GIS-Based Real Estate Market Analysis

by

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A Masters Project submitted to the faculty
of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements
for the degree of Master of Regional Planning
in the Department of City and Regional Planning.

Chapel Hill, NC

2005

Approved by:

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ABSTRACT
This paper presents a Geographic Information System (GIS) based Real Estate Market Analysis. It uses an Aggregated Floating Trade Area (AFTA) method to compile data relative to a particular subject property. This method is an expansion upon the GIS based Floating Catchment Area method which has been successfully applied to situations outside of the real estate field. Data for the AFTA method is compiled from various sources and aggregation levels, including such data as census tracts, local tax parcel information, road networks, and zip code business patterns. This data is then aggregated to a spatially defined trade area by a spatially based weighted average, in order to provide more effective data and results for the market analysis. This paper provides a basis from which individual users can apply GIS to their particular real estate market analysis needs.

INTRODUCTION

From the time when Geographic Information Systems' (GIS) logic was originally laid out in *Design with Nature*, it has been a beneficial tool to apply spatial information to any data analysis (McHarg 1969). Real Estate as an industry has been traditionally characterized by one phase; Location, Location, Location. Remarkably though, dynamic spatial information remains largely absent from real estate market analysis.

Real Estate Market Analysis is an essential analysis as a new development proposal is being evaluated. Traditionally market analysis has been an after thought, as developers pick a site and product type based on their gut instinct. Market analysis has the potential to be much more important to the development process though. Using an Aggregated Floating Trade Area (AFTA) a developer specializing in a particular product type can evaluate the data available for many different sites and their associated markets. This is oppose to data now available broken down by somewhat arbitrarily defined local sub-markets available through local market research firms.

Demographic data, existing market conditions, etc. are all data to be included in the analysis. Literature review on related topics supports this method and provides many useful insights for the final product. To help comprehension of the concepts presented, data will be applied to an illustrative, running example through the paper. The scope of this research attempts to show the conceptual implementation of GIS in real estate market analysis. It seeks to take the existing market research model and integrate GIS technology into the process, improving the ease, effectiveness, and efficiency of market analysis. The methods used will show the great opportunity to use GIS to improve market analysis in each of the three main steps of the process. Trade Area Delineation is improved through the use of the network analysis extension. While Supply and Demand Analysis are improved by the introduction of spatial data through the AFTA method. This yields an end product far superior to the traditional product.

LITERATURE REVIEW

The AFTA method is an expansion upon the Floating Catchment method described in detail in *Using a GIS-based Floating Catchment Method to Assess Areas with Shortage of Physicians* (Luo 2004). The Floating Catchment Area Method (FCA) defines a catchment area for each tract, this is comparable to a trade area in real estate. The catchment area is calculated as a circle centered at the centroid for each census tract. Any physician that falls within this catchment area is considered to provide service to the tract. While the logic is quite beneficial to build off of, the precise implementation of FCA is unsatisfactory for real estate market analysis. While there is similar logic between FCA and real estate market analysis, they approach the process inversely. FCA seeks to find how many points fall with in a certain distance of polygon. While real estate tries to find what kind of polygons fall within a certain distance of a point. The second issue is that even if inversed, the FCA model yields results equivalent to the traditional market analysis. That is, an agglomeration of data from census tracts close to the subject of analysis. In addition When incorporating polygons into a data analysis, some polygons contribute to the demographics of the trade area more substantially than others. It is important to take into consideration these differences. It is also worth mentioning that catchment areas are typically not uniform in shape, transportation corridors and natural barriers have significant impacts on its shape.

One of the most extensive works on the subject is *Business Geography and New Real Estate Market Analysis* (Business 2002). Unfortunately this writing provides little innovative methods for integrating GIS into Real Estate Market Analysis. It does address the need to identify a trade area as well as supply and demand within the trade. However the implementation of GIS in the process involves little more than data mining of local data in order to gather data for an otherwise traditional market analysis.

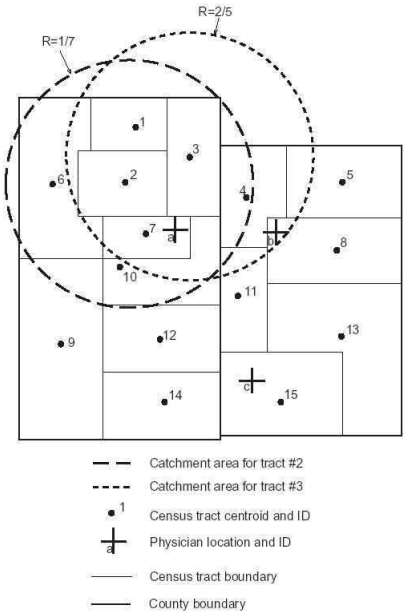

FIGURE 1: Diagram of FCA, points are selected based on the tract centroid, while useful, the method is expanded for polygons (Luo 2004)

This paper will take form as a derivative of the market analysis process presented in *Real Estate Market Analysis: A Case Study Approach* (Brett and Schmitz 2001). This book is one of the most comprehensive and concise works on the subject. While it does not approach the use of GIS, it does thoroughly explain the traditional market analysis for all product types. Most importantly, it provides examples of a market analysis for each product type, making it easy to identify where GIS could augment the process.

DATA

The example in this document uses data from Mecklenburg County, NC, in which the City of Charlotte is located. The example was done in conjunction with a separate project using the traditional market analysis method. The Data used in this method was intended to meet the following three criteria:

- Readily Available
- Spatially Aggregated to a Small Area
- Available at Regular Time Intervals

Data used in this analysis is relatively easy to acquire for those parties in the real estate industry. Data sources include, Local Government for road network and tax parcel data, census tract information from the Geolytics Neighborhood Change CD, Zip Code Business Patterns, and local employment data, available from different sources for different metropolitan areas.

With the increasing prevalence of GIS data in the planning profession, spatial data has become increasingly easy to obtain at the local level. Most counties with a significant population now have GIS data compiled for their jurisdiction. This data can usually be acquired from the county planning office by the private sector for a nominal fee. This data is usually relatively current, though it is not uncommon for it to have small errors.

Census data is available from many sources including the U.S. Census Bureau. Census data is available at ten year intervals, and includes a plethora of accurate information. The data is available at the census tract level, providing more detailed data than any at the city or county level. The Geolytics Neighborhood Change CD compiles all census data from 1970 to 2000 and normalizes the data to 2000. It also contains a function to associate selected data to spatial information, making it by far the easiest means to acquire census data. The CD is held by many local libraries and can also be purchased online for private use, at a nominal fee.

Zip Code data had to be created from database files and spatial data. The data is collected from either the internet at http://censtats.census.gov/cbpnaic/cbpnaic.shtml or the Zip Code Business Patterns CDs available for each year. The data usually has a two to three year lag from the current time, but is quite comprehensive. Data at the zip code level also provides much more detailed data than anything at either the city or county level. Data on the website is typically available before the CD. The data is compiled with spatial data to create usable shapefiles.

METHODOLOGY

A market analysis includes three major steps; defining the trade area, estimating demand, and estimating supply. Defining a trade area seeks to delineate what spatial area the analysis will evaluate. Estimating demand seeks to evaluate prospective consumers in that trade area, including who they are, their income and preferences. Finally, estimating supply seeks to determine what competitive products are in the market, or will be entering soon, their rents, vacancies, amenities, and other performance measures.

STEP 1: DEFINING THE TRADE AREA

One of the first steps towards creating a market analysis is defining a trade area. The data necessary for this step is tax parcel and road network data for the area near a proposed site. Extensions necessary include the Network Analyst and Xtools extensions. For this paper, travel distance will be used to determine the trade area based on the data available for Mecklenburg County (Appendix T1). A trade area defined by appropriate travel times would also provide a useful trade area for the market analysis.

Start by selecting the proposed site in the tax parcel shapefile and export it as a shapefile. Then use the "Convert Shapes to Centroids" tool in the Xtools extension. This will result in a new point shapefile, this point will represent the site for trade area delineation.

The Network Analysis Extension[1] and local road network data will be needed to define trade areas for the selected site. After adding the Network Analysis Extension, use the pull down menu to "Find Service Area" at a desired distance. For Mecklenburg County, trade areas are defined at the 1, 3, 5, and 10 mile distance. Similarly sized areas defined by the traditional straight line radii method are shown in Appendix T2 as a comparison. For simplicity's sake, only the 1 mile radius will be carried through as an example in this paper.

FIGURE 2: Convert Shapes to Centroids Dialog Box

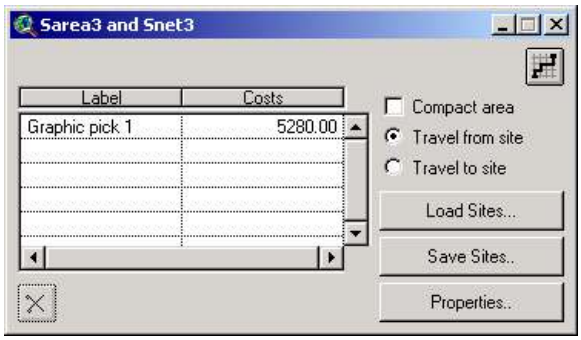

FIGURE 3: Find Service Area Dialog Box; once the site is loaded enter "costs", trade area distance, in this case 5,280 feet or one mile

This process will create a polygon of the trade area as well as a clipped area of the road network within the trade area, save

[1] It is important to note that the Network Analysis Extension with the polygon creation feature is currently available only in the version for ArcView 3.x. The Network Analysis Extension for both ArcMap 8.x and 9.x do not currently have this feature.

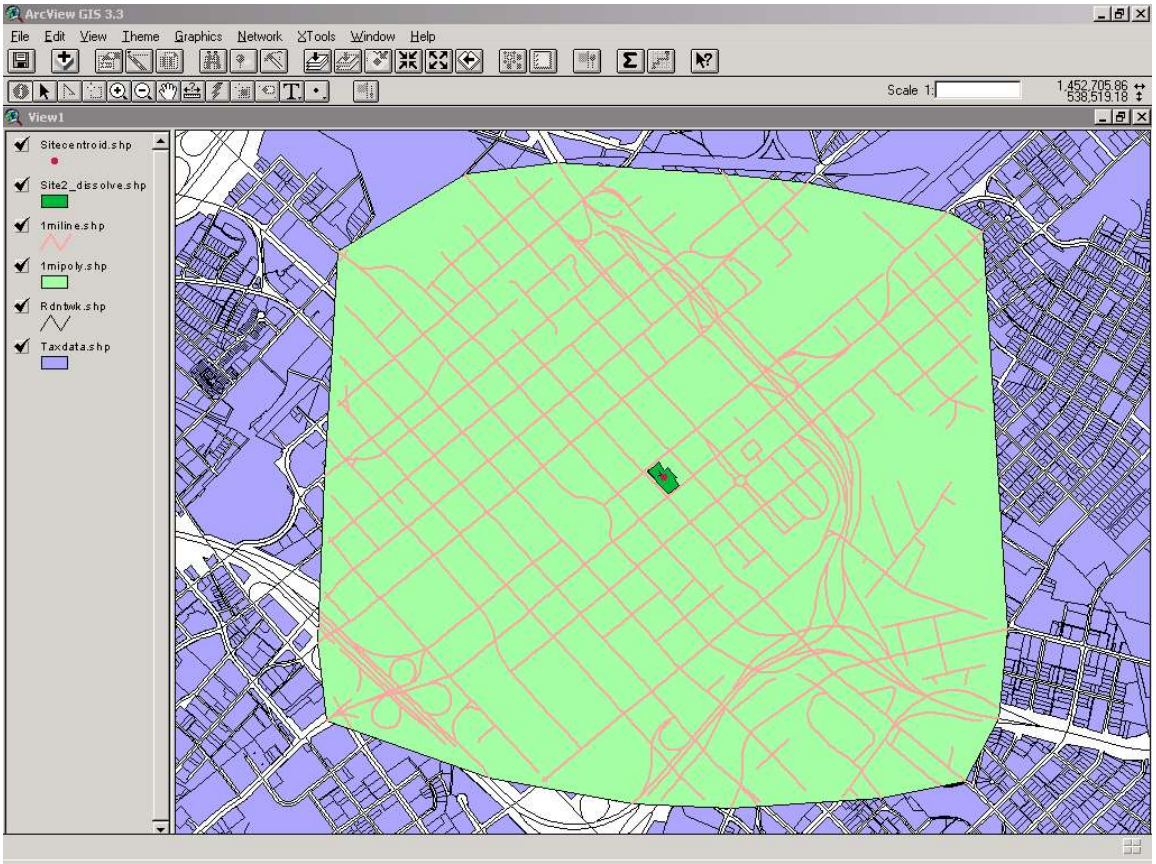

Figure 4: Result of Trade Area Definition

these shapefiles. This is the area in which further the market analysis will be preformed. One of the benefits of GIS based market research is that once the data has been gathered for a greater market, market analyses for varied size trade areas, or varied product locations can be preformed with significant improvements in ease and speed. This could become an extension to a product sensitivity analysis.

Defining trade areas in this way will also have a much larger impact in suburban areas or locales with natural barriers. These areas have road networks that are less contiguous and trade areas may be more irregularly shaped, see Appendix T3 for a one mile trade area for a site in Mecklenburg County between a large water body and freeway right of way, Mountain Island Lake and Future I-485 respectively.

STEP 2: ESTIMATING DEMAND

After establishing a trade area for the proposed development, demand for the proposed product should be calculated for the area. The first step in doing this is identifying the target market. This can be determined and then further refined as the process moves along. The example project in uptown Charlotte is proposed to be a high rise apartment building with views of the city as well as green building techniques. The expected target market is young professionals and couples between the ages of 20 and 39; likely without children; and potentially interested in purchasing a home in a more suburban area sometime in the future. When identifying a target group for a development, it is important to determine what qualities they determine desirable, focus groups can assist in the determination of these preferences (Mason 2005). Data used in the demand analysis was collected from the U.S. Census bureau through the Geolytics Neighborhood Change CD, Zip Code Business Patterns and NPA Data Services, Inc. NPA Data Services, Inc. is national data research firm focusing on real estate, and provides comprehensive historic and forecast data on population, income and employment (NPA 2005).

One of the first steps in estimating demand is estimating future population. The data best spatially aggregated to the smallest area is census data associated with tracts. This census data can most effectively be used to forecast population data by the Cohort-Component Method explained thoroughly in many papers, including the U.S. Census Bureau's Population Division Working Paper No. 38, *Methodology and Assumptions for the Population Projections of the United States: 1999 to 2100*. The method is explained in the simplest means by the equation:

$$P_t = P_{t-1} + B_{t-1,t} - D_{t-1,t} + M_{t-1,t}$$

Whereas:

P_t = population at time t;
P_{t-1} = population at time t-1;
$B_{t-1,t}$ = births, in the interval from time t-1 to time t;
$D_{t-1,t}$ = deaths, in the interval from time t-1 to time t;
$M_{t-1,t}$ = net migration, in the interval from time t-1 to time t.
Source U.S. Census Bureau

This method has been used extensively in the past for forecasting population, usually with a ten-year cohort interval. Using GIS to apply this method to the trade area will provide more targeted data than has been available in the past. Weighted averages will be used for those tracts both wholly and partially contained within the trade area. The weighted average will be applied based on percentage of the tract area within the trade area. This will yield results that include not only how a population is growing as a whole in a area, but also which cohorts are growing, shrinking, or more significant to the population.

For the proposed project in downtown Charlotte, the Cohort-Component will be applied. First census data must be collected for tracts in Mecklenburg County, this includes population data for every male and female cohort from 0-4 to 75+ years, from 1970 to 2000. While there are many sources of this data the most user friendly and concise means in which to acquire this data is through the Geolytics Neighborhood Change CD for 1970-2000. Once this data is selected from the CD it can be exported to a shapefile with all proper spatial and attribute information associated with the file.

Once the tract data has been gathered, it should be loaded with the trade area polygon shapefile and those tracts falling either completely or partially in the trade area should be selected by the "Select by theme..." function and exported to a new shapefile (Appendix D1). All population data for the trade area is contained in the attribute table for this shapefile.

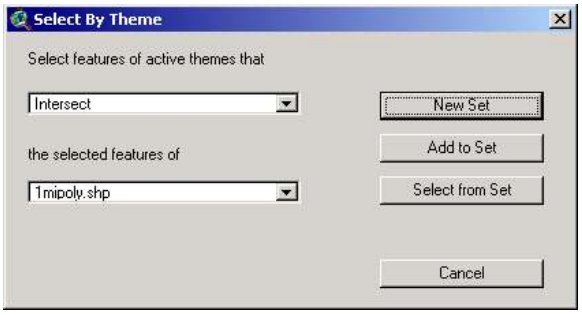

FIGURE 5: Select by Theme dialog box; when using this tool ensure that the tract layer is the current layer

At this point it may prove easier to work with the data in a spreadsheet program for the Cohort-Component method. This can be done by copying the information from the dbf file associated with the shapefile to a new spreadsheet. Once in the spreadsheet, the data can be formatted into a logical form for manipulation (Appendex D2). The projection of population for the trade area involves computation of the average change in population for each cohort in each tract. A weight is then assigned to each tract based on what percentage of its area lies within the trade area. This will yield a population projection for the trade area broken down by age and sex, with relevant population shift information for each respective cohort. The projection for the Charlotte project can be seen in Table 1. For this development there are some interesting demographics to note. Overall the population is decreasing and expected to continue to do so. However this is primarily in due to declines in the older demographic. The younger population is expected to growth, for our target market particularly males from the age of 25 to 34. It might prove useful to use focus groups to target this group more effectively.

Table 1: Projections for Trade Area

	Females									Males									Total
Cohort	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	
Actual 1970	291	757	755	375	387	398	369	354	354	309	826	668	382	337	344	271	237	85	7498
Expected 1980	0	291	757	755	375	387	398	369	707	0	309	826	668	382	337	344	271	322	7498
Actual 1980	121	301	641	360	222	200	149	196	141	190	342	539	442	179	193	137	131	31	4518
▲	121	11	-116	-395	-153	-186	-249	-173	0	190	33	-287	-227	-203	-144	-206	-140	-290	-2413
Expected 1990	0	121	301	641	360	222	200	149	337	0	190	342	539	442	179	193	137	163	4518
Actual1990	186	318	494	421	236	201	173	155	169	217	336	336	473	284	147	125	96	77	4446
▲	186	197	193	-221	-124	-21	-27	6	-168	217	145	-7	-66	-157	-32	-68	-41	-86	-72
Expected 2000	0	186	318	494	421	236	201	173	324	0	217	336	336	473	284	147	125	173	4446
Actual 2000	87	216	292	416	236	176	151	130	91	141	215	413	804	542	287	154	48	45	4443
▲	87	30	-26	-79	-185	-60	-50	-43	-233	141	-2	77	468	69	3	7	-78	-128	-3
Expected 2010	0	87	216	292	416	236	176	151	221	0	141	215	413	804	542	287	154	93	4443
Projected 2010	131	167	234	111	262	180	105	85	109	183	199	143	471	706	483	198	92	8	3867
Projected ▲	131	79	18	-231	-154	-89	-109	-70	-134	183	58	-72	58	-97	-58	-89	-87	-169	-831
Expected 2020	0	131	167	234	111	262	180	105	194	0	183	199	143	471	706	483	198	100	3867
Projected 2020	135	233	229	158	61	206	169	101	93	180	251	199	297	409	677	433	153	32	4017
Projected ▲	135	102	62	-177	-154	-57	-63	-36	-178	180	67	-1	154	-62	-29	-50	-69	-127	-303

The next information to gather for the trade area is employment data. This data is also important as it will give a view of the employment opportunities for potential consumers of the product in the trade area. The method used will be similar in logic to the Cohort-Component method but will use employment sectors instead of population cohorts. The data used is collected from Zip Code Business Patterns as it is the smallest spatially aggregated data source. This data is applied to the trade area by the weighted average method in a similar manner as the population, and is aggregated by major NAICS code. The U.S. Census Bureau does have similar data available at the tract level, but it has a time disadvantage to Zip Code Business Pattern data as it is available every 10 years rather than annually.

The first step in evaluating employment in the trade area is determining what zip codes fall either wholly or partially within the trade area. A shapefile of zip codes for an area larger than the trade area should be obtained. For the proposed development a shapefile of zip codes in Mecklenburg County was obtained, though a state or country could work just as well. Load this shapefile with the trade area polygon shapefile, then use the "Select by theme..." function, as used in the population projection, to select those zip codes that fall in the trade area (Appendix D3).

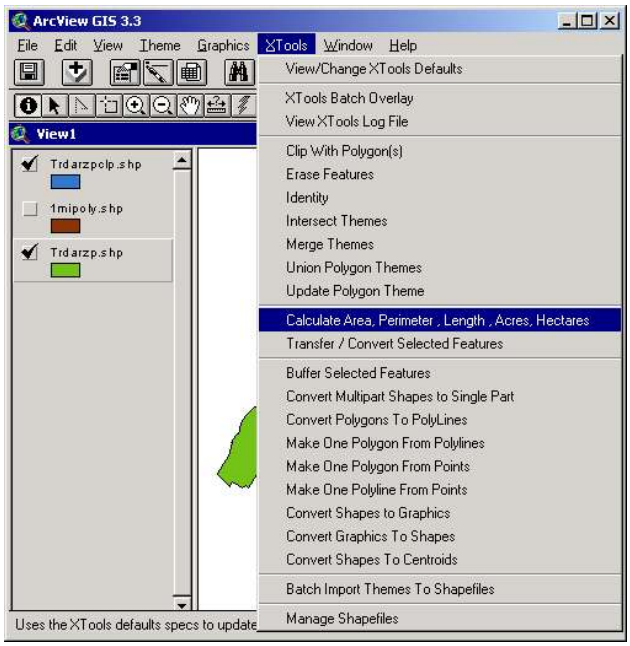

FIGURE 6: Xtools Pulldown menu; use this extension to calculate the area of polygons in a shapefile, automatically updates the attribute table

The Xtools extension can then be used to calculate to area of each zip code, using the "Calculate Area, Perimeter, Length, Acres, Hectares" function. The Geoprocessiong wizard should then be used to "Clip one theme based on another," in this case the zip code shapefile will be clipped based on trade area polygon shapefile. The Xtools extension can then be used again to calculate the area of these clipped polygons, thus yielding the area of the zip code within the trade area. The area of the

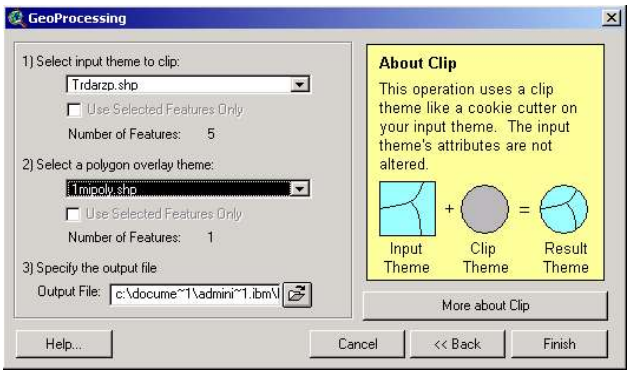

FIGURE 7: Geoprocessing Wizard; Clip function, use this extension to clip the zip code polygons based on the trade area

zip code within the trade area divided by the total area of the zip code will yield a weight for that zip code, similar to the weight for tracts used in the population projection. This weight will later be multiplied against employment projections to project statistics for the entire trade area.

The next step involves collecting the employment data from Zip Code Business Patterns, this data is available either from the Zip Code Business Patterns CD or the Zip Code Business Patterns website at http://censtats.census.gov/cbpnaic/cbpnaic.shtml. Unlike population data which is easily compiled and associated with spatial data, Zip Code Business Patterns data is returned in csv format, a generic spreadsheet format, one sheet for each zip code, each year. Because of this it may be easier to continue working with the zip code data in a spreadsheet program until needed to be associated with spatial data.

The annual data for each year should first be combined by zip code. With these statistics the change in employment for each sector in each zip code can be calculated (Appendix D4). The change in employment can then be used to forecast future changes in employment and thusly gross employment figures. The area based weights can then be applied to each statistic and summed from each zip code to yeild forecasts for the trade area. Please see Table 2 for the results from Mecklenburg County.

Once the number of employees for the trade area has been projected for both individual industries and total, it would be beneficial to know the projected average income of employees in those industries. County Business Patterns, available from the same census source, provides the best comparable data for this analysis. This is a simpler analysis as data from multiple areas will not be aggregated. A table should be compiled of all industries in the county and the average annual salary associated with each industry. The change in average salary for each industry from year to year should then be calculated. These changes in salary can be used to forecast future changes in salary, thusly average salary for each industry. Please see Table 3 for the results from Mecklenburg County.

Table 2: Employment Projections for the Trade Area

	1998	▲	1999	▲	2000	▲	2001	▲	2002	▲*	2003*	▲*	2004*	▲*	2005*	▲*	2006*	▲*	2007*
Forestry, Fishing	2	-1	1	0	1	2	3	-2	1	0	1	0	1	0	1	-1	-0	0	-0
Utilities	90	2	92	6	97	32	129	-24	105	4	109	4	113	4	117	-3	114	2	116
Construction	1,136	34	1,170	335	1,505	-47	1,458	101	1,559	106	1,665	124	1,789	71	1,860	101	1,961	101	2,062
Manufacturing	771	19	791	-199	592	-78	514	46	560	-53	507	-71	436	-39	397	-29	368	-48	320
Wholesale trade	449	53	502	-68	435	-34	401	-74	326	-31	295	-52	243	-48	195	-51	144	-46	98
Retail trade	678	135	813	27	840	-128	711	-74	637	-10	627	-46	581	-65	516	-49	467	-43	424
Trans. And Warehouse	413	-16	397	-16	382	-4	378	-127	250	-41	209	-47	162	-55	107	-68	39	-53	-14
Information	2,018	119	2,137	303	2,440	324	2,764	327	3,091	268	3,359	306	3,665	306	3,971	302	4,273	296	4,569
Finance & insurance	3,892	-684	3,208	603	3,811	89	3,900	-32	3,868	-6	3,862	163	4,025	-24	4,001	0	4,001	0	4,001
Real Estate	1,187	-217	970	83	1,052	-106	946	218	1,163	-6	1,157	47	1,204	38	1,242	74	1,316	38	1,354
Professional Services	5,248	211	5,459	-267	5,192	89	5,281	35	5,316	17	5,333	-31	5,302	27	5,329	12	5,341	6	5,347
Mngmnt of Companies	1,684	-483	1,201	-165	1,036	127	1,163	146	1,310	-93	1,217	4	1,221	46	1,267	26	1,293	-4	1,289
Administrative Support	1,725	-272	1,454	271	1,724	847	2,571	-719	1,853	32	1,885	108	1,993	67	2,060	-128	1,932	20	1,952
Educational services	377	48	425	21	446	229	675	-276	399	5	404	-5	399	-12	387	-72	315	-21	294
Health Care	429	-17	412	87	499	28	526	98	624	49	673	65	738	60	798	68	866	61	927
Arts and Entertainment	2,121	28	2,150	54	2,203	168	2,371	-328	2,043	-20	2,023	-32	1,991	-53	1,938	-108	1,830	-53	1,777
Accommodations	1,802	244	2,046	80	2,126	-164	1,961	113	2,075	68	2,143	24	2,167	10	2,177	54	2,231	39	2,270
Other Services	1,279	-33	1,246	145	1,391	-20	1,371	-195	1,176	-26	1,150	-24	1,126	-66	1,060	-78	982	-49	933
Auxiliaries	456	-2	454	-94	360	30	391	-16	375	-20	355	-25	330	-8	322	-17	305	-18	287
Unclassified Estblhmnt	20	-14	6	5	11	-7	4	-0	4	-4	0	-2	1	-1	0	0	0	0	0
Total	25,778	-846	24,932	1,210	26,141	1,376	27,517	-783	26,734	239	26,973	510	27,486	258	27,744	33	27,777	228	28,005

Data Source: Zip Code Business Patterns

Table 3: Mecklenburg County Income Projections

	1998	▲	1999	▲	2000	▲	2001	▲	2002	▲*	2003*	▲*	2004*	▲*	2005*	▲*	2006*	▲*	2007*
Forestry, Fishing	-	-	51,794	-27,725	24,070	6,800	30,870	-	-	-10,462	20,408	-1,831	18,577	-6,147	12,430	-3,989	8,441	-5,068	3,373
Utilities	-	-	69,209	-19,043	50,167	7,350	57,517	-	-	-5,846	51,671	752	52,423	752	53,175	-1,447	51,728	19	51,747
Construction	37,524	-352	37,172	37,231	74,403	-1,417	72,986	-547	72,439	8,729	81,168	10,999	92,167	4,441	96,608	5,905	102,513	7,519	110,032
Manufacturing	36,735	586	37,321	3,357	40,677	-2,344	38,334	1,542	39,875	785	40,660	835	41,495	204	41,699	841	42,540	666	43,206
Wholesale trade	45,045	-626	44,419	-4,346	40,074	-2,069	38,005	1,236	39,241	-1,451	37,790	-1,657	36,133	-985	35,148	-714	34,434	-1,202	33,232
Retail trade	19,437	1,611	21,048	25,297	46,345	2,366	48,711	-1,521	47,190	6,938	54,128	8,270	62,398	4,013	66,411	4,425	70,836	5,912	76,748
Trans. And Warehouse	37,589	1,025	38,615	-16,505	22,110	937	23,047	-876	22,172	-3,854	18,318	-5,074	13,244	-2,217	11,027	-3,005	8,022	-3,538	4,484
Information	44,069	-441	43,628	-3,985	39,643	2,030	41,673	980	42,654	-354	42,300	-332	41,968	581	42,549	219	42,768	29	42,797
Finance & insurance	49,975	1,754	51,729	-6,932	44,797	7,197	51,994	-2,868	49,126	-212	48,914	-704	48,210	853	49,063	-733	48,330	-199	48,131
Real Estate	34,875	2,362	37,237	20,845	58,082	-2,309	55,773	534	56,306	5,358	61,664	6,107	67,771	2,422	70,193	3,605	73,798	4,373	78,171
Professional Services	50,584	-139	50,445	-12,438	38,007	1,117	39,124	1,531	40,655	-2,482	38,173	-3,068	35,105	-726	34,379	-1,186	33,193	-1,866	31,327
Mngmnt of Companies	56,840	7,008	63,848	-8,739	55,109	86	55,195	4,662	59,856	754	60,610	-809	59,801	1,173	60,974	1,445	62,419	641	63,060
Administrative Support	22,531	-1,232	21,299	43,353	64,652	1,824	66,476	-971	65,505	10,743	76,248	13,737	89,985	6,333	96,318	7,460	103,778	9,568	113,346
Educational services	-	-	21,911	4,706	26,617	-1,182	25,435	1,160	26,595	1,561	28,156	1,561	29,717	775	30,492	1,264	31,756	1,290	33,046
Health Care	32,507	-1,375	31,133	-8,298	22,835	-2,485	20,350	943	21,293	-2,804	18,489	-3,161	15,328	-1,877	13,451	-1,725	11,726	-2,392	9,334
Arts and Entertainment	30,174	4,792	34,966	-1,570	33,395	632	34,028	2,713	36,741	1,642	38,383	854	39,237	1,460	40,697	1,667	42,364	1,406	43,770
Accommodations	11,899	749	12,648	29,108	41,756	301	42,057	-7,704	34,353	5,614	39,967	6,830	46,797	1,260	48,057	1,500	49,557	3,801	53,358
Other Services	19,754	2,103	21,856	-8,271	13,586	-252	13,333	125	13,458	-1,574	11,884	-2,493	9,391	-1,049	8,342	-1,248	7,094	-1,591	5,503
Auxiliaries	38,261	-1,911	36,350	-14,075	22,275	693	22,968	-739	22,229	-4,008	18,221	-4,532	13,689	-2,146	11,543	-2,856	8,687	-3,386	5,301
Unclassified Estblhmnt	20,766	5,816	26,582	11,772	38,353	-5,204	33,149	-629	32,520	2,939	35,459	2,219	37,678	-169	37,509	1,090	38,599	1,520	40,119
Average	34,621	1,278	37,660	2,187	39,848	704	40,551	-24	40,123	601	41,130	1,425	42,556	448	43,003	626	43,629	875	44,504

Data Source: Zip Code Business Patterns

With this data it is possible to make some inferences about the consumer to target with the development of a new product at the proposed site. In the trade area employment is expected to grow but at a slow pace. Most of the growth can be attributed to one industry, the information industry. The Information Industry has an average annual income of approximately $42,800, this is not much different from the average annual income of the entire trade area, about $44,500. Therefore it would be appropriate to target a consumer earning approximately $40,000 to $44,999. Considering rent as 25% of income, a price range of $830 to $940/mo. would target the market well.

STEP 3: ESTIMATING SUPPLY

After estimating what future demand will be like for the trade area, the next important step is to identify the supply. Both existing and future supply will have an impact on the proposed development and therefore should be included in the analysis. In order to conduct this analysis, needed data includes existing parcels from local government. This is the same data as used earlier in this process. Ensure that the data obtained includes current land use. Zoning may also prove to be useful information but does not necessarily coincide with land use. In addition, qualitative data and as much quantitative data as possible for future products entering the market in the defined trade area should be included. For analyzing supply data, the market has already established a fairly efficient process, but GIS can provide noticeable improvements.

The first step in evaluating existing supply is to create a trade area shapefile at the parcel level. For this the existing tax parcel data and the trade area polygon created earlier will be needed. Use "Select by Theme" tool to select all parcels that intersect the trade area. Convert these features to a shapefile, this results in a shapefile that contains all parcels either partially or wholly within the trade area as defined earlier (Appendix S1).

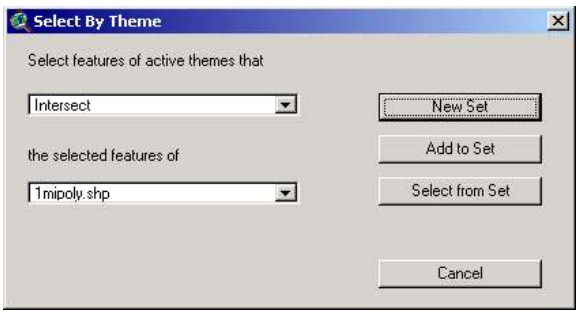

FIGURE 8: Select by Theme dialog box; when using this tool ensure that the parcel layer is the current layer

Open the Trade Area Parcel shapefile's attribute table and select all parcels with an apartment land use. This can be accomplished either through a query or sorting the attribute table based on land use. Export these parcel as a new shapefile, this produces a shapefile with all competitive products in the trade area. In Mecklenburg County's case this information is located in the "Neighborh" attribute (Appendix S2).

At this point the analysis must revert to traditional on the ground market research. The GIS analyst must take the results given by the data and insure that all parcels selected in the previous process are in fact competitive products, and any competitive products that were left off are included. In an idealized world this would not be necessary as all GIS data received would include accurate and up to date information, unfortunately this is not the case for many datasets at the local level. If GIS becomes further integrated into the market analysis process though, and the real estate industry begins to demand such data, private real estate research firms could find it beneficial to provide such data to the industry. In the case of Mecklenburg County, a cemetery and public housing building were listed in the GIS data as apartments. These should be removed, but only if necessary, for in this particular example some, but not all, public housing in the trade area

are actually mixed income neighborhoods rather than pure public housing. Mixed income neighborhoods provide some competitive units to the market that should be included in the analysis. Please see Appendix S3 for a visual comparison between GIS based and traditional market analysis results for identifying competitive properties.

As competitive properties are now identified, data needs to be collected from these individual properties as in traditional market analysis. Either phone surveys or personal discussions with brokers, developers, property management personnel or other members of the real estate industry are proven effective methods for this research (Berens et. al. 365, 2000). Data to collect on competitive properties includes:

- Occupancy Rate
- Unit Mix
- Total Units
- Price by Unit
- Average Price per Sq ft
- Associated Fees
- Year Built
- Included Utilities
- Lease terms
- Amenities

As this data is collected it may prove more intuitive to be collected and calculated in a spreadsheet program and then added to the GIS dataset, rather than directly incorporating it into the GIS dataset (Appendix S4). As the data is collected it is also important to consider that attributes such as amenities have a wide variety of possibilities. For attributes in this condition it would be more effective to break them down into dummy variables, adding new amenity dummy variables for each amenity, i.e. pool, fitness room, business center, etc.

For competitive projects in the pipeline a similar process must take place. The most noticeable contrast being in the creation of the spatial data, as this information is typically compiled from projects publicly announced through local newspapers or projects floating around in local real estate circles. This data will still need to be compiled the old fashion way. Data to compile includes, location, possible pre-leases, as well as, as much of the same data for pre-existing supply as possible. Again local real estate research firms can prove to be excellent resources, especially when working with a larger trade area. Once compiled, the addresses can then be used in conjunction with the local parcel data and/or road network depending on preferred method. Geocoding techniques or simply selecting the appropriate project parcels and exporting the selections as a shapefile would be effective techniques, depending on the scale and complexity of the trade area that is being evaluated.

In the case of Mecklenburg County, the trade area being considered generally coincides with the Downtown Charlotte Sub-market. This market, while quite active, is relatively small and uncomplex, therefore a simple selection technique will be used. In the defined trade area there are only two competitive projects in pipeline, The Renwick and Alpha Mill. Use the select tool to select each of the competitive products, and export them to their own shapefile. Then add data to competitive pipeline products in trade area shapefile in the same format as data added for existing products (Appendix S5).

At this point all data has been selected and can be manipulated into creating useful statistics for future supply. If ample data has been collected, annual projections can be made for the future based on population and employment projections, along with existing and pipeline supply. Traditional focus groups can be used to place values on amenities in the market, in addition to seeing what amenities are preexisting in the market. The resultant amenity adjusted rental rates for competitive units can be used to display any spatial patterns for rents in the market. When evaluating amenities it is important to also consider the target market for the product. Young professionals may prefer access to jobs and entertainment, whereas active adults may want to be away from the traffic such centers create. Focus groups can provide keen insights into this information.

Please see Table 4 for a summary display of the results of data collection for the Mecklenburg County trade area, Appendix S6 has a comprehensive version of this table. After the base data for the trade area was collected from GIS, most of the additional data was easily collected from Property Managers of properties in the trade area. It is important to collect as much data as possible to prevent errors in the analysis, however it is rare that 100% of the data will be able to be collected from the market, as was the case with Mecklenburg County (Common 46, 1998).

Simple statistical measures of association, such chi-squared, can be run between such attributes as vacancy or rent/sqft vs. a certain amenity or unit size to see if there is relation between the two. If there are relationships, the product should be adjusted accordingly. If there are none or there are equal relations between all amenities, there is likely a close

Table 4: Competitive Products in the Trade Area

				Unit	Unit Size Range			Avg. Tot.	Rent/Sq. Ft.		
Product	Address	Date	Occu.	Beds	Min.	Max.	Avg.	Rent	Min.	Max.	Avg.
The Arbors	517 W. Trade ST	1985	98%	120	774	1052	873	908	1.02	1.07	1.04
Canterbury Court	417 W. Tenth ST	1985	-	30	660	880	770	740	0.91	1.03	0.97
Charlotte Cotton Mills	520 W. Fifth ST	2003	95%	180	624	1120	839	1125	1.16	1.68	1.39
First Ward Place	550 E. Eighth ST	2000	95%	283	725	1310	1032	887	0.81	1.03	0.87
Fifth and Poplar	300 W. Fifth ST	2003	95%	304	720	1579	1171	1618	1.32	1.45	1.39
The Fourth Ward Square	501 N. Graham ST	1991	-	154	560	1212	874	971	0.98	1.38	1.13
Post Gateway	120 N. Cedar ST	2000	96%	436	353	2011	1077	1198	0.99	1.7	1.24
Post Uptown	305 N. Graham ST	1999	97%	227	534	782	946	1147	1.17	1.5	1.25
Summit Grandview	309 E. Morehead ST	2000	-	266	771	1860	1313	-	-	-	-
Sycamore Green	1005 W. Trade ST	2003	73%	190	765	1321	1013	1176	1.09	1.24	1.17
Minimum			73%		353	782	770	740	0.81	1.03	0.87
Total/Average			93%	2190	649	1313	991	1086	1.05	1.34	1.16
Maximum			98%		774	2011	1313	1618	1.32	1.7	1.39

Source: Real Estate Market Analysis: A Case Study Approach, Mecklenburg County Planning and Brian Oxford

to a market equilibrium condition existing and new developments should provide a similar product to the market.

GIS's best contribution to this process would be the identification of competitive properties in the trade area, this can be cumbersome to do thoroughly by traditional methods. Once properties are identified the data will still have to be collected by person to person communication. Details such as property location, gross units, unit mix, average unit size, amenities, rarely change and could be inputted into GIS data, providing a much quicker and more organized method of accessing this information. However, important details relating to current market performance such as, rents, concessions, and absorption rates change regularly and would require research for each development proposal. Perhaps this type of dataset could be something provided by market research firms in the future as GIS become more integrated into the real estate process. The data could be augmented from existing local spatial data and once the sunk cost in the creation of such data, updating the data would be relatively inexpensive for a research firm. This would give those involved in the real estate field the ability to create market analyses more accurately aggregated to any one particular development.

EVALUATION OF IMPROVEMENTS

GIS has great potential to make improvements in real estate market analysis. One of the most beneficial improvements is the precision of trade area definition. While only a 1 mile area was used as the example in this paper, this method can be used to compare the local trade area (1 mile) to a broader trade area more representation of the greater market (10mile), to another local trade area (1 mile) at a different location in the greater market, an even larger area such as a metro, and/or also include secondary trade areas in the market analysis. AFTA can then be used to take these trade areas and create projects more precisely aggregated to a proposed project. Projections include a significant number of demographic components, making it easy to find the most advantageous market segment to target.

As GIS works more effectively with quantitative data, an ordinal rating system of all commercial real estate would be beneficial, similar to class ratings for office space. GIS can be easily used to compare ordinal data, which would allow those in the field to easily compare both trade areas and individual properties in a market analysis. There is the potential for users of this system to develop weights for particular qualities of a trade area, amenities in competitive properties, etc. These weights would be developed independently though, as each product and organization has different values, priorities and efficiencies that would drive them to target different qualities in a trade area. A quantitative GIS market analysis process will serve to normalize market analysis, making variable projects on various sites more comparable. Investors and developers can set up their own criteria in order judge the market for multiple different projects on the same criteria.

Individual data from focus groups can also be incorporated into GIS based real estate market analysis. Data from focus groups can be spatially aggregated to provide better data management and more effectively target a particular market segment. Until strongly reliable GIS data is available at all levels though, be it from the public or private sector, on the ground market research will not be excluded from the real estate market analysis process. This type of research provides the most accurate, up-to-date information available in the market. With there is a sunk cost invested into this data, some additional efficiencies will also be realized from the data management aspect as certain data collected will not change on a regular basis.

As with all research and analysis, the more aggregated the data used in this method the better the results that will be produced. Easily accessible and reliable GIS data has been difficult to acquire until recently, but the availability of such data has been greatly improving. Parcel level analysis would be ideal and yield extremely accurate results, but creating/acquiring such data requires significant investment in the data collection, an investment that is currently cost prohibitive, but an investment that may prove quite worthwhile for the real estate industry to make in the future.

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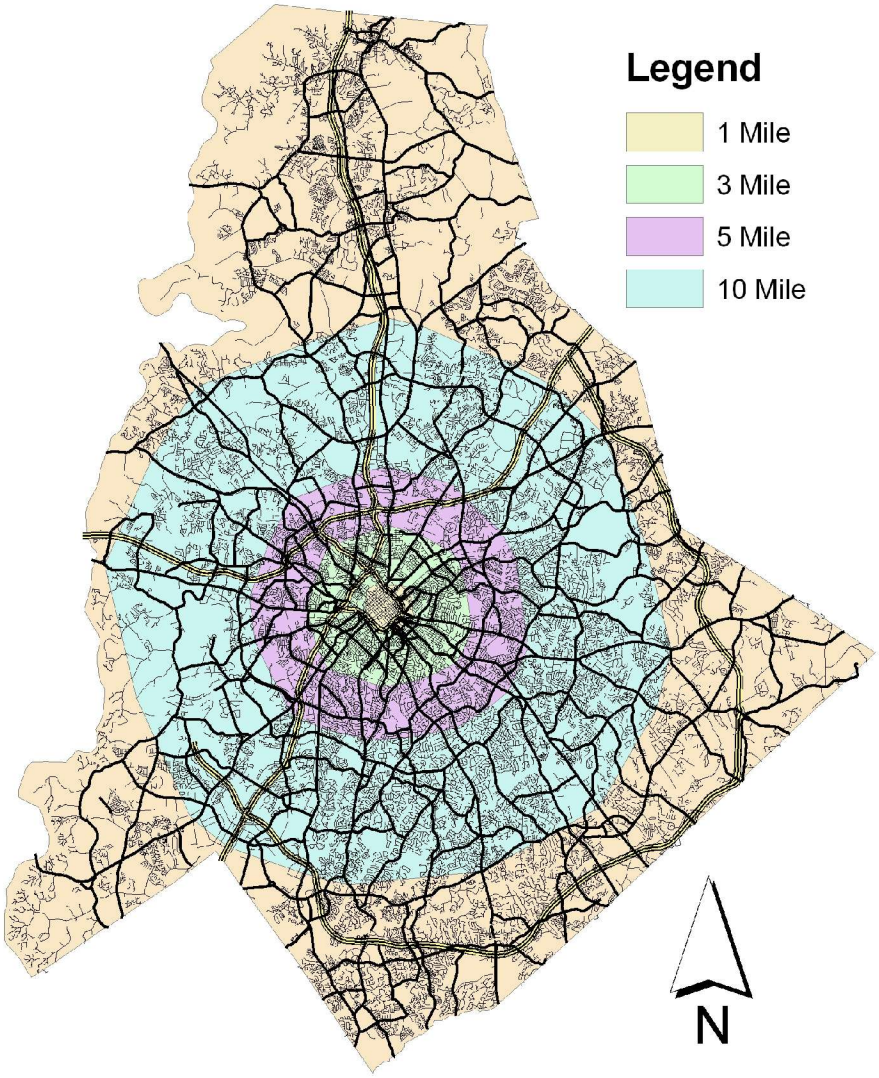
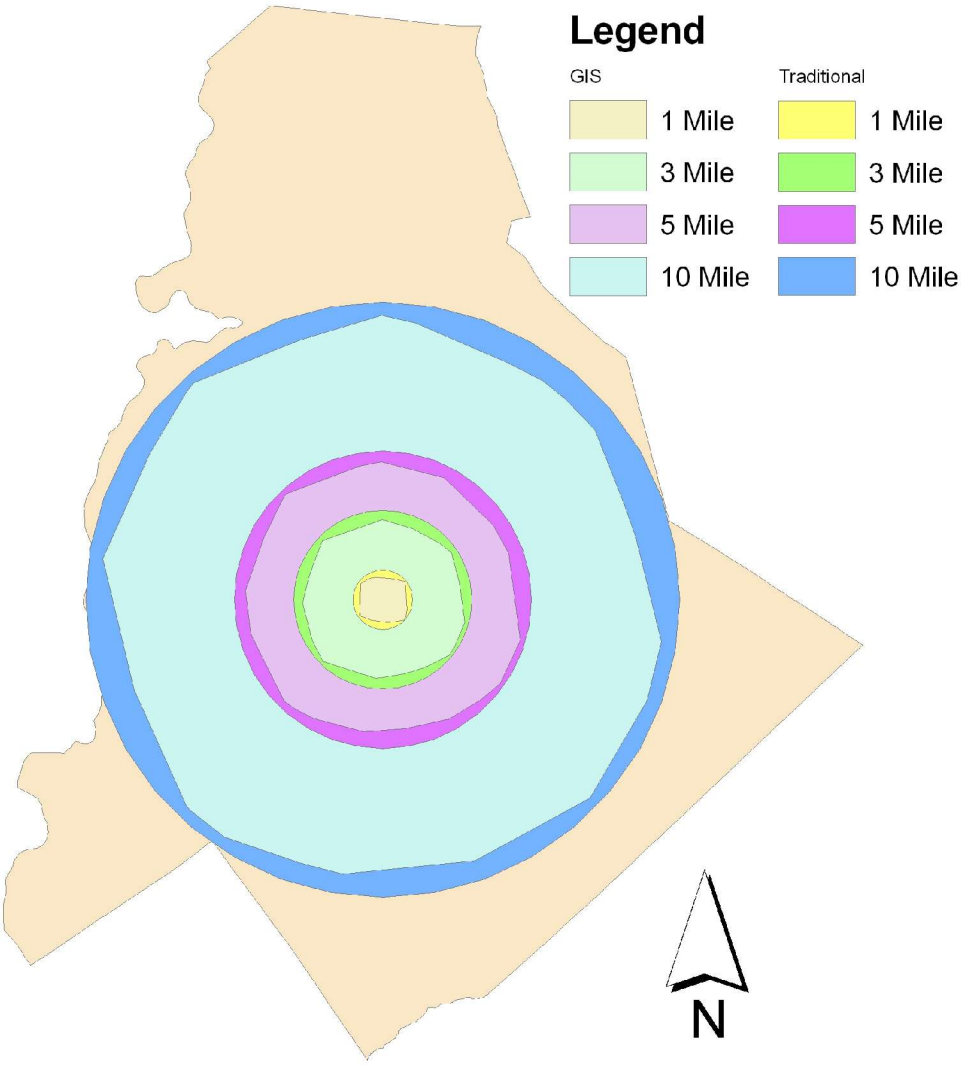
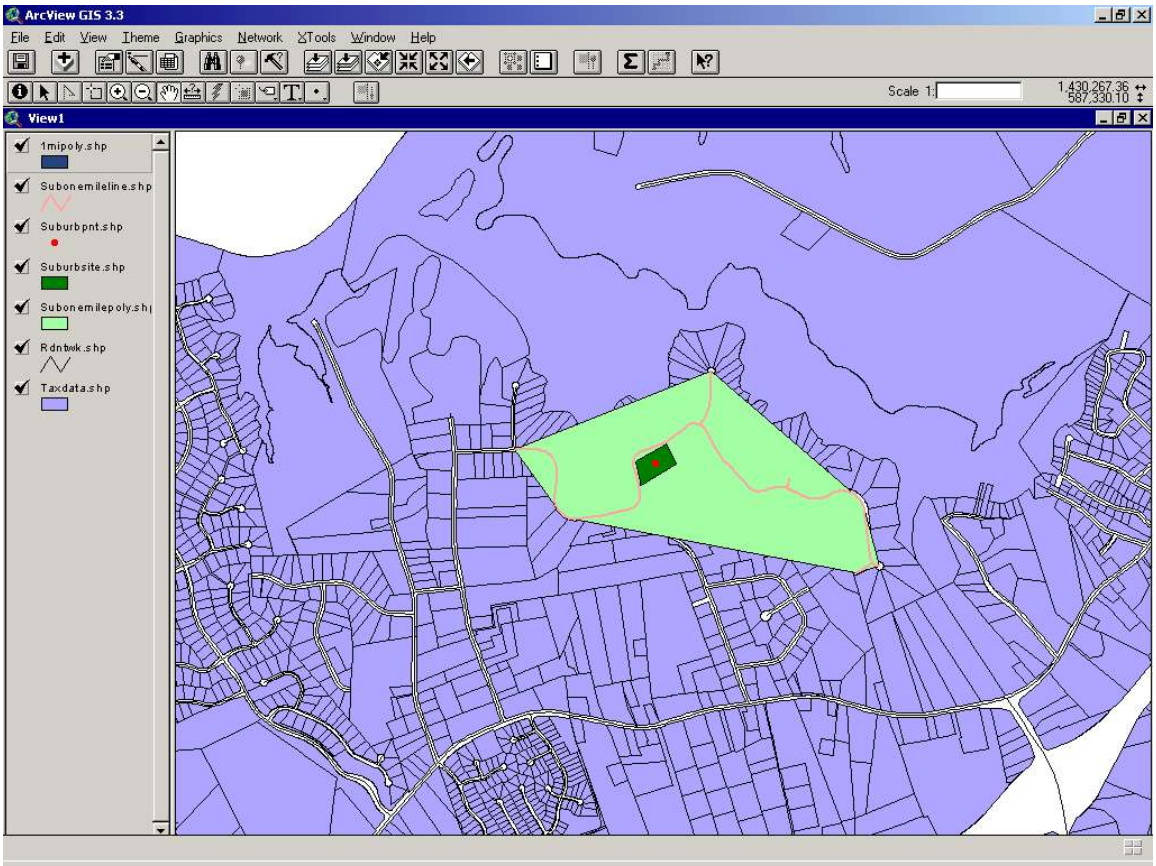
Appendix T1: Mecklenburg County Trade Areas



Appendix T2: GIS Defined vs. Traditionally Defined Trade Areas for Mecklenburg County

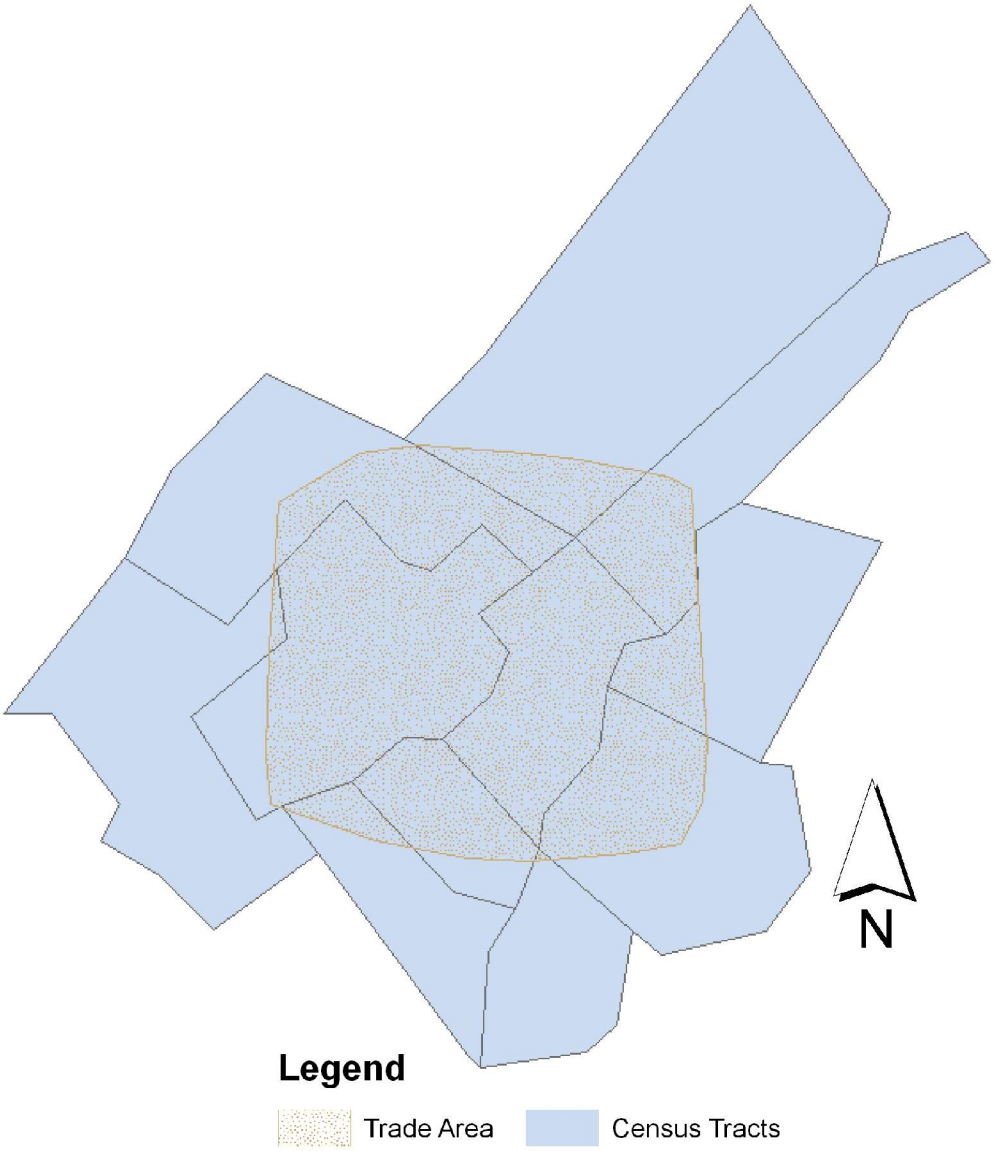


Appendix T3: One Mile Trade Area Definition in Suburban Mecklenburg County



This screenshot is at the same scale as Figure 4. The trade area in a suburban area was calculated to be approximately 10% of the size of the trade area calculated in the running example.

Appendix D1: Trade Area defined by Census Tract



Appendix D2: Population Data, Projections and Weight for each Census Tract

Table 1: Projections for Tract 37119000100

	Females									Males									Total
Cohort	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	
Actual 1970	0	54	74	57	40	87	73	92	92	4	87	62	55	54	100	108	49	29	1117
Expected 1980	-	0	54	74	57	40	87	73	184	-	4	87	62	55	54	100	108	78	1117
Actual 1980	6	0	51	66	0	18	0	31	26	6	6	75	123	50	70	51	42	8	629
▲	6	0	-3	-8	-57	-22	-87	-42	0	6	2	-12	61	-5	16	-49	-66	-70	-330
Expected 1990	-	6	0	51	66	0	18	0	57	-	6	6	75	123	50	70	51	50	629
Actual1990	0	0	66	83	31	8	39	59	24	14	1	91	215	125	31	39	52	41	919
▲	0	-6	66	32	-35	8	21	59	-33	14	-5	85	140	2	-19	-31	1	-9	290
Expected 2000	-	0	0	66	83	31	8	39	83	-	14	1	91	215	125	31	39	93	919
Actual 2000	13	0	36	113	61	43	59	53	38	6	0	66	266	110	132	101	27	23	1147
▲	13	0	36	47	-22	12	51	14	-45	6	-14	65	175	-105	7	70	-12	-70	228
Expected 2010	-	13	0	36	113	61	43	59	91	-	6	0	66	266	110	132	101	50	1147
Projected 2010	6	11	33	60	75	60	38	69	65	9	0	46	191	230	111	129	75	0	1208
Projected ▲	6	-2	33	24	-38	-1	-5	10	-26	9	-6	46	125	-36	1	-3	-26	-50	61
Expected 2020	-	6	11	33	60	75	60	38	134	-	9	0	46	191	230	111	129	75	1208
Projected 2020	6	3	56	67	28	81	82	66	99	10	1	65	193	145	226	123	117	32	1400
Projected ▲	6	-3	45	34	-32	6	22	28	-35	10	-8	65	147	-46	-4	12	-12	-43	192

Track Area (Acres)	471.52
Area within Trade Area	414.06
Weight	0.8781

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Table 2: Projections for Tract 37119000200

	Females									Males									Total
Cohort	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	
Actual 1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expected 1980	-	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0
Actual 1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
▲	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expected 1990	-	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0
Actual1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
▲	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expected 2000	-	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0
Actual 2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
▲	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expected 2010	-	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0
Projected 2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Projected ▲	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expected 2020	-	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0
Projected 2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Projected ▲	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Track Area (Acres)	143.18
Area within Trade Area	110.25
Weight	0.7700

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Appendix D2 cont.: Population Data, Projections and Weight for each Census Tract

Table 3: Projections for Tract 37119000300

	Females									Males									Total
Cohort	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	
Actual 1970	16	17	70	39	37	29	68	26	26	22	27	37	10	51	13	55	28	0	571
Expected 1980	-	16	17	70	39	37	29	68	52	-	22	27	37	10	51	13	55	28	571
Actual 1980	11	32	48	47	20	36	53	135	71	12	0	71	14	10	6	28	64	20	678
▲	11	16	31	-23	-19	-1	24	67	0	12	-22	44	-23	0	-45	15	9	-8	88
Expected 1990	-	11	32	48	47	20	36	53	206	-	12	0	71	14	10	6	28	84	678
Actual1990	0	0	8	44	23	0	33	58	146	0	0	0	54	19	33	33	10	46	507
▲	0	-11	-24	-4	-24	-20	-3	5	-60	0	-12	0	-17	5	23	27	-18	-38	-171
Expected 2000	-	0	0	8	44	23	0	33	204	-	0	0	0	54	19	33	33	56	507
Actual 2000	0	0	7	44	40	29	20	22	34	0	0	9	47	54	44	26	18	37	431
▲	0	0	7	36	-4	6	20	-11	-170	0	0	9	47	0	25	-7	-15	-19	-76
Expected 2010	-	0	0	7	44	40	29	20	56	-	0	0	9	47	54	44	26	55	431
Projected 2010	4	2	5	10	28	35	43	40	0	4	-11	18	11	49	55	56	18	33	400
Projected ▲	4	2	5	3	-16	-5	14	20	-77	4	-11	18	2	2	1	12	-8	-22	-52
Expected 2020	-	4	2	5	10	28	35	43	40	-	4	-11	18	11	49	55	56	51	400
Projected 2020	1	1	-2	17	-5	22	45	48	0	1	0	0	29	13	65	66	42	25	368
Projected ▲	1	-3	-4	12	-15	-6	10	5	-102	1	-8	9	11	2	16	11	-14	-26	-100

Track Area (Acres)	192.08
Area within Trade Area	28.93
Weight	0.1506

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Table 4: Projections for Tract 37119000400

	Females									Males									Total
Cohort	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	
Actual 1970	89	116	82	83	60	68	132	80	80	55	117	130	120	78	125	93	39	50	1597
Expected 1980	-	89	116	82	83	60	68	132	160	-	55	117	130	120	78	125	93	89	1597
Actual 1980	4	42	40	17	11	43	83	174	150	29	63	50	89	50	51	59	89	63	1107
▲	4	-47	-76	-65	-72	-17	15	42	0	29	8	-67	-41	-70	-27	-66	-4	-26	-480
Expected 1990	-	4	42	40	17	11	43	83	324	-	29	63	50	89	50	51	59	152	1107
Actual1990	14	12	45	21	50	24	49	147	177	10	21	36	139	81	24	37	58	29	974
▲	14	8	3	-19	33	13	6	64	-147	10	-8	-27	89	-8	-26	-14	-1	-123	-133
Expected 2000	-	14	12	45	21	50	24	49	324	-	10	21	36	139	81	24	37	87	974
Actual 2000	22	0	21	49	40	69	47	53	89	0	8	33	71	93	46	10	30	9	690
▲	22	-14	9	4	19	19	23	4	-235	0	-2	12	35	-46	-35	-14	-7	-78	-284
Expected 2010	-	22	0	21	49	40	69	47	142	-	0	8	33	71	93	46	10	39	690
Projected 2010	13	4	0	0	42	45	84	84	15	13	0	0	61	30	64	15	6	0	476
Projected ▲	13	-18	-21	-27	-7	5	15	37	-127	13	-1	-27	28	-41	-29	-31	-4	-76	-298
Expected 2020	-	13	4	0	0	42	45	84	99	-	13	0	0	61	30	64	15	6	476
Projected 2020	16	5	1	0	15	54	60	119	0	8	9	0	51	29	0	44	11	0	422
Projected ▲	16	-8	-3	-14	15	12	15	35	-170	8	-4	-14	51	-32	-30	-20	-4	-92	-239

Track Area (Acres)	448.84
Area within Trade Area	6.78
Weight	0.0151

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Appendix D2 cont.: Population Data, Projections and Weight for each Census Tract

Table 5: Projections for Tract 37119000500

	Females									Males									Total
Cohort	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	
Actual 1970	43	214	150	64	126	98	151	171	171	28	251	120	89	132	172	134	53	63	2230
Expected 1980	-	43	214	150	64	126	98	151	342	-	28	251	120	89	132	172	134	116	2230
Actual 1980	28	29	84	111	44	89	68	175	178	40	77	109	101	114	75	106	39	26	1493
▲	28	-14	-130	-39	-20	-37	-30	24	0	40	49	-142	-19	25	-57	-66	-95	-90	-573
Expected 1990	-	28	29	84	111	44	89	68	353	-	40	77	109	101	114	75	106	65	1493
Actual1990	34	95	132	264	210	8	73	110	196	52	94	129	250	274	91	61	34	43	2150
▲	34	67	103	180	99	-36	-16	42	-157	52	54	52	141	173	-23	-14	-72	-22	657
Expected 2000	-	34	95	132	264	210	8	73	306	-	52	94	129	250	274	91	61	77	2150
Actual 2000	40	87	131	240	157	139	114	85	123	34	80	166	389	217	200	129	42	15	2388
▲	40	53	36	108	-107	-71	106	12	-183	34	28	72	260	-33	-74	38	-19	-62	238
Expected 2010	-	40	87	131	240	157	139	114	208	-	34	80	166	389	217	200	129	57	2388
Projected 2010	34	75	90	214	231	109	159	140	95	42	78	74	293	444	166	186	67	0	2497
Projected ▲	34	35	3	83	-9	-48	20	26	-113	42	44	-6	127	55	-51	-14	-62	-58	108
Expected 2020	-	34	75	90	214	231	109	159	235	-	42	78	74	293	444	166	186	67	2497
Projected 2020	36	86	122	214	208	179	146	186	84	43	84	117	250	358	395	169	135	20	2832
Projected ▲	36	52	47	124	-6	-52	37	27	-151	43	42	39	176	65	-49	3	-51	-47	335

Track Area (Acres)	411.39
Area within Trade Area	0.04
Weight	0.0001

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Table 6: Projections for Tract 37119000600

	Females									Males									Total
Cohort	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	
Actual 1970	190	459	307	179	242	163	157	129	129	196	506	373	189	186	141	74	88	33	3741
Expected 1980	-	190	459	307	179	242	163	157	258	-	196	506	373	189	186	141	74	121	3741
Actual 1980	43	167	314	137	158	96	67	72	41	118	207	294	173	56	70	41	24	0	2078
▲	43	-23	-145	-170	-21	-146	-96	-85	0	118	11	-212	-200	-133	-116	-100	-50	-121	-1446
Expected 1990	-	43	167	314	137	158	96	67	113	-	118	207	294	173	56	70	41	24	2078
Actual1990	102	211	200	153	80	115	78	40	49	118	219	152	99	48	40	33	13	4	1754
▲	102	168	33	-161	-57	-43	-18	-27	-64	118	101	-55	-195	-125	-16	-37	-28	-20	-324
Expected 2000	-	102	211	200	153	80	115	78	89	-	118	219	152	99	48	40	33	17	1754
Actual 2000	27	95	97	153	48	25	41	54	31	58	84	240	414	267	64	13	0	0	1711
▲	27	-7	-114	-47	-105	-55	-74	-24	-58	58	-34	21	262	168	16	-27	-33	-17	-43
Expected 2010	-	27	95	97	153	48	25	41	85	-	58	84	240	414	267	64	13	0	1711
Projected 2010	57	73	20	0	92	0	0	0	44	98	84	2	196	384	228	9	0	0	1287
Projected ▲	57	46	-75	-126	-61	-81	-63	-45	-41	98	26	-82	-44	-30	-39	-55	-37	-53	-605
Expected 2020	-	57	73	20	0	92	0	0	44	-	98	84	2	196	384	228	9	0	1287
Projected 2020	62	126	21	0	0	32	0	0	0	91	129	45	10	200	371	188	0	0	1275
Projected ▲	62	69	-52	-111	-74	-60	-52	-32	-54	91	31	-39	8	4	-13	-40	-33	-30	-325

Track Area (Acres)	261.68
Area within Trade Area	261.68
Weight	1.0000

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Appendix D2 cont.: Population Data, Projections and Weight for each Census Tract

Table 7: Projections for Tract 37119000700

	Females									Males									Total
Cohort	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	
Actual 1970	48	105	135	48	78	125	68	78	78	85	136	142	71	48	86	61	70	9	1471
Expected 1980	-	48	105	135	48	78	125	68	156	-	85	136	142	71	48	86	61	79	1471
Actual 1980	18	61	81	54	21	42	34	12	44	16	54	106	40	65	37	11	65	20	781
▲	18	13	-24	-81	-27	-36	-91	-56	0	16	-31	-30	-102	-6	-11	-75	4	-59	-578
Expected 1990	-	18	61	81	54	21	42	34	56	-	16	54	106	40	65	37	11	85	781
Actual1990	61	68	60	72	61	29	22	33	7	57	82	76	90	45	42	11	29	17	862
▲	61	50	-1	-9	7	8	-20	-1	-49	57	66	22	-16	5	-23	-26	18	-68	81
Expected 2000	-	61	68	60	72	61	29	22	40	-	57	82	76	90	45	42	11	46	862
Actual 2000	26	21	39	16	44	54	30	8	8	24	69	66	19	103	36	41	12	11	627
▲	26	-40	-29	-44	-28	-7	1	-14	-32	24	12	-16	-57	13	-9	-1	1	-35	-235
Expected 2010	-	26	21	39	16	44	54	30	16	-	24	69	66	19	103	36	41	23	627
Projected 2010	35	34	3	0	0	32	17	6	0	32	40	61	8	23	89	2	49	0	431
Projected ▲	35	8	-18	-45	-16	-12	-37	-24	-27	32	16	-8	-58	4	-14	-34	8	-54	-244
Expected 2020	-	35	34	3	0	0	32	17	6	-	32	40	61	8	23	89	2	49	431
Projected 2020	41	41	18	0	0	0	13	4	0	38	63	39	17	15	8	69	11	0	377
Projected ▲	41	6	-16	-33	-12	-4	-19	-13	-36	38	31	-1	-44	7	-15	-20	9	-52	-133

Track Area (Acres)	324.1
Area within Trade Area	99.85
Weight	0.3081

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Table 8: Projections for Tract 37119000800

	Females									Males									Total
Cohort	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	
Actual 1970	286	687	419	320	204	153	198	127	127	268	625	351	220	178	118	121	118	8	4528
Expected 1980	-	286	687	419	320	204	153	198	254	-	268	625	351	220	178	118	121	126	4528
Actual 1980	200	343	308	249	132	158	187	135	41	154	331	301	163	91	145	112	88	7	3145
▲	200	57	-379	-170	-188	-46	34	-63	0	154	63	-324	-188	-129	-33	-6	-33	-119	-1170
Expected 1990	-	200	343	308	249	132	158	187	176	-	154	331	301	163	91	145	112	95	3145
Actual1990	193	293	245	302	160	134	121	84	33	150	280	191	188	216	89	117	58	30	2884
▲	193	93	-98	-6	-89	2	-37	-103	-143	150	126	-140	-113	53	-2	-28	-54	-65	-261
Expected 2000	-	193	293	245	302	160	134	121	117	-	150	280	191	188	216	89	117	88	2884
Actual 2000	128	380	289	213	274	161	108	47	26	166	354	287	139	231	149	78	36	33	3099
▲	128	187	-4	-32	-28	1	-26	-74	-91	166	204	7	-52	43	-67	-11	-81	-55	215
Expected 2010	-	128	380	289	213	274	161	108	73	-	166	354	287	139	231	149	78	69	3099
Projected 2010	174	240	220	220	111	260	151	28	0	157	297	202	169	128	197	134	22	0	2710
Projected ▲	174	112	-160	-69	-102	-14	-10	-80	-78	157	131	-152	-118	-11	-34	-15	-56	-80	-405
Expected 2020	-	174	240	220	220	111	260	151	28	-	157	297	202	169	128	197	134	22	2710
Projected 2020	165	305	153	184	147	107	236	65	0	158	311	202	108	197	94	179	70	0	2681
Projected ▲	165	131	-87	-36	-73	-4	-24	-86	-104	158	154	-95	-94	28	-34	-18	-64	-67	-150

Track Area (Acres)	309.71
Area within Trade Area	61.68
Weight	0.1992

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Appendix D2 cont.: Population Data, Projections and Weight for each Census Tract

Table 9: Projections for Tract 37119002500

	Females									Males									Total
Cohort	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	
Actual 1970	21	115	538	101	54	173	154	207	207	27	94	236	143	80	128	89	129	49	2545
Expected 1980	-	21	115	538	101	54	173	154	414	-	27	94	236	143	80	128	89	178	2545
Actual 1980	39	41	389	176	36	58	30	85	96	49	53	122	239	72	29	24	32	24	1594
▲	39	20	274	-362	-65	4	-143	-69	0	49	26	28	3	-71	-51	-104	-57	-154	-633
Expected 1990	-	39	41	389	176	36	58	30	181	-	49	53	122	239	72	29	24	56	1594
Actual1990	36	23	365	208	144	67	34	43	145	68	25	60	213	120	63	45	21	39	1719
▲	36	-16	324	-181	-32	31	-24	13	-36	68	-24	7	91	-119	-9	16	-3	-17	125
Expected 2000	-	36	23	365	208	144	67	34	188	-	68	25	60	213	120	63	45	60	1719
Actual 2000	21	37	181	226	103	106	35	11	20	64	40	38	242	178	108	32	10	16	1468
▲	21	1	158	-139	-105	-38	-32	-23	-168	64	-28	13	182	-35	-12	-31	-35	-44	-251
Expected 2010	-	21	37	181	226	103	106	35	31	-	64	40	38	242	178	108	32	26	1468
Projected 2010	32	23	289	0	159	102	40	9	0	60	55	56	130	167	154	68	0	0	1344
Projected ▲	32	2	252	-227	-67	-1	-66	-26	-68	60	-9	16	92	-75	-24	-40	-32	-72	-253
Expected 2020	-	32	23	289	0	159	102	40	9	-	60	55	56	130	167	154	68	0	1344
Projected 2020	30	28	268	107	0	156	61	28	0	64	40	67	178	54	152	136	45	0	1414
Projected ▲	30	-4	245	-182	-68	-3	-41	-12	-91	64	-20	12	122	-76	-15	-18	-23	-44	-124

Track Area (Acres)	381.47
Area within Trade Area	151.94
Weight	0.3983

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Table 10: Projections for Tract 37119002600

	Females									Males									Total
Cohort	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	+75	
Actual 1970	28	206	150	100	74	149	136	87	87	59	198	107	70	91	99	78	42	28	1789
Expected 1980	-	28	206	150	100	74	149	136	174	-	59	198	107	70	91	99	78	70	1789
Actual 1980	37	56	77	80	59	73	64	65	51	38	67	85	90	59	70	39	51	17	1078
▲	37	28	-129	-70	-41	-1	-85	-71	0	38	8	-113	-17	-11	-21	-60	-27	-53	-588
Expected 1990	-	37	56	77	80	59	73	64	116	-	38	67	85	90	59	70	39	68	1078
Actual1990	47	59	102	168	66	25	36	50	67	22	90	73	117	66	33	53	20	16	1110
▲	47	22	46	91	-14	-34	-37	-14	-49	22	52	6	32	-24	-26	-17	-19	-52	32
Expected 2000	-	47	59	102	168	66	25	36	117	-	22	90	73	117	66	33	53	36	1110
Actual 2000	16	79	105	114	68	69	55	39	59	26	47	51	37	64	84	12	32	14	971
▲	16	32	46	12	-100	3	30	3	-58	26	25	-39	-36	-53	18	-21	-21	-22	-139
Expected 2010	-	16	79	105	114	68	69	55	98	-	26	47	51	37	64	84	12	46	971
Projected 2010	33	43	67	116	62	57	38	28	62	29	54	0	44	8	54	51	0	4	750
Projected ▲	33	27	-12	11	-52	-11	-31	-27	-36	29	28	-49	-7	-29	-10	-33	-22	-42	-233
Expected 2020	-	33	43	67	116	62	57	38	90	-	29	54	0	44	8	54	51	4	750
Projected 2020	32	60	70	105	61	48	44	25	42	26	64	27	0	9	2	30	30	0	675
Projected ▲	32	27	27	38	-55	-14	-13	-13	-48	26	35	-27	-4	-35	-6	-24	-21	-39	-114

Track Area (Acres)	185.27
Area within Trade Area	0.85
Weight	0.0046

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Appendix D2 cont.: Population Data, Projections and Weight for each Census Tract

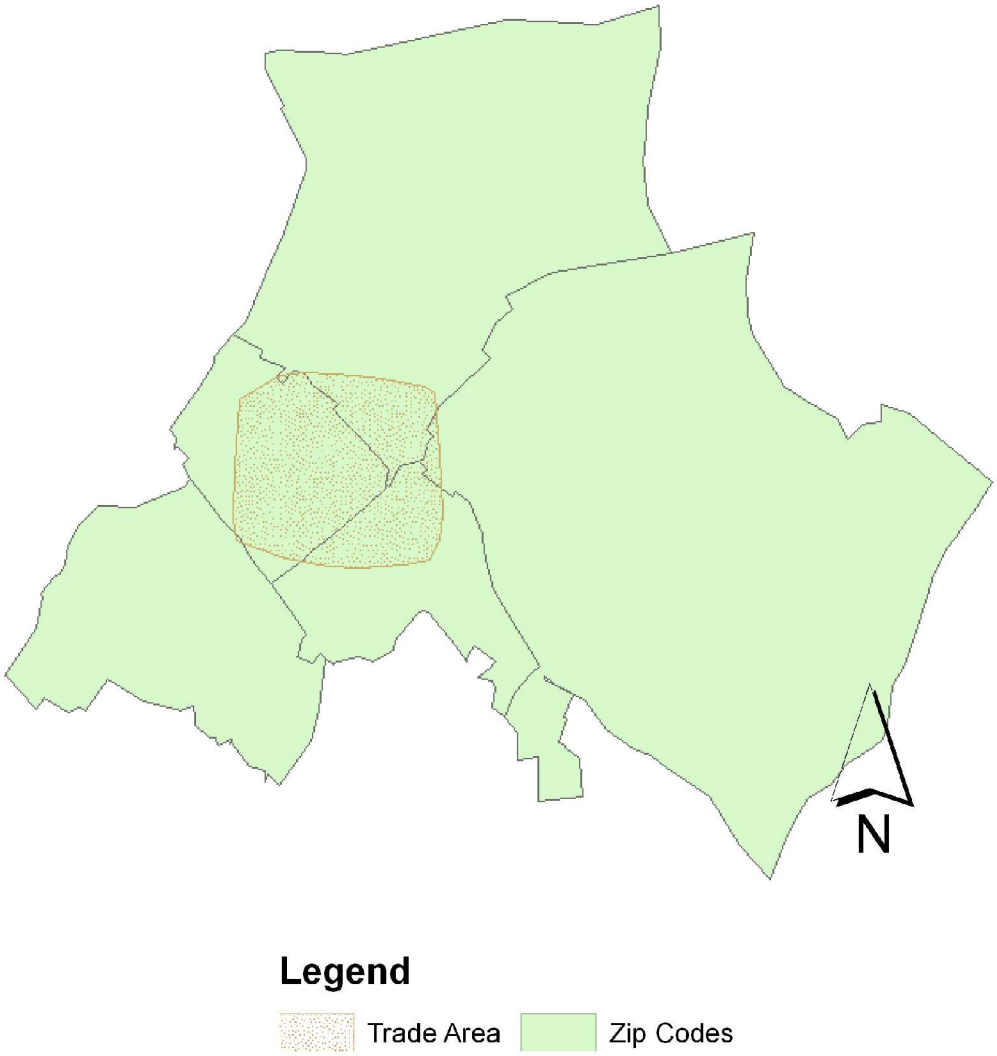
Table 11: Projections for Tract 37119005200

	Females									Males									Total
Cohort	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	**0-4**	**5-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**+75**	
Actual 1970	203	370	377	235	203	182	161	81	81	181	407	310	222	155	116	170	52	23	3529
Expected 1980	-	203	370	377	235	203	182	161	162	-	181	407	310	222	155	116	170	75	3529
Actual 1980	126	307	403	255	164	180	156	115	45	117	308	324	204	119	95	133	110	39	3200
▲	126	104	33	-122	-71	-23	-26	-46	0	117	127	-83	-106	-103	-60	17	-60	-36	-212
Expected 1990	-	126	307	403	255	164	180	156	160	-	117	308	324	204	119	95	133	149	3200
Actual1990	150	225	262	267	197	202	132	95	92	150	295	216	299	214	230	94	72	37	3229
▲	150	99	-45	-136	-58	38	-48	-61	-68	150	178	-92	-25	10	111	-1	-61	-112	29
Expected 2000	-	150	225	262	267	197	202	132	187	-	150	295	216	299	214	230	94	109	3229
Actual 2000	82	291	245	223	221	200	121	110	47	141	279	249	216	239	192	92	72	36	3056
▲	82	141	20	-39	-46	3	-81	-22	-140	141	129	-46	0	-60	-22	-138	-22	-73	-173
Expected 2010	-	82	291	245	223	221	200	121	157	-	141	279	249	216	239	192	92	108	3056
Projected 2010	119	197	294	146	165	227	148	78	88	136	286	205	205	165	249	151	44	34	2937
Projected ▲	119	115	3	-99	-58	6	-52	-43	-69	136	145	-74	-44	-51	10	-41	-48	-74	-119
Expected 2020	-	119	197	294	146	165	227	148	166	-	136	286	205	205	165	249	151	78	2937
Projected 2020	117	237	190	203	92	181	167	106	74	142	287	215	182	171	198	189	107	0	2858
Projected ▲	117	118	-7	-91	-54	16	-60	-42	-92	142	151	-71	-23	-34	33	-60	-44	-86	-87

Track Area (Acres)	942.72
Area within Trade Area	77.10
Weight	0.0818

Data Source: Geolytics Neighborhood Change CD, U.S. Census Bureau

Appendix D1: Trade Area defined by Zip Code



Appendix D4: Employment Data, Projections and Weight for each Zip Code

Table 1: Employment Projections for Zip Code 28202

	1998	▲	1999	▲	2000	▲	2001	▲	2002	▲*	2003*	▲*	2004*	▲*	2005*	▲*	2006*	▲*	2007*
Forestry, Fishing	0	0	0	0	0	3	3	-3	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	3	3	14	17	-17	0	0	0	0	0	0	0	0	0	0	0
Construction	951	44	995	505	1,500	-61	1,439	179	1,618	167	1,785	198	1,983	121	2,104	166	2,270	163	2,433
Manufacturing	198	37	235	12	247	-9	238	25	263	16	279	11	290	11	301	16	317	14	331
Wholesale trade	360	72	432	-77	355	10	365	-154	211	-37	174	-65	109	-62	47	-47	0	0	0
Retail trade	481	156	637	-59	578	-160	418	-19	399	-21	378	-65	313	-66	247	-43	204	-49	155
Trans. And Warehouse	236	-34	202	-8	194	0	194	-132	62	-44	18	-18	0	0	0	0	0	0	0
Information	2,999	168	3,167	437	3,604	490	4,094	508	4,602	401	5,003	459	5,462	465	5,927	458	6,385	446	6,831
Finance & insurance	5,548	-1,063	4,485	1,142	5,627	138	5,765	-52	5,713	41	5,754	317	6,071	111	6,182	104	6,286	143	6,429
Real Estate	1,519	-350	1,169	164	1,333	-214	1,119	395	1,514	-1	1,513	86	1,599	67	1,666	137	1,803	72	1,875
Professional Services	7,558	376	7,934	-419	7,515	142	7,657	55	7,712	39	7,751	-46	7,705	48	7,753	24	7,777	16	7,793
Mngmnt of Companies	1,592	-740	852	-442	410	158	568	479	1,047	-136	911	15	926	129	1,055	122	1,177	33	1,210
Administrative Support	2,442	-332	2,110	391	2,501	1,270	3,771	-1,033	2,738	74	2,812	176	2,988	122	3,110	-165	2,945	52	2,997
Educational services	81	42	123	8	131	27	158	8	166	21	187	16	203	18	221	16	237	18	255
Health Care	543	-38	505	138	643	43	686	153	839	74	913	102	1,015	93	1,108	106	1,214	94	1,308
Arts and Entertainment	848	4	852	53	905	203	1,108	-254	854	2	856	1	857	-12	845	-66	779	-19	760
Accommodations	2,626	367	2,993	115	3,108	-234	2,874	85	2,959	83	3,042	12	3,054	-14	3,040	42	3,082	31	3,113
Other Services	1,078	-34	1,044	173	1,217	-24	1,193	-85	1,108	8	1,116	18	1,134	-21	1,113	-20	1,093	-4	1,089
Auxiliaries	304	-20	284	-139	145	48	193	0	193	-28	165	-30	135	-3	132	-15	117	-19	98
Unclassified Estblhmnt	15	-7	8	7	15	-10	5	0	5	-3	2	-2	0	0	0	0	0	0	0
Total	29,379	-1,352	28,027	2,004	30,031	1,834	31,865	138	32,003	656	32,659	1,185	33,844	1,007	34,851	835	35,686	991	36,677

Zip Code Area (Acres)	1118.054
Area within Trade Area	748.623
Weight	0.6696

Data Source: Zip Code Business Patterns

Table 2: Employment Projections for Zip Code 28203

	1998	▲	1999	▲	2000	▲	2001	▲	2002	▲*	2003*	▲*	2004*	▲*	2005*	▲*	2006*	▲*	2007*
Forestry, Fishing	0	0	0	0	0	0	0	3	3	1	4	1	5	1	6	2	8	1	9
Utilities	0	0	0	0	0	0	0	3	3	1	4	1	5	1	6	2	8	1	9
Construction	1,749	-150	1,599	84	1,683	-145	1,538	-136	1,402	-87	1,315	-71	1,244	-110	1,134	-101	1,033	-92	941
Manufacturing	1,677	-48	1,629	12	1,641	-39	1,602	-241	1,361	-79	1,282	-87	1,195	-112	1,083	-130	953	-102	851
Wholesale trade	986	77	1,063	67	1,130	-49	1,081	-1	1,080	24	1,104	10	1,114	-4	1,110	7	1,117	9	1,126
Retail trade	1,407	184	1,591	13	1,604	-168	1,436	-253	1,183	-56	1,127	-116	1,011	-148	863	-143	720	-116	604
Trans. And Warehouse	61	-5	56	-3	53	2	55	1	56	-1	55	0	55	1	56	0	56	0	56
Information	279	-122	157	2	159	-13	146	44	190	-22	168	3	171	3	174	7	181	-2	179
Finance & insurance	213	-12	201	2	203	55	258	94	352	35	387	47	434	58	492	59	551	50	601
Real Estate	278	-42	236	19	255	57	312	53	365	22	387	38	425	43	468	39	507	36	543
Professional Services	1,066	364	1,430	286	1,716	401	2,117	-555	1,562	124	1,686	64	1,750	9	1,759	-90	1,669	27	1,696
Mngmnt of Companies	286	51	337	-106	231	-51	180	-55	125	-40	85	-63	22	-22	0	0	0	0	0
Administrative Support	1,856	985	2,841	-1,106	1,735	-74	1,661	-295	1,366	-123	1,243	-400	843	-223	620	-260	360	-252	108
Educational services	87	-53	34	39	73	-20	53	8	61	-7	54	5	59	-4	55	1	56	-1	55
Health Care	3,022	274	3,296	-121	3,175	230	3,405	1,483	4,888	467	5,355	515	5,870	674	6,544	785	7,329	610	7,939
Arts and Entertainment	66	20	86	201	287	38	325	-72	253	47	300	54	354	17	371	12	383	33	416
Accommodations	1,277	373	1,650	223	1,873	417	2,290	-136	2,154	219	2,373	181	2,554	170	2,724	109	2,833	170	3,003
Other Services	933	237	1,170	-190	980	-33	947	298	1,245	78	1,323	38	1,361	95	1,456	127	1,583	85	1,668
Auxiliaries	3	2	5	0	5	10	15	0	15	3	18	3	21	4	25	3	28	3	31
Unclassified Estblhmnt	15	5	20	25	45	-35	10	3	13	-1	12	-2	10	-9	1	-1	0	0	0
Total	15,261	2,140	17,401	-553	16,848	583	17,431	246	17,677	605	18,282	221	18,503	444	18,947	428	19,375	460	19,835

Zip Code Area (Acres)	1995.001
Area within Trade Area	1.341
Weight	0.0007

Data Source: Zip Code Business Patterns

Appendix D4 cont.: Employment Data, Projections and Weight for each Zip Code

Table 3: Employment Projections for Zip Code 28204

	1998	▲	1999	▲	2000	▲	2001	▲	2002	▲*	2003*	▲*	2004*	▲*	2005*	▲*	2006*	▲*	2007*
Forestry, Fishing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	1,250	0	1,250	0	1,250	0	1,250	0	1,250	0	1,250	0	1,250	0	1,250	0	1,250	0	1,250
Manufacturing	1,453	65	1,518	-715	803	-177	626	197	823	-158	665	-213	452	-88	364	-66	298	-131	167
Wholesale trade	553	-14	539	-50	489	-185	304	172	476	-19	457	-21	436	-13	423	30	453	-6	447
Retail trade	422	43	465	54	519	-30	489	-102	387	-9	378	-22	356	-41	315	-44	271	-29	242
Trans. And Warehouse	841	3	844	-47	797	-13	784	-127	657	-46	611	-58	553	-61	492	-73	419	-60	359
Information	8	0	8	21	29	23	52	-33	19	3	22	4	26	-1	25	-7	18	0	18
Finance & insurance	553	94	647	-569	78	-5	73	-12	61	-61	0	0	0	0	0	0	0	0	0
Real Estate	576	48	624	-110	514	123	637	-154	483	-23	460	-41	419	-24	395	-61	334	-37	297
Professional Services	481	-27	454	78	532	-205	327	8	335	-37	298	-39	259	-68	191	-34	157	-45	112
Mngmnt of Companies	1,831	72	1,903	504	2,407	42	2,449	-623	1,826	-1	1,825	-20	1,805	-151	1,654	-199	1,455	-93	1,362
Administrative Support	236	-195	41	20	61	-20	41	-1	40	-40	0	0	0	0	0	0	0	0	0
Educational services	1,180	75	1,255	64	1,319	774	2,093	-1,127	966	-54	912	-86	826	-123	703	-348	355	-153	202
Health Care	116	27	143	-6	137	18	155	25	180	16	196	13	209	18	227	18	245	16	261
Arts and Entertainment	5,381	221	5,602	-171	5,431	120	5,551	-188	5,363	-5	5,358	-61	5,297	-34	5,263	-72	5,191	-43	5,148
Accommodations	61	-4	57	12	69	-3	66	47	113	13	126	17	143	19	162	24	186	18	204
Other Services	2,041	-36	2,005	105	2,110	-16	2,094	-535	1,559	-121	1,438	-142	1,296	-204	1,092	-251	841	-180	661
Auxiliaries	933	42	975	-3	972	-7	965	-60	905	-7	898	-19	879	-23	856	-27	829	-19	810
Unclassified Estblhmnt	37	-34	3	0	3	0	3	0	3	-3	0	0	0	0	0	0	0	0	0
Total	17,953	380	18,333	-813	17,520	439	17,959	-2,513	15,446	-552	14,894	-688	14,206	-794	13,412	-1,110	12,302	-762	11,540

Zip Code Area (Acres)	1158.739
Area within Trade Area	313.552
Weight	0.2706

Data Source: Zip Code Business Patterns

Table 4: Employment Projections for Zip Code 28205

	1998	▲	1999	▲	2000	▲	2001	▲	2002	▲*	2003*	▲*	2004*	▲*	2005*	▲*	2006*	▲*	2007*
Forestry, Fishing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	1,635	-290	1,345	-205	1,140	311	1,451	-135	1,316	-80	1,236	-27	1,209	17	1,226	-56	1,170	-37	1,133
Manufacturing	1,346	47	1,393	-233	1,160	23	1,183	-274	909	-109	800	-148	652	-127	525	-165	360	-137	223
Wholesale trade	984	319	1,303	152	1,455	-127	1,328	-490	838	-37	801	-126	675	-195	480	-212	268	-143	125
Retail trade	2,938	-122	2,816	93	2,909	-174	2,735	-236	2,499	-110	2,389	-107	2,282	-157	2,125	-153	1,972	-132	1,840
Trans. And Warehouse	296	-34	262	65	327	-40	287	49	336	10	346	21	367	10	377	23	400	16	416
Information	109	44	153	116	269	-5	264	9	273	41	314	40	354	21	375	28	403	33	436
Finance & insurance	307	10	317	-29	288	66	354	19	373	17	390	18	408	30	438	21	459	22	481
Real Estate	483	-29	454	-1	453	33	486	4	490	2	492	10	502	12	514	7	521	8	529
Professional Services	844	81	925	2	927	5	932	-228	704	-35	669	-64	605	-81	524	-102	422	-71	351
Mngmnt of Companies	425	-19	406	4	410	-11	399	0	399	-7	392	-4	388	-6	382	-4	378	-5	373
Administrative Support	1,352	789	2,141	549	2,690	644	3,334	-1,916	1,418	17	1,435	-177	1,258	-358	900	-609	291	-282	9
Educational services	211	-95	116	-40	76	45	121	86	207	-1	206	23	229	38	267	37	304	24	328
Health Care	1,042	11	1,053	124	1,177	-158	1,019	4	1,023	-5	1,018	-9	1,009	-42	967	-13	954	-17	937
Arts and Entertainment	310	-63	247	52	299	-64	235	-4	231	-20	211	-9	202	-24	178	-14	164	-17	147
Accommodations	2,231	-339	1,892	-209	1,683	68	1,751	-236	1,515	-179	1,336	-139	1,197	-122	1,075	-169	906	-152	754
Other Services	1,044	-69	975	89	1,064	-80	984	185	1,169	31	1,200	56	1,256	48	1,304	80	1,384	54	1,438
Auxiliaries	27	-7	20	42	62	0	62	-25	37	3	40	5	45	-4	41	-5	36	0	36
Unclassified Estblhmnt	84	-34	50	27	77	-47	30	-25	5	-5	0	0	0	0	0	0	0	0	0
Total	15,668	200	15,868	598	16,466	489	16,955	-3,213	13,742	-467	13,275	-637	12,638	-940	11,698	-1,306	10,392	-836	9,556

Zip Code Area (Acres)	7627.248
Area within Trade Area	29.536
Weight	0.0039

Data Source: Zip Code Business Patterns

Appendix D4 cont.: Employment Data, Projections and Weight for each Zip Code

Table 5: Employment Projections for Zip Code 28206

	1998	▲	1999	▲	2000	▲	2001	▲	2002	▲*	2003*	▲*	2004*	▲*	2005*	▲*	2006*	▲*	2007*
Forestry, Fishing	35	-20	15	0	15	0	15	0	15	-5	10	-1	9	-2	7	-2	5	-3	2
Utilities	1,447	29	1,476	58	1,534	362	1,896	-210	1,686	60	1,746	68	1,814	70	1,884	-3	1,881	49	1,930
Construction	2,467	97	2,564	-40	2,524	-117	2,407	-294	2,113	-89	2,024	-135	1,889	-159	1,730	-169	1,561	-138	1,423
Manufacturing	3,857	-376	3,481	-201	3,280	-382	2,898	-369	2,529	-332	2,197	-321	1,876	-351	1,525	-343	1,182	-337	845
Wholesale trade	874	115	989	-52	937	159	1,096	-254	842	-8	834	-39	795	-36	759	-84	675	-42	633
Retail trade	3,696	312	4,008	828	4,836	-198	4,638	-527	4,111	104	4,215	52	4,267	-142	4,125	-128	3,997	-29	3,968
Trans. And Warehouse	418	105	523	37	560	-5	555	-77	478	15	493	-8	485	-19	466	-22	444	-9	435
Information	118	96	214	76	290	-167	123	-69	54	-16	38	-38	0	0	0	0	0	0	0
Finance & insurance	417	40	457	-124	333	-33	300	91	391	-7	384	-18	366	8	374	19	393	1	394
Real Estate	190	68	258	41	299	55	354	-86	268	20	288	8	296	-1	295	-15	280	3	283
Professional Services	860	-555	305	-118	187	785	972	-42	930	18	948	161	1,109	231	1,340	92	1,432	126	1,558
Mngmnt of Companies	1,939	-105	1,834	-86	1,748	165	1,913	-93	1,820	-30	1,790	-11	1,779	8	1,787	-32	1,755	-16	1,739
Administrative Support	321	-7	314	32	346	-3	343	-308	35	-1	34	0	34	0	34	0	34	0	34
Educational services	49	-2	47	-32	15	17	32	373	405	89	494	112	606	148	754	181	935	133	1,068
Health Care	447	17	464	-73	391	-87	304	-205	99	-87	12	-1	11	-11	0	0	0	0	0
Arts and Entertainment	1,551	-548	1,003	1,032	2,035	-7	2,028	-1,720	308	-308	0	0	0	0	0	0	0	0	0
Accommodations	291	0	291	0	291	-120	171	722	893	151	1,044	188	1,232	235	1,467	324	1,791	225	2,016
Other Services	3	0	3	5	8	7	15	101	116	28	144	35	179	43	222	52	274	40	314
Auxiliaries	0	0	0	0	0	0	0	8	8	2	10	3	13	3	16	4	20	3	23
Unclassified Estblhmnt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	18,980	-734	18,246	1,383	19,629	431	20,060	-2,959	17,101	-396	16,705	55	16,760	25	16,785	-126	16,659	6	16,665

Zip Code Area (Acres)	4525.371
Area within Trade Area	280.680
Weight	0.0620

Data Source: Zip Code Business Patterns

Appendix S1: Trade Area Defined at the Parcel Level

Appendix S2: Attribute Table for Trade Area Defined at the Parcel Level

ArcView GIS 3.3

File Edit Table Field Window Help

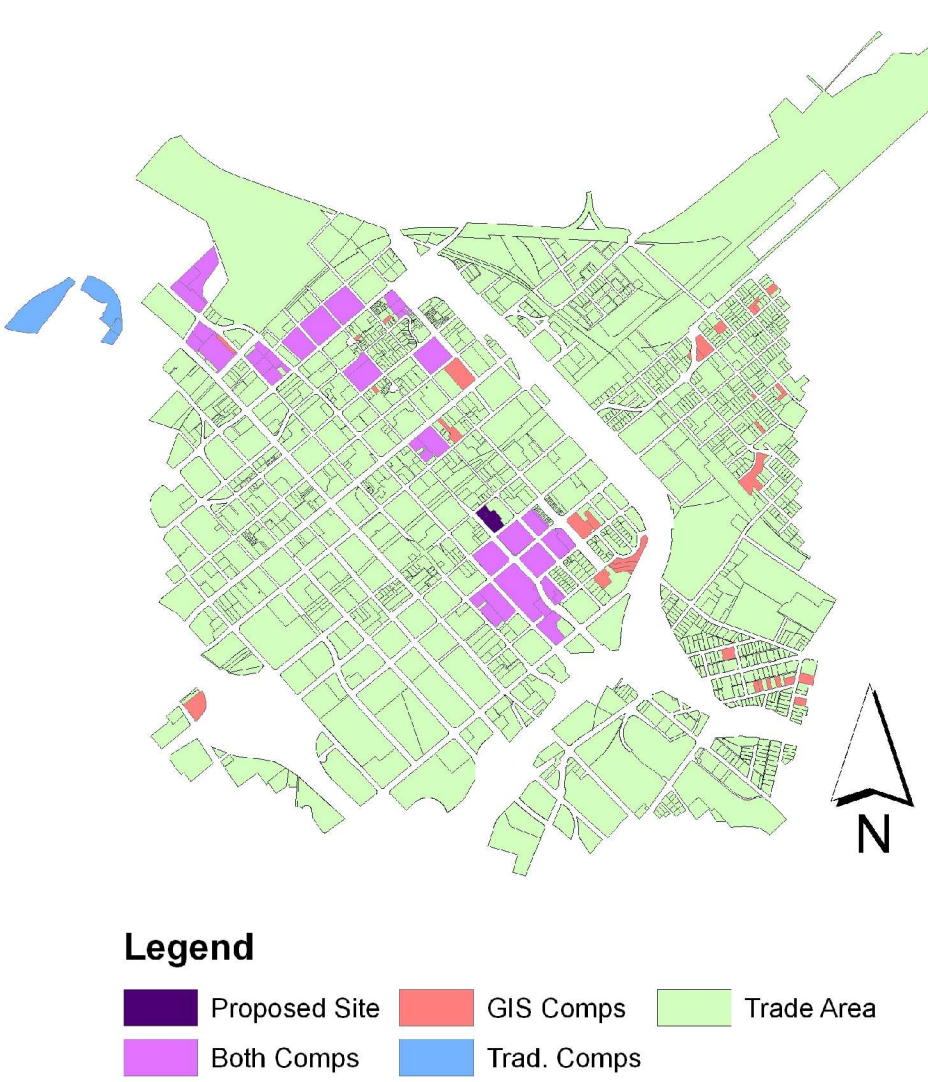
30 of 3402 selected

Attributes of Prcltrdr.shp

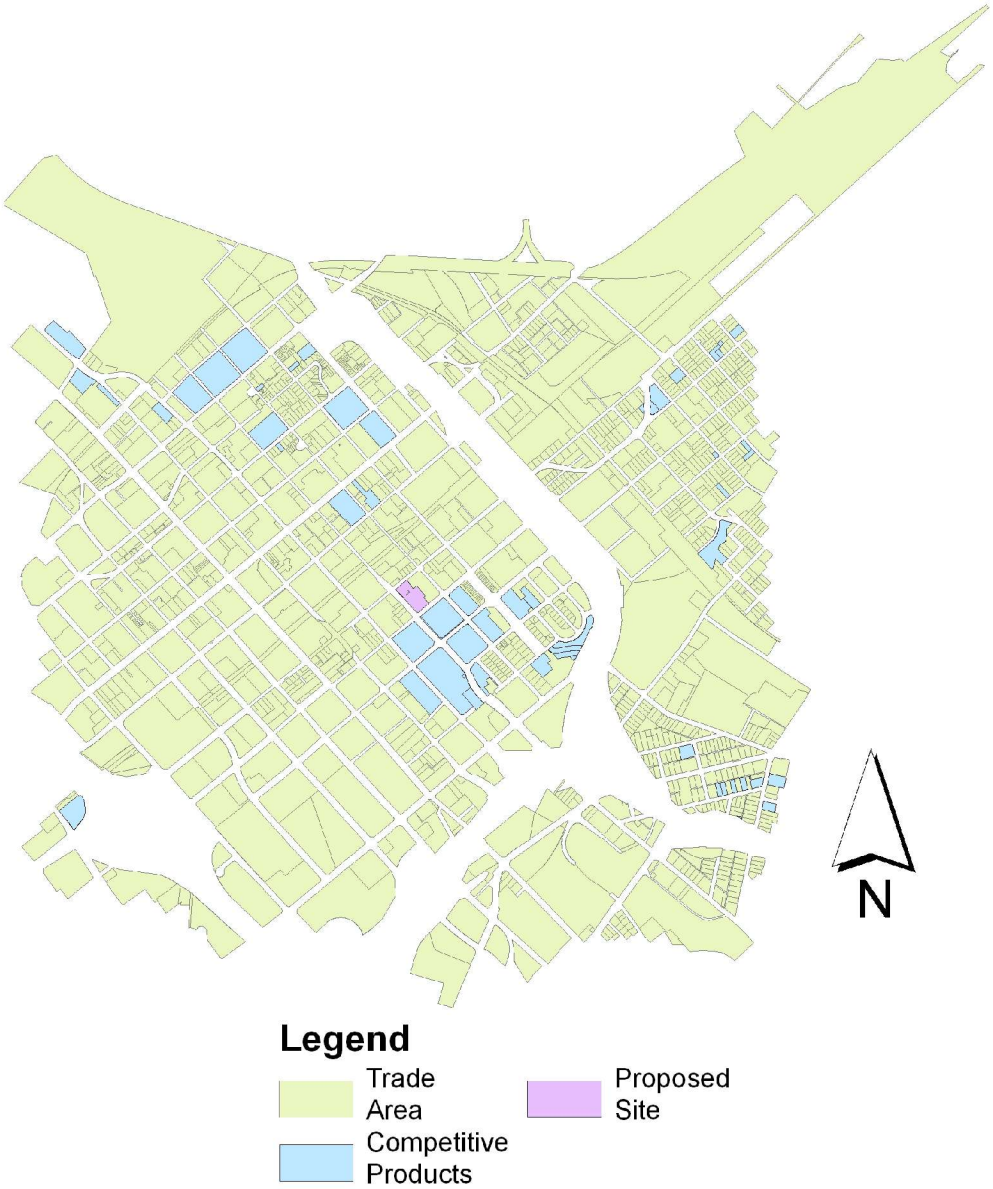
Dateannewd	Landusecod	Netbldgval	Physicalde	Propertyus	Descproper	Neighbourh	Ownertype	Ownerna	Accountyp	Parlegalde	Parlandun
	A500	150600.00000000000	AV	04	Office	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	CA
	A500	162500.00000000000	AV	05	Multi-Family	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	CA
	A500	162500.00000000000	AV	05	Multi-Family	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	CA
	A500	239600.00000000000	AV	04	Office	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	CA
	A500	162500.00000000000	AV	05	Multi-Family	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	CA
	A500	162500.00000000000	AV	05	Multi-Family	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	CA
	A500	162500.00000000000	AV	05	Multi-Family	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	CA
	A500	0.00000000000				APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	P9-11B9M332-95	
	A500	0.00000000000				APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA (PT ALEXANDER PARK)	
	R111	0.00000000000				APARTMENT - NORTHEAST-1 SUE		1	HOMEOWNER	NA	DE
	A500	71100.00000000000	AV	05	Multi-Family	APARTMENT - NORTHEAST-1 SUE		1	INDIVIDUAL	L14B10M332 95	
	A500	0.00000000000				APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	NA	
	7100	52100.00000000000	AV	10	Govt-Inst	APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	1139 N ALEXANDER ST	
	A500	0.00000000000				APARTMENT - NORTHEAST-1 SUE		1	NC CORP	PARKWOOD AVE	
	A500	0.00000000000				APARTMENT - NORTHEAST-1 SUE		1	EXEMPT	P11B6M209-458 OFF 18TH S	
	A500	0.00000000000				APARTMENT - NORTHEAST-1 SUE		1	NC CORP	1407 N CALDWELL ST	
	A500	28759200.0000000000	AV	05	Multi-Family	APARTMENT - SOUTHEAST-1 SUB		1	NC CORP	NA	GA
	A500	10966400.0000000000	AV	07	Commercial	APARTMENT - SOUTHEAST-1 SUB		1	NC CORP	NA	GA
	C700	102900.00000000000	AV	01	Single-Fam	COMM E MOREHEAD ST		1	EXEMPT	NA	CA
	C700	333100.00000000000	AV	10	Govt-Inst	COMM E MOREHEAD ST		1	EXEMPT	NA	CA
	C700	1041200.00000000000	AV	10	Govt-Inst	COMM E MOREHEAD ST		1	EXEMPT	L2 B3	
	C700	159200.00000000000	AV	04	Office	COMM E MOREHEAD ST		1	EXEMPT	NA	CA
	R100	122500.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L14 M29-58	SU
	R100	152700.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN	HUSBAND	1	INDIVIDUAL	L10 M29-58	SU
	9010	0.00000000000				COMM/DOWNTOWN		1	EXEMPT	CROSSWALK OVER S COLLE	
	R100	196600.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN	RIGHTS SURV	1	INDIVIDUAL	L8 B3 M32-959	SU
	R100	219100.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L7 B3 M32-959	SU
	R100	195300.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L9A B3 M36-435	SU
	R100	182000.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN	HUSBAND	1	INDIVIDUAL	L9B B3 M36-435	SU
	R100	198600.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L6 B3 M32-959	SU
	R100	193100.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L5 B3 M32-959	SU
	R100	217400.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L4 B3 M32-959	SU
	R100	253200.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L3 B3 M32-959	SU
	R100	205400.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L9 B4 M32-959	SU
	R100	201700.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN	RIGHTS SURV	1	INDIVIDUAL	L8 B4 M32-959	SU
	R100	207600.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN	HUSBAND	1	INDIVIDUAL	L2 B3 M32-959	SU
	R100	199400.00000000000	AV	01	Single-Fam	COMM/DOWNTOWN		1	INDIVIDUAL	L1B B3 M36-435	SU

Competitive apartments in the trade area are selected from the attribute table. For Mecklenburg County the data is stored in the "Neighborh" attribute, which is the highlighted column above. When the data is sorted ascending by this column, apartments can be selected from the table easily.

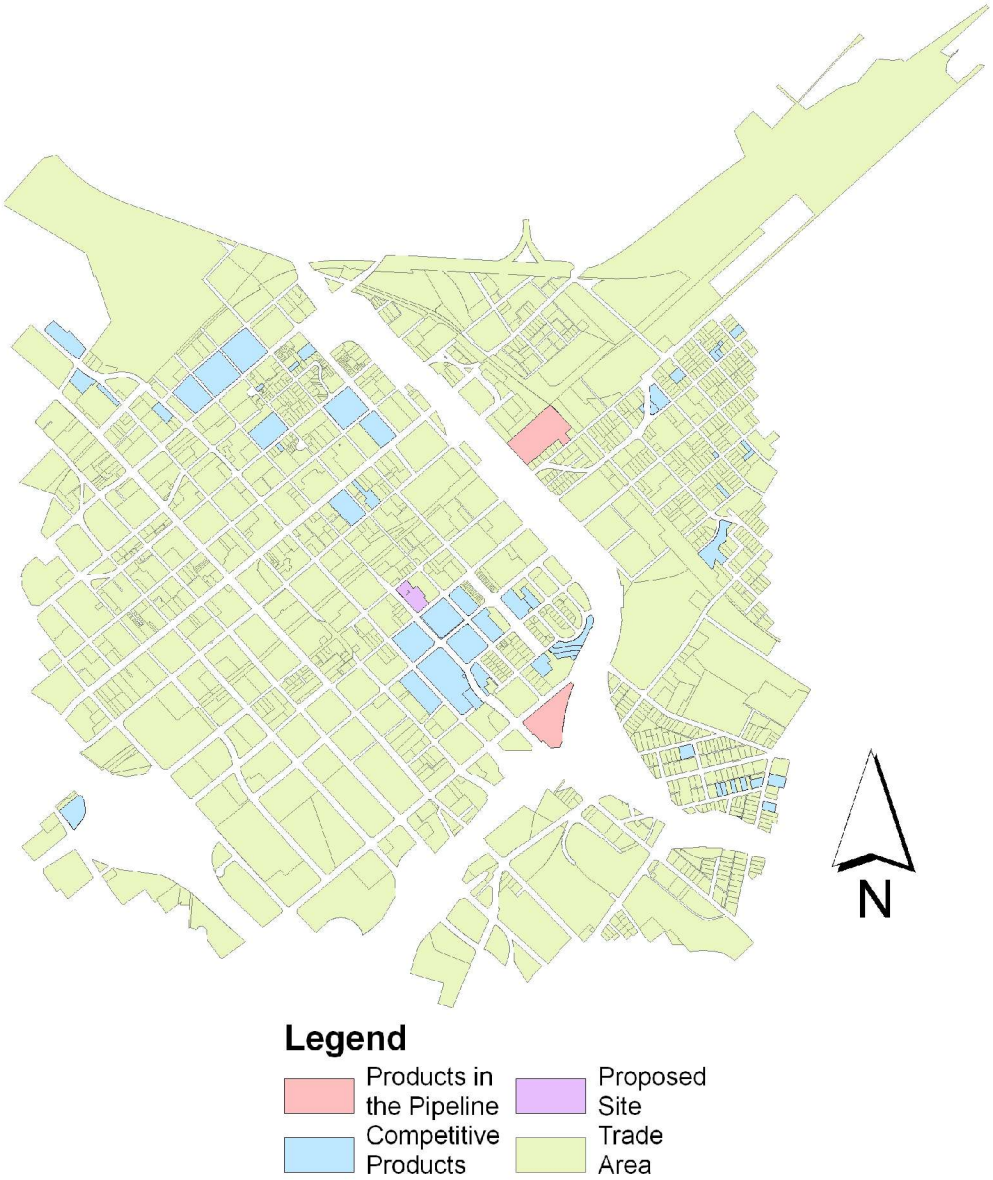
Appendix S3: Comparision Map of Traditionally Defined Competitive Product and GIS Defined Products



Appendix S4: Competitive Products in the Trade Area



Appendix S5: Competitive Products in the Trade Area and in the Pipeline



Appendix S6: Expanded Supply Data Table

Studio						
Property	**Bathrooms**	**2005 Rent**	**SF**	**Rent/SF**	**Rent/Bed**	**Built**
Charlotte Cotton Mills S-1	1	900	624	1.44	900	2003
Post Uptown S-1	1	799	534	1.50	799	1999
Post Gateway S-1	1	600	353	1.70	600	2000
5th and Poplar S-1	1	-	720	0.00	-	2003
	Average	**575**	**558**	**1.16**	**575**	
	High	**900**	**720**	**1.70**	**900**	
	Low	**0**	**353**	**0.00**	**0**	
	Median	**700**	**579**	**1.47**	**700**	

1 Bedrooms 1 Bathroom						
Property	**Bathrooms**	**2005 Rent**	**SF**	**Rent/SF**	**Rent/Bed**	**Built**
Charlotte Cotton Mills A-1	1	1,100	654	1.68	1,100	2003
Post Gateway A-1	1	995	861	1.16	995	2000
Sycamore Green A-1	1	948	765	1.24	948	2003
Sycamore Green A-2	1	948	815	1.16	948	2003
Post Uptown A-1	1	915	782	1.17	915	1999
The Fourth Ward Square A-4	1	915	792	1.16	915	1991
The Arbors A-1	1	825	774	1.07	825	0
The Arbors A-2	1	825	794	1.04	825	0
The Fourth Ward Square A-1	1	770	560	1.38	770	1991
First Ward Place A-1	1	745	725	1.03	745	2000
First Ward Place A-2	1	745	725	1.03	745	2000
Canterbury Court A-1	1	680	660	1.03	680	0
5th and Poplar A-1	1	-	821	0.00	-	2003
5th and Poplar A-2	1	-	1,172	0.00	-	2003
	Average	**744**	**779**	**1.01**	**744**	
	High	**1,100**	**1,172**	**1.68**	**1,100**	
	Low	**0**	**560**	**0.00**	**0**	
	Median	**825**	**778**	**1.11**	**825**	

2 Bedrooms 1 Bathroom						
Property	**Bathrooms**	**2005 Rent**	**SF**	**Rent/SF**	**Rent/Bed**	**Built**
Charlotte Cotton Mills B-1	1	1,200	956	1.26	1,200	2003
	Average	**1,200**	**956**	**1.26**	**1,200**	
	High	**1,200**	**956**	**1.26**	**1,200**	
	Low	**1,200**	**956**	**1.26**	**1,200**	
	Median	**1,200**	**956**	**1.26**	**1,200**	

Source: Brian Oxford

Appendix S6 cont.: Expanded Supply Data Table

2 Bedrooms 2 Bathrooms						
Property	**Bathrooms**	**2005 Rent**	**SF**	**Rent/SF**	**Rent/Bed**	**Built**
Sycamore Green B-2	2	1,503	1,321	1.14	752	2003
Charlotte Cotton Mills B-2	2	1,300	1,120	1.16	650	2003
Sycamore Green B-1	2	1,240	1,137	1.09	620	2003
Post Gateway B-1	2	1,200	1,084	1.11	600	2000
Post Uptown B-1	2	1,200	1,146	1.05	600	1999
The Fourth Ward Square B-3	2	1,190	1,212	0.98	595	1991
The Arbors B-1	2	1,075	1,052	1.02	538	0
The Fourth Ward Square B-1	2.5	1,010	992	1.02	505	1991
First Ward Place B-4	2.5	885	1,070	0.83	443	2000
First Ward Place B-5	2.5	885	1,070	0.83	443	2000
First Ward Place B-1	2	865	1,024	0.84	433	2000
First Ward Place B-2	2	865	1,024	0.84	433	2000
First Ward Place B-3	2	865	1,048	0.83	433	2000
Canterbury Court B-1	2	800	880	0.91	400	0
5th and Poplar B-1	2	-	1,168	0.00	-	0
5th and Poplar B-2	2	-	1,260	0.00	-	0
	Average	**930**	**1,101**	**0.85**	**465**	
	High	**1,503**	**1,321**	**1.16**	**752**	
	Low	**0**	**880**	**0.00**	**0**	
	Median	**948**	**1,077**	**0.95**	**474**	

3 Bedrooms 2 Bathroom						
Property	**Bathrooms**	**2005 Rent**	**SF**	**Rent/SF**	**Rent/Bed**	**Built**
Post Uptown C-1	2	1,675	1,322	1.27	838	1999
Sycamore Green C-1	2	1,503	1,321	1.14	752	2003
First Ward Place C-2	2.5	1,075	1,310	0.82	538	2000
First Ward Place C-1	2	1,050	1,290	0.81	525	2000
5th and Poplar C-1	2	-	1,480	0.00	-	2003
5th and Poplar C-2	2	-	1,579	0.00	-	2003
	Average	**884**	**1,384**	**0.67**	**442**	
	High	**1,675**	**1,579**	**1.27**	**838**	
	Low	**0**	**1,290**	**0.00**	**0**	
	Median	**1,063**	**1,322**	**0.82**	**531**	

3 Bedrooms 3 Bathroom						
Property	**Bathrooms**	**2005 Rent**	**SF**	**Rent/SF**	**Rent/Bed**	**Built**
Post Gateway C-1	3	2,000	2,011	0.99	667	2000
	Average	**2,000**	**2,011**	**0.99**	**667**	
	High	**2,000**	**2,011**	**0.99**	**667**	
	Low	**2,000**	**2.011**	**0.99**	**667**	
	Median	**2.000**	**2,011**	**0.99**	**667**	

Source: Brian Oxford