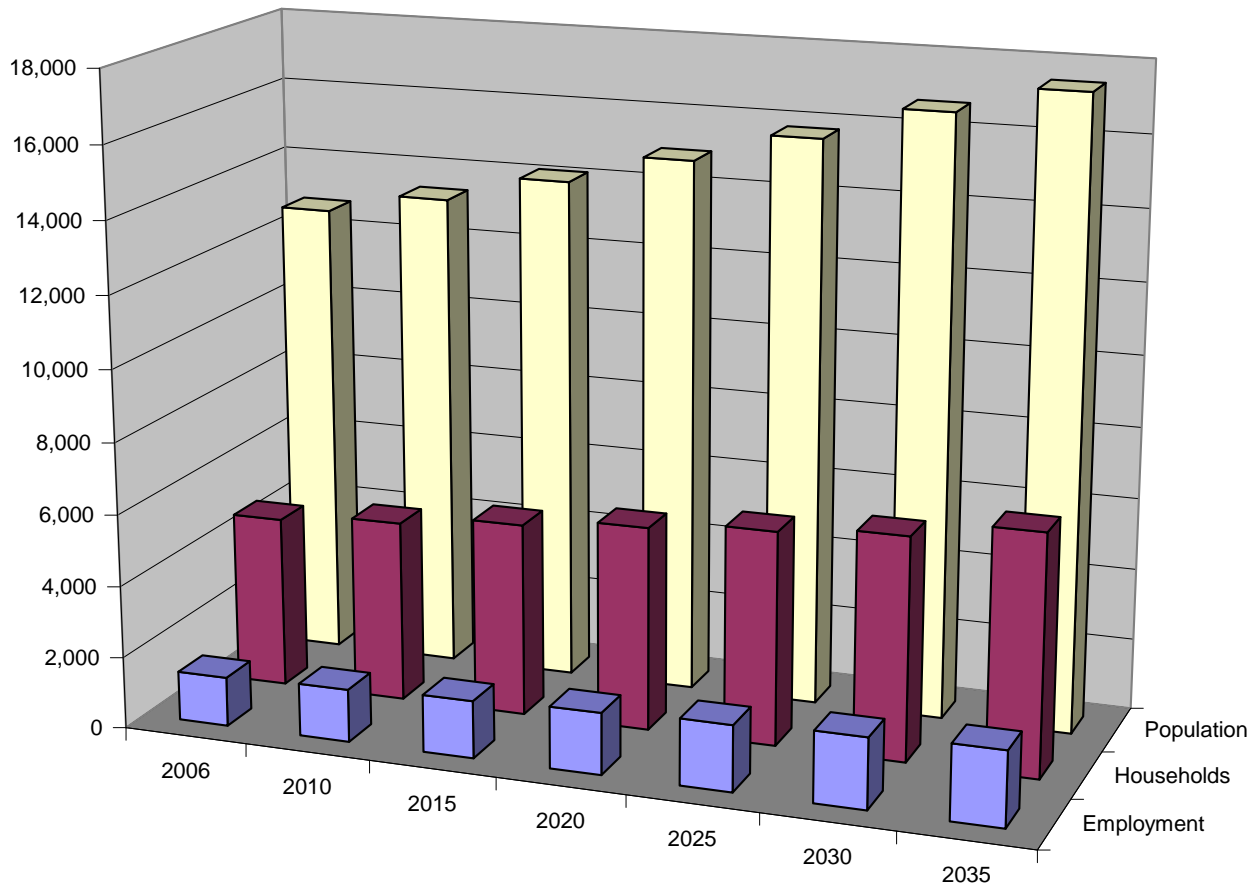
Summary

This Section presents a detailed analysis of population, household and employment trends over the recent past in the Jones County portion of the MATS Planning Area. Forecasts to the year 2035 are also presented and analyzed in order to arrive at a “most likely” scenario for the MATS portion of Jones County. These forecasts are summarized on the following two charts.

The role Jones County plays as a suburbanizing area within Metro Macon is illustrated by the population and employment forecasts, and the acres of land demand forecast for the future. While population growth is forecast to remain strong, employment is forecast to grow somewhat faster (at least on a percentage basis), particularly in the retail commercial and office categories.

With regard to future land development, particular increases for nonresidential land development are forecast in the retail commercial category, which will create more than twice as much future demand for land development as for purely office, and almost four times as much for industrial development. By far, however, development of single-family subdivisions will dominate land absorption over the next twenty-five + years compared to all other land use categories if trends established during the 1990s continue.

Forecasts-2006-2035



**Table JS-1
Population - Households - Employment
Jones County (Part)**

	2006	2010	2015	2020	2025	2030	2035	Change 2006-2035	
								Number	Percent
Employment	1,369	1,469	1,594	1,719	1,843	1,968	2,088	719	52.5%
Households	4,789	5,057	5,386	5,687	5,969	6,228	6,714	1,925	40.2%
Population	12,796	13,364	14,119	14,948	15,781	16,717	17,470	4,675	36.5%

Net Demand in Acres-2006-2035

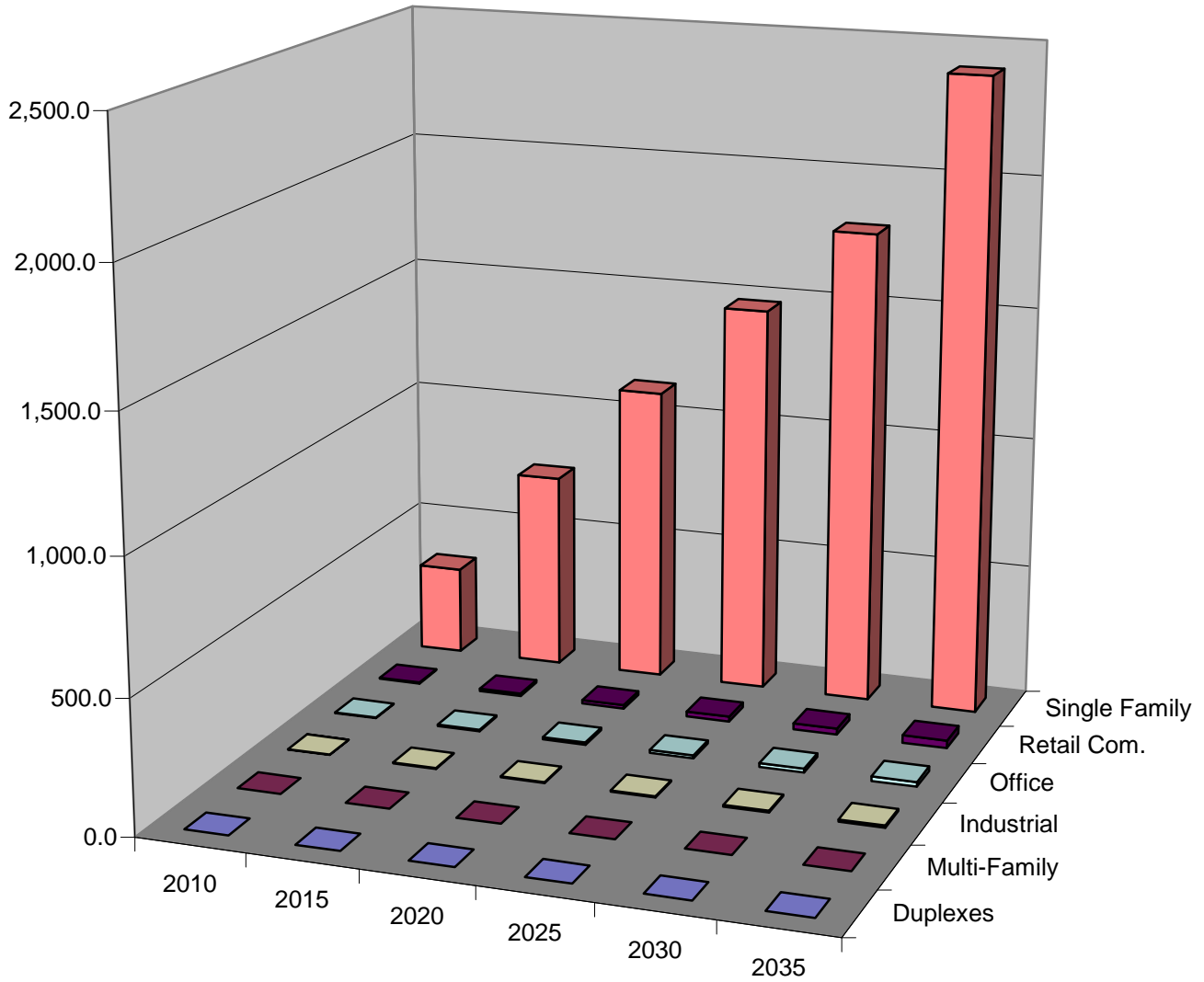
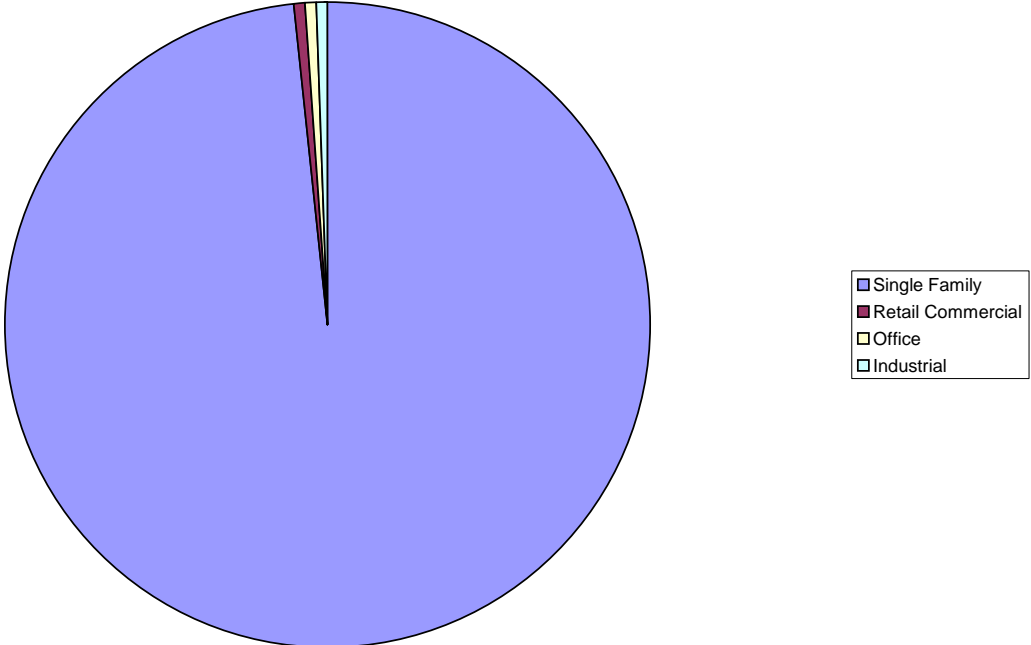


Table JS-2
Net Demand in Acres-2006-2035
Jones County (Part)

	2006 to 2010	2010 to 2015	2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035	Change 2006 to 2035	
							Number	Percent
Single Family	334.9	411.3	376.1	352.6	323.2	608.8	2,406.9	97.8%
Duplexes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Multi-Family	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Retail Com.	4.0	5.0	5.0	5.0	5.0	5.0	29.0	1.2%
Office	2.4	3.0	3.0	3.0	3.0	3.0	17.5	0.7%
Industrial	1.1	1.3	1.4	1.3	1.4	1.4	7.8	0.3%
Total	342.4	420.7	385.4	361.9	332.6	618.1	2,461.1	100.0%

The net demand for land—that is, the actual amount of land that is expected to be occupied in the future by new buildings, driveways, yards, parking lots, etc.—must be expanded in order to allow market choice and to recognize that development projects do not use up all of their land area all at once. For instance, a single-family subdivision builds out slowly as houses are built on the individual lots. The “net” demand accounts only for the actual lots that have been built upon, while the total area of the subdivision has been “consumed” by development of the streets and the layout of the lots. Likewise, a shopping center may have the main building built but the spin sites that have been graded and included in the development are still vacant. Adding land area that will have been included in development projects but is actually vacant recognizes these “inefficiencies” in the land development process. Secondly, additional land is added to “net” demand to recognize the uncertainty as to exactly which properties will be developed within a particular area. Taken together, the land that should be designated on the Future Land Use Map to accommodate actual new growth is:

Land Allocated for Future Growth to 2035



**Table JS-3
Land Allocated for Future Growth to 2035
Jones County (Part)**

	Acres	Square Miles
Single Family	12,034.3	18.80
Retail Commercial	69.5	0.11
Office	65.6	0.10
Industrial	58.4	0.09
	12,227.8	19.11

Residential Growth—Southern Jones County

Methodology

Estimates of residential growth to the year 2035 are based on forecasts of the number of housing units, by structure type (single-family, duplex and multi-family). The housing unit forecasts themselves are based on forecasts of the number of future households, since households and occupied housing units are synonymous.

The tables below reflect the following general methodology:

- The number of housing units in Jones County in MATS in 1990 and 2000 is obtained from the decennial Census data.
- The number of housing units built since the 2000 Census are added to the Census figure to estimate the number of units in 2006.
- Household growth is based on the forecasts for the county by Woods & Poole Economics added by each benchmark year (2006, 2010, 2015, 2020, 2025, and 2030) and projected to 2035, adjusted for actual housing counts in 2006.
- The number of new households added by each benchmark is allocated by structure type in the same proportions that were reflected in the new growth in housing units from 1990 to 2006.

It should be noted that persons living in group quarters (such as nursing homes, dormitories, fraternities and the jail) are considered separately in these forecasts since the residents represent population growth but no household growth, and therefore do not generate housing development.

Current Housing Supply

Tables JH-1A and JH-1B show the number of housing units, by structure type, reported in the 1990 and 2000 Censuses for the MATS portion of Jones County. The data are summarized under the general categories of single-family, duplexes, multi-family, and “other.” The Tables JH-1A and JH-1B also show the number and percentage of units that were vacant for each general category, both “total” vacant and those units that were vacant for each general category in the two Census years.

**Table JH-1A
Housing Units - 1990
Jones County (Part)**

Type of Structure	Total Units	Occupied	Total Vacant	% Vacant
Single Family Detached	2,345	2,253	92	3.9%
Mobile Home	1,115	1,044	71	6.4%
Subtotal Single Family	3,460	3,297	163	4.7%
Two Family (Duplex)	53	42	11	20.8%
Single Family Attached	38	35	3	7.9%
3 to 4 Units	7	7	0	0.0%
5 to 9 Units	2	2	0	0.0%
10 to 19 Units	3	3	0	0.0%
20 to 49 Units	0	0	0	
50 or more Units	0	0	0	
Subtotal Multi-Family	50	47	3	6.0%
Other	27	20	7	25.9%
Total	3,590	3,406	184	5.1%

Source: U.S. Dept of Commerce, Bureau of Census, 1990 database STF1A for Census Tracts 3001.01 and 301.02

**Table JH-1B
Housing Units - 2000
Jones County (Part)**

Type of Structure	Total Units	Occupied	Total Vacant	% Vacant
Single Family Detached	2,888	2,753	135	4.7%
Mobile Home	1,315	1,204	111	8.4%
Subtotal Single Family	4,203	3,957	246	5.9%
Two Family (Duplex)	72	63	9	12.5%
Single Family Attached	57	57	0	0.0%
3 to 4 Units	0	0	0	
5 to 9 Units	0	0	0	
10 to 19 Units	0	0	0	
20 to 49 Units	0	0	0	
50 or more Units	0	0	0	
Subtotal Multi-Family	57	57	0	0.0%
Other	0	0	0	
Total	4,332	4,077	255	5.9%

Source: U.S. Dept of Commerce, Bureau of Census, 1990 database STF1A for Census Tracts 3001.01 and 301.02

Future Growth in Households

The increase in the number of housing units between 1990 and 2006 in the Jones County portion of the MATS Planning Area is shown on Table JH-2. Of the total number of housing units added between 1990 and 2006, the vast majority in single-family houses. This continued growth in single-family types of dwellings is expected to continue with no further duplex or multi-family construction of any consequence.

Table JH-2
Housing Units Growth - 1990-2006
Jones County (Part)

	1990	2000	2000-2006	2006	1990-2006 Change	
					Number	Percent
Total Units						
Single Family	3,487	4,203	454	4,657	1,170	97.83%
Duplexes	53	72	0	72	19	1.59%
Multi-Family	50	57	0	57	7	0.59%
Total	3,590	4,332	454	4,786	1,196	100.00%

Source: 1990 & 2000 -Bureau of Census (1990 & 2000 Census Data)
2000- 2006 New Housing Permits Jones County

Table JH-3 forecasts population and households to the year 2035. The forecasts are based on the forecasts prepared by Woods & Poole for the county as a whole, and on 1990 and 2006 data for the portion in the MATS Planning Area.

Southern Jones County maintained a steady portion of all households in the county throughout the 1990s. By 2006, the MATS portion of Jones County had grown to 47% of all households in the county and contained the vast majority of persons in group quarters (96%). It is projected that the MATS portion will continue to maintain this 47% share of all of all households and 96% of all group quarters population.

**Table JH-3
Population and Household Forecasts - 2035
Jones County**

	1990	2000	2006	2010	2015	2020	2025	2030	2035	Increase 2006-2035
Jones County (Total)										
Total Population	20,795	23,639	27,200	28,400	29,950	31,540	33,200	34,970	36,951	9,751
Population in Group Quarters	220	352	502	532	612	806	942	1,183	1,178	676
Population in Households	20,575	23,287	26,698	27,868	29,338	30,734	32,258	33,788	35,774	9,076
Total Households	7,345	8,659	10,190	10,760	11,460	12,100	12,700	13,250	14,286	4,096
Avg. Household Size	2.80	2.69	2.62	2.59	2.56	2.54	2.54	2.55	2.48	
Jones County (Part)										
Total Population	9,764	11,226	12,796	13,364	14,119	14,948	15,781	16,717	17,470	4,675
Population in Group Quarters	5	337	481	509	586	772	902	1,132	1,128	647
Population in Households	9,759	10,889	12,315	12,855	13,532	14,176	14,879	15,585	16,342	4,028
Total Households	3,427	4,131	4,789	5,057	5,386	5,687	5,969	6,228	6,714	1,925
Avg. Household Size	2.85	2.64	2.57	2.54	2.51	2.49	2.49	2.50	2.43	
Households-% of County-Wide	46.66%	47.71%	47.00%	47.00%	47.00%	47.00%	47.00%	47.00%	47.00%	
Avg. Size-%County-Wide	98.14%	98.14%	98.14%	98.14%	98.14%	98.14%	98.14%	98.14%	98.14%	
% Pop in Group Qtrs in MATS	95.74%	95.74%	95.74%	95.74%	95.74%	95.74%	95.74%	95.74%	95.74%	

Source: Total population, households and average household sizes- Woods & Poole Economics, Inc. (2035 Projections MATS).
 Jones County part: 1990 & 2000 population and household data-Bureau of the Census for CTs 301.01 & 301.02. 2006 households based
 on building permits issued by Jones County

Table JH-4 estimates the future number of households by structure type in the MATS portion of Jones County. The net number of new households added between each benchmark year (from Table JH-2) is allocated exclusively to single-family houses.

It is assumed that, on average, there is no more than a six-month lag between permit issuance and the completion of construction. Thus, units issued building permits through December of one year would be completed and available for occupancy prior to July 1 of the next year.

Table JH-4
Housing Units Growth - 2006-2035
Jones County (Part)

	2006	2010	2015	2020	2025	2030	Increase	
							2035	2006-2035
Total Households	4,789	5,057	5,386	5,687	5,969	6,228	6,714	
Net New Households Increase over Previous Increment		268	329	301	282	259	487	1,925
Growth Share by Type								
Single Family		100%	100%	100%	100%	100%	100%	
Duplex		0%	0%	0%	0%	0%	0%	
Multi-Family		0%	0%	0%	0%	0%	0%	
Net New Households by Type								
Single Family		268	329	301	282	259	487	1,925
Duplex		0	0	0	0	0	0	
Multi-Family		0	0	0	0	0	0	

Residential Development— Southern Jones County

Methodology

Once the number of new households is estimated, the number of new housing units can be estimated, and the amount of land that they will consume in development can be calculated using average density factors for each structure type. The methodology is:

- The number of new housing units that are anticipated to be built is based on the future increase in the number of households (i.e., occupied housing units) plus a factor for vacant units.
- An estimate is made of the average density at which future residential development will occur.
- The future number of housing units divided by the average density yields the number of acres that are anticipated to be consumed by actual construction.

**Table JR-1
Housing Demand-2006-2035
Jones County (Part)**

	2006 to 2010	2010 to 2015	2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035	Total
Net New Households							
Single Family	268	329	301	282	259	487	1,925
Duplex	0	0	0	0	0	0	0
Multi-Family	0	0	0	0	0	0	0
Net New Households	268	329	301	282	259	487	1,925
Vacancy Rates							
Single Family	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	
Duplex	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	
Multi-Family	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Net New Housing Units							
Single Family	285	350	320	300	275	517	2046
Duplex	0	0	0	0	0	0	0
Multi-Family	0	0	0	0	0	0	0
Net New Housing Units	285	350	320	300	275	517	2,046

Source: Vacancy rates from 2000 Census

Future Housing Demand

Table JR-1 shows the estimated number of new housing units that are forecast to be constructed during each of the incremental periods between 2006 and 2035. The estimates are based on the forecasts of net new households (i.e., occupied housing units) from Table JH-4, to which an estimate of vacant units is added reflecting 2000 vacancy rates.

Residential Development Densities

The total number of acres occupied by existing development has been calculated for the MATS portion of the county, by land use category. Those acreages, divided into the current number of housing units, produces an average density of housing units per acre. These figures are shown on Table JR-2.

The current density for single-family houses is very low, reflecting the agricultural nature of much of the area. New residential development is anticipated at higher densities as subdivisions replace rural properties. Without sewer, the minimum lot requirement of 1 acre will continue, and larger lots along the area's existing roads will also attract new houses. Overall, it is anticipated that an average density roughly twice that existing can be anticipated over the next 25 years.

**Table JR-2
Average Residential Densities-2002
Jones County (Part)**

Land Use Category	Number of Acres	Total Housing Units	Housing Units per Acre
Total Single Family	11,883	4,203	0.35

Minimum lot on septic tank = 1 acre

Single Family rounded to 0.85

Total 2 + Multi-Family	57	129	2.29
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2 = Multi-Family rounded to 2.0

Source: 2002 land use acreages compiled by Jones County

Residential Land Demand

Table JR-3 shows the estimated number of acres that will be developed with actual construction to accommodate the number of new housing units that are forecast to be constructed during each of the five-year incremental periods to 2035. The net number of new units is shown for each benchmark year, as well as the cumulative total.

The demand in acres is estimated using the average density figures from Table JR-2, expressed in housing units per acre, divided into the number of new units. These figures should be interpreted as being land on which housing units have been actually built. Land consumed by residential development will exceed the figures shown on Table JR-3, reflecting vacant lots in subdivisions, future phases dedicated to development but not yet begun, and projects under construction but not yet completed. (This land consumption is discussed in alter section.)

**Table JR-3
Residential Land Demand
Jones County (Part)**

	2006 to 2010	2010 to 2015	2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035	Total
Net New Housing Units							
Single Family	285	350	320	300	275	517	2,046
Duplex	0	0	0	0	0	0	0
Multi-Family	0	0	0	0	0	0	0
Net New Housing Units by Increment							
Total Cumulative New Units	285	634	954	1,254	1,528	2,046	2,046
Average Units per Acre							
Single Family	0.85	0.85	0.85	0.85	0.85	0.85	
Duplex	2.00	2.00	2.00	2.00	2.00	2.00	
Multi-Family	2.00	2.00	2.00	2.00	2.00	2.00	
Demand in Acres							
Single Family	335	411	376	353	323	609	2,407
Duplex	0	0	0	0	0	0	0
Multi-Family	0	0	0	0	0	0	0
Net New Housing Acres by Increment							
Total Cumulative New Acres	335	746	1122	1475	1798	2407	2,407

Employment Growth— Southern Jones County

Methodology

An important distinction to bear in mind when considering future nonresidential development is the difference between “employed persons” and “employees.” The Census reports employment characteristics of the resident population, which has less relevance to the future growth of business and industry in Jones County than the number of actual jobs. More people work in Jones County than the number of residents who are employed, underlining the “central city” role that Jones County plays in attracting workers from surrounding areas.

The Woods & Poole forecasts of employment are particularly useful in that the data reports jobs, not people. That is, if a person has two jobs—possibly a full-time job during the day and a part-time job nights or weekends—Woods & Poole reports two jobs, not one employed person. Since it is ultimately the number of jobs that generates floor space requirements for the number of employees, and thus future land development to accommodate that floor space, the Woods & Poole approach generates more realistic results. In addition, Woods & Poole includes in their forecasts self-employed people and sole proprietors, unlike statistics from a State Dept. of Labor or the U.S. Dept. of Commerce. This is an important consideration in estimating the true demand for space for future business growth.

The methodology proceeds along the following lines:

- Employment forecasts are obtained for each employment category.
- For each private sector employment category, the percentage of employees normally occupying retail, office or industrial space is determined.
- The percentages by land use category are applied to the employment data to estimate the number of employees in retail, office or industrial settings.

Employment Forecasts

Table JE-1 shows the Woods & Poole figures for employment to 2030 by benchmark (five-year) increments for Jones County. The number of employees for each sector is then projected to 2035 using regressions against the Woods & Poole figures. Several of the sectors show very little growth, while Retail Trade and Services have and are projected to continue with very high increases in employment.

In 2006, 1,369 people were employed by businesses in the MATS portion of Jones County, or about 25% of the countywide total. Table JE-1 shows the percentage of countywide employment in the MATS area in 2006 for each economic sector category. Employment forecasts for the MATS area are based on maintaining the same rate of capture as the current ratios to county-wide employment.

**Table JE-1
Employment-2006-2035
Jones County**

	2006	2010	2015	2020	2025	2030	2035	Increase 2006-2035
Jones County (Total)								
Construction	954	1,047	1,162	1,278	1,392	1,507	1,620	666
Manufacturing	205	205	205	205	205	205	210	5
Wholesale Trade	85	87	89	92	94	97	100	15
Retail Trade	900	965	1,046	1,127	1,209	1,290	1,370	470
Transport., Communications & Utilities	246	257	270	284	297	311	320	74
Finance, Insurance & Real Estate	363	373	386	398	411	423	440	77
Services	1,529	1,659	1,822	1,984	2,145	2,308	2,470	941
Federal, State & Local Government	1,150	1,215	1,296	1,377	1,459	1,540	1,594	444
Total-Jones County (Total)	5,432	5,808	6,276	6,745	7,212	7,681	8,124	2,692
Jones County (Part)								
Construction	208	228	254	279	304	329	354	145
Manufacturing	54	54	54	54	54	54	55	1
Wholesale Trade	21	21	22	23	23	24	25	4
Retail Trade	232	249	270	291	312	333	353	121
Transport., Communications & Utilities	32	33	35	37	38	40	41	10
Finance, Insurance & Real Estate	45	46	48	50	51	53	55	10
Services	560	608	668	727	786	846	905	345
Federal, State & Local Government	216	229	244	259	275	290	300	84
Total-Jones County (Part)	1,369	1,469	1,594	1,719	1,843	1,968	2,088	719

% Jones

County

Source: County-wide forecasts 2006-2030: Woods & Poole Economists, Inc.;
2035 estimates MATS staff.

Employment by Land Use Category

In order to estimate future demand for nonresidential development, future employment estimates must be translated from employment sector category to land use category. Table JE-2 shows the percentage breakdown by land use category estimated for each of the employment sectors. The percentages are estimated from the detailed employment-by-NAICS-code data reported in the *County Business Patterns: 2001*. As shown on Table A-2 in Appendix A, employment by detailed category is distributed to or among the three types of land use based on the most likely setting appropriate to the category. The number of employees by land use are then summed by general employment category and percentages calculated. These percentages are summarized on Table JE-2. Government employment is allocated exclusively to “public” land use.

It should be noted that *County Business Patterns* data exclude most small businesses and virtually all sole proprietors. However, the proportion of employees in each sector from *County Business Patterns* that would be expected to be located in the various land use categories is viewed as being equally valid for the larger number of workers when the “excluded” categories are added back in.

Table JE-2
Percent Employment by Land Use
Jones County (Total)

	Land Use Type				
	Retail	Office	Industrial	Public	
Construction	0.0%	18.1%	18.1%	0.0%	36.2%
Manufacturing	0.0%	0.0%	100.0%	0.0%	100.0%
Wholesale Trade	0.0%	25.0%	75.0%	0.0%	100.0%
Retail Trade	89.1%	0.0%	10.9%	0.0%	100.0%
Transport., Communications & Utilities	5.0%	20.9%	74.1%	0.0%	100.0%
Finance, Insurance & Real Estate	25.6%	74.4%	0.0%	0.0%	100.0%
Services	24.2%	71.3%	4.5%	0.0%	100.0%
Federal, State & Local Government	0.0%	0.0%	0.0%	100.0%	100.0%

Source: Ross+associates evaluation of County Business Patterns: 2001 for Jones County, U.S. Dept of Commerce, Bureau of the Census.

Table JE-3 summarizes employment in the MATS portion of Jones County by employment sector and land use category. Employment by land use category is estimated by applying the percentages from Table JE-2 to the employment data by sector on Table JE-1. Because some economic sector increases, such as construction, result in limited increases in land uses, the total number of employees by land use category is less than total employment by economic sector.

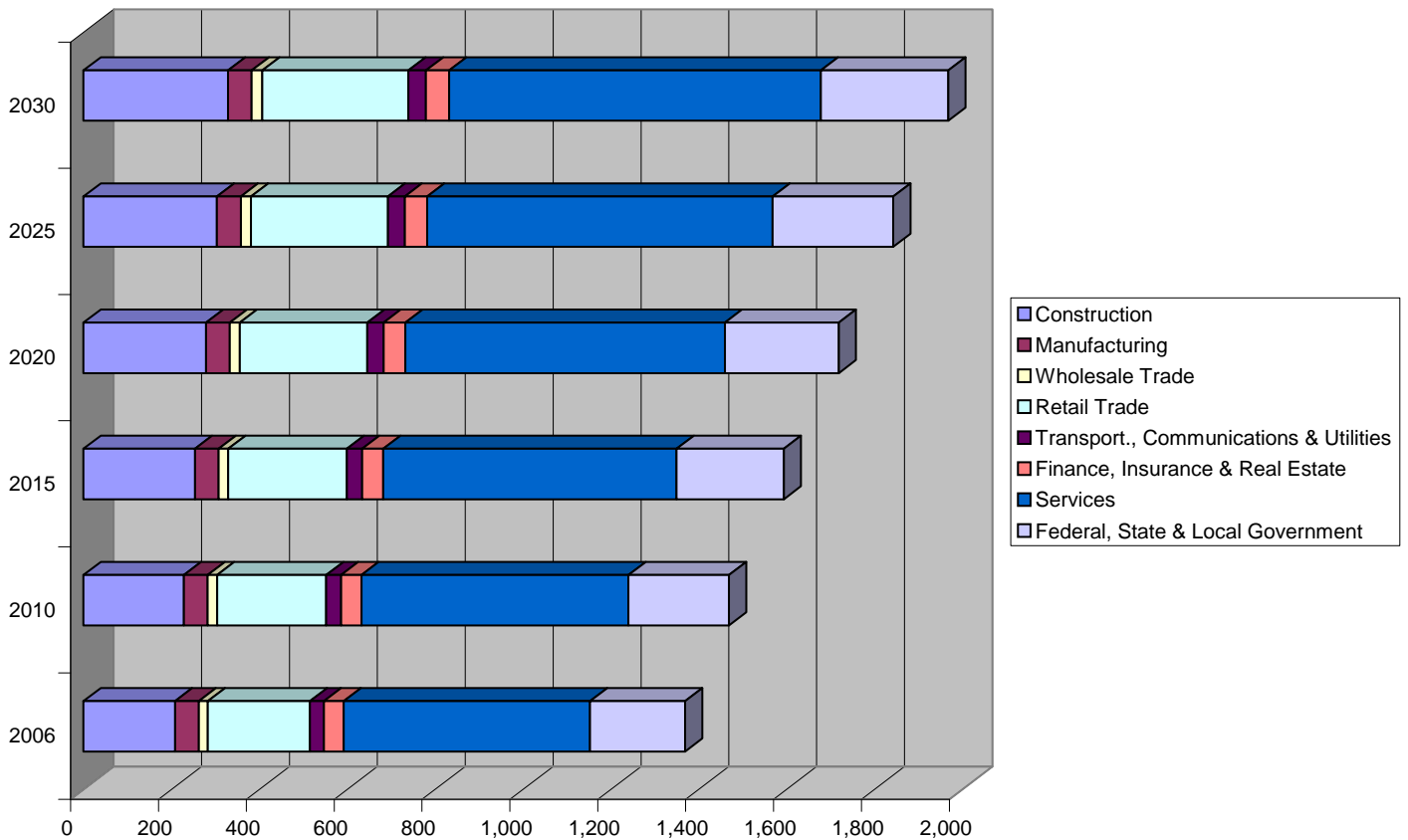
The data from Table JE-3 is shown in chart and tabular form on Tables JE-4, *Employment by Sector*, and Table JE-5, *Employment by Land Use Category*, for the 2006-2035 time period.

**Table JE-3
Number of Employees-2006-2035
Jones County (Part)**

Employment by Sector	2006	2010	2015	2020	2025	2030	2035	2006 to 2035
Construction	208	228	254	279	304	329	354	145
Manufacturing	54	54	54	54	54	54	55	1
Wholesale Trade	21	21	22	23	23	24	25	4
Retail Trade	232	249	270	291	312	333	353	121
Transport., Communications & Utilities	32	33	35	37	38	40	41	10
Finance, Insurance & Real Estate Services	45	46	48	50	51	53	55	10
Federal, State & Local Government	560	608	668	727	786	846	905	345
	216	229	244	259	275	290	300	84
Total Employment by Sector	1,369	1,469	1,594	1,719	1,843	1,968	2,088	719
Employment by Land Use Category								
Retail Commercial	356	382	416	449	483	517	550	194
Office	483	522	571	619	667	716	765	282
Industrial	182	191	202	213	224	236	248	66
Public	216	229	244	259	275	290	300	84
Total-by Land Use Category*	1,236	1,324	1,432	1,541	1,649	1,758	1,863	626

* Totals by land use category are less than totals by economic sector due to employment that does not permanently consume land such as construction workers

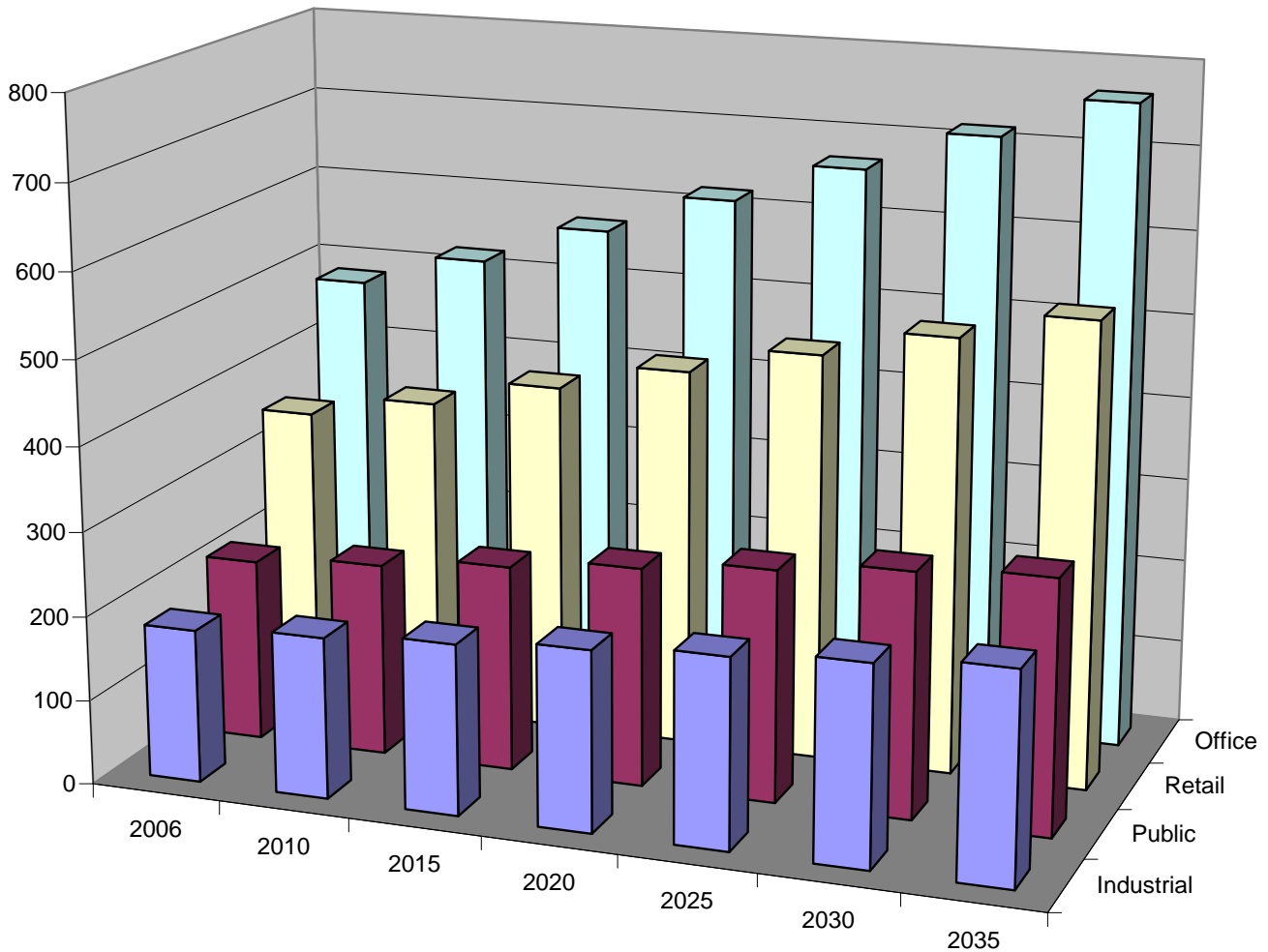
Employment by Sector-2006-2035



**Table JE-4
Employment by Sector-2006-2035
Jones County (Part)**

Employment by Sector	2006	2010	2015	2020	2025	2030	2035	2006-2035	
								Number	% Change
Construction	208	228	254	279	304	329	354	145	69.8%
Manufacturing	54	54	54	54	54	54	55	1	2.4%
Wholesale Trade	21	21	22	23	23	24	25	4	17.6%
Retail Trade	232	249	270	291	312	333	353	121	52.2%
Transport., Communications & Utilities	32	33	35	37	38	40	41	10	30.1%
Finance, Insurance & Real Estate	45	46	48	50	51	53	55	10	21.2%
Services	560	608	668	727	786	846	905	345	61.5%
Federal, State & Local Government	216	229	244	259	275	290	300	84	38.6%
Total Employment by Sector	1,369	1,469	1,594	1,719	1,843	1,968	2,088	719	52.5%

Employment by Land Use Category-2006-2035



**Table JE-5
Employment by Land Use Category-2006-2035
Jones County (Part)**

	2006	2010	2015	2020	2025	2030	2035	% Increase 2006-2035
Industrial	182	191	202	213	224	236	248	36.5%
Public	216	229	244	259	275	290	300	38.6%
Retail	356	382	416	449	483	517	550	54.7%
Office	483	522	571	619	667	716	765	58.5%

Nonresidential Development— Southern Jones County

Methodology

Estimates are presented in the preceding section of the number of employees (i.e., jobs) that are expected in the future in retail, office and industrial settings in the MATS portion of Jones County. This section of the report provides estimates of the amount of building floor space and land acreage that will be needed to accommodate these future employees in each land use category. The methodology is:

- The total number of employees that will occupy retail, office or industrial space is estimated for each benchmark year.
- The number of employees is multiplied by an average floor area per employee factor, resulting in an estimate of the amount of floor area that will be needed to accommodate the future number of employees in each of the land use categories.
- The net new floor area added in each five-year increment is determined for each benchmark year.
- The amount of new development in acres is determined by dividing the net new square footage of floor area by an average floor area per acre factor, for each land use category.

New Growth Demand—Floor Area

Tables JN-1, JN-2 and JN-3 show estimates of the total number of square feet of floor area that will be needed to accommodate private sector employment in the MATS Planning Area at each future benchmark year. A separate table is presented for each of the three private sector land use categories—retail, office and industrial.

Each of the three tables shows the total number of employees by employment sector that is forecast for each benchmark year in the relevant land use category (retail, office or industrial). The figures are derived by multiplying the total number of employees by sector (on Table JE-3) by the percentages of employment by land use category (on Table JE-2) for each benchmark year.

The floor area needed to accommodate these employees is estimated by multiplying the number of employees by the average amount of floor area each employee will occupy. The “floor area per employee” factors used on the three tables are derived from national vehicle trip data, which are shown on Table A-3 of Appendix A. The floor area per employee factors used on the following tables are generalized from the specific results shown on Table A-3, as appropriate to the nature of the land use type and the employment sector.

**Table JN-1
Retail Demand-2006-2035
Jones County (Part)**

	Factor	2006	2010	2015	2020	2025	2030	2035
Retail Employment	% of Total							
Construction	0.0%	0	0	0	0	0	0	0
Manufacturing	0.0%	0	0	0	0	0	0	0
Wholesale Trade	0.0%	0	0	0	0	0	0	0
Retail Trade	89.1%	207	222	240	259	278	296	315
T.C.U.	5.0%	2	2	2	2	2	2	2
F.I.R.E.	25.6%	12	12	12	13	13	13	14
Services	24.2%	136	147	162	176	190	205	219
Total Retail Employment		356	382	416	449	483	517	550

	Floor Area per Employee *	2006	2010	2015	2020	2025	2030	2035
Retail Floor Area								
Construction	0	0	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0	0	0
Wholesale Trade	0	0	0	0	0	0	0	0
Retail Trade	600	124,027	132,985	144,147	155,310	166,610	177,772	188,797
T.C.U.	600	956	999	1,050	1,104	1,155	1,209	1,244
F.I.R.E.	300	3,468	3,564	3,688	3,802	3,927	4,041	4,204
Services	600	81,382	88,301	96,977	105,599	114,168	122,844	131,467
Total-Retail Floor Area		209,833	225,848	245,861	265,815	285,859	305,867	325,711

* Estimate of average gross floor area per employee based analysis of data from Trip Generation, 6th Edition, ITE

**Table JN-2
Office Demand-2006-2035
Jones County (Part)**

	2006	2010	2015	2020	2025	2030	2035
Office Employment							
Construction	38	41	46	50	55	60	64
Manufacturing	0	0	0	0	0	0	0
Wholesale Trade	5	5	5	6	6	6	6
Retail Trade	0	0	0	0	0	0	0
T.C.U.	7	7	7	8	8	8	9
F.I.R.E.	34	35	36	37	38	39	41
Services	400	434	476	519	561	603	646
Total Office Employment	483	522	571	619	667	716	765

	2006	2010	2015	2020	2025	2030	2035
Office Floor Area							
Construction	11,305	12,407	13,770	15,145	16,496	17,859	19,198
Manufacturing	0	0	0	0	0	0	0
Wholesale Trade	1,733	1,773	1,814	1,875	1,916	1,977	2,038
Retail Trade	0	0	0	0	0	0	0
T.C.U.	1,999	2,088	2,194	2,307	2,413	2,527	2,600
F.I.R.E.	10,079	10,357	10,718	11,051	11,412	11,745	12,217
Services	95,909	104,064	114,288	124,450	134,549	144,773	154,935
Total-Office Floor Area	121,025	130,689	142,784	154,828	166,785	178,881	190,988

* Estimate of average gross floor area per employee based analysis of data from Trip Generation, 6th Edition, ITE

**Table JN-3
Industrial Demand-2006-2035
Jones County (Part)**

Industrial Employment	Factor	2006	2010	2015	2020	2025	2030	2035
	% of Total							
Construction	18.1%	38	41	46	50	55	60	64
Manufacturing	100.0%	54	54	54	54	54	54	55
Wholesale Trade	75.0%	16	16	16	17	17	18	19
Retail Trade	10.9%	25	27	29	32	34	36	38
T.C.U.	74.1%	24	25	26	27	29	30	31
F.I.R.E.	0.0%	0	0	0	0	0	0	0
Services	4.5%	25	27	30	33	35	38	41

Total Industrial Employment		182	191	202	213	224	236	248
Industrial Floor Area	Floor Area per Employee *							
Construction	430	16,204	17,784	19,737	21,708	23,644	25,597	27,517
Manufacturing	540	29,160	29,160	29,160	29,160	29,160	29,160	29,871
Wholesale Trade	800	12,600	12,896	13,193	13,638	13,934	14,379	14,824
Retail Trade	800	20,230	21,691	23,512	25,333	27,176	28,997	30,795
T.C.U.	1050	24,801	25,910	27,220	28,632	29,942	31,354	32,261
F.I.R.E.	0	0	0	0	0	0	0	0
Services	430	10,845	11,767	12,924	14,073	15,215	16,371	17,520
Total-Industrial Floor Area		113,841	119,209	125,746	132,543	139,071	145,858	152,788

* Estimate of average gross floor area per employee based analysis of data from Trip Generation, 6th Edition, ITE

Nonresidential Development Densities

The total number of acres occupied by existing development has been calculated for the MATS portion of the county, by land use category. Those acreages divided into the current number of employees, produces an average density of employees per acre.

Currently, nonresidential densities in the MATS Planning Area of Jones County are extraordinarily low, reflecting the rural character of today. In addition to the calculations of actual densities, Table JN-4 shows densities more commonly characteristic of commercial shopping facilities, office facilities, and distribution-type industries. For this analysis, densities one-half that of normal development have been used, each of which are considerably higher than current densities. This approach is considered more realistic, however, as future development is more reflective of classic suburban patterns.

Table JN-4
Average Non-Residential Development Densities-2002
Jones County (Part)

Land Use Category	Number of Acres	Total Employment	Employees per Acre	Square Feet per Employee	Square Feet per Acre
Total Retail & Office	781	709	0.91	600	545
				Strip shopping center development, commonly =	8000
				Retail/Office rounded to	4,000
Total Industrial	455	164	0	1,000	361
				Warehousing, truck terminals, distribution, commonly=	10,000
				Industrial rounded to	5,000

Source: 2002 land use acreages compiled by Jones County

Nonresidential Growth Demand—Land Area

Table JN-5 converts the forecasted number of square feet of floor area by land use into land demand for new nonresidential development in acres, using the average densities shown on Table JN-4. The total floor area for each of the land use categories by benchmark year are shown at the top of the Table, taken from Tables JN-1, JN-2 and JN-3. The net increase for each five-year increment is then calculated from the totals. The total for the increment and the cumulative total since 2006 are both shown. By dividing the increase in floor area for each increment by the average density figures for each land use type, the net number of acres that the floor area will occupy can be determined.

Table JN-5
Land Area Demand-Private Non-Residential Uses
Jones County (Part)

	2006	2010	2015	2020	2025	2030	2035	Total to 2035
Total Floor Area for Each Land Use Category								
Retail Commercial	209,833	225,848	245,861	265,815	285,859	305,867	325,711	325,711
Office	121,025	130,689	142,784	154,828	166,785	178,881	190,988	190,988
Industrial	113,841	119,209	125,746	132,543	139,071	145,858	152,788	152,788
Total Non-Residential Floor Area	444,699	475,746	514,391	553,186	591,716	630,605	669,487	669,487
New Floor Area Added Each Increment								
Retail Commercial		16,015	20,013	19,954	20,044	20,007	19,845	115,878
Office		9,664	12,095	12,044	11,957	12,095	12,107	69,963
Industrial		5,368	6,537	6,796	6,529	6,786	6,930	38,947
Total Added Each Increment		31,048	38,645	38,795	38,530	38,889	38,882	224,788
Cumulative New Floor Area		31,048	69,693	108,487	147,018	185,907	224,788	
Acres of Land								
	Sq. Ft. per Acre							
Retail Commercial	4,000	4.0	5.0	5.0	5.0	5.0	5.0	29.0
Office	4,000	2.4	3.0	3.0	3.0	3.0	3.0	17.5
Industrial	5,000	1.1	1.3	1.4	1.3	1.4	1.4	7.8
Total Added Each Increment		7.5	9.3	9.4	9.3	9.4	9.4	54.2
Cumulative Developed Acres		7.5	16.8	26.2	35.5	44.9	54.2	

It should be understood that the demand shown on Table JN-5 reflects land on which businesses and industries actually have been built. Land consumed by non-residential development will exceed the figures shown on Table JN-5, reflecting vacant lots in office and industrial parks, future phases dedicated to development but not yet begun, and projects under construction but not yet completed.

Land Consumption— Southern Jones County

Previous sections of this report have estimated the net acres that will be needed to accommodate actual growth to the year 2035. These land areas are, specifically, the land upon which actual buildings will be placed (along with such accessory areas as parking lots, normal yards and, where appropriate, loading areas). For the purposes of developing a land use plan, these acreages need to be expanded to account for inefficiencies in the land development process, and for the “uncertainty” as to precisely which lands will be developed.

Table JD-1 summarizes projected land demand for the Jones County portion of the MATS Planning Area to accommodate future development to 2035, and all the attendant land uses that that development implies.

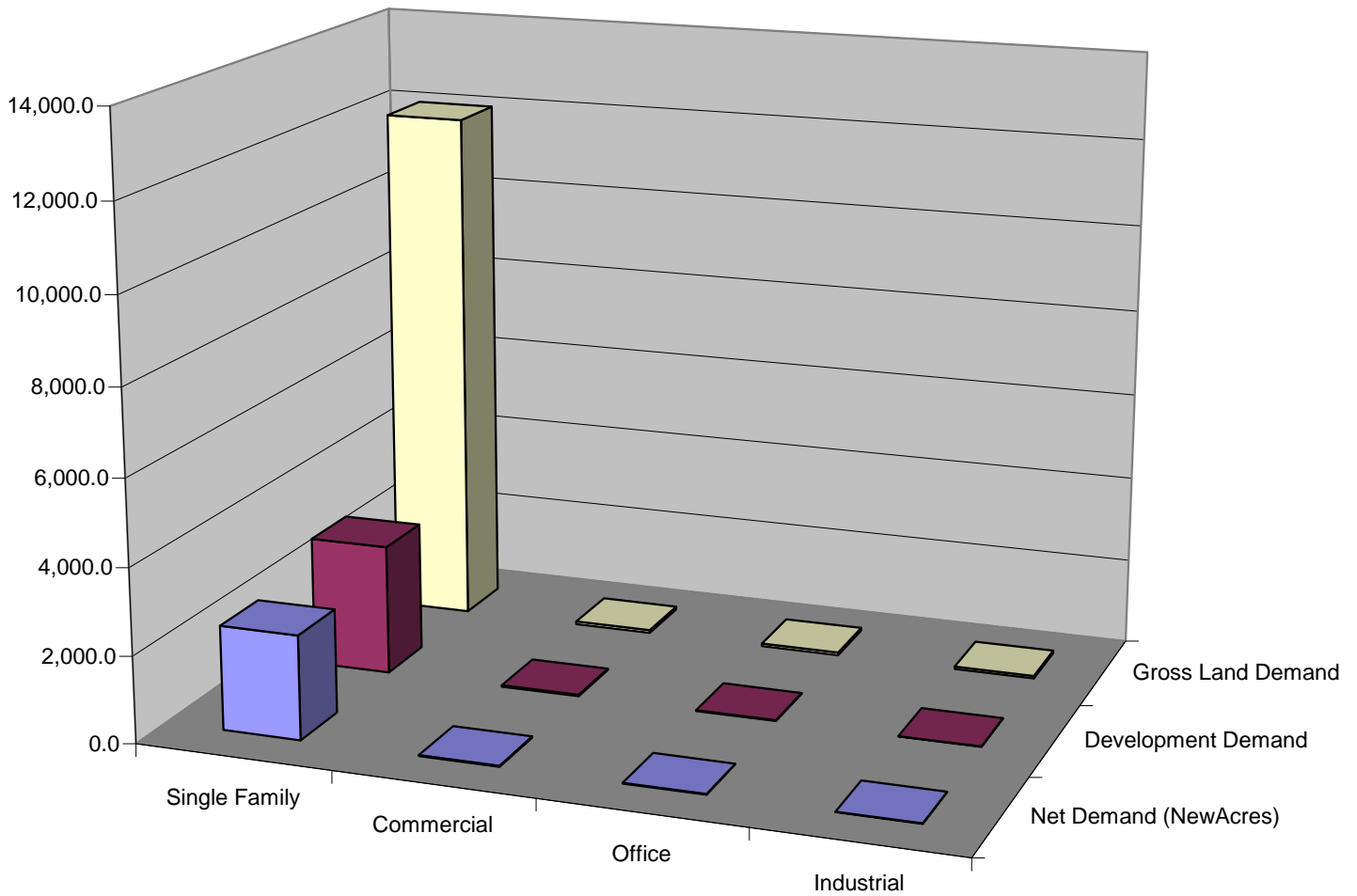
The net new demand from the various land use categories is shown on Table JD-1, as estimated for the year 2035 in previous sections of this report. The “efficiency multiplier” recognizes that, during the land development process, some lands are vacant but irrevocably dedicated to development in that particular land use category. For instance, a single-family subdivision will contain vacant lots throughout development until the subdivision is 100% built out. A shopping center may contain spin sites and an industrial park may contain pad sites, all graded and ready for development, but vacant nonetheless. The “efficiency multiplier” accounts for these lands that have been included within a land development project, but have not yet been used to satisfy actual market (“net”) demand. The efficiency multiplier also recognizes that some land use developments, such as industrial parks, are generally built with comparatively more vacant sites (and build out more slowly) than other developments, such as an apartment complex.

The “market choice” multiplier differs notably from the efficiency multiplier. The “market choice” multiplier relates directly to the uncertainty of a particular property to develop, compared to other similar properties. For instance, a particular area may contain 1,000 acres, but only 400 are expected to develop within the planning horizon. The problem is that: 1) which 400 acres is not clear, and 2) all 1,000 acres may be appropriate for development for the particular land use. Thus, more acres normally will be shown on the land use plan for each land use category than are actually expected to be developed in order to allow the market to choose the appropriate sites within the appropriate areas identified for the use. Simply stated, an intersection may be appropriate for one future gas station, but which specific corner will be occupied by the new station may be uncertain, so the land use plan may designate all of the corners that are appropriate. The market choice multiplier also varies according to land use type, reflecting the level of “certainty” that one may have about the variety of appropriate locations for each use and the level of “compactness” of urban form desired.

The “gross land demand” acreages shown on Table JD-1, then, represent the total number of acres that should be designated on the land use plan map to accommodate future development while allowing the market to operate freely within the designated areas.

The following two charts illustrate the gross amount of land allocated to future development. Overwhelmingly, single-family residential dominates the future development scene in terms of acres of land use. The second chart has therefore been created without the single-family residential category in order to clearly see the differences between the other land use categories.

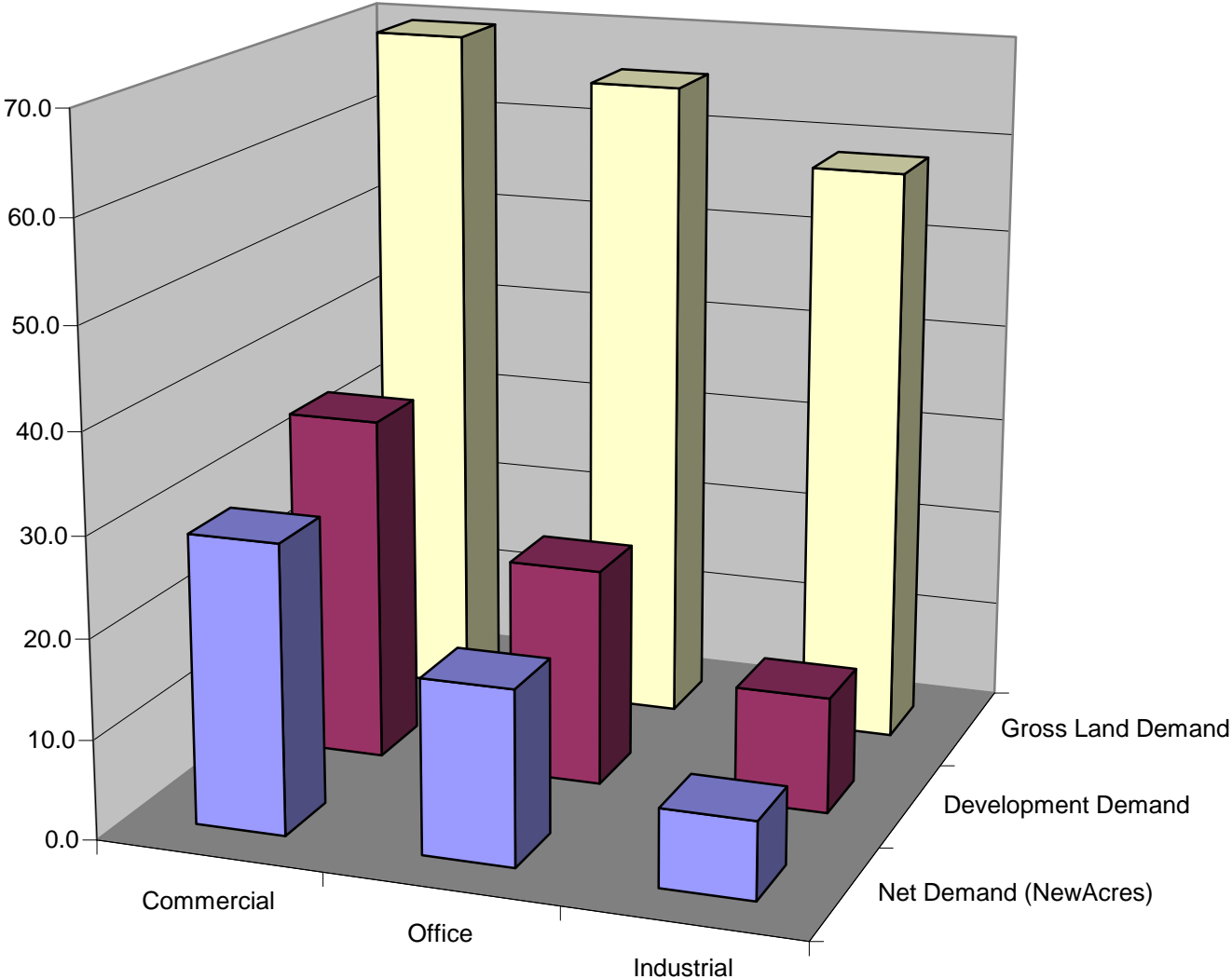
Gross Land Demand in New Acres-2035



**Table JD-1
Gross Future Demand in Acres-2035
Jones County (Part)**

	Single Family	Duplex	Mutli-Family	Commercial	Office	Industrial	Total
Net Demand (NewAcres)	2,406.9	0.0	0.0	29.0	17.5	7.8	2,461.1
Efficiency Multiplier	25%	10%	20%	20%	25%	50%	
Development Demand	3,008.6	0.0	0.0	34.8	21.9	11.7	3,076.9
Market Choice Multiplier	4.0	3.0	3.0	2.0	3.0	5.0	
Gross Land Demand	12,034.3	0.0	0.0	69.5	65.6	58.4	12,227.8

Gross Demand Excluding Single Family



Section 3: Appendices

Appendix A

Miscellaneous Tables

The tables on the following pages present data or calculations used in the preparation of this report, and are included as background information.

Table A-1
Estimates of Private Employment by Land Use Category- 2001
Macon-Bibb County

Table A-2
Estimates of Private Employment by Land Use Category- 2001
Jones County

Table A-3
Floor Area per Employee-Common Uses

Appendix B

A primary resource for the employment and population forecasts used in this report is the data provided by Woods & Poole Economics, Inc. This Appendix presents background information on the methodology used by Woods & Poole in preparing their forecasts in general.

Woods and Poole — Forecast Methodology

The following has been excerpted from the *2006 Data Pamphlets: Bibb and Jones Counties, Georgia*, prepared by Woods & Poole Economics, Inc., Washington, D.C.:

Introduction

The Woods & Poole Economics, Inc. database contains more than 550 economic and demographic variables for every county in the United States for every year from 1970 to 2020. This comprehensive database includes detailed population data by age, sex, and race; employment and earnings by major industry; personal income by source of income; retail sales by kind of business; and data on the number of households, their size, and their income. All of these variables are projected for each year through 2020. In total, there are over 91 million statistics in the regional database. The regional model that produces the projection component of this database was developed by Woods & Poole. The regional projection methods are revised somewhat year to year to reflect new computational techniques and new sources of regional economic and demographic information. Each year, a new projection is produced based on an updated historical database and revised assumptions.

The fact that the proprietary Woods & Poole economic and demographic projections rely on a very detailed database, makes them one of the most comprehensive county-level projections available. A description of some characteristics of the database and projection model is contained in this chapter.

Overview of the Projection Methods

The strength of Woods & Poole's economic and demographic projections stems from the comprehensive historical county database and the integrated nature of the projection model. The projection for each county in the United States is done simultaneously so that changes in one county will affect growth or decline in other counties. For example, growth in employment and population in Houston will affect growth in other metropolitan areas, such as Cleveland. This reflects the flow of economic activity around the country as new industries emerge or relocate in growing areas and as people migrate, in part because of job opportunities. The county projections are developed within the framework of the United States projection made by Woods & Poole. The U.S. projection is the control total for the 1997 regional projections and is described in the "Overview of the 1997 Projections" chapter included in Woods & Poole publications.

The regional projection technique used by Woods & Poole - linking the counties together to capture regional flows and constraining the results to a previously determined United States total - avoids a common pitfall in regional projections. Regional projections are sometimes made for a city or county without regard for potential growth in surrounding areas or other areas in the country. Such projections may be simple extrapolations of recent historical trends and, as a re-

sult, may be too optimistic or pessimistic. If these county projections were added together, the total might differ considerably from any conceivable national forecast scenario; this is the result of each regional projection being generated independently without interactive procedures and without being integrated into a consistent national projection.

The methods used by Woods & Poole to generate the county projections proceed in four stages. First, forecasts to 2020 of total United States personal income, earnings by industry, employment by industry, population, inflation, and other variables are made. Second, the country is divided into 172 Economic Areas (EAs) as defined by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). The EAs are aggregates of contiguous counties that attempt to measure cohesive economic regions in the United States (a list of all EAs and their component counties can be found in Appendix 4 following this chapter); in the 1997 Woods & Poole model, EA definitions released by the BEA in May 1995 are used. For each EA, a projection is made for employment, using an “export-base” approach; in some cases, the employment projections are adjusted to reflect the results of individual EA models or exogenous information about the EA economy. The employment projection for each EA is then used to estimate earnings in each EA. The employment and earnings projections then become the principal explanatory variables used to estimate population and number of households in each EA.

The third stage is to project population by age, sex, and race for each EA on the basis of net migration rates projected from employment opportunities. For stages two and three, the U.S. projection is the control total for the EA projections. The fourth stage replicates stages two and three except that it is performed at the county level, using the EAs as the control total for the county projections.

The “Export-Base” Approach

The specific economic projection technique used by Woods & Poole to generate the employment, earnings, and income estimates for each county in the United States generally follow a standard economic “export-base” approach. This relatively simple approach to regional employment projections is one that has been used by a number of researchers (see [5] and [9]). Although this approach has been criticized by several empirical studies (e.g., [8]), given the availability of regional data it remains one of the most feasible methodologies.

Certain industrial sectors at the regional level are considered “basic.” This means that these sectors produce output that is not consumed locally but is “exported” out of the region for national or international consumption. This assumption allows these sectors to be linked closely to the national economy, and hence follow national trends in productivity and output growth. Normally, the “basic” sectors are mining, agriculture, manufacturing, and the Federal government. In contrast, “non-basic” sectors are those such as retail trade, transportation, communication, and construction, the output of which is usually consumed locally. The growth of the “non-basic” sectors depends largely on the growth of the “basic” sectors that form the basis of the region’s economy.

Intuitively, this approach has great appeal and there are numerous examples that seem to support the “export-base” theory. Automobile production in Detroit, for instance, is obviously much more sensitive to national and international price and demand for transportation equipment than to local demand. In Texas, oil and natural gas exploration and production are tied closely to the worldwide demand and supply of petroleum resources and not tied primarily to energy consumption in Texas.

Although the theory is appealing, some shortcomings do exist in the “export-base” approach. For example, some “basic” commodities produced locally are consumed locally. Producers of

durable equipment used in other manufacturing processes are often affected not by the national demand for their product but by the regional demand. Machine tool makers that supply the local automobile industry in Detroit will prosper to the extent Detroit's automobile producers prosper. In Houston, the strength of the local oil industry will affect the demand and production of equipment for oil and natural gas production and exploration. In both of these instances, some durable manufacturing industries exist to serve local, not national, markets.

However, despite the shortcomings, the availability of relatively clean data for sub-national geographic areas makes the "export-base" approach very useful. The analytical framework for projections using the "export-base" approach entails estimating either demand equations or calculating historical growth rate differentials for output by sector. The principal explanatory variable, or the comparative data series for growth rate differentials, is the national demand for the output of that sector. Employment-by-sector data are often used as a surrogate variable since county output-by-sector data are not available; employment-by-sector data is used by Woods & Poole. Earnings projections are then obtained by using earnings-per-employee data either estimated as part of the model or imposed exogenously on the system. The complementary relationship could also be estimated, i.e., using an earnings forecast to derive employment based on earnings-per-employee data; this procedure has been used previously in some Woods & Poole regional models.

The Demographic Model

The demographic portion of the regional model follows a traditional cohort-component analysis based on calculated fertility and mortality in each county or EA. The "demand" for total population is estimated from the economic model: if the demand for labor is forecast to rise for a particular county or EA, then either the labor force participation rate will rise or population immigration will be positive. The inverse is true for counties and EAs with projected declines in employment. Therefore, future EA and county migration patterns for population by age, sex, and race are based on employment opportunities. Individuals and families are assumed to migrate, at least in part, in response to employment opportunities (see [1], [4], and [6]) with two exceptions: for population aged 65 and over and for college or military-aged population, migration patterns over the forecast period are based on historical net migration and not economic conditions. The integration of economic and demographic regional analysis is a significant strength of the Woods & Poole approach.

The age, sex, and race distribution of the population is projected by aging the population by single year of age by sex and by race for each year through 2020 based on county or EA specific mortality, fertility, and migration rates estimated from historical data. In the Woods & Poole model, projected net mortality and migration are estimated based on the historical net change in population by age, race, and sex for a particular county or EA. Similarly, projected net births and migration of age zero population by race are estimated based on the historical change in age zero population by race per female population age 15 to 44 by race for a particular county or EA.

The United States population by age, sex, and race projections, 1995-2020, are based on Bureau of the Census population estimates. Woods & Poole adjusts these estimates to reflect current year population estimates. The U.S. population by age, sex, and race forecast is the control total for the EA projections. Each EA projection serves as the control totals for the county projections.

Population and Households

Population is defined as residential population and includes civilian population; military population except personnel stationed overseas; college residents; institutional populations, such as prison inmates and residents of mental institutions, nursing homes, and hospitals; and estimates of undocumented aliens. Excluded are persons residing in Puerto Rico, U.S. territories and possessions, and U.S. citizens living abroad.

Households are defined as occupied housing units. A housing unit is a house, an apartment, a group of rooms, or a single room occupied as separate living quarters. The occupants of a housing unit may be a single family, one person living alone, two or more families living together, or any group of related or unrelated persons who share living quarters. All people are part of a household except those who reside in group quarters. Group quarters include living arrangements such as prisons, homes for the aged, rooming houses, college dormitories, and military barracks. The average size of households is defined as total population less group quarters population divided by the number of households.

Employment

The employment data in the Woods & Poole database are a complete measure of the number of full- and part-time jobs by place of work. Historical data, 1969-1994, are from the U.S. Department of Commerce, Bureau of Economic Analysis. The employment data include wage and salary workers, proprietors, private household employees, and miscellaneous workers. Wage and salary employment data are based on an establishment survey in which employers are asked the number of full- and part-time workers at a given establishment. Because part-time workers are included, a person holding two part-time jobs would be counted twice. Also, since the wage and salary employment data are based on an establishment survey, jobs are counted by place of work and not place of residence of the worker; thus, a job in the New York Metropolitan Area is counted in the New York Metropolitan Area regardless of where the worker lives.

Data on proprietors include farm and non-farm proprietors by sector. Proprietors include not only those people who devote the majority of their time to their proprietorship, but people who devote any time at all to a proprietorship. Thus, a person who has a full-time wage and salary job and on nights and weekends runs a small business legally defined as a proprietorship would be counted twice. The employment data therefore include full- and part-time proprietors.

Private household employment data include persons employed by a household on the premises, such as full-time baby-sitters, housekeepers, gardeners, and butlers. Miscellaneous employment data include judges and all elected officials, persons working only on commission in sectors such as real estate and insurance, students employed by the colleges or universities in which they are enrolled, and unincorporated subcontractors in sectors such as construction.

The employment data used by Woods & Poole comprise the most complete definition of the number of jobs by county. Woods & Poole data may be higher than that from other sources because they measure more kinds of employment.

There are three other commonly used government sources for employment data: the Bureau of Labor Statistics (BLS), the Bureau of the Census, and the National Income and Product Accounts (NIPA). These sources of employment data differ from the data used by Woods & Poole. The BLS establishment data are generally much lower than the Woods & Poole data because agricultural workers, the military, proprietors, households, and miscellaneous employment are not included; the exclusion of proprietors from the BLS data is the most significant difference. Data from the Census (and some survey data from the BLS) are based on employment by place of residence and differ fundamentally in concept from the Woods & Poole employment data by place of work; Census employment data are generally lower than Woods & Poole data, but not

always. Since Census data are based on a household survey, persons holding two jobs would be counted only once, and, therefore, the data would be lower than Woods & Poole. However, Census survey data for counties that have a large number of commuters and relatively few jobs within the county could yield employment data higher than Woods & Poole. Employment data in the National Income and Product Accounts are close to Woods & Poole data, except that part-time proprietors and certain miscellaneous employees are excluded; therefore, these data are usually lower.

Employment by Sector

The employment data are by one-digit SIC industry. The one-digit industries are defined in the 1987 Standard Industrial Classification Manual. Over the years, the definitions of certain sectors have changed as new industries have emerged or vanished, entailing some reclassification. However, at the broad industry group level used by Woods & Poole, there have been no changes since 1969, so the sector data are consistent from year to year.

As a rule, employment is classified in a given industry depending on the primary activity of the establishment. For example, employees of a large oil company are classified in many different sectors depending on the specific establishment in which they worked, even though the company as a whole would be considered a mining company: employees at a refinery are in manufacturing; employees at the company headquarters are in services; pipeline operators are in transportation; and oil field workers are in mining. If a given establishment is engaged in activities in different sectors, all employees are classified according to the primary activity of the establishment regardless of their actual occupations; thus, a secretary for a trucking company is a transportation worker and an accountant at a small plumbing company is a construction worker. The main exception to this rule is the classification of government workers in the Woods & Poole database: all government employees are classified in Federal civilian, Federal military, or state and local government employment, regardless of the usual classification of the establishment in which they work. Definitions for each sector in the Woods & Poole database are as follows:

Farming includes all establishments such as farms, orchards, greenhouses, and nurseries primarily engaged in the production of crops, plants, vines, trees (excluding forestry operations), and specialties such as sod, bulbs, and flower seed. It also includes all establishments such as ranches, dairies, feedlots, egg production facilities, and poultry hatcheries primarily engaged in the keeping, grazing, or feeding of cattle, hogs, sheep, goats, poultry of all kinds, and special animals such as horses, bees, pets, and fish in captivity.

Agricultural services, forestry, fisheries, and other includes establishments primarily engaged in performing soil preparation, crop services, veterinary services, farm labor and management, and horticultural services. Forestry includes establishments engaged in the operation of timber tracts, tree farms, forest nurseries, and related activities such as reforestation. Fisheries include commercial fishing (including shellfish) and commercial hunting and trapping. Other includes the jobs of U.S. residents working for international organizations, foreign embassies, and consulates in the U.S.

Mining includes establishments primarily engaged in the extraction, exploration, and development of coal, oil, natural gas, metallic minerals (such as iron and copper), and nonmetallic minerals (such as stone and sand). Mining does not include refining, crushing, or otherwise preparing mining products; this activity is classified as manufacturing.

Construction includes establishments engaged in building new structures and roads, alterations, additions, reconstruction, installations, and repairs. It includes general contractors engaged in

building residential and nonresidential structures; contractors engaged in heavy construction, such as bridges, roads, tunnels, and pipelines; and special trade contracting, such as plumbing, electrical work, masonry, and carpentry. Employment is counted at the fixed place of business where establishment-type records are maintained and not at the job site. Establishments engaged in managing construction projects are classified under services. Establishments engaged in the selling and installation of construction materials are generally classified under trade, except for materials such as installed elevators and sprinkler systems. The installation of prefabricated building materials is included in construction.

Manufacturing includes establishments engaged in the mechanical or chemical transformation of materials or substances into new products. Included in manufacturing are establishments engaged in assembling component parts not associated with structures and those engaged in blending materials, such as lubricating oils or liquor. Broadly defined, manufacturing industries include the following: food processing, such as canning, baking, meat processing, and beverages; tobacco products; textile mill products, such as fabric, carpets and rugs; apparel; wood products, including logging, sawmills, prefabricated homes, and mobile homes; furniture; paper; printing and publishing; chemicals, such as plastics, paints, and drugs; petroleum refining; rubber and plastics; leather products; stone, clay, and glass; primary metals, such as steel, copper, aluminum, and including finished products such as wire, beams, and pipe; fabricated metals, such as cans, sheet metal, cutlery, and ordnance; industrial machinery, including computers, office equipment, and engines; electronics and electrical equipment; transportation equipment, such as cars, trucks, ships, and airplanes; instruments; and miscellaneous industries, such as jewelry, musical instruments, and toys.

Transportation, communications, and public utilities includes establishments providing, to the general public or to other business enterprises, passenger and freight transportation, communications services, electricity, gas, steam, water, or sanitation services, and the Postal Service. Transportation includes railroads, highway passenger transportation, trucking and warehousing, shipping, air transportation, pipelines, and transportation services such as travel agencies and tours. Communications includes point-to-point telephone and telegraph services, radio, television, and cable broadcasting. Sanitary services includes water supply and trash removal.

Wholesale trade includes establishments primarily engaged in selling merchandise to retailers; or to industrial, commercial, institutional, farm, construction contractors; or to professional business users; or to other wholesalers or brokers. The merchandise sold by wholesalers includes all goods used by institutions, such as schools and hospitals, as well as virtually all goods sold at the retail level. The three main types of wholesalers are merchant wholesalers who purchase goods from manufacturers or other wholesalers and sell them; sales branches of manufacturing, mining, or farm companies engaged in marketing the products of the company to retail establishments; and agents, merchandise or commodity brokers, and commission merchants.

Retail trade includes establishments engaged in selling merchandise for personal or household consumption and rendering services incidental to the sale of goods. Buying goods for resale to the consumer is a characteristic of retail trade establishments that distinguishes them from agricultural and extractive industries: farmers who sell only their own produce at or from the point of production are not classified as retailers. Retail establishments include hardware stores, garden supply stores, and mobile home dealers; department stores; food stores, including supermarkets, convenience stores, butchers, bakeries, and fruit stands; automobile dealers; gasoline service stations; apparel and accessory stores; furniture and home furnishing stores, including electronics and home appliances; eating and drinking places, including restaurants, bars, and take-out stands; and miscellaneous establishments, including drug stores, liquor stores, thrift shops, bookstores, florists, mail-order houses, and pet stores.

Finance, insurance, and real estate includes the following establishments: depository institutions, such as commercial banks, savings and loans, and foreign banks; credit institutions; holding companies not engaged in operation; investment companies; brokers and dealers in securities and commodity contracts; security and commodity exchanges; carriers of all types of insurance; insurance agents and insurance brokers; real estate operators including operators of non-residential facilities, apartments, other residential properties, mobile home parks, and railroad properties; real estate agents and managers; title offices; and developers not engaged in construction.

Services includes establishments primarily engaged in providing services for individuals, businesses, governments, and other organizations. Service industries include the following: hotels and other lodging places; personal services, such as laundries, dry cleaners, barber shops, shoe repair, and funeral homes; business services, such as advertising, employment agencies, office equipment repair, computer and data processing, credit reporting and collecting; automobile repair and automobile services, including car washes and car rental; motion pictures, including video rentals; entertainment, including theaters, casinos, amusement parks, and professional sports; health services, such as hospitals, clinics, nursing homes, and dentists; legal services; education services, such as private elementary and secondary schools, colleges, junior colleges, universities, and vocational schools; social services provided in privately owned establishments; private museums and zoos; membership organizations, including churches, labor unions, professional membership organizations, and political organizations; professional services, such as engineering, architecture, accounting, research services, and public relations; and private household employment, such as full-time baby-sitters, housekeepers, and butlers employed by a household on the premises.

Federal civilian includes all Federal government workers regardless of their establishment classification. Federal civilian employment includes executive offices and legislative bodies; courts; public order and safety; correctional institutions; taxation; administration and delivery of human resource programs, such as health, education, and public assistance services; housing and urban development programs; environmental programs; regulators, including air traffic controllers and public service commissions; and other Federal government agencies.

Federal military includes Air Force, Army, Marine Corps, National Guard, and Navy. In the Woods & Poole database, only personnel stationed in Alaska, Hawaii, and the continental U.S. are counted in employment and earnings. Civilians working on a military base are classified in the sector appropriate to their occupation.

State and local government is defined the same as Federal civilian except that the activities are run by state and local governments. At the local level, this includes all public schools as well as police and fire departments; at the state level, it includes all public junior colleges, colleges, and universities.

The Accuracy of the Projections

Unlike other sciences, economics and demographics cannot rely on experimentation to test theories and verify hypotheses. Rather, historical data are analyzed and theories are developed that explain the historical data. The resulting models are then used to make a projection. Woods & Poole projections, like all economic and demographic projections, utilizes this approach: analyzing historical data to make estimates of future data. There are, of course, inherent limitations to projections, and the Woods & Poole projections should never be interpreted as an infallible prediction of the future; future data may differ significantly from Woods & Poole projections and Woods & Poole does not guarantee the accuracy of the projections. In all Woods & Poole publi-

cations, the word “forecast” is a synonym for “projection” and refers to Woods & Poole estimated data for any year from 1995 to 2020; in Woods & Poole publications “forecasts” and “projections” both mean estimates of future data (1995 to 2020).

One key limitation to all projections, and Woods & Poole projections in particular, is that the future is never known with any certainty. The model on which the projections are based may not accurately reflect future events. In addition, there is always the possibility of an unanticipated shock to the economy, or of some other event that was not foreseen based on an analysis of historical data. For instance, a local government may enact a new industrial policy that has an unexpected, beneficial effect on employment growth. Or an abrupt economic change, although anticipated, may occur with much greater intensity or in a shorter time period than expected. For example, the projection may assume an increase in the price of a commodity, such as oil, over a five-year period, but an embargo may raise the price to that level in only one year. In addition, the projections may not be accurate because historical data is revised; or because the projection model does not accurately reflect demographic or economic phenomena; or because the projections contain errors; or because the smooth growth path of the long-term projections inaccurately reflects important variance in economic or demographic growth for particular regions; or because assumptions about national or regional growth, upon which the projections are based, turn out to be incorrect. There are many other types of economic and demographic events that could create outcomes far different from Woods & Poole’s projections.

Another limitation results from doing forecasts for small geographic areas for small data series. Statistically, models are more reliable the larger the area and/or the series being studied. Small area forecasts, such as county population for men of “Other” races aged 85 and over, are subject to more error because of the small sample size. This error can be reduced, although never eliminated, by constraining the small area forecasts to the forecast totals for a larger area or series; this is the method used by Woods & Poole.

Introduction

The Woods & Poole Economics, Inc. database contains more than 900 economic and demographic variables for every county in the United States for every year from 1970 to 2030. This comprehensive database includes detailed population data by age, sex, and race; employment and earnings by major industry; personal income by source of income; retail sales by kind of business; and data on the number of households, their size, and their income. All of these variables are projected for each year through 2030. In total, there are over 180 million statistics in the regional database. The regional model that produces the projection component of this database was developed by Woods & Poole. The regional projection methods are revised somewhat year to year to reflect new computational techniques and new sources of regional economic and demographic information. Each year, a new projection is produced based on an updated historical database and revised assumptions.

The fact that the proprietary Woods & Poole economic and demographic projections rely on a very detailed database, makes them one of the most comprehensive county-level projections available. A description of some characteristics of the database and projection model is contained in this chapter.

Overview of the Projection Methods

The strength of Woods & Poole's economic and demographic projections stems from the comprehensive historical county database and the integrated nature of the projection model. The

projection for each county in the United States is done simultaneously so that changes in one county will affect growth or decline in other counties. For example, growth in employment and population in Houston will affect growth in other metropolitan areas, such as Cleveland. This reflects the flow of economic activity around the country as new industries emerge or relocate in growing areas and as people migrate, in part because of job opportunities. The county projections are developed within the framework of the United States projection made by Woods & Poole. The U.S. projection is the control total for the 2006 regional projections and is described in the "Overview of the 2006 Projections" chapter included in Woods & Poole publications.

The regional projection technique used by Woods & Poole - linking the counties together to capture regional flows and constraining the results to a previously determined United States total - avoids a common pitfall in regional projections. Regional projections are sometimes made for a city or county without regard for potential growth in surrounding areas or other areas in the country. Such projections may be simple extrapolations of recent historical trends and, as a result, may be too optimistic or pessimistic. If these county projections were added together, the total might differ considerably from any conceivable national forecast scenario; this is the result of each regional projection being generated independently without interactive procedures and without being integrated into a consistent national projection.

The methods used by Woods & Poole to generate the county projections proceed in four stages. First, forecasts to 2030 of total United States personal income, earnings by industry, employment by industry, population, inflation, and other variables are made. Second, the country is divided into 172 Economic Areas (EAs) as defined by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). The EAs are aggregates of contiguous counties that attempt to measure cohesive economic regions in the United States (a list of all EAs and their component counties can be found in Appendix 6 following this chapter); in the 2006 Woods & Poole model, EA definitions released by the BEA in May 2003 are used. For each EA, a projection is made for employment, using an "export-base" approach; in some cases, the employment projections are adjusted to reflect the results of individual EA models or exogenous information about the EA economy. The employment projection for each EA is then used to estimate earnings in each EA. The employment and earnings projections then become the principal explanatory variables used to estimate population and number of households in each EA.

The third stage is to project population by age, sex, and race for each EA on the basis of net migration rates projected from employment opportunities. For stages two and three, the U.S. projection is the control total for the EA projections. The fourth stage replicates stages two and three except that it is performed at the county level, using the EAs as the control total for the county projections.

The "Export-Base" Approach

The specific economic projection technique used by Woods & Poole to generate the employment, earnings, and income estimates for each county in the United States generally follow a standard economic "export-base" approach. This relatively simple approach to regional employment projections is one that has been used by a number of researchers (see [5] and [9]). Although this approach has been criticized by several empirical studies (e.g., [8]), given the availability of regional data it remains one of the most feasible methodologies.

Certain industrial sectors at the regional level are considered "basic." This means that these sec-

tors produce output that is not consumed locally but is "exported" out of the region for national or international consumption. This assumption allows these sectors to be linked closely to the national economy, and hence follow national trends in productivity and output growth. Normally, the "basic" sectors are mining, agriculture, manufacturing, and the Federal government. In contrast, "non-basic" sectors are those such as retail trade, transportation, communication, and construction, the output of which is usually consumed locally. The growth of the "non-basic" sectors depends largely on the growth of the "basic" sectors that form the basis of the region's economy.

Intuitively, this approach has great appeal and there are numerous examples that seem to support the "export-base" theory. Automobile production in Detroit, for instance, is obviously much more sensitive to national and international price and demand for transportation equipment than to local demand. In Texas, oil and natural gas exploration and production are tied closely to the worldwide demand and supply of petroleum resources and not tied primarily to energy consumption in Texas.

Although the theory is appealing, some shortcomings do exist in the "export-base" approach. For example, some "basic" commodities produced locally are consumed locally. Producers of durable equipment used in other manufacturing processes are often affected not by the national demand for their product but by the regional demand. Machine tool makers that supply the local automobile industry in Detroit will prosper to the extent Detroit's automobile producers prosper. In Houston, the strength of the local oil industry will affect the demand and production of equipment for oil and natural gas production and exploration. In both of these instances, some durable manufacturing industries exist to serve local, not national, markets.

However, despite the shortcomings, the availability of relatively clean data for sub-national geographic areas makes the "export-base" approach very useful. The analytical framework for projections using the "export-base" approach entails estimating either demand equations or calculating historical growth rate differentials for output by sector. The principal explanatory variable, or the comparative data series for growth rate differentials, is the national demand for the output of that sector. Employment-by-sector data are often used as a surrogate variable since county output-by-sector data are not available; employment-by-sector data is used by Woods & Poole. Earnings projections are then obtained by using earnings-per-employee data either estimated as part of the model or imposed exogenously on the system. The complementary relationship could also be estimated, i.e., using an earnings forecast to derive employment based on earnings-per-employee data; this procedure has been used previously in some Woods & Poole regional models.

The Demographic Model

The demographic portion of the regional model follows a traditional cohort-component analysis based on calculated fertility and mortality in each county or EA. The "demand" for total population is estimated from the economic model: if the demand for labor is forecast to rise for a particular county or EA, then either the labor force participation rate will rise or population immigration will be positive. The inverse is true for counties and EAs with projected declines in employment. Therefore, future EA and county migration patterns for population by age, sex, and race are based on employment opportunities. Individuals and families are assumed to migrate, at least in part, in response to employment opportunities (see [1], [4], and [6]) with two exceptions: for population aged 65 and over and for college or military-aged population, migra-

tion patterns over the forecast period are based on historical net migration and not economic conditions. The integration of economic and demographic regional analysis is a significant strength of the Woods & Poole approach.

The age, sex, and race distribution of the population is projected by aging the population by single year of age by sex and by race for each year through 2030 based on county or EA specific mortality, fertility, and migration rates estimated from historical data. In the Woods & Poole model, projected net mortality and migration are estimated based on the historical net change in population by age, race, and sex for a particular county or EA. Similarly, projected net births and migration of age zero population by race are estimated based on the historical

change in age zero population by race per female population age 15 to 44 by race for a particular county or EA.

The United States population by age, sex, and race projections, 2006-2030, are based on Bureau of the Census population estimates for 2000 through 2005. Woods & Poole forecasts these U.S. estimates with a cohort-component model based on the year to year change in U.S. population by single year of age, race, and sex. Forecast fertility, mortality, and international migration are estimated from the Census population estimates and are applied exogenously to the Woods & Poole U.S. projections. Woods & Poole produces only a "middle" U.S. population forecast - this forecast is similar to the Census "middle" forecast scenario for the U.S. population. The U.S. population by age, sex, and race forecast is the control total for the EA projections. Each EA projection serves as the control totals for the county projections.

Population and Households

Population is defined as July 1 residential population and includes: civilian population; military population except personnel stationed overseas; college residents; institutional populations, such as prison inmates and residents of mental institutions, nursing homes, and hospitals; and estimates of undocumented aliens. Excluded are persons residing in Puerto Rico, U.S. territories and possessions, and U.S. citizens living abroad.

Households are defined as occupied housing units. A housing unit is a house, an apartment, a group of rooms, or a single room occupied as separate living quarters. The occupants of a housing unit may be a single family, one person living alone, two or more families living together, or any group of related or unrelated persons who share living quarters. All people are part of a household except those who reside in group quarters. Group quarters include living arrangements such as prisons, homes for the aged, rooming houses, college dormitories, and military barracks. The average size of households is defined as total population less group quarters population divided by the number of households. Mean household income is defined as total personal income less estimated income of group quarters population divided by the number of households.

Employment

The employment data in the Woods & Poole database are a complete measure of the number of full- and part-time jobs by place of work. Historical data, 1969-2003, are from the U.S. Department of Commerce, Bureau of Economic Analysis. The employment data include wage and

salary workers, proprietors, private household employees, and miscellaneous workers. Wage and salary employment data are based on an establishment survey in which employers are asked the number of full- and part-time workers at a given establishment. Because part-time workers are included, a person holding two part-time jobs would be counted twice. Also, since the wage and salary employment data are based on an establishment survey, jobs are counted by place of work and not place of residence of the worker; thus, a job in the New York Metropolitan Area is counted in the New York Metropolitan Area regardless of where the worker lives.

Data on proprietors include farm and non-farm proprietors by sector. Proprietors include not only those people who devote the majority of their time to their proprietorship, but people who devote any time at all to a proprietorship. Thus, a person who has a full-time wage and salary job and on nights and weekends runs a small business legally defined as a proprietorship would be counted twice. The employment data therefore include full- and part-time proprietors.

Private household employment data include persons employed by a household on the premises, such as full-time baby-sitters, housekeepers, gardeners, and butlers. Miscellaneous employment data include judges and all elected officials, persons working only on commission in sectors such as real estate and insurance, students employed by the colleges or universities in which they are enrolled, and unincorporated subcontractors in sectors such as construction.

The employment data used by Woods & Poole comprise the most complete definition of the number of jobs by county. Woods & Poole data may be higher than that from other sources because they measure more kinds of employment.

There are three other commonly used government sources for employment data: the Bureau of Labor Statistics (BLS), the Bureau of the Census, and the National Income and Product Accounts (NIPA). These sources of employment data differ from the data used by Woods & Poole. The BLS establishment data are generally much lower than the Woods & Poole data because agricultural workers, the military, proprietors, households, and miscellaneous employment are not included; the exclusion of proprietors from the BLS data is the most significant difference. Data from the Census (and some survey data from the BLS) are based on employment by place of residence and differ fundamentally in concept from the Woods & Poole employment data by place of work; Census employment data are generally lower than Woods & Poole data, but not always. Since Census data are based on a household survey, persons holding two jobs would be counted only once, and, therefore, the data would be lower than Woods & Poole. However, Census survey data for counties that have a large number of commuters and relatively few jobs within the county could yield employment data higher than Woods & Poole. Employment data in the National Income and Product Accounts are close to Woods & Poole data, except that part-time proprietors and certain miscellaneous employees are excluded; therefore, these data are usually lower.

Employment by Sector

The employment data is by one-digit SIC industry. The one-digit industries are defined in the 1987 Standard Industrial Classification Manual. The employment data in the Woods & Poole 2006 database is not based on the 1997 North American Industry Classification System (NAICS) definitions. For the years 2001-2003 only the BEA provided employment industry data by NAICS rather than by SIC; Woods & Poole has estimated the SIC industry data for 2001-2003 from the BEA NAICS 2001-2003 employment industry data and the SIC employ-

ment industry data for the years 1969-2000.

As a rule, employment is classified in a given industry depending on the primary activity of the establishment. For example, employees of a large oil company are classified in many different sectors depending on the specific establishment in which they worked, even though the company as a whole would be considered a mining company: employees at a refinery are in manufacturing; employees at the company headquarters are in services; pipeline operators are in transportation; and oil field workers are in mining. If a given establishment is engaged in activities in different sectors, all employees are classified according to the primary activity of the establishment regardless of their actual occupations; thus, a secretary for a trucking company is a transportation worker and an accountant at a small plumbing company is a construction worker. The main exception to this rule is the classification of government workers in the Woods & Poole database: all government employees are classified in Federal civilian, Federal military, or state and local government employment, regardless of the usual classification of the establishment in which they work. Definitions for each sector, based on SIC industries, in the Woods & Poole database are as follows:

Farming includes all establishments such as farms, orchards, greenhouses, and nurseries primarily engaged in the production of crops, plants, vines, trees (excluding forestry operations), and specialties such as sod, bulbs, and flower seed. It also includes all establishments such as ranches, dairies, feedlots, egg production facilities, and poultry hatcheries primarily engaged in the keeping, grazing, or feeding of cattle, hogs, sheep, goats, poultry of all kinds, and special animals such as horses, bees, pets, and fish in captivity.

Agricultural services, forestry, fisheries, and other includes establishments primarily engaged in performing soil preparation, crop services, veterinary services, farm labor and management, and horticultural services. Forestry includes establishments engaged in the operation of timber tracts, tree farms, forest nurseries, and related activities such as reforestation. Fisheries include commercial fishing (including shellfish) and commercial hunting and trapping. Other includes the jobs of U.S. residents working for international organizations, foreign embassies, and consulates in the U.S.

Mining includes establishments primarily engaged in the extraction, exploration, and development of coal, oil, natural gas, metallic minerals (such as iron and copper), and nonmetallic minerals (such as stone and sand). Mining does not include refining, crushing, or otherwise preparing mining products; this activity is classified as manufacturing.

Construction includes establishments engaged in building new structures and roads, alterations, additions, reconstruction, installations, and repairs. It includes general contractors engaged in building residential and nonresidential structures; contractors engaged in heavy construction, such as bridges, roads, tunnels, and pipelines; and special trade contracting, such as plumbing, electrical work, masonry, and carpentry. Employment is counted at the fixed place of business where establishment-type records are maintained and not at the job site. Establishments engaged in managing construction projects are classified under services. Establishments engaged in the selling and installation of construction materials are generally classified under trade, except for materials such as installed elevators and sprinkler systems. The installation of prefabricated building materials is included in construction.

Manufacturing includes establishments engaged in the mechanical or chemical transformation

of materials or substances into new products. Included in manufacturing are establishments engaged in assembling component parts not associated with structures and those engaged in blending materials, such as lubricating oils or liquor. Broadly defined, manufacturing industries include the following: food processing, such as canning, baking, meat processing, and beverages; tobacco products; textile mill products, such as fabric, carpets and rugs; apparel; wood products, including logging, sawmills, prefabricated homes, and mobile homes; furniture; paper; printing and publishing; chemicals, such as plastics, paints, and drugs; petroleum refining; rubber and plastics; leather products; stone, clay, and glass; primary metals, such as steel, copper, aluminum, and including finished products such as wire, beams, and pipe; fabricated metals, such as cans, sheet metal, cutlery, and ordnance; industrial machinery, including computers, office equipment, and engines; electronics and electrical equipment; transportation equipment, such as cars, trucks, ships, and airplanes; instruments; and miscellaneous industries, such as jewelry, musical instruments, and toys.

Transportation, communications, and public utilities includes establishments providing, to the general public or to other business enterprises, passenger and freight transportation, communications services, electricity, gas, steam, water, or sanitation services, and the Postal Service. Transportation includes railroads, highway passenger transportation, trucking and warehousing, shipping, air transportation, pipelines, and transportation services such as travel agencies and tours. Communications includes point-to-point telephone and telegraph services, radio, television, and cable broadcasting. Sanitary services includes water supply and trash removal.

Wholesale trade includes establishments primarily engaged in selling merchandise to retailers; or to industrial, commercial, institutional, farm, construction contractors; or to professional business users; or to other wholesalers or brokers. The merchandise sold by wholesalers includes all goods used by institutions, such as schools and hospitals, as well as virtually all goods sold at the retail level. The three main types of wholesalers are merchant wholesalers who purchase goods from manufacturers or other wholesalers and sell them; sales branches of manufacturing, mining, or farm companies engaged in marketing the products of the company to retail establishments; and agents, merchandise or commodity brokers, and commission merchants.

Retail trade includes establishments engaged in selling merchandise for personal or household consumption and rendering services incidental to the sale of goods. Buying goods for resale to the consumer is a characteristic of retail trade establishments that distinguishes them from agricultural and extractive industries: farmers who sell only their own produce at or from the point of production are not classified as retailers. Retail establishments include hardware stores, garden supply stores, and mobile home dealers; department stores; food stores, including supermarkets, convenience stores, butchers, bakeries, and fruit stands; automobile dealers; gasoline service stations; apparel and accessory stores; furniture and home furnishing stores, including electronics and home appliances; eating and drinking places, including restaurants, bars, and take-out stands; and miscellaneous establishments, including drug stores, liquor stores, thrift shops, bookstores, florists, mail-order houses, and pet stores.

Finance, insurance, and real estate includes the following establishments: depository institutions, such as commercial banks, savings and loans, and foreign banks; credit institutions; holding companies not engaged in operation; investment companies; brokers and dealers in securities and commodity contracts; security and commodity exchanges; carriers of all types of insurance; insurance agents and insurance brokers; real estate operators including operators of non-residential facilities, apartments, other residential properties, mobile home parks, and railroad properties; real estate agents and managers; title offices; and developers not engaged in con-

struction.

Services includes establishments primarily engaged in providing services for individuals, businesses, governments, and other organizations. Service industries include the following: hotels and other lodging places; personal services, such as laundries, dry cleaners, barber shops, shoe repair, and funeral homes; business services, such as advertising, employment agencies, office equipment repair, computer and data processing, credit reporting and collecting; automobile repair and automobile services, including car washes and car rental; motion pictures, including video rentals; entertainment, including theaters, casinos, amusement parks, and professional sports; health services, such as hospitals, clinics, nursing homes, and dentists; legal services; education services, such as private elementary and secondary schools, colleges, junior colleges, universities, and vocational schools; social services provided in privately owned establishments; private museums and zoos; membership organizations, including churches, labor unions, professional membership organizations, and political organizations; professional services, such as engineering, architecture, accounting, research services, and public relations; and private household employment, such as full-time baby-sitters, housekeepers, and butlers employed by a household on the premises.

Federal civilian includes all Federal government workers regardless of their establishment classification. Federal civilian employment includes executive offices and legislative bodies; courts; public order and safety; correctional institutions; taxation; administration and delivery of human resource programs, such as health, education, and public assistance services; housing and urban development programs; environmental programs; regulators, including air traffic controllers and public service commissions; and other Federal government agencies.

Federal military includes Air Force, Army, Marine Corps, National Guard, and Navy. In the Woods & Poole database, only personnel stationed in Alaska, Hawaii, and the continental U.S. are counted in employment and earnings. Civilians working on a military base are classified in the sector appropriate to their occupation.

State and local government is defined the same as Federal civilian except that the activities are run by state and local governments. At the local level, this includes all public schools as well as police and fire departments; at the state level, it includes all public junior colleges, colleges, and universities.

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2030, or 2006 to 2030 for population).

One key limitation to all projections, and Woods & Poole projections in particular, is that the future is never known with any certainty. The model on which the projections are based may not accurately reflect future events. In addition, there is always the possibility of an unanticipated shock to the economy, or of some other event that was not foreseen based on an analysis of historical data. For instance, a local government may enact a new industrial policy that has an unexpected, beneficial effect on employment growth. Or an abrupt economic change, although anticipated, may occur with much greater intensity or in a shorter time period than expected. For example, the projection may assume an increase in the price of a commodity, such as oil, over a five-year period, but an embargo may raise the price to that level in only one year. In addition, the projections may not be accurate because historical data is revised; or because the projection model does not accurately reflect demographic or economic phenomena; or because the projections contain errors; or because the smooth growth path of the long-term projections inaccurately reflects important variance in economic or demographic growth for particular regions; or because assumptions about national or regional growth, upon which the projections are based, turn out to be incorrect. There are many other types of economic and demographic events that could create outcomes far different from Woods & Poole's projections.

Another limitation results from doing forecasts for small geographic areas for small data series. Statistically, models are more reliable the larger the area and/or the series being studied. Small area forecasts, such as county population for White men age 84, are subject to more error because of the small sample size. This error can be reduced, although never eliminated, by constraining the small area forecasts to the forecast totals for a larger area or series; this is the method used by Woods & Poole.

